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PLEASE CHECK FOR CHANGE INFORMATION AT THE REAR OF THIS MANUAL.

AA 501 DISTORTION ANALYZER

WITH OPTIONS

INSTRUCTION MANUAL

Tektronix, Inc.
P.O. Box 500
Beaverton, Oregon 97077

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Dave & Lynnette

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TABLE OF CONTENTS

TABLE OF CONTENTS (cont)

WARNING

THE FOLLOWING SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

TABLE OF CONTENTS (cont)

LIST OF ILLUSTRATIONS

LIST OF TABLES

NOTE

The following tables are located in the diagrams foldout section at the rear of this manual.

OPERATORS SAFETY SUMMARY

The general safety information in this part of the summary is for both operating and servicing personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear in this summary.

TERMS

In This Manual

CAUTION statements identify conditions or practices that could result in damage to the equipment or other property.

WARNING statements identify conditions or practices that could result in personal injury or loss of life.

As Marked on Equipment

CAUTION indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property including the equipment itself.

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

SYMBOLS

In This Manual

⚠ This symbol indicates where applicable cautionary or other information is to be found.

As Marked on Equipment

⚡ DANGER — High voltage.

⏚ Protective ground (earth) terminal.

⚠ ATTENTION — refer to manual.

Power Source

This product is intended to operate from a power module connected to a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

Grounding the Product

This product is grounded through the grounding conductor of the power module power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the product input or output terminals. A protective ground connection by way of the grounding conductor in the power module power cord is essential for safe operation.

Danger Arising From Loss of Ground

Upon loss of the protective-ground connection, all accessible conductive parts (including knobs and controls that may appear to be insulating) can render an electric shock.

Use the Proper Fuse

To avoid fire hazard, use only the fuse of correct type, voltage rating and current rating as specified in the parts list for your product.

Refer fuse replacement to qualified service personnel.

Do Not Operate in Explosive Atmospheres

To avoid explosion, do not operate this product in an explosive atmosphere unless it has been specifically certified for such operation.

Do Not Operate Without Covers

To avoid personal injury, do not operate this product without covers or panels installed. Do not apply power to the plug-in via a plug-in extender.

SERVICE SAFETY SUMMARY

FOR QUALIFIED SERVICE PERSONNEL ONLY

Refer also to the preceding Operators Safety Summary.

Do Not Service Alone

Do not perform internal service or adjustment of this product unless another person capable of rendering first aid and resuscitation is present.

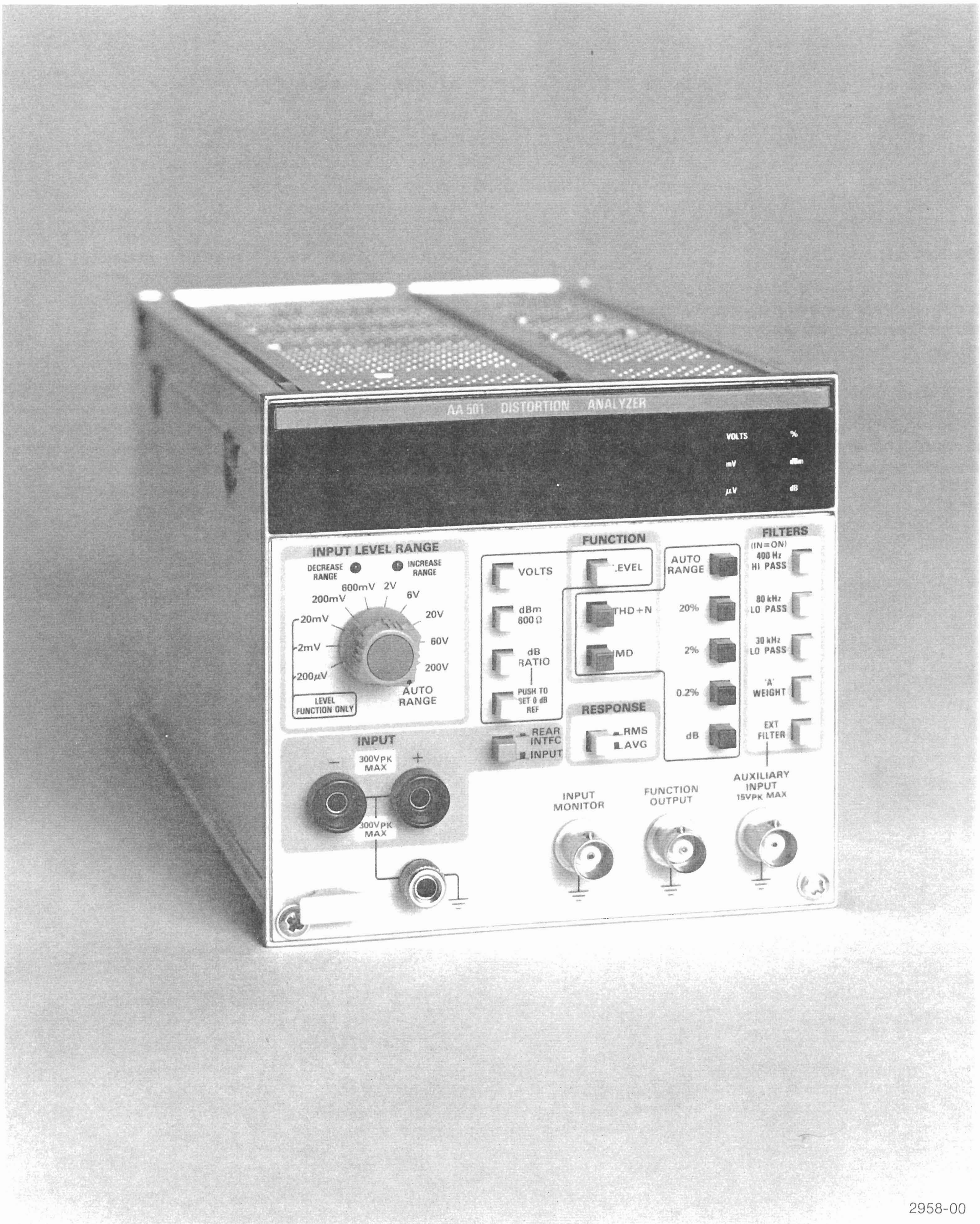
Use Care When Servicing With Power On

Dangerous voltages may exist at several points in this product. To avoid personal injury, do not touch exposed connections and components while power is on.

Disconnect power before removing protective panels, soldering, or replacing components.

Power Source

This product is intended to operate in a power module connected to a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.



AA501 Distortion Analyzer

SPECIFICATION

Instrument Description

The AA 501 is a fully automatic distortion analyzer, packaged as a two-wide TM 500 plug-in. Total harmonic distortion is measured with the standard instrument. Option 01 instruments also measure SMPTE/DIN intermodulation distortion and CCIF two-tone difference frequency distortion. Option 02 instruments permit noise measurements in accordance with CCIR recommendation 468-2 or DIN 45405.

Distortion set level, frequency tuning and nulling are fully automatic, requiring no operator adjustment. Input level range and distortion measurement range selections are fully automatic or may be manually selected. Distortion readout is provided in percent or dB.

The AA 501 is also a high sensitivity, autoranging, audio frequency voltmeter. Readings may be in volts, dBm, or dB relative to any arbitrary reference.

Filters are included which allow measurement of noise to IHF and FCC specifications. Option 02 instruments provide a quasi-peak detector for noise measurements in accordance with CCIR or DIN standards. A hum rejection filter is provided as are provisions for external filters.

All readings are displayed on a 3 1/2 digit readout. An uncalibrated analog readout is also provided to aid in nulling and peaking applications.

Ac to dc conversion is either average or true rms responding, allowing conformance with most standards. Option 02 instruments provide quasi-peak or true rms detection. This feature permits comparison with readings obtained on other instruments.

Ac input and output connections are available on both the front panel and the rear interface. Dc signals, corresponding to the displayed reading, are available through the rear interface. This allows flexibility in interconnection with other instruments such as filters, chart recorders, spectrum analyzers, oscilloscopes, etc.

Performance Conditions

The electrical characteristics in this specification are valid only if the AA 501 has been adjusted at an ambient temperature between +20° C and +30° C. The instrument must be in a noncondensing environment whose limits are described under the environmental part. Allow twenty minutes warm-up time for operation to specified accuracy; sixty minutes after exposure to or storage in a high humidity (condensing) environment. Any conditions that are unique to a particular characteristic are expressly stated as part of that characteristic.

The electrical and environmental performance limits, together with their related validation procedures, comprise a complete statement of the electrical and environmental performance of a calibrated instrument.

Items listed in the Performance Requirements column of the Electrical Characteristics are verified by completing the Performance Check in the Calibration section of this manual. Items listed in the Supplemental Information column are not verified in this manual.

Table 1-1
ELECTRICAL CHARACTERISTICS

Characteristics	Performance Requirements		Supplemental Information
INPUT (all functions)			
Impedance	100 kΩ, ±2%, each side to ground		Full differential. Each side ac coupled through 1 μF and shunted to ground by ≈ 100 pF. Dual banana jack connectors at 0.750 inch spacing with ground connector additionally provided.
Input ranges	200 μV to 200 V in 10 steps (2-6 sequence from 200 mV to 200 V)		Range selection is manual or automatic. Auto-ranging time is typically <1 second. Separate increase range and decrease range indicators illuminate whenever input level does not fall within optimum window for selected range. For specified instrument performance both indicators must be extinguished.
Maximum input voltage			300 V peak, 200 V rms either input to ground or differentially. Will recover without damage from continuous overloads of 120 V rms or 200 V rms for 30 minutes on all ranges. For linear response peak input voltage must not exceed 3 times INPUT LEVEL RANGE setting.
Common mode rejection (inputs shorted)	≥50 dB at 50 or 60 Hz for common mode signals up to one-half of selected input range or 50 mV, whichever is greater.		Typically ≥40 dB to 300 kHz.
LEVEL FUNCTION			
Modes			Volts, dBm (600 Ω), or dB ratio with push to set 0 dB reference. Input range determines display range. Single effective range in dB modes with 0.1 dB resolution. Stored 0 dB reference is unaffected by subsequent changes in mode or function.
Accuracy (V_{in} ≥100 μV with level ranging indicators extinguished)			On the 200 μV range accurcy above 50 kHz is +4%, −6% (+0.5 dB, −0.7 dB). Accuracy with quasi-peak response (Option 02 only) is valid from 20 Hz to 50 kHz only).
	Volts	dBm or dB ratio	
20 Hz to 20 kHz	Within ±2%	±0.3 dB	
10 Hz to 100 kHz	Within ±4%	±0.5 dB	

Table 1-1 (cont)

Characteristics	Performance Requirements	Supplemental Information
Bandwidth	At least 300 kHz with no filters selected.	
Residual noise (Source resistance ≤1 kΩ)	≤3.0 μV (−108 dBm) with 80 kHz, 400 Hz filters and rms response ≤1.5 μV (−114 dBm) with A weighting filter and rms response (standard and Option 01 instruments only) ≤5.0 μV (−104 dBm) with CCIR weighting filter and quasi-peak response (Option 02 only)	
TOTAL HARMONIC DISTORTION PLUS NOISE FUNCTION		
Fundamental frequency range	10 Hz to 100 kHz	Fully automatic tuning and nulling. For proper tuning THD+N ≤10%. After initial tuning THD+N can degrade to 30% without loss of lock for SINAD testing. Typical nulling time is less than 5 s above 20 Hz.
Minimum input level	60 mV (−22 dBm)	
Distortion ranges		Autorange, 20%, 2%, 0.2%, and dB. dB is internally autoranging with single effective display range. Autorange allows measurements above 20%.
Accuracy (THD ≤30% and readings ≥4% of selected distortion range)		Accuracy is limited by residual THD+N and filter selection. Not applicable with quasi-peak response (Option 02 only).
20 Hz to 20 kHz	Within ±10% (±1 dB) for harmonics ≤100 kHz.	
10 Hz to 100 kHz	Within +10%, −30% (+1 dB, −3 dB) for harmonics ≤300 kHz.	
Residual THD+N (V_{in} ≥250 mV, source resistance ≤1 kΩ)		Measured with SG 505 oscillator. All distortion, noise, and nulling error sources combined.
20 Hz to 20 kHz with 80 kHz noise limiting filter and T ≤+40°C	≤0.0025% (−92 dB) average response ≤0.0032% (−90 dB) rms response	
10 Hz to 50 kHz	≤0.0071% (−83 dB), rms response	
50 kHz to 100 kHz	≤0.010% (−80 dB), rms response	
Typical fundamental rejection		At least 10 dB below specified residual THD+N or the actual signal THD, whichever is greater.

Table 1-1 (cont)

Characteristics	Performance Requirements	Supplemental Information
INTERMODULATION DISTORTION FUNCTION		
Operation		Fully automatic SMPTE, DIN, or CCIF difference tone tests depending upon actual input signal whenever respective IMD ≤20%. Distortion ranges are same as THD+N function.
SMPTE and DIN tests		
Lower frequency range		50 Hz to 250 Hz
Upper frequency range		3 kHz to 100 kHz
Level ratio range		1:1 to 5:1 (lower : upper)
Residual IMD (V_{in} ≥250 mV, source resistance ≤1 kΩ, ≤40°C)	≤0.0025% (−92 dB) for 60 Hz-7 kHz or 250 Hz-8 kHz, 4:1 signals, rms response	
CCIF difference tone test (IM components ≤1 kHz)		
Frequency range		4 kHz to 100 kHz
Difference frequency range		80 Hz to 1 kHz
Residual IMD (V_{in} ≥250 mV, source resistance ≤1 kΩ, ≤+40°C)	≤0.0018% (−95 dB) with 14 kHz and 15 kHz, rms response	
Minimum input level	60 mV (−22 dBm)	
Accuracy (IMD ≤30% and readings ≥4% of selected distortion range)	Within ±10% (±1 dB)	Accuracy is limited by residual IMD and filter selection. Not applicable with quasi-peak response (Option 02 only)
FILTERS		
400 Hz high pass	−3 dB at 400 Hz, ±5%; at least −40 dB rejection at 60 Hz	3 pole Butterworth response
80 kHz low pass	−3 dB at 80 kHz, ±5%	3 pole Butterworth response
30 kHz low pass (standard and Option 01 only)	−3 dB at 30 kHz, ±5%	3 pole Butterworth response
22.4 Hz-22.4 kHz (Option 02 only)	−3 dB at 22.4 Hz, ±5% and 22.4 kHz, ±5%	Within specifications of CCIR Recommendation 468-2 and DIN 45405 for unweighted measurement response.
A weighting (standard and Option 01 only)		Within specifications for type 1 sound level meters listed in ANSI S 1.4 1971 (revised 1976) and IEC Recommendation 179.
CCIR WTG (Option 02 only)		Within specifications of CCIR Recommendation 468-2 and DIN 45405 for noise measurements. Functional only with quasi-peak detector (response).

Table 1-1 (cont)

Characteristics	Performance Requirements	Supplemental Information
Auxiliary		Selects front panel AUXILIARY INPUT allowing connection of external filter between it and FUNCTION OUTPUT.
FRONT PANEL SIGNALS		
MONITOR OUTPUT		
$V_{in} \geq 50$ mV	1 V rms, ±10%	Constant amplitude (average response) version of differential input signal. THD is typically ≤0.0010% (−100 dB) from 20 Hz to 20 kHz.
$V_{in} \geq 50$ mV		Approximately 20 times input signal.
Impedance	1 kΩ, ±5%	
FUNCTION OUTPUT		
Signal	1 V, ±3%, for 1000 count volts or % display.	Selected and filtered ac signal actually being measured.
Impedance	1 kΩ, ±5%	
AUXILIARY INPUT		
Sensitivity	1 V, ±3%, for 1000 count volts or % display.	Loop-through accuracy from FUNCTION OUTPUT is ±3%.
Maximum Input Voltage		15 V peak, 6 V peak for linear response.
Impedance	100 kΩ, ±5%	Ac coupled.
DETECTORS AND DISPLAYS		
Detectors (Response)		
RMS		True rms detection.
AVG (standard and Option 01)		Average detection, rms calibrated for sinewaves. Typically reads 1 to 2 dB lower than true rms detection for noise, THD+N, and IMD measurements.
Q-PK (Option 02 only)		Quasi-peak detection, rms calibrated for sinewaves. Within specifications of CCIR Recommendation 468-2 and DIN 45405. Due to the peak hold nature of its response readings considerably higher than rms response will occur with large crest factor signals such as noise. The input range indicators should be ignored and auto-ranging avoided with these types of signals.

Table 1-1 (cont)

Characteristics	Performance Requirements	Supplemental Information
Displays		
Digital		3 1/2 digit, 2000 count LED. Overrange indication is 1, blank, blank, blank.
Analog bar graph		10 segment LED intensity modulated bar graph display of digital readout. Segments are logarithmically activated with approximately 2.5 dB/segment.
MISCELLANEOUS		
Power consumption		≈24 watts
Internal Power Supplies		
+15		Nominally +15.1 V, ±3%
−15		Nominally −15.1 V, ±5%
+5		Nominally +5.0 V, ±5%
Fuse Data		
F1610		3 AG, 1 A, 250 V, fast blow
F1620		3 AG, 1 A, 250 V, fast blow
F1621		3 AG, 1 A, 250 V, fast blow
Recommended adjustment interval		1000 hours or 6 months whichever occurs first
Warm-up time		20 minutes (60 minutes after storage in high humidity environment)

Table 1-2
ENVIRONMENTAL CHARACTERISTICS[a]

Characteristics	Description	
Temperature		Meets MIL-T-28800B, class 5.
Operating	0°C to +50°C	
Non-operating	−55°C to +75°C	
Humidity		Exceeds MIL-T-28800B, class 5.
	95% RH, 0°C to +40°C 45% RH, to +50°C	
Altitude		Exceeds MIL-T-28800B, class 5.
Operating	4.6 km (15,000 feet)	
Non-operating	15 km (50,000 feet)	
Vibration		Exceeds MIL-T-28800B, class 5, when installed in qualified power modules[b].
	0.38 mm (0.015") peak-to-peak, 5 Hz to 55 Hz, 75 minutes.	
Shock		Meets MIL-T-028800B, class 5, when installed in qualified power modules[b].
	30 g's (1/2 sine) 11 ms duration, 3 shocks in each direction along 3 major axes, 18 total shocks.	
Bench handling[c]		Meets MIL-T-28800B, class 5.
	12 drops from 45@, 4" or equilibrium, whichever occurs first.	
Transportation[c]	Qualified under National Safe Transit Association Preshipment Test Procedure 1A-B-1 and 1A-B-2.	
EMC	Within limits of MIL-461A.	
Electrical discharge	20 kV maximum charge applied to instrument case.	

[a]With power module.

[b]Refer to TM 500 power module specifications.

[c]Without power module.

Table 1-3
PHYSICAL CHARACTERISTICS

Characteristics	Description
Maximum Overall Dimensions	
Height	126.0 mm (4.96 inches)
Width	131.2 mm (5.16 inches)
Length	285.5 mm (11.24 inches)
Net Weight	≈1.7 kg (3.75 lbs.)
Finish	
Front Panel	Plastic-aluminum laminate
Chassis	Anodized aluminum

OPERATING INSTRUCTIONS

Preparation For Use

The AA 501 is calibrated and ready for use when received. It operates in any two compartments of a TM 500-Series power module. See the power module instruction manual for line voltage requirements and power module operation. Figure 2-1 shows the AA 501 installation and removal procedure.

CAUTION

Turn the power module off before inserting the AA 501. Otherwise, arcing may occur at the rear interface connectors, reducing their useful life and damage may result to the plug-in circuitry.

Check to see that the plastic barriers on the interconnecting jack of the selected power module compartment match the cutouts in the AA 501 circuit board edge connector. Align the AA 501 chassis with the upper and lower guides of the selected compartment. Press the AA 501 in, to firmly seat the circuit board in the interconnecting jack.

To remove the AA 501 pull the release latch (located in the lower left corner) until the interconnecting jack disengages and the AA 501 slides out.

Check that the AA 501 is fully inserted in the power module. Pull the power switch on the power module. One or more characters in the LED display should now be visible.

Repackaging Information

If the Tektronix instrument is to be shipped to a Tektronix Service Center for service or repair, attach a tag

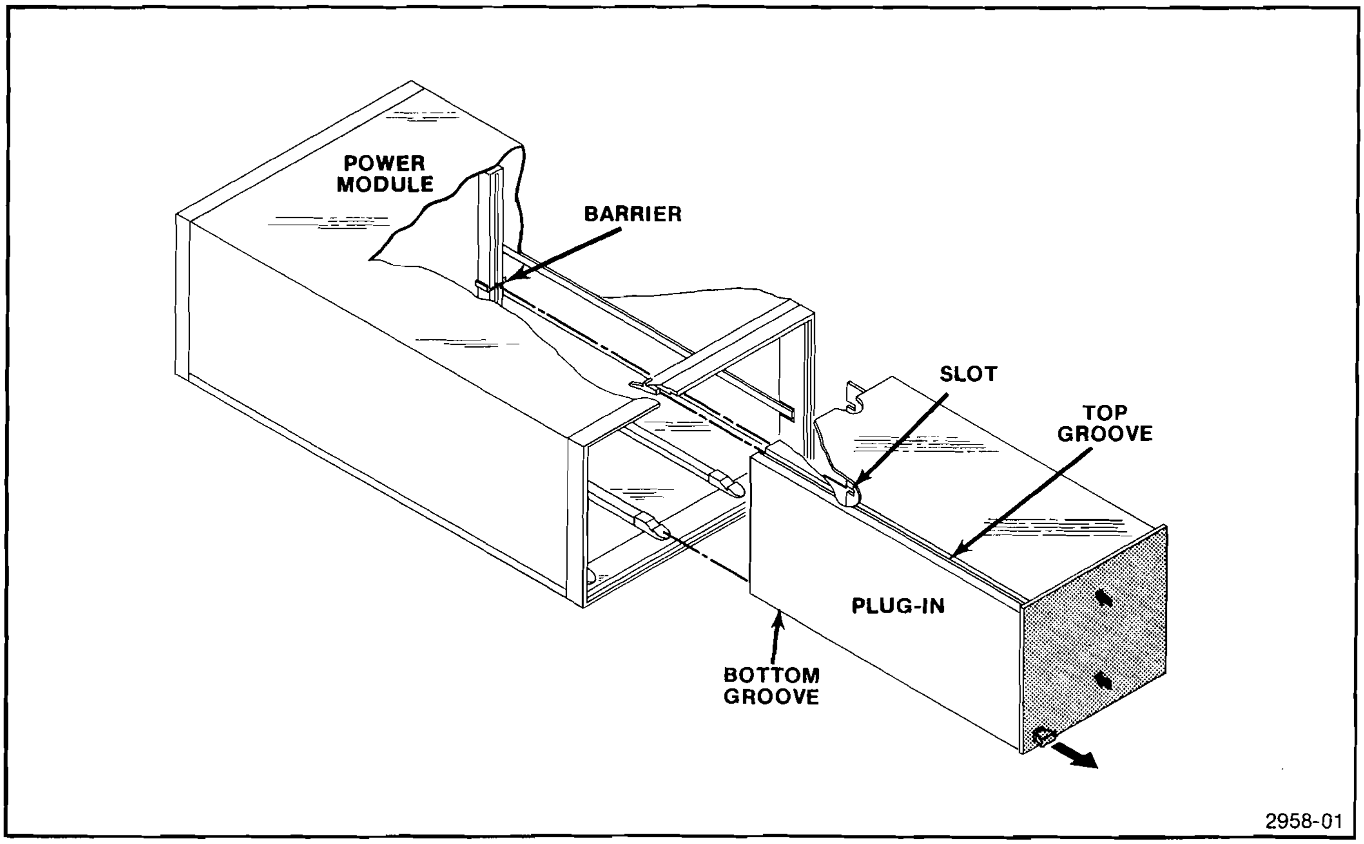


Fig. 2-1. Installation and removal.

showing the owner (with address) and the name of an individual at your firm that can be contacted. Include the complete instrument serial number and a description of the service required.

Save and reuse the package in which your instrument was shipped. If the original packaging is unfit for use or not available, repackage the instrument as follows:

Surround the instrument with polyethylene sheeting to protect the finish of the instrument. Obtain a carton of corrugated cardboard of the correct carton strength and having inside dimensions of no less than six inches more than the instrument dimensions. Cushion the instrument by tightly packing three inches of dunnage or urethane foam between carton and instrument on all sides. Seal the carton with shipping tape or an industrial stapler.

The carton test strength for this instrument is 200 pounds per square inch.

Controls, Connectors, and Indicators

All controls, connectors and indicators (except for the rear interface connector) required for operation of the AA 501 are located on the front panel. Figure 2-2 provides a brief description of all front panel controls, connectors, and indicators.

(1) **INPUT LEVEL RANGE**

Selects input voltage range or AUTORANGE. The three most sensitive ranges operate in the LEVEL FUNCTION only.

(2) **DECREASE RANGE**

When this light is illuminated, reduce the INPUT LEVEL RANGE until the light goes out.

(3) **INCREASE RANGE**

When this light is illuminated, increase the INPUT LEVEL RANGE until the light goes out.

(4) **INPUT**

Differential input terminal. Positive going input signal provides positive going output signal at INPUT MONITOR.

(5) **INPUT**

Differential input terminal. Negative going input signal provides positive going output at INPUT MONITOR.

(6) **Release Latch**

(7) **LEVEL**

Button in selects input level measuring function.

(8) **VOLTS**

Button in selects voltage units for level function.

(9) **dBm 600 Ω**

Button in selects dBm (reference is 1 mW into 600 Ω) units for level function.

(10) **dB RATIO**

Button in selects dB ratio, with respect to preset level, as units for level function.

(11) **PUSH TO SET 0 dB REF**

Push button to set display to 0 with input signal applied to INPUT terminals in LEVEL function. dB RATIO and LEVEL pushbuttons must be in for this feature to operate.

(12) **REAR INTFC-INPUT**

Button in selects rear interface input; button out selects front panel input.

(13) **RESPONSE**

Button in gives RMS detection (responds to the rms value of the input waveform). Button out gives average detection (rms calibrated for sinewaves).

(14) **THD+N**

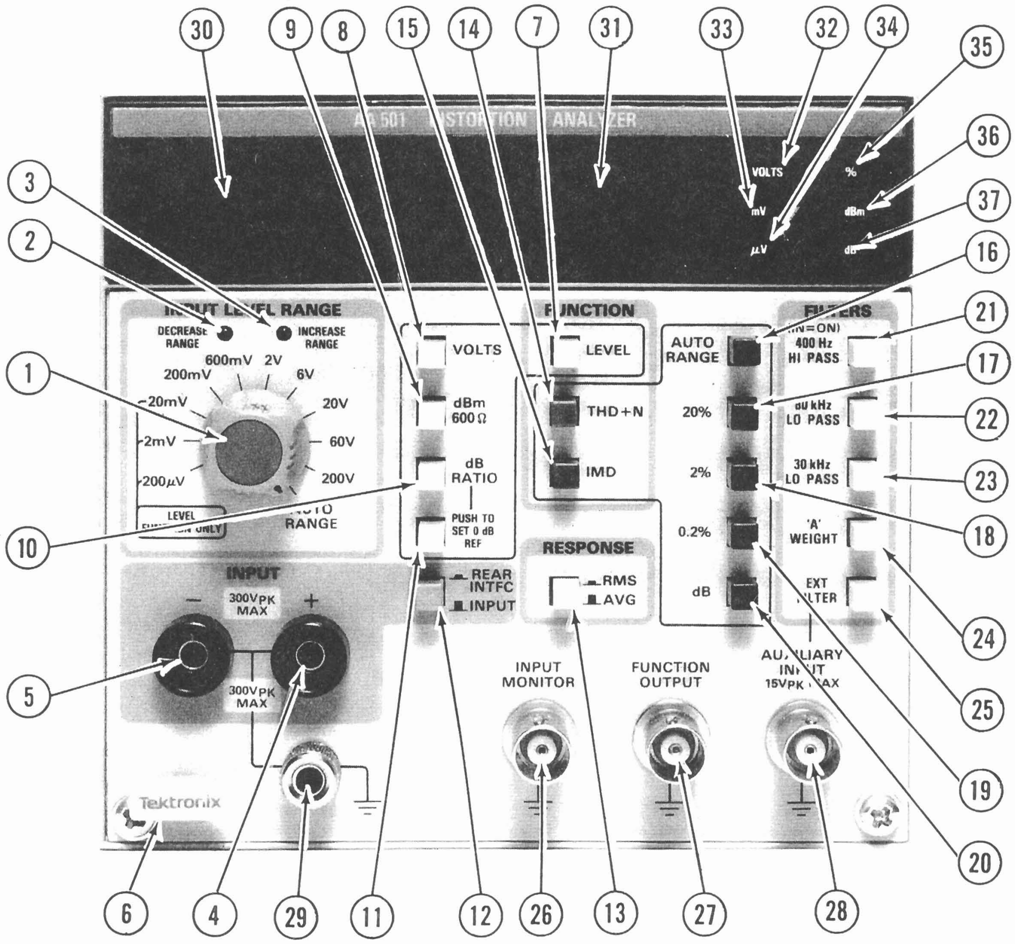
Button in selects total harmonic distortion FUNCTION.

(15) **IMD (Option 01 instruments only)**

Button in selects intermodulation distortion function.

(16) **AUTO RANGE**

Button in selects automatic distortion range selection (0.2% to 100% full scale).



2958-13A

Fig. 2-2. Front panel controls and connectors.

(17) **20%**

Button in selects full scale distortion readout of 20% with 0.01% resolution.

(18) **2%**

Button in selects full scale distortion readout of 2% with 0.001% resolution.

(19) **0.2%**

Button in selects full scale distortion readout of 0.2% with 0.0001% resolution.

(20) **dB**

Selects single equivalent 0 dB to −100 dB distortion display range with 0.1 dB resolution.

(21) **400 Hz HI PASS**

Button in connects filter before detector circuit in all functions.

(22) **80 kHz LO PASS**

Button in connects filter before detector circuit in all functions.

(23) **30 kHz LO PASS**

Button in connects filter before detector circuit in all functions.

(24) **'A' WEIGHTING**

Button in connects filter before detector circuit in all functions.

(25) **EXT FILTER**

Button in allows connection of external filter between FUNCTION OUTPUT and AUXILIARY INPUT in all functions.

(26) **INPUT MONITOR**

Provides a sample of the input signal.

(27) **FUNCTION OUTPUT**

Provides a sample of the selected FUNCTION signal.

(28) **AUXILIARY INPUT**

Provides input to the detector circuit when the EXT FILTER button is pressed.

(29) **Ground**

Provides front panel chassis ground connection.

(30) **LED Bar Graph**

Provides approximate analog display of the digital display for nulling and peaking. Each segment represents about 2.5 dB.

(31) **Digital Display**

3 1/2 digits. Overrange indication is a blanked display with the numeral 1 in the most significant digit position.

(32) **VOLTS**

Illuminated when display units are volts.

(33) **mVOLTS**

Illuminated when display units are millivolts.

(34) **μVOLTS**

Illuminated when display units are microvolts.

(35) **%**

Illuminated when display units are percent.

(36) **dBm**

Illuminated when display units are dBm.

(37) **dB**

Illuminated when display units are dB.

Instrument Connections

To make connections to the AA 501, refer to Fig. 2-3. Connections can be made to the rear interface connector. However, due to possible crosstalk, low level or distortion measurements made through the rear interface may be degraded. To measure signals connected to the front panel make certain the INPUT pushbutton is out. To select the rear interface signal input press the INPUT pushbutton.

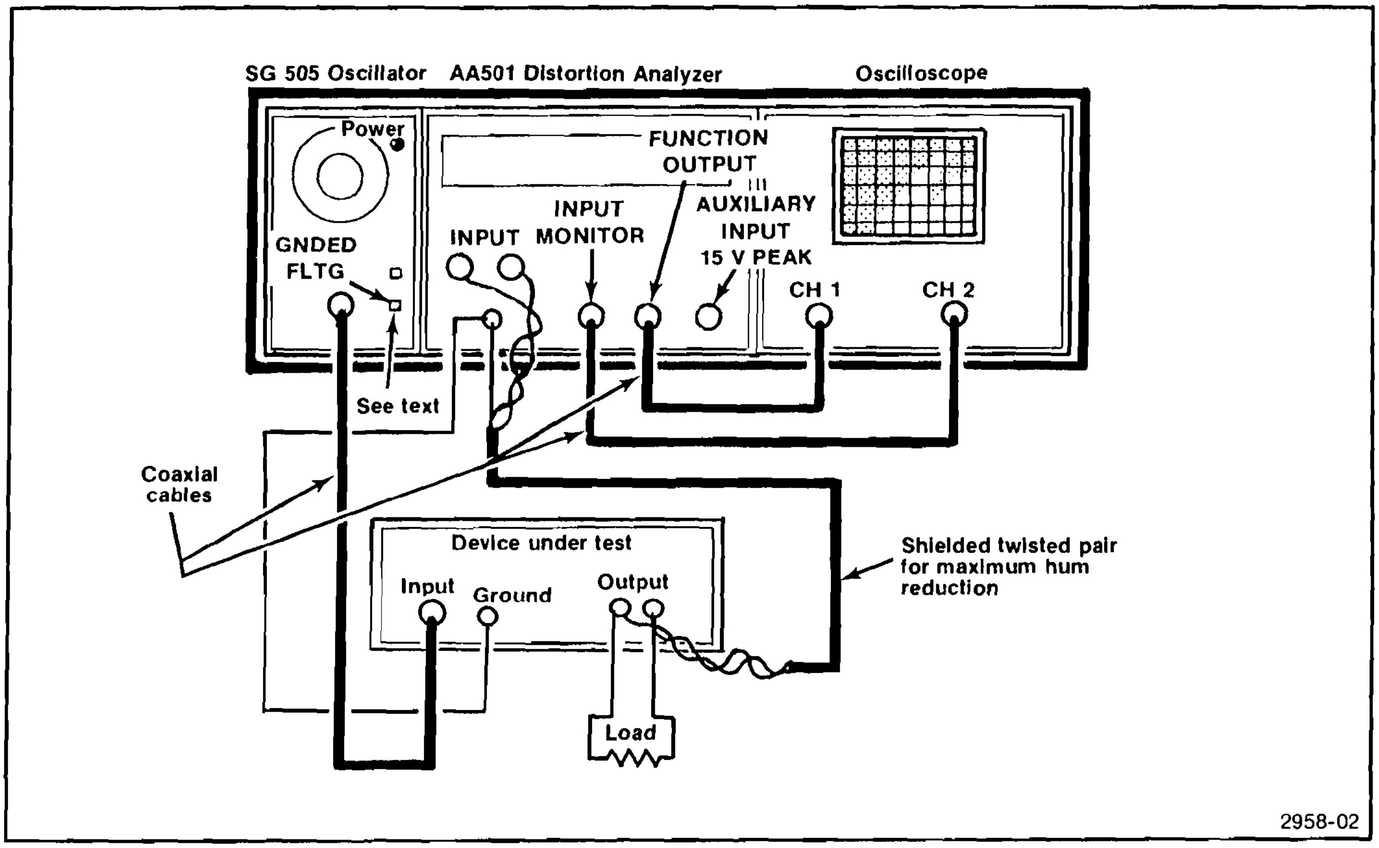


Fig. 2-3. Typical connections for distortion measurements. See text.

CAUTION

Maximum front panel input voltage is 300 V peak, 200 V rms either input to ground or differentially. Maximum rear interface input is 42 V peak and 30 V rms.

The AA 501 input circuitry is protected against accidental overloading. This circuitry will recover without damage from continuous 120 V rms (30 minutes at 200 V rms) overloads in any INPUT LEVEL RANGE setting.

In most cases, for maximum hum rejection, follow the cabling and grounding as shown in the figure. Shielded, twisted pair offers maximum hum and radio frequency interference rejection. Cable shielding, if used, should be grounded only at the AA 501 front panel ground post. Use shielded cable to connect the output of an oscillator, external to the device under test, to the input of the device. Generally, if the device under test has one side of the input grounded, float the output of the external oscillator to avoid possible ground loops. If the input to the device under test is floating (not chassis grounded) then select the grounded mode for the output of the oscillator. Terminate the output of the device under test in its recommended load impedance, or the load impedance specified in the appropriate standard.

The illustration shows an optional oscilloscope for visual monitoring. If connected as shown in the illustration, channel 1 displays a sample of the input signal and channel 2 displays the distortion components when in the IM or THD+N function.

Level Measurements

In the LEVEL function the AA 501 operates as a wide band ac voltmeter. The Specification section of this manual contains operating parameters for this meter. The meter is rms calibrated and either rms or average responding, depending on the position of the RESPONSE pushbutton.

Press the FUNCTION LEVEL pushbutton. The top three buttons to the left of the FUNCTION pushbuttons select readout units as VOLTS, dBm 600 Ω, or dB RATIO. An LED to the right of the display indicates the display units. To measure voltage press the VOLTS pushbutton. If the INCREASE RANGE LED is illuminated, adjust the INPUT LEVEL RANGE control to higher ranges until the

LED goes out. If the DECREASE RANGE LED is illuminated, turn the INPUT LEVEL RANGE control counterclockwise to a lower range until the DECREASE RANGE LED goes out. For specified instrument accuracy adjust the INPUT LEVEL RANGE as just described. However, readings are usable as long as the display is not overranged. Overrange is indicated by a blank display with the numeral 1 in the most significant digit slot. If the INPUT LEVEL RANGE switch is placed in the AUTO RANGE position, the input level adjustment is accomplished automatically. The LED's (VOLTS, mVOLTS or μVOLTS) automatically illuminate showing the proper display units. Notice that the three most sensitive ranges on the INPUT LEVEL RANGE control operate in the LEVEL FUNCTION only.

When the dBm 600 Ω pushbutton is pressed, the LED opposite dBm on the display indicates the display units. The reference level for this measurement, 0 dBm, is 1 mW dissipated in 600 Ω. This is equivalent to 0.7746 V rms developed across a 600 Ω resistor. The INPUT LEVEL RANGE switch operates in the same manner as previously described.

The dB RATIO mode permits direct ratio measurements of two input signal amplitudes. When the dB RATIO pushbutton is pressed, the LED opposite the dB nomenclature on the display is illuminated. To use this feature, press the dB RATIO pushbutton. To establish the input signal as 0 dB reference, push the PUSH TO SET 0 dB REF pushbutton and notice that the display reads all zeros. As the amplitude of the input signal is changed, the display will read the dB ratio of the input signal to the reference signal amplitudes.

There are many useful applications for the dB RATIO mode in measurements of gain-loss, frequency response, S/N ratio, etc. For example, the corner frequency of a filter may be quickly checked. Set the test frequency to some midband value and set the zero dB reference. Adjust the test frequency until the display reads −3.0 dB; this is the corner frequency of the filter.

Gain measurements may be similarly simplified by using this feature. Set the device to be tested as desired and connect the AA 501 input to the input of the device under test. Press the PUSH TO SET 0 dB REF pushbutton. Connect the input of the AA 501 to the device output and read the gain or loss directly from the display. When using the SG 505 oscillator and the TM 500 rear interface feature, changing of external connections to establish the 0 dB input level reference is not necessary. Interconnect the Buffered Main Output of the SG 505 and the rear interface input of the AA 501. Pressing the REAR INTFC pushbutton will conveniently allow direct measurement of the signal level going to the input of the device under test.

When measuring signal to noise ratio or making noise level measurements, it is often desired to employ a frequency dependent weighting network. The AA 501 provides several internal filters as well as facilities for connecting external filters. For information on their operation and use, see the text under Filters in this section of the manual.

Distortion Measurements

Distortion is a measure of signal impurity. It is usually expressed as a percentage or dB ratio of the undesired components to the desired components of a signal. Harmonic distortion is simply the presence of harmonically related or integral multiples of a single pure tone called the fundamental, and can be expressed for each particular harmonic. Total harmonic distortion, or THD, expresses the ratio of the total power in all significant harmonics to that in the fundamental.

A distortion analyzer removes the fundamental of the signal to be investigated and measures the remainder. See Fig. 2-4. Because of the notch filter response, any signal other than the fundamental will influence the measurement. A total harmonic distortion measurement will inevitably include effects from noise or hum. The term THD+N has been recommended[1] to distinguish distortion measurements made with a distortion analyzer from those made with a spectrum analyzer. A spectrum analyzer allows direct measurement of each harmonic. However, it is relatively complex, time consuming, and requires interpretation of a graphic display.

All distortion analyzers are limited ultimately by their internal distortion and noise. Traditionally, distortion analyzer residual noise and distortion have been specified separately. However, because an actual measurement always includes both effects, both residuals must be combined to determine the minimum valid reading. For example, an analyzer rated at 0.002% residual distortion and 0.002% noise may exhibit a THD+N reading of 0.0028% and still be within specification. Also, average responding analyzers may read up to 25% lower than true rms responding analyzers. The AA 501 specifies the combined residual effect with rms response and offers selection of rms or average response.

Distortion analyzers can quantify the nonlinearity of a device or system. The transfer (input vs output) characteristic of a typical device is shown in Fig. 2-5. Ideally this is a straight line. A change in the input produces a proportional change in the output. Since the actual transfer characteristic is nonlinear, a distorted

[1] **IHF-A-202 1978, Standard Methods of Measurement for Audio Amplifiers, The Institute of High Fidelity, Inc., 489 Fifth Avenue, New York, N.Y. 10017**

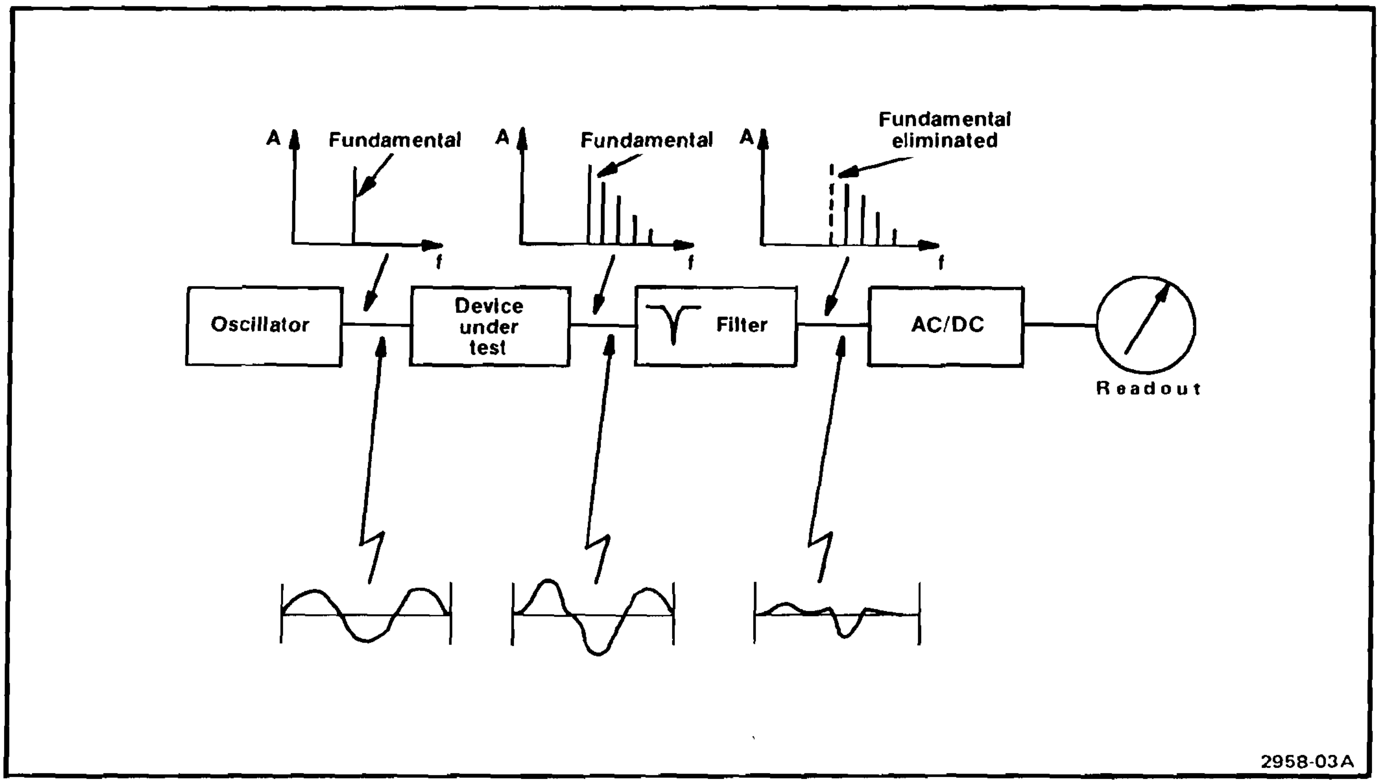


Fig. 2-4. Block diagram of a basic harmonic distortion analyzer.

version of the input waveshape appears at the output. The output waveform is the projection of the input sine wave on the device transfer characteristic as shown in Fig. 2-6. The output waveform is no longer sinusoidal, due to the nonlinearity of the transfer characteristic. Using Fourier series it can be shown that the output waveform consists of the original input sine wave, plus sine waves at integer multiples of the input frequency. These harmonics represent nonlinearity in the device under test. Their amplitudes are related to the degree of nonlinearity.

Distortion Measurement Procedure

All of the controls found on a traditional distortion analyzer are automated on the AA 501. It is only necessary to set the INPUT LEVEL RANGE and distortion range switches to AUTO RANGE, press THD+N and wait briefly for a reading. Minimum input signal amplitude for distortion measurements is 60 mV. To provide greater flexibility the instrument may be manually operated as described in the following paragraphs.

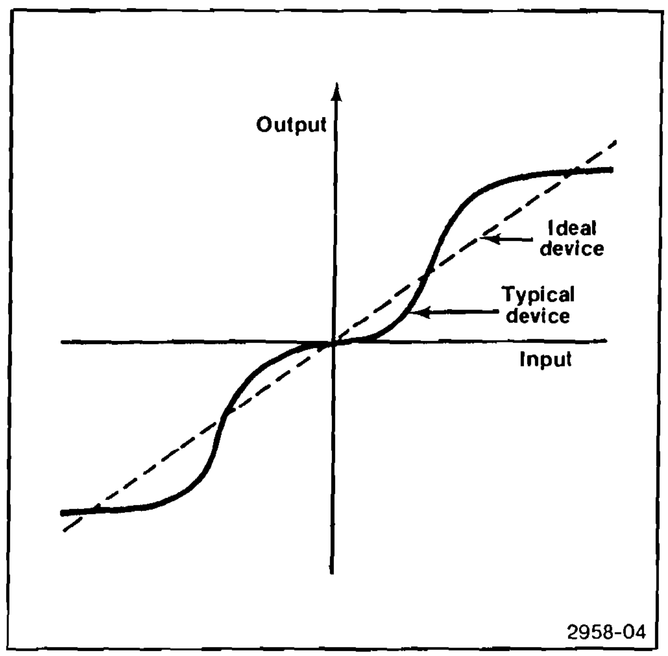


Fig. 2-5. Transfer characteristics of an audio device.

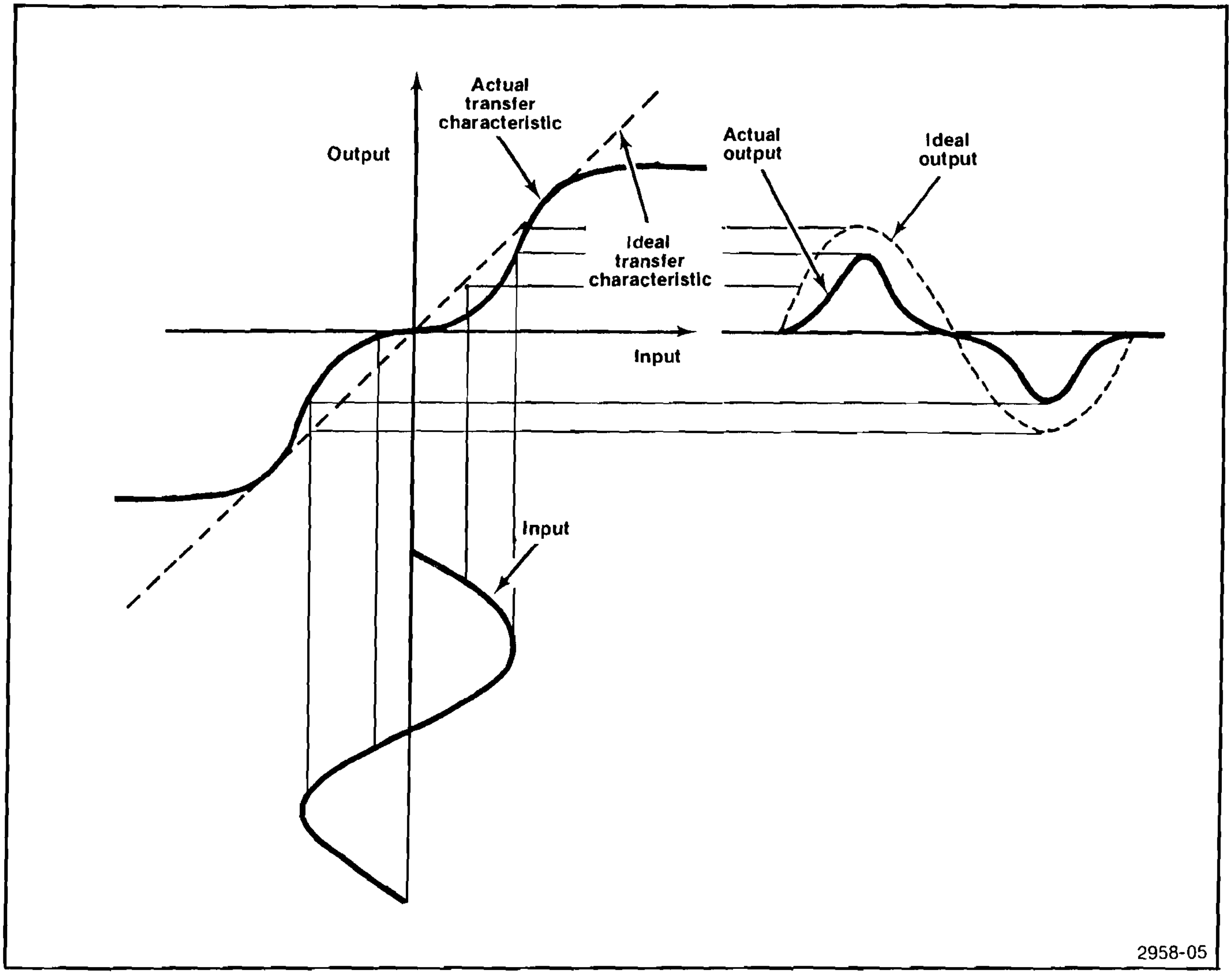


Fig. 2-6. THD test of transfer characteristics.

Adjustment of the input level range control is the same as for level measurements. Manually setting the INPUT LEVEL RANGE control to the correct scale ensures that the input is within the 10 to 12 dB range of the internal auto set-level circuitry. The range lights must be extinguished to make readings to specified accuracy. The 200 μV, 2 mV and 20 mV ranges do not operate in the distortion function.

To manually select a distortion range, press the THD+N button and the desired range button. Selection of AUTO RANGE causes the instrument to autorange the distortion readout. The remaining range pushbuttons cause the instrument to stay in these ranges without autoranging. This can reduce the measurement time slightly if the approximate reading is already known. This is useful in production line testing or in the testing of low distortion equipment. The dB display is effectively a single range; however, internal instrument operation is identical to AUTO RANGE.

When making distortion measurements, the RESPONSE button should normally be in the RMS position. Current distortion measurement standards require the use of rms reading instruments by specifying power summation of each of the components. The AVG mode may be used when making comparisons with readings taken with traditional distortion analyzers. However, it may read up to 25% (2 dB) lower than rms response.

For frequencies below 20 kHz the residual noise in the measurement may be improved by activating the 80 kHz LO PASS filter. If hum (line related components) are interfering with the measurement, they may be removed

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with the 400 Hz HI PASS filter. This filter should not be employed at frequencies below 1 kHz as erroneous readings will result. For more information see text under Filters in this section of this manual.

A distortion analyzer must tune out the fundamental frequency. In the AA 501 all tuning of frequency is done automatically. For input signals with greater than about 20% noise and distortion, care must be taken to ensure proper locking of this circuitry. In most applications which require higher distortion measurements (for example, SINAD[2] testing) the circuitry remains locked after it is initially given a clean signal. To perform a SINAD test, the receiver under test is first given a high level input. The AA 501 will lock onto the audio signal at the output. The rf level feeding the receiver is then reduced until a −12 dB distortion reading is obtained on the AA 501.

[2] **Defined in Electronic Industries Association Standard No. RS 204A, July 1972, Electronic Industries Association, Engineering Department, 2001 Eye St. N.W., Washington, D.C. 20006.**

IM Distortion Measurements (Option 01)

Another measurement of distortion is the interaction of two or more signals. Many tests have been devised to measure this interaction. Three standards are SMPTE[3], DIN[4], and CCIF[5]. The Option 01 AA 501 is capable of automatically selecting and performing all three tests.

To measure intermodulation distortion (IM), according to SMPTE and DIN standards, the device under test is excited with a low frequency and high frequency signal simultaneously (Fig. 2-7). The output signal is high-pass filtered to remove the low frequency component. The high frequency tone is then demodulated, as an AM radio signal. The demodulator output is low-pass filtered to

[3] **Society of Motion Picture and Television Engineers, Standard No. TH 22.51, 862 Scarsdale Avenue, Scarsdale, N.Y. 10583.**

[4] **Deutsches Institut fur Normung e V, No. 45403 Blatt 3 and 4, January 1975, Beuth Verlag GmbH, Berlin 30 and Koln 1.**

[5] **International Telephone Consultative Committee.**

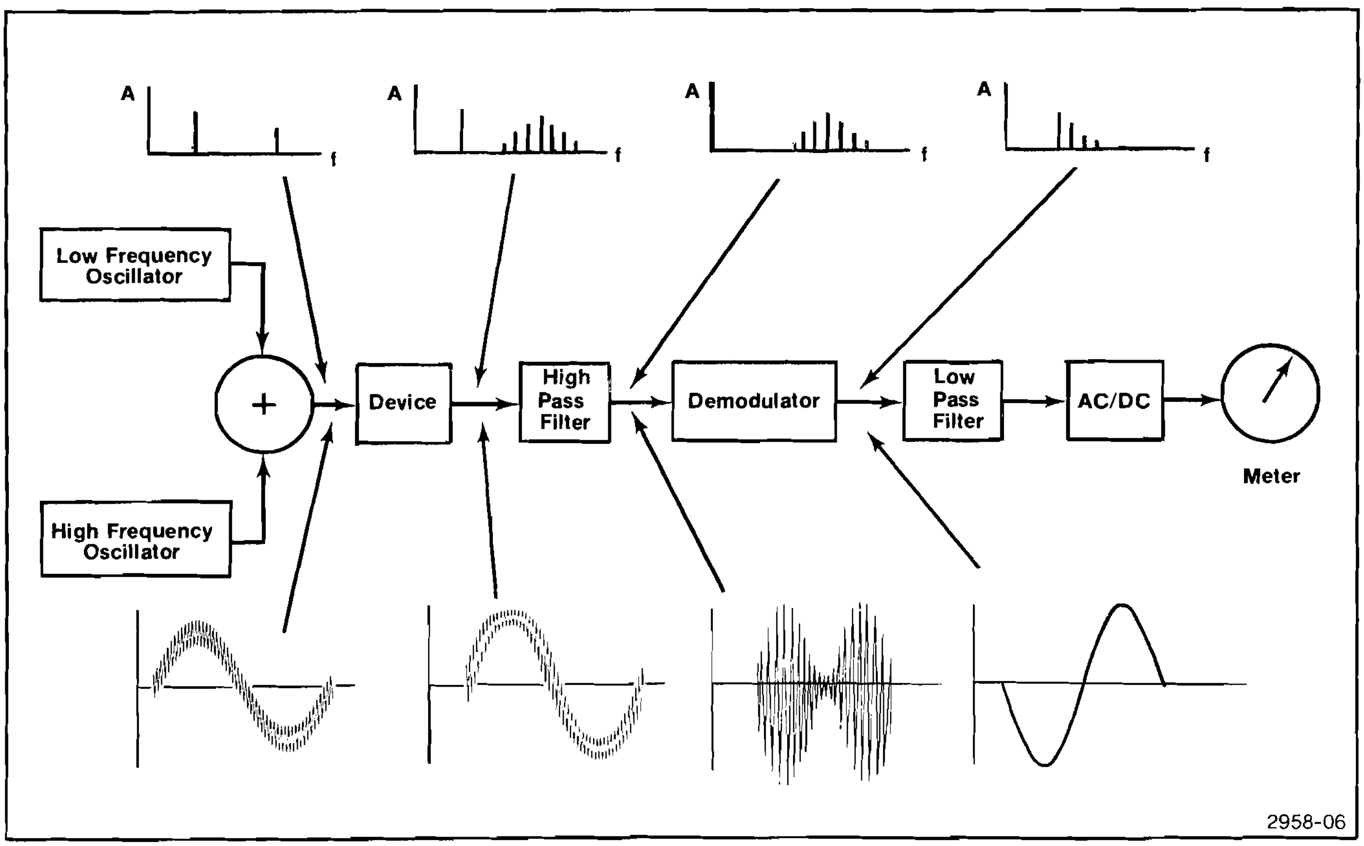


Fig. 2-7. Block diagram of basic IM analyzer.

remove the residual carrier (high frequency) components. The amplitude of the low frequency modulation is displayed as a percentage of the high frequency level.

As shown in Fig. 2-8, when this composite signal is applied to the device, the output waveform is distorted. As the high frequency tone is moved along the transfer characteristic, by the low frequency tone, its amplitude changes. This results in low frequency amplitude modulation of the high frequency tone. This modulation is apparent in the frequency domain as sidebands around the high frequency tone. The power in these sidebands represents nonlinearity in the device under test.

The amplitude ratio of low to high frequencies should be between 4:1 and 1:1. The AA 501 circuitry automatically adjusts calibration to compensate for the selected test signal ratio. Some additional range is provided in this circuitry to enable measurement of devices with nonflat frequency response.

SMPTE standard test frequencies are 60 Hz and 7 kHz. The DIN standard is virtually identical to the SMPTE standard except for the two frequencies used. They may be any pair of octave band center frequencies, with the upper at least eight times as high as the lower (250 Hz and 8 kHz are common). The AA 501 can accept a wide range of test frequencies as shown in the Specification section.

CCIF difference frequency distortion is measured with two high frequency sine waves driving the device under test. Both are of equal level and closely spaced in frequency. Nonlinearities in the device under test cause the sine waves to cross modulate. This creates new signals at various sum and difference frequencies from the inputs. For example, the commonly used 14 kHz and 15 kHz test frequencies produce 1 kHz, 13 kHz, 14 kHz, 15 kHz, 16 kHz, 28 kHz, etc. Ideally, one would measure each new component with a tunable filter such as a spectrum analyzer. However, this is usually limited to an 80 dB dynamic range and is very tedious. A good measure of this

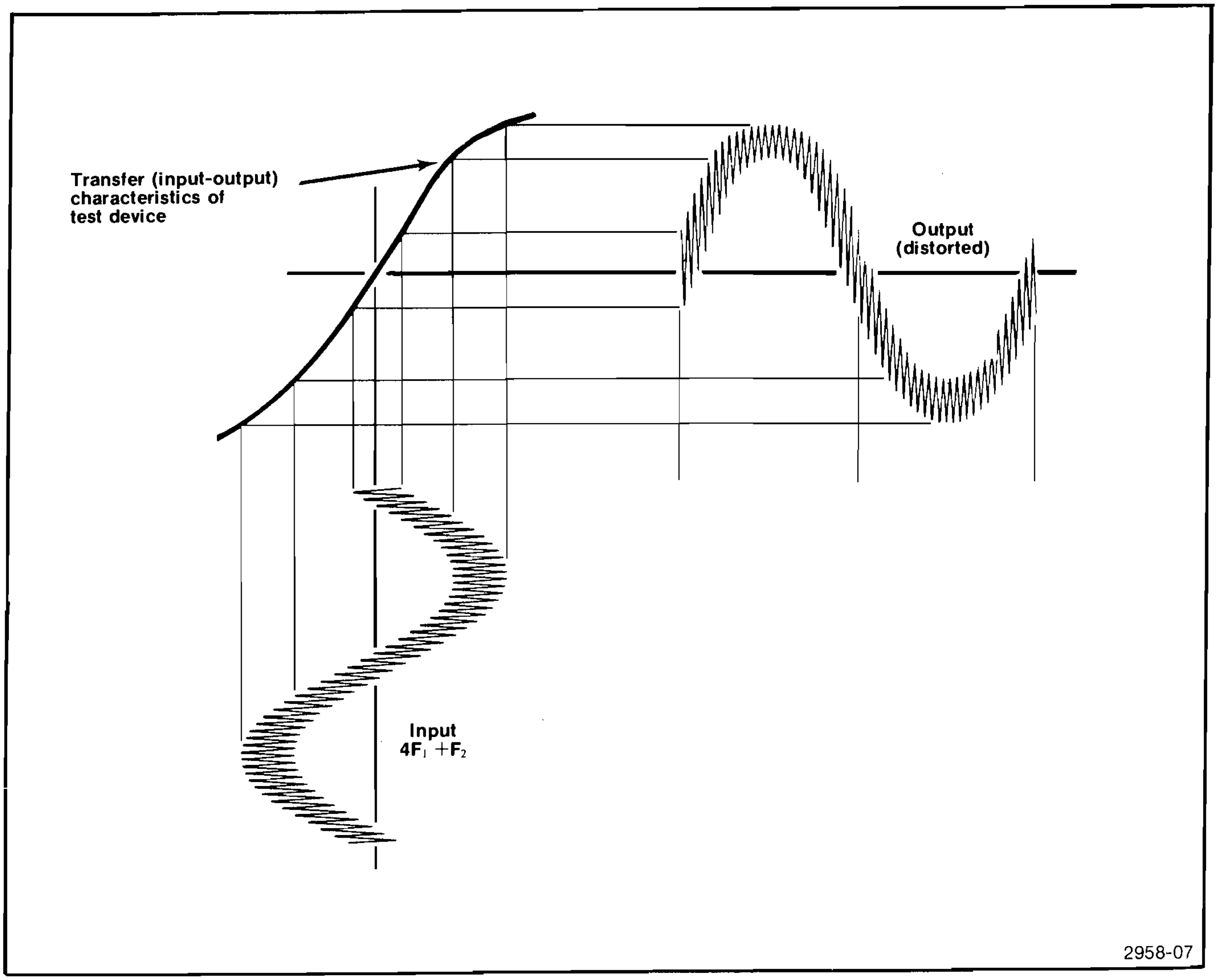


Fig. 2-8. IM test of transfer characteristics in time and frequency domain.

distortion may be obtained by measuring only the difference frequency (in this example 1 kHz). If only the low frequency component is measured, it is called a CCIF second order difference frequency distortion test.

To measure two tone difference frequency distortion the device is excited with two input signals as described above. The output of the device is low-pass filtered to extract the difference frequency. The level of this component is expressed as a percentage of the high frequency signals and is another measure of nonlinearity.

The AA 501 CCIF difference frequency mode will accept any pair of input frequencies which are within limits as listed in the Specification section. The amplitudes of the two signals should be equal.

IM Distortion Measurement Procedure (Option 01)

Intermodulation and THD testing are similar, using the AA 501 (Option 01 only). After connecting the appropriate signal source to the device under test, set the INPUT LEVEL RANGE as described in the THD section. Press the IMD FUNCTION button and select a distortion range. Selecting AUTO RANGE or dB provides automatic ranging. The AA 501 accepts either a SMPTE, DIN, or a CCIF difference frequency test signal. Selection between the necessary analyzing circuits is accomplished automatically.

There is a moveable jumper inside the AA 501 to allow selection of SMPTE-DIN, CCIF or automatic selection between the two modes. Defeating the automatic test selection circuitry is recommended if making intermodulation distortion measurements greater than 20%. Refer any jumper changes to qualified service personnel.

The LO PASS filters may be selected in the IM mode but will have little effect. The 400 Hz HI PASS and the 'A' WEIGHTING filters will cause erroneous readings because the IM components of interest generated by the tests fall between 50 Hz and 1 kHz. These filters, when activated in the IM mode attenuate some of the frequency components being measured.

Filters

The five buttons along the right edge of the instrument allow selection of four built-in frequency weighting filters plus an external filter, as desired. See Fig. 2-9 for response curves of the various filters. The 400 Hz, 30 kHz and 80 kHz filters are all 3-pole (18 dB per octave rolloff) Butterworth alignment. They are placed in the measuring circuitry immediately before the average or rms detectors. These filters are functional in all modes of operation and affect the signal at the FUNCTION OUTPUT connector.

Check the position of all filter pushbuttons before making measurements to prevent inaccurate results. Filtering takes place after all gain circuits. It is possible to overload part of the instrument, when operating in the manual distortion ranges with a filter selected, even though the display is not overranged. This may be checked by releasing the filter pushbuttons and checking the display for overrange or by pressing the AUTO RANGE pushbutton.

The 400 Hz HI PASS filter is used to reduce the effects of hum on the measurement. Although the differential input and common mode rejection of the AA 501 reduce the effects of ground loops, extremely bad measurement conditions may require use of this filter. The device under test may also generate an undesirable amount of hum, limiting the noise and distortion residuals obtainable. This filter may be used when measuring level or harmonic distortion of signals at about 1 kHz or greater. This filter should not be used when measuring signals less than 1 kHz nor when measuring intermodulation distortion.

Use of the 80 kHz LO PASS filter reduces the effects of wideband noise and permits measurement of lower THD +N for input signals up to 20 kHz. For 20 kHz inputs, it allows measurement of harmonics up to the fourth order. Do not use this filter if harmonic components above 80 kHz are of interest. When checking noise the 80 kHz filter may be used to reduce the measurement bandwidth. However, for most noise measurements, the 30 kHz LO PASS or 'A' WEIGHTING filters are recommended as they correlate better with the perceived noise level.

The 30 kHz LO PASS filter provides bandwidth limiting for broadcast proof of performance testing. It is also useful for unweighted noise measurements on audio equipment, providing an equivalent noise bandwidth of 31.5 kHz. When the 30 kHz filter is used, the 80 kHz filter is disabled. It may be desirable to modify the 30 kHz filter so that it conforms to the 22.4 kHz IEC standard for audio noise measurements. This may be performed by qualified service personnel as described in the Service section of this manual.

The 'A' weighting filter is used when measuring the subjective noisiness of audio equipment. It conforms to the noise measurement standards of the Institute of High Fidelity (IHF). The filter shape is within ANSI, DIN, and IEC[6] standards for class 1 sound level meters.

[6] International Electrotechnical Commission, Publication 179, second edition, Precision Sound Level Meters, 1973, Central Office of IEC (sales department), 1, rue de Varembe', 1211 Geneva 20 Switzerland.

Fig. 2-9. Response curves for AA 501 filters.

Connections for an external filter are also provided. Press the EXT FILTER pushbutton. Connect the external filter between the FUNCTION OUTPUT and the AUXILIARY INPUT. One application for the external filter is selective measurement of individual harmonics or components of an input signal. This may be accomplished using a TEKTRONIX AF 501 bandpass filter as an external filter. Adjust the AF 501 to the desired harmonic frequency; set the mode switch to NARROW and the gain to 1.

Another application, using the external filter, is the measurement of noise according to the CCIR/ARM[7] method. A CCIR[8] filter is inserted as an external filter with the response button in the AVG position.

[7] **Dolby et al, CCIR/ARM: A Practical Noise-Measurement Method, Journal of the Audio Engineering Society, Vol. 27, No. 3, March 1979, p. 149.**

[8] **International Radio Consultative Committee.**

When the AA 501 is used as a sound level meter, an octave or one-third octave filter set may be used to measure sound spectra. The rear interface outputs may be used to drive a storage oscilloscope or chart recorder for plots, as desired.

Displays

The AA 501 provides two forms of display for measurements. The digital readout displays the selected function with units. Overrange indication blanks all digits and displays a 1 in the most significant digit slot.

For rapid nulling or peaking applications, the digital display is supplemented by an uncalibrated LED bar graph for an analog meter-like display. The bar graph responds logarithmically, with each segment representing approximately a 2.5 dB change in the selected function. Additionally, the intensity of the segments is modulated between steps permitting resolution of changes as small as 0.5 dB. The range of the bar graph is determined by the measurement range in use. When using this feature it may be desirable to select a manual range to prevent confusing displays caused by autoranging.

Monitoring

The interface capabilities of the AA 501 may aid considerably in the interpretation of measurements.

The INPUT MONITOR connector provides a fixed amplitude version (≈1 V rms) of the input signal for input signals of 50 mV or greater. This allows display of the input signal on an oscilloscope, without constantly readjusting the oscilloscope sensitivity. At input levels below about 50 mV the INPUT MONITOR signal is approximately 26 dB (A ≈20) above the input signal level.

The FUNCTION OUTPUT is taken after the distortion measurement and high gain amplifier circuitry. It can be used for monitoring the signal read on the display. The signal at the FUNCTION OUTPUT connector is 2 V for a full scale reading on the display. In the level function this connector becomes an amplified version of the input signal. The gain from the input to this output is dependent on the LEVEL RANGE switch, and is given in Table 2-1. When the AA 501 is used as a constant gain differential amplifier the INPUT LEVEL RANGE switch must be set to a fixed range. In the distortion function this output can be displayed on an oscilloscope to view the distortion components. This output may also be used to drive a spectrum analyzer or selective voltmeter for examining the individual harmonics or modulation products. When an oscilloscope is used, the triggering signal is best taken from the sync output on the oscillator. If this is not possible (for example in tape recorder or Telco link testing) it should be obtained from the INPUT MONITOR connector on the AA 501.

Table 2-1

Gains from INPUT terminals to FUNCTION OUTPUT connector for various settings of the INPUT LEVEL RANGE control

LEVEL RANGE Setting	Gain to FUNCTION OUTPUT
200 V	−40 dB
60 V	−30 dB
20 V	−20 dB
6 V	−10 dB
2 V	0 dB
600 mV	+10 dB
200 mV	+20 dB
20 mV	+40 dB
2 mV	+60 dB
200 μV	+80 dB

A procedure which may be used in the THD+N mode is to plot the transfer function of the device under test. For this measurement the FUNCTION OUTPUT drives the vertical input of an oscilloscope while the INPUT MONITOR drives the horizontal. The resulting display is similar to Fig. 2-10, and represents the deviation from linearity of the transfer characteristic. In other words, it represents the transfer characteristic after the best fit straight line is removed. If the device under test has large amounts of phase shift at the test frequencies it may be necessary to introduce a compensating phase shift into the horizontal channel. Since the FUNCTION OUTPUT is taken after the filters, they will affect the signal seen at this connector. The vertical scale is the deviation from the best fit line and is related to the distortion range and vertical sensitivity of the oscilloscope.

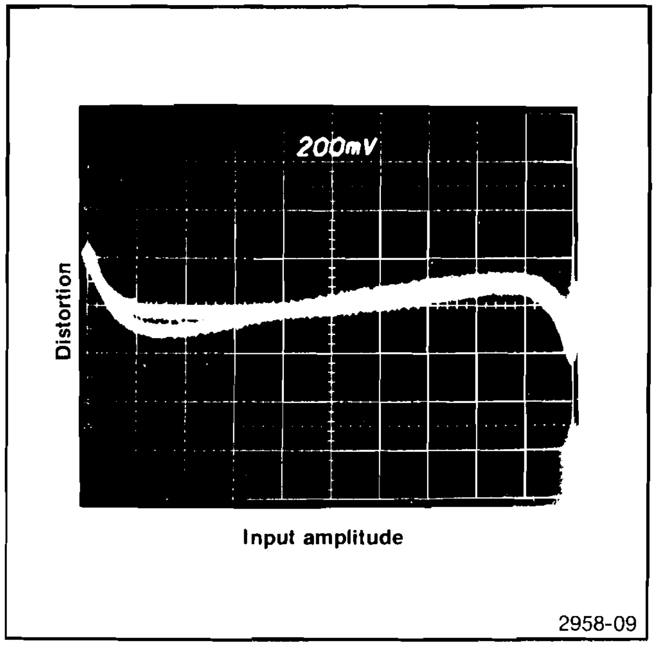


Fig. 2-10. Oscilloscope display of deviation from linearity.

A similar procedure may be employed in the SMPTE IM mode. The vertical signal is derived as before, but the horizontal is obtained from the low frequency input test signal (not the actual input test signal). On the SG 505 this signal is available at the SYNC OUTPUT connector. The display is interpreted as in the THD method, while the units are calculated as above. If two oscillators are summed to obtain the IM test signal, the horizontal drive is taken from the output of the low frequency oscillator. Transfer function testing is not possible in the CCIF difference tone mode.

THEORY OF OPERATION

Introduction

Refer to the block diagram located in the foldout pages of this manual for a brief description and overall view of the AA 501 operation. A detailed circuit description follows.

Input Amplifier ⟨1⟩

The input amplifier is designed for low noise and distortion. The input is differential with single-ended output. This circuit provides good common mode rejection for suppression of ground loop currents and other unwanted signals which may be present on both input leads. The input stage is protected to withstand at least 200 V rms on any input range.

The input amplifier gain is set by the logic circuitry at 0 dB (unity), +10 dB or +20 dB. The logic circuitry controls the gain so that the signal voltage at the output of the input amplifier remains between 0.75 V and 3.0 V rms. An attenuator, prior to the amplifier, additionally provides gain settings from −10 dB to −40 dB in 10 dB steps. The actual gain or attenuation selected depends on the input voltage level (or the setting of the INPUT LEVEL RANGE switch if not in AUTO RANGE). A full scale reading of 200 V corresponds to 40 dB of attenuation and 2 V full scale for unity gain.

The input signal, from the front panel connections or the rear interface input (selected by SOURCE switch S1531) enters the input amplifier through P1620/J1620. Each input is ac coupled through C1630 or C1631. The signal then passes to the differential input attenuator hybrid, R1510. These resistors are laser trimmed and ratioed to maintain gain accuracy and good common mode rejection. Relays K1412, K1510, K1511, K1512, and K1610 select attenuation from 0 dB (unity gain) to 40 dB, respectively in 10 dB steps. Frequency compensation of the attenuator is provided by C1433 and C1520.

When there is no attenuation (0 dB), DS1520 and DS1521 limit the input current. The current passing through the lamps warms their filaments, increasing their resistance from a fairly low value. These lamps can handle 120 Vac indefinitely and 200 Vac for at least 30 minutes. If the AA 501 is subjected to greater overloads in the 0 dB attenuator position, the lamps act as fuses to prevent damage to the input circuitry. When any attenuation other than 0 dB is selected, the resistance in the hybrid network provides current limiting. The inputs are clamped by Zener diodes VR1620 and VR1621 through eight diodes, CR1520 through CR1626. When the post attenuator voltage on any scale exceeds about ±10 V, one set of clamp diodes turns on to limit the voltage at U1420A and B. The effect of the nonlinear capacitance of clamp diodes CR1620, CR1621, CR1624 and CR1625 is eliminated by maintaining a constant voltage across the diodes via a bootstrap arrangement.

The input signal is buffered by low noise amplifiers U1520A and U1420B. On the 0 dB through 40 dB attenuation ranges, these buffers provide unity gain. Relays K1410 and K1411 change the gain to +20 dB or +10 dB, respectively, by adding resistors R1420D or R1420E. Capacitors C1423 and C1520 provide frequency compensation.

The buffer outputs are combined into a single-ended output signal by U1432 (gain = 1.5). The output of U1432 pin 6 is ac coupled by C1421 to remove any dc offsets caused by U1420A, B and U1432. This signal is then routed to the automatic gain control circuitry (agc) and input amplifier level detector.

The gains of the combining stage and the buffers are controlled by hybrid resistor R1420. These resistors are laser trimmed and ratioed to insure gain accuracy and good common mode rejection.

The signal level at the output of the input amplifier is detected by active rectifier U1320 in conjunction with CR1330 and CR1331. This full wave rectified signal is filtered by U1330A with C1420 and routed to the logic circuitry through J1500, pin 1. Recovery from overload is provided by VR1320. Resistor R1322 sets the filter gain so that, with 2 V into the AA 501 input on the 2 V scale (3 V at pin 6 of U1432) the output at pin 1 of U1330A is 6 Vdc.

The gain setting relays K1410 through K1610 are driven by transistors Q1400 through Q1600. Control signals from the logic circuitry enter the input board through P1500-J1500, pins 2 through 9, with one line at a time high (about +12 V). This logic high at the base of a transistor turns the transistor on and closes the relay. When either 0 dB, +10 dB or +20 dB (pins 6, 7 or 8) is activated, Q1402, is also activated closing K1412. In AUTORANGE, the logic circuitry selects the proper input attenuation or gain to maintain 0.75 V to 3.0 V at U1432 pin 6 for inputs greater than about 50 mV. Below 50 mV the range is 0.3 V to 3.0 V.

Automatic Gain Control ⟨2⟩

The output of the input amplifier feeds the agc circuitry at levels between 0.75 V and 3.0 V for inputs greater than 50 mV, and the agc automatically adjusts the signal to a constant 2 Vac. This is the reference level for the subsequent distortion measuring circuits.

The agc circuitry is composed of attenuator R1431, U1331, U1431, R1432, and amplifier U1430. The control element in the agc is a pair of light-dependent resistors (LDR's), U1331 and U1431. These devices consist of a light emitting diode and a semiconductor resistance cell in one package. As more control current is forced through the LED's, the cells are illuminated more brightly and their cell's resistance decreases. This shunts more signal to ground. Two LDRs are used in series with shunting resistors R1338 and R1339 to minimize distortion at the signal levels present.

The control circuitry for the agc consists of active rectifier, U1330B with diodes CR1332 and CR1333. The filters are composed of U1530A and U1530B and associated components. The circuitry seeks to keep the voltage at the output pin 6 of low noise operational amplifier U1430 at about 2.0 V. This output voltage is varied to standardize the THD measurements by adjusting R1330, the DIST CAL control. The output of U1430 is fullwave rectified by U1330B with diodes CR1332, CR1333 and integrated by U1530A and C1533 with the reference current from R1330. Amplifier U1530B in conjunction with C1530, C1534, R1530 and R1531 provides additional filtering of the rectified voltage to reduce distortion introduced by the agc action. Transistor Q1530 provides the current drive necessary for the LDRs, while VR1430 linearizes the open loop gain of the agc loop to optimize transient response at all signal amplitudes.

Notch Filter ⟨2⟩

The leveled output from the agc (U1430) provides the input for the notch filter. The notch is formed by summing the output of an inverting band pass filter with the input signal. See Fig. 3-1. Operational amplifiers U1130, U1131 and their associated resistors and capacitors comprise the band pass filter. Amplifier U1020A is an inverting summer. Filter tuning is accomplished in half decade bands by switching both resistors and capacitors. Capacitors are switched each decade. Relay K1232 is energized for input

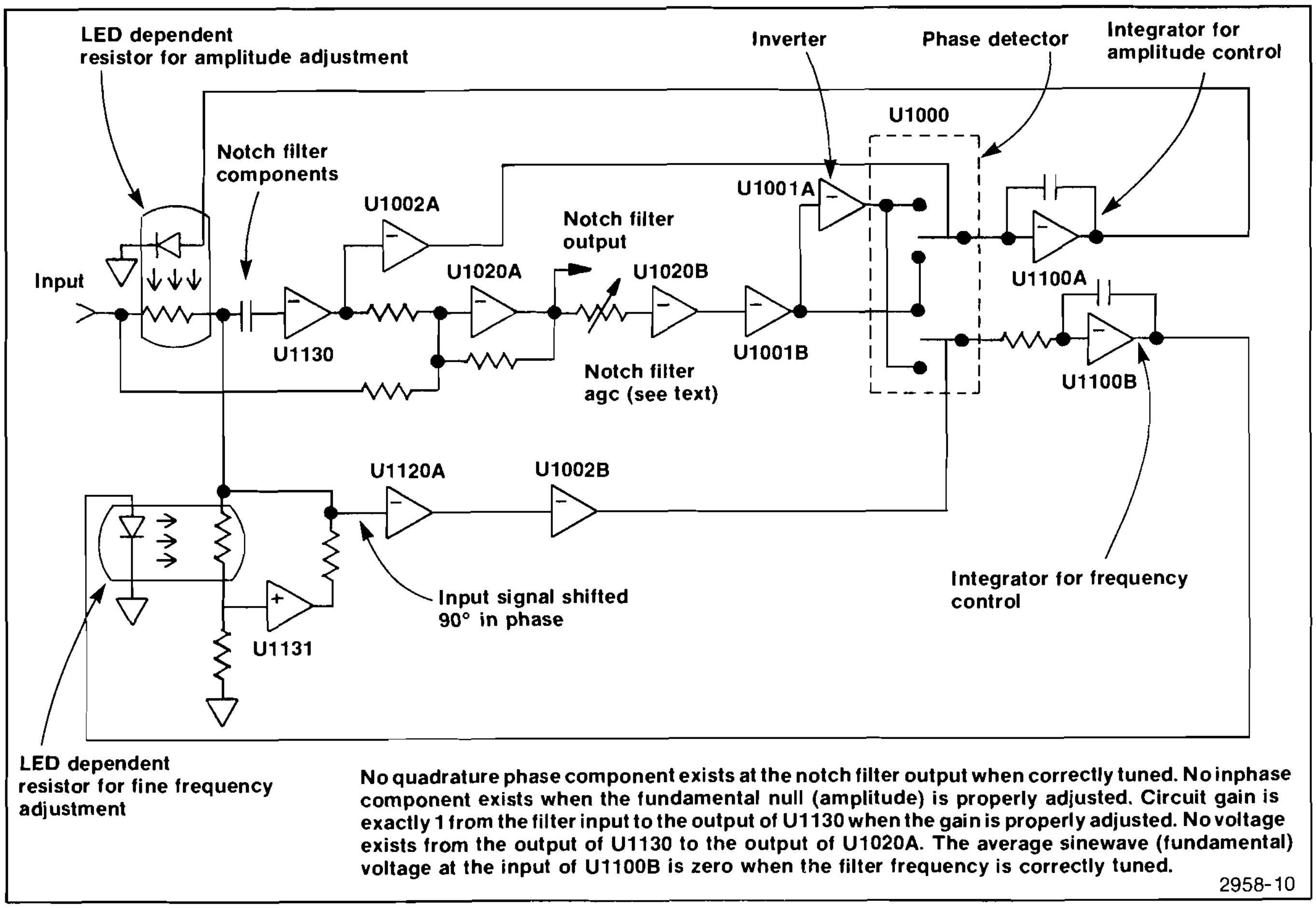


Fig. 3-1. Simplified notch filter and control loop.

frequencies below about 10 kHz. Below about 1 kHz K1231 is also activated, while below about 100 Hz K1230, K1231, and K1232 are used. K1030 is energized in the upper half of each decade reducing resistances by a factor of three and scaling up frequency by three. Continuous tuning within each half decade is achieved by adjusting the impedance of an electronic resistor (U1131) with LDR opto isolators U1031 and U1032. As the LDR resistance rises, the electronic resistor value decreases, at the junction of U1031 and R1132, raising the filter frequency. Minor variations in the gain of the band pass filter (which would cause incomplete cancellation of the fundamental) are compensated by a third LDR, U1030. Drive signals for the LDRs come from the control loop circuitry. Synchronization signals to run the control loops come from the outputs of U1130 and U1120A.

Frequency Band Discriminator ⟨3⟩

The signal from U1120B is squared by a Schmitt trigger, composed of Q1400 and Q1401. The frequency band is determined by measuring the period of the resulting squarewave. When the input goes high, the outputs of U1500 change state. Assume the Q outputs have just gone high, starting the four rc networks, connected to Q outputs of U1500, changing. The capacitor voltage on each network is compared via U1610 to a reference voltage developed across R1610, R1611, and R1612. When the input signal again goes high, the outputs of the comparators are latched in U1410. Simultaneously, the outputs of U1500 go low to discharge the capacitors in the rc networks preparing for the next cycle.

If the period of the input is more than half the rc time constant, the capacitor voltage will be above the threshold and the comparator output is high at the transition. See Fig. 3-2. Discrimination of half decades is obtained by selecting the appropriate rc network via a CMOS switch (U1600) and comparing it to a higher reference voltage at pin 6 of U1610B. The last column in Table 3-1 shows the inputs for U1600. If the input frequency is below the ban switch point of the selected decade (about 2.8 kHz for the 1 kHz to 10 kHz band) the output of U1610B is low. Resistors R1510, R1512, R1514 and R1518 provide a slight hysteresis at each decade edge, while R1515 provides hysteresis at the half decade points. This hysteresis prevents random band switching when measuring signals close to the transition frequencies.

A bounce eliminator, U1400, prevents random band changes caused by grossly nonperiodic signals. Capacitor C1400 sets the internal clock frequency of U1400 at about 100 Hz. The input state to U1400 must be stable for four clock cycles or 0.04 seconds for any change in output to occur.

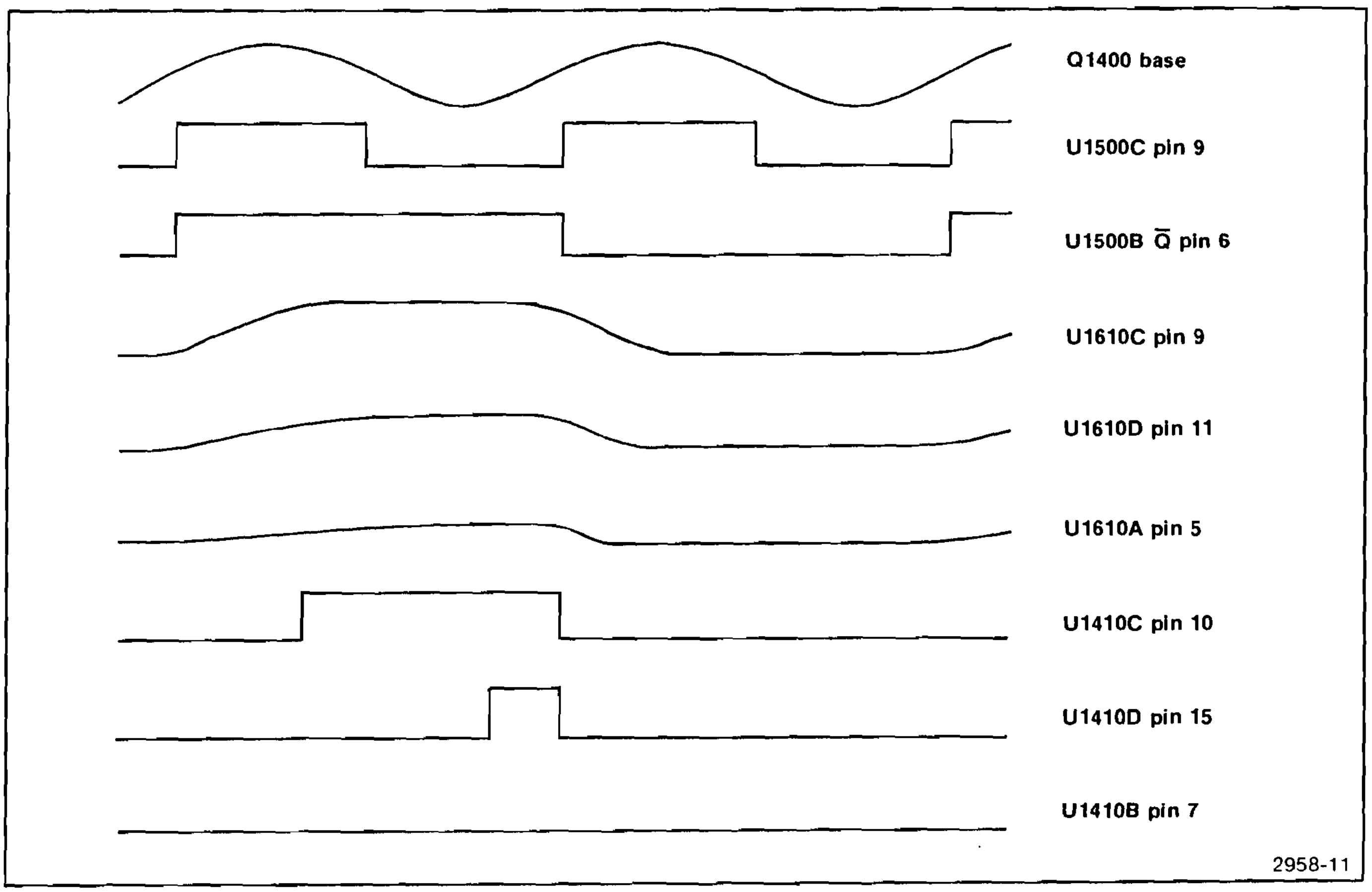


Fig. 3-2. Typical frequency discriminator waveforms at about 800 Hz.

Table 3-1

TRUTH TABLE FOR U1400 OUTPUTS

Fin (Hz)	$\overline{Q}$ U1410A pin 3	Q U1410C pin 10	Q U1410D pin 15	Q U1410B pin 7	U1600 input pin no.
9.5-28	L	H	H	H	4
28-95	H	H	H	H	4
95-280	L	H	H	L	12
280-950	H	H	H	L	12
950-2.8k	L	H	L	L	14
2.8k-9.5k	H	H	L	L	14
9.5k-28k	L	L	L	L	13
28k-110k	H	L	L	L	13

Notch Filter Control 4

The notch filter is tuned by in-phase and quadrature phase (shifted 90°) components of the input fundamental signal. See Fig. 3-1. The in-phase component inputs to pin 2 of U1002A while the quadrature component inputs at pin 6 of U1002B. When the notch frequency is correctly tuned, there is no quadrature phase component at the notch filter output. When the fundamental null (maximum amplitude rejection) is adjusted correctly, there is no in-phase component in the notch filter output.

The notch filter output is amplified by U1020B and U1001B. A total of 50 dB of gain is provided by these amplifiers. Differential input to U1000 is provided by U1001A. The output of the 50 dB amplifier stage is rectified by CR1001 and CR1002. This signal is amplified by Q1010 and filtered by C1013 to control the attenuation of Q1011. This automatic gain control loop serves to level the input to the phase detector at about 5 V peak or less. The amplifier gain is reduced by Q1012 in the lowest fundamental frequency decade.

As stated earlier the in-phase component of the output of the notch filter feeds pin 2 of U1002A. This circuitry forms a CMOS compatible logic signal to drive the CMOS multiplexer, U1000. The 90° phase shifted component similarly feeds pin 6 of U1002B. The switching arrangements of U1000 are shown in Table 3-2. The input to U1100A is switched between the inverted (pins 1 and 13) and the normal (pins 2 and 12) output of the notched filter at a rate and phase determined by the in-phase signal at pin 10. The input to U1100B is also switched between the normal and inverted inputs to U1000 at a rate and phase determined by the quadrature signal at pin 11.

The outputs of the synchronous demodulator are integrated by U1100A, for the amplitude control loop and U1100B for the frequency control loop, buffered by Q1001 and Q1110, to drive the LDR opto-isolators in the notch filter. The net dc polarity of the signals at pins 15 and 14 determine, after passing through integrators U1100A and U1100B, the direction of frequency change and amplitude change necessary to properly set the notch frequency and null the fundamental. Adjustments R1100 and R1101 trim out the effects of offsets in the operational amplifiers enabling adjustment of the loops for best nulling of the fundamental frequency. When stabilized, the dc signal at pins 14 and 15 of U1000 is essentially 0 V.

Table 3-2

INTERNAL CONNECTIONS IN U1000 DEPENDING ON LOGIC STATES OF PINS 10 AND 11

	11	10	Pins
	0	0	12 & 2 to 14 & 15
	1	0	13 & 1 to 14; 2 & 12 to 15
Logic	0	1	12 & 2 to 14; 13 & 1 to 15
States	1	1	13 & 1 to 14 & 15

Distortion Amplifier 5

This circuitry amplifies the distortion components from the THD notch filter or the IMD section, as well as providing additional gain for the three lowest input level ranges.

Multiplexer U1300, selects the input source for the distortion amplifier. The four sources are: input stage pins 5 and 14, input stage less 10 dB pins 1 and 13 (through R1212 and R1213) THD notch filter pins 2 and 4, and IMD pins 12 and 15. Control of U1300 is through the level and IMD switches, as well as the output of U1012A. In the IMD mode Q1300 turns on through Q1602. This action shorts the THD input to U1300 to prevent possible crosstalk.

The distortion amplifier gain is controlled by multiplexer U1210. The input to U1101B, attenuated by R1216, R1217 or R1218 is supplied from U1210. See Table 3-1. A gain of +46 dB is provided by U1101A and B. The output of U1101A supplies a 4 V rms full scale signal to the filters.

Table 3-3

GAIN AND SWITCHING THROUGH U1210

Pins 9 10	Gain through Dist Amp	U1310 gain	Internal connections pins
0 0	+6 dB	0 dB	13 to 2 and 1 to 3
0 1	+26 dB	0 dB	13 to 2 and 5 to 3
1 0	+46 dB	0 dB	13 to 2 and 2 to 3
1 1	+66 dB	+20 dB	13 to 5 and 2 to 3

Filters and Ac-Dc Converters ⟨6⟩

The output of the distortion amplifier enters the main board through P and J1300 to drive the weighting filters and the distortion amplifier ranging level detector. The detector, composed of U1121A and U1121B full wave rectifies and filters the distortion amplifier output. This dc signal goes to the logic board to control auto-ranging of the distortion amplifier.

The weighting filters consist of U1210A, U1220 and U1321. Switch S1100B routes the signal through R1111, R1113, R1211, C1101 and C1211. These components comprise the 3 pole 80 kHz Butterworth low pass filter. Pressing S1100C routes the signal through R1110, R1112, R1210, C1102 and C1210 which comprise the 30 kHz low pass filter. Switch S1100D connects the 30 kHz low pass filter to the input of U1210A and inserts U1321 and associated components to supply the extra low and high frequency poles for "A" weighting response. A three pole 400 Hz Butterworth high pass composed of U1220 and associated components is activated by S1100A. An external filter connects into the circuit via S1100E through U1210B and the AUXILIARY INPUT at pin 5. Pin 6 of U1220 provides signal to the FUNCTION OUTPUT connector, through R1100.

After filtering, the signal is converted to a dc voltage by both rms and average techniques. Rms conversion is accomplished in U1201 (pin 10 out) using an implicit computing approach. The averaging capacitor is C1213. A low pass filter, U1310B, reduces noise in the readout.

The averaging rectifier is U1301 along with CR1301 and CR1302. The output from this rectifier is smoothed and filtered by U1310A, C1301, and associated components.

The average detector output connects to U1310B via Q1310 in the average response mode, overriding the rms converter.

dB Converter ⟨7⟩

The dB section is fed by the dc output voltage from the rms or average detector. Shown on this schematic are the dB converter, dB/Volts switch, offset generator, dB ratio circuit, and a voltage reference.

The dB converter consists of quad operational amplifier U1312, transistor array U1222 and associated circuitry. The input to the converter is a 0-4 V dc signal from the rms or average detectors and the 6 V reference. The output is a dc signal at U1312A pin 1. This signal is proportional to the log of the ratio of the dc input signal to the reference voltage as described in the relationship:

$$E = C \cdot \log_{10} \frac{\text{Ic for U1222A}}{\text{Ic for U1222B}}$$

C is a constant and Ic is the noted collector current. The converter output is zero when the input voltage is 1.55 V, with a scale factor of −100 mV/dB.

Operational amplifier U1312D provides a constant collector current in U1222B while holding the collector voltage at 0. The collector of U1222A is held at 0 V by the action of U1312C. The collector current in U1222A varies with the input voltage. When the two collector currents are equal (at Vin = 1.550 Volts), U1222A pin 2 is at 0 V and U1312C pin 8 is at 0 V. The offset voltage of the differential pair and U1312A is adjusted by R1341, which sets the 0 dB output level. Compensation for the offset voltage of U1312C is provided by R1245. This provides correct log conformity at low input voltages. Inversion of the dB output is provided by U1312A. Pin 1 of U1312A also provides the dB voltage to the bar graph display.

The three remaining transistors in U1222 serve as heaters to maintain the differential pair (U1222A and B) at a constant temperature. The voltage at U1222 pin 3 is proportional to the temperature of U1222B. This voltage is compared with the reference voltage and any error is amplified by U1312B. The amplified error signal drives Q1311 which supplies current to the heater transistors. The −20 dB Adjust, R1501, sets the temperature of the differential pair for the correct scale factor.

dB Offset Generator ⟨7⟩

The offset generator consists of U1313D, U1231, and R1332. This circuitry provides a dc offset voltage that is added to the log converter output at the input of operational amplifier U1313C. This voltage is set by input from the logic section which indicates the gain in the signal path.

The reference voltage is divided by R1332 into six offset voltages. Multiplexer U1231 selects one of these six voltages (or ground) and supplies it to U1313D. The gain setting resistor for U1313D, as well as a resistor in series with its output, is included in R1332. The offset output is supplied to U1313C through R1246.

This signal is routed to U1407, a multiplexer, which selects the dB-processed voltage (+10 mV/dB) or the voltage directly from the rms-average detectors. This voltage is supplied to the dvm section. In the distortion modes, R1400 provides a small offset so that the 0 dB reference is changed from .775 V (0 dBm) to 1 V (100%). In the dB ratio mode, U1313C also adds the stored reference voltage from the dBr section.

dB Ratio Circuitry ⟨7⟩

The dB ratio circuitry allows selection of any input voltage as 0 dB. This is accomplished by adding a dc offset voltage from pin 15 of R1333 to pin 9 of U1313C. This causes 0 V at pin 8 of U1313C at the desired AA 501 input voltage.

Amplifiers U1331C and D with resistor network R1333 form a digital to analog converter which supplies the dc offset to the input of U1313C. This converter is driven by an 11 bit binary counter composed of U1321 and U1332. This counter is controlled by dual flip-flop U1531B which is supplied with a clock signal from the gated oscillator composed of U1431A and B.

When the dB ratio button is pushed (grounded) a debounce circuit composed of U1431C and D causes pin 3 of U1531A to go high. A short time later, determined by R1441 and C1445, pin 4 of U1531A goes high terminating the high at pin 1. A positive pulse appears at U1531 pin 1, resetting counters U1321 and U1332 and flip-flop U1531B. This allows the oscillator to start. The oscillator increments the counters changing the voltage offset. When the 0 dB reference button is pushed the counter starts with the most negative voltage offset and increments in the positive direction. The output of U1313C connects to comparator U1331B. When the output of U1313C is 0 V, U1331B pin 7 goes high, causing U1531B pin 12 to go low at the next clock pulse. This action stops the oscillator. Future dBr readings are referenced to this voltage. Pin 1 of U1331A goes positive a short time before U1331B pin 7. This switches the oscillator ot a lower frequency through Q1447 and C1433 to prevent the circuits from overshooting the correct value.

6 V Reference ⟨7⟩

A 6 V reference voltage to the dB converter, offset generator, dBr section, and dvm is provided by U1313A and VR1406.

Dvm ⟨8⟩

The dvm section accepts the dc voltage from the dB converter or directly from the ac to dc converter and drives the digital display. The dvm input is proportional to the input signal voltage, the percent distortion or the log (dB) of the selected function. An LSI analog to digital converter with display drivers, U1111, drives the respective segments in LED display. Overrange indication is supplied internally in U1111. Reference voltage adjustment for the correct full scale reading is provided by R1218. Other external components support the internal operation of U1111.

The most significant LED module, DS1022, is controlled by U1201D and Q1201. This digit displays blank, 1 or 0. The 0 is displayed only in the 0.2% distortion range.

If a decimal point is needed in LED display DS1020, pin 2 of U1201A is low. This assures that pin 11 of U1201D is also low and illuminates the two segments comprising the one (1) in the most significant digit module, DS1022. Pin 19 of U1111 is high when a 0 is required and low when a 1 is required. The one is changed to a zero by illuminating an additional four segments of DS1022. The minus sign to the left of the most significant digit module is used only in the dB mode. Q1210 prevents the minus sign from illuminating in any other mode.

The ten operational amplifiers, U1030A, B, U1130 and U1230 comprise the drivers for the bar graph display. The analog signal from the dB converter is applied to the negative inputs of these amplifiers. The input resistance dividers are selected so that only one operational amplifier at a time is operating in the linear region. There is approximately 2.5 dB between each segment, with a slight overlap from one segment to the next.

Display Board ⟨9⟩

The four LED digit display modules and the sign module are illuminated by lowering the cathode voltages. The display module anodes and the state LEDs are operated from +5 V.

Pins 11 through 20 of DS1010, the bar graph display, are connected to −15 V. Pins 1 through 10 are driven by operational amplifiers in conformance with the anlog signal strength.

Logic Circuitry ⟨10⟩ ⟨11⟩ ⟨12⟩

The input signals to the logic section come from the front panel switches, the input stage level detector, and the distortion amplifier level detector. The logic circuitry controls the gain of the input stage and distortion amplifier, the dB offset generator, location of the decimal points and the function annunicator LEDs.

Schematic 10 shows the logic switching circuitry.

On schematic 11 a presettable up-down counter, U1031, controls and gain of the input stage. In the manual ranges, the preset inputs are enabled by S1521-4. The proper input level range signals are supplied by S1521-1, 2, and 3. In the auto range position, the counter accepts clock inputs from level comparators U1221A and B. These signals pass from U1031 to U1011. They are decoded in U1011, a bcd to decimal decoder, to drive the input stage gain control lines.

A dc signal, proportional to the input signal amplitude appears at pin 4 of U1221A. The bias voltages on pins 5 and 6 of U1221A and B are such that pin 2 of U1221A goes low when the input signal is higher than the range the input stage is presently in. This low appears at pin 10 of U1031 which causes the binary up-down counter to count down. If the input attenuator is in the least sensitive range, a high exists on pin 1 of U1032A. A low then exists on pin 3 of U1032A which prevents the underrange LED from being illuminated. Pin 1 of U1221B is low when the input signal is lower than the input attenuator range. Pin 6 of U1032B is high in the most sensitive range. The up-down counter counts only when pin 5 is low. This occurs when the input signal level is higher than the attenuator range and the unit is not in the least sensitive position, or when the input signal is lower than the input attenuator range and the unit is not in the most sensitive range. The over-range and underrange LEDs are illuminated through Q1508 and Q1509 respectively. When the bases of these transistors are high, through the outputs of U1032A and U1032B, the lights are illuminated. The overrange and underrange lights are also controlled by the distortion amplifier gain in the level mode. These inputs, from U1407, are shown at the bases of transistors Q1509 and Q1508.

U1012A decodes the odd 10 dB steps in the input stage gain and supplies this information to the distortion amplifier control and to U1021 for decimal point and offset formatting purposes.

Distortion amplifier gain is controlled in a manner similar to the input circuitry gain. U1221C, and U1221D are the level comparator and U1132A, U1132B, and U1132D perform the enable gating function.

The gain control input for the distortion amplifier is selected by U1033, a 4 bit and/or selector. In the level mode pin 9 is high, pin 14 is low, and pins 6, 4, and 2 are routed to the outputs. This selects the Input Level Range Switch, S1521, as the gain control input. In the distortion modes, pin 14 is high, 9 is low and pins 7, 5 and 3 are connected to the output. The distortion range switches now control the gain.

The signals from and to U1032C control the switching of U1033. A dc voltage proportional to the output of the distortion amplifier connects to pin 11 of U1221D. The operation of U1221 and U1132 are identical as described for the input stage up/down counter. These gates control up/down counter, U1131, for the distortion amplifier gain. A three to eight decoder driver, U1124, supplies decimal output for the distortion amplifier gain control circuitry.

A binary adder, U1021, shown on schematic 12, sums the gain of the input stage and the distortion amplifier. Pins 7, 5 3 and 6 provide input stage gain information. Pins 4 and 2 provide distortion amplifier gain information. This sum is decoded by U1022, and passes through CR1022, CR1025 and CR1028. These diodes drive U1012B and U1111 to operate the μV, mV, and Volts annunicator LEDs. The control source for the decimal points is selected by U1013, a 4 bit and/or selector which operates as a multiplexer. In the volts mode, the decimal points are controlled by the decoded decimal information from U1022 and the diodes. In the distortion modes, the decimal points are controlled by the distortion amplifier gain. Gain information from the distortion amplifier appears at pins 1, 3, 5 and 7. In the dB modes, U1013 is disabled, and Q1106 is turned on by U1112A or U1112B. This illuminates the proper decimal point for all dB displays.

A 4 bit and/or selector (U1123) operating as a mutliplexer, selects the control source for the dB offset generator. In the level mode, the offset is controlled by the sum at the output of U1021. In the distortion modes U1123 is controlled by the distortion amplifier gain.

Power Supplies 13

There are three operating voltages in the AA 501: + and − 15 V dc and +5 V dc. The ±15 V supplies the operational amplifiers, linear circuitry and CMOS, while + V is used for the logic and display circuitry.

The +5 V dc supply is derived from the +11.5 V dc supply in the mainframe. A three terminal votlage regulator, U1523, provides +5 V and includes built-in current limiting. Additional overcurrent protection is provided by F1621.

The +15 V dc supply is regulated from the +33 V dc mainframe supply. The reference voltage, against which the regulator output, divided down by R1425 and R1426 is compared, is supplied by VR1401. Errors between the reference voltage and divided output are amplified by U1420B and Q1510. The mainframe NPN transistor and Q1513 form a Darlington series-pass transitor. Frequency compensation for stability is provided by R1521 and C1510. Current limiting is accomplished by Q1511 which senses the voltage across R1519. When the current delivered by the +15 volt supply exceeds about 500 mA, Q1511 turns on. This shunts base drive current from Q1513 lowering the output voltage. Fuse F1610 provides additional protection.

−15 V Supply

The −15 V is supplied from the −33 V dc in the mainframe. Amplifier U1420A compares the regulated +15 V supply with the −15 V through R1420 and R1421. Voltage differences are amplified by U1420A and Q1520.

The mainframe PNP transistor and Q1522 form a Darlington series-pass transistor. Frequency compensation for stability is provided by R1520 and C1413. Current limiting is accomplished by Q1521 which senses the current through R1526. When the current delivered by the −15 volt supply exceeds about 500 mA, Q1521 turns on. This shunts base drive current away from Q1522 and lowers the output voltage of the power supply. Fuse F1620 provides additional protection.

Im Option 14

The IM analyzer is block diagramed in Fig. 3-3. In the difference frequency distortion mode (CCIF) the analyzer is a 9 pole Butterworth low pass filter at 1.1 kHz. Two poles of this filter are provided by U1310B and associated components. The CCIF signal then passes to the level sensor composed of Q1231, CR1325 and C1331. Depending on the position of jumper P1131 and the amplitude of low frequency components at the anode of CR135, multiplexer U1240 selects the SMPTE signal at pin 2 or the CCIF signal at pin 3. If 1 V of low frequency signal (≤1.1 kHz) is present at the anode of CR1325, Q1231 turns on. If the jumper is in the automatic position, the collector of U1231 goes low. This lowers pins 9, 10, and 11 of U1240 and connects pin 2 to pin 14, the output. In the CCIF mode, there is little power below 1.1 kHz. Under these conditions Q1231 is off, and pin 3 is connected to pin 14 of U1240.

The output of U1240 feeds buffer U1230B. The signals then pass through the remaining 7 poles of the 1.1 kHz low pass filter, comprised of U1230A, U1130A and U1130B, to the distortion amplifier.

In the SMPTE modes, the input signal passes through 7 poles of a 2 kHz high pass filter. This filter is composed of U1310A, U1215A and U1215B. The signal is full-wave rectified by U1115A and applied to the input of a voltage controlled amplifier U1115B. To maintain a constant signal amplitude of 3.6 V dc U1110A integrates the difference between this signal and a dc reference voltage. The current through the LED in gain control resistor U1100 maintains the gain of U1115B so that the output signal is at 3.6 Vdc. The rectified signal passes through a 30 Hz two pole high pass filter comprised of C1111, C1012, R1012 and R1013 to the input of U1110B. This amplifier, along with C1023, C1024, C1025, R1111 and R1112, forms the first two poles of the 1.1 kHz low pass filter. Pin 7 of U1110B connects to multiplexer U1240. From this point, the signal is processed exactly the same as the CCIF signal.

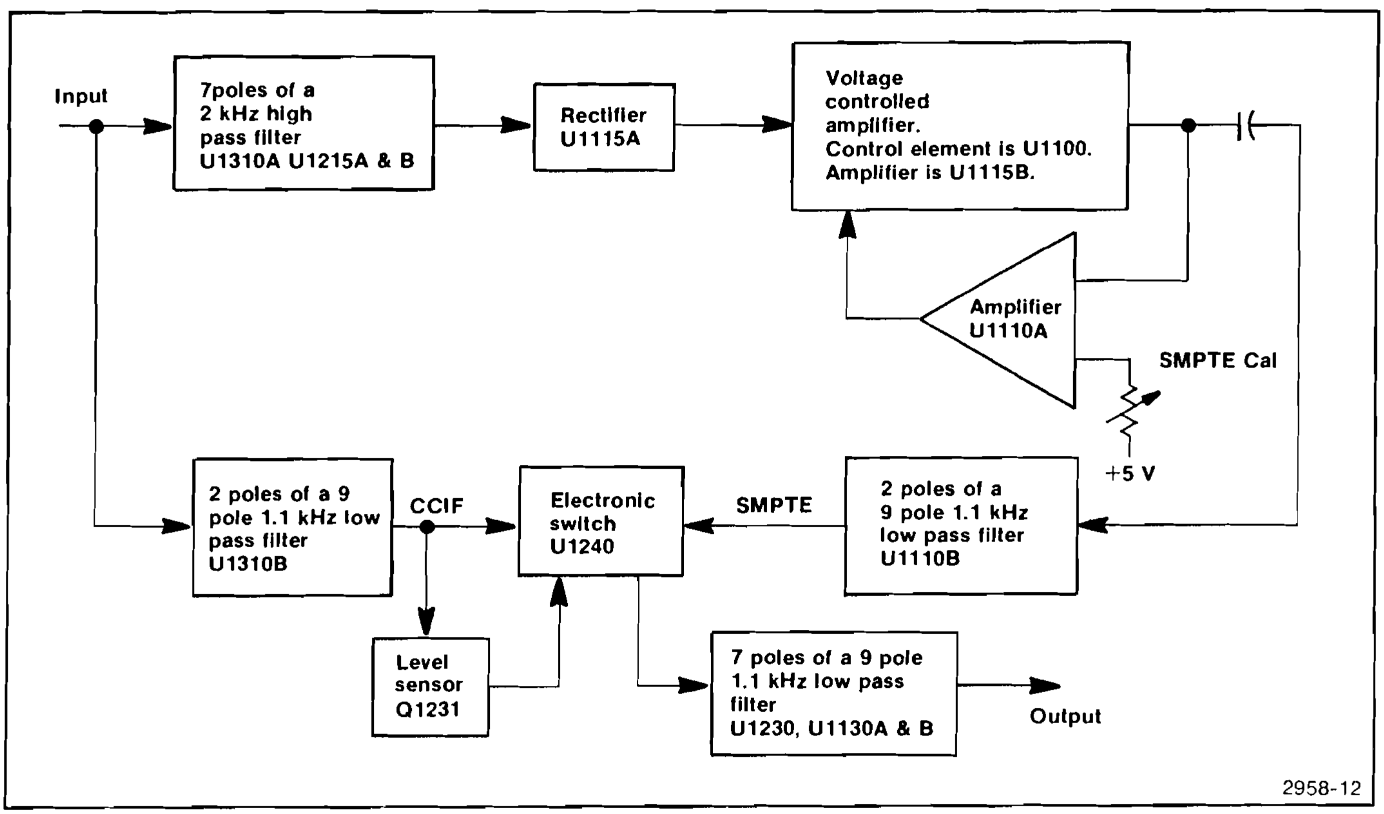


Fig. 3-3. Intermodulation distortion option block diagram.

CALIBRATION

PERFORMANCE CHECK PROCEDURE

Introduction

This procedure checks the Electrical Performance Requirements as listed in the Specification section in this manual. Perform the internal adjustment procedure if the instrument fails to meet these checks. If recalibration does not correct the discrepancy, circuit troubleshooting is indicated. Also, use this procedure to determine acceptibility of performance in an incoming inspection facility. For convenience, many steps in this procedure check the performance of this instrument at only one value in the specified performance range. Any value within the specified range, within appropriate limits, may be substituted. The performance check may be done at any ambient temperature between 0° C and +50° C.

Test Equipment Required

The test equipment listed in Table 4-1, or equivalent, is suggested to perform the performance check and the adjustment procedure.

WARNING

Exercise caution as dangerous voltages may be encountered in some of the following steps.

Table 4-1

SUGGESTED TEST EQUIPMENT

Description	Minimum Requirements	Performance Check Step	Adjustment Procedure Step	Recommended Equipment
Low distortion sinewave oscillator with IM test signal	≤0.0008% THD 20 Hz to 20 kHz; ≤0.0018%, 10 Hz to 20 kHz and 20 kHz to 50 kHz; ≤0.0032% 50 kHz to 100 kHz. 60 mV to ≥6 V rms, 10 Hz to 100 kHz. IM test signal capability.	6, 7, 8, 9, 10, 11, 11A, 12, 13, 14	8, 9, 10, 11, 11A	TEKTRONIX SG 505
Sinewave oscillator (2 required for alternate Step 11A)	Sinewave 600 μV to ≥5 V rms Frequency 20 Hz to >300 kHz.	4, 6, 9, 10, 11, 11A, 12	9, 10, 11, 11A	TEKTRONIX SG 502
Ac voltage calibrator	100 μV to 180 V 10 Hz to 100 kHz	1, 2, 3, 15	3, 4, 5, 6, 7	Fluke 5200A and 5205A
Dvm	1 mV to 2 V	2, 13, 14		TEKTRONIX DM 505
Counter	60 Hz to 84 kHz @ 0.9 V	12		TEKTRONIX DC 504
Bnc male to dual binding post adapter		1, 2, 5, 13, 14, 15		

Table 4-1 (cont)

Description	Minimum Requirements	Performance Check Step	Adjustment Procedure Step	Recommended Equipment
50 Ω coaxial cable with bnc connectors, 2 ea. (3 required for alternate Step 11A)		4, 6, 7, 8, 9, 10, 11, 11A, 12, 13, 14	8, 9, 10, 11, 11A	Tektronix Part No. 012-0057-01
Bnc female to dual banana adapter		1, 4, 5, 6, 7, 8, 9, 10, 11, 11A, 12, 13, 14	8, 9, 10, 11, 11A	Tektronix Part No. 103-0090-00
Bnc T-adapter (2 ea. required for alternate Step 11A)		6, 9, 10, 11, 11A	9, 10, 11, 11A	Tektronix Part No. 103-0030-00
Banana to alligator test leads to voltage calibrator		1, 2, 3, 15	3, 4, 5, 6, 7	Tektronix Part Nos. 012-0014-00 (black) and 012-0015-00 (red), 30"
18" banana test leads		2, 13, 14		Tektronix Part Nos. 012-0039-00 (black) and 012-0031-00 (red)
6" banana to banana patch cord		1, 3		Tektronix Part No. 012-0024-00
1 kΩ resistor	0.1%	5, 13, 14		Tektronix Part No. 321-0193-00
100 kΩ resistor	0.1%	1, 15		Tektronix Part No. 321-0385-04
Shorting plug		2	1, 2	Tektronix Part No. 134-0012-00

List of Check and Adjustment Steps

Performance Check Steps

1. Check Input Impedance
2. Check Common Mode Rejection
3. Check Level Function Accuracy
4. Check Bandwidth
5. Check Residual Noise
6. Check Total Harmonic Distortion Accuracy
7. Check Residual Total Harmonic Distortion + Noise
8. Check Residual Intermodulation Distortion in the SMPTE/DIN Mode (Option 01 only)
9. Check Residual Intermodulation Distortion in the CCIF Difference Tone Test Mode (Option 01 only)
10. Check IM Distortion Accuracy, SMPTE Test (Option 01 only)
11. Check IM Distortion Accuracy, CCIF Difference Tone Test (Option 01 only)

11A. Check IM Distortion Accuracy, CCIF Difference Tone Test (alternate procedure, omit if step 11 is performed, Option 01 only)

12. Check Filter Accuracy
13. Check INPUT MONITOR
14. Check FUNCTION OUTPUT
15. Check AUXILIARY INPUT

Adjustment Procedure Steps

1. Adjust Dist Amp Offset
2. Adjust Rms and Avg Zero
3. Adjust Volts and Avg Cal
4. Adjust Attn Comp
5. Adjust 0 dB Adj, −20 dB Adj and Input Zero
6. Adjust Offset Gain
7. Adjust dBr Zero
8. Adjust Null, Freq Trim and 3 H Null
9. Adjust Dist Cal
10. Adjust SMPTE Cal (Option 01 only)
11. Adjust Diff Freq Cal (Option 01 only)

11A. Check IM Distortion Accuracy, CCIF Difference Tone Test (alternate procedure, omit if step 11 is performed, Option 01 only)

NOTE

The AA 501 has selectable average or true rms measurement response. Unless specifically noted all performance checks may be performed using either response.

PERFORMANCE CHECK SUMMARY SHEET

This sheet may be duplicated and used as a short form performance check procedure. Perform the check and record the reading in the "Measured" column. Compare the reading with the upper and lower limits. After maintenance or adjustment again perform the procedure and compare the readings.

Date ______________________

Serial Number ______________________ Tested by ______________________

Step	Description	Minimum	Measured	Maximum

1. Check Input Impedance

a. Connect the ac voltage calibrator to the input terminals of the AA 501 as shown in Fig. 4-1. Connect the black clip lead to the low terminal and the red clip lead to the high terminal of the voltage calibrator.

b. Make certain the FUNCTION LEVEL and VOLTS pushbuttons are pressed. All other pushbuttons out.

c. Set the INPUT LEVEL RANGE switch to the 2 V position.

d. Set the ac voltage calibrator to any frequency from 400 Hz to 1 kHz.

e. Set the ac voltage calibrator amplitude for an AA 501 display reading of 1.800 V.

f. Move the red clip lead from the red binding post to the free end of the 100 kΩ resistor.

g. CHECK—that the display reads between 0.891 and 0.909.

h. Reverse the connector at the INPUT terminals of the AA 501.

i. CHECK—that the reading is between 0.891 and 0.909.

j. Remove these connections from the front panel INPUT connector for the next step.

2. Check Common Mode Rejection

a. Set the ac voltage calibrator for an output frequency of 50 Hz.

b. Connect the test equipment as shown in Fig. 4-2.

c. Press the FUNCTION LEVEL and VOLTS pushbuttons. All other pushbuttons out.

d. Refer to Table 4-2.

e. CHECK—that the dvm reads according to the table for the listed input conditions.

f. Remove these connections for the next step.

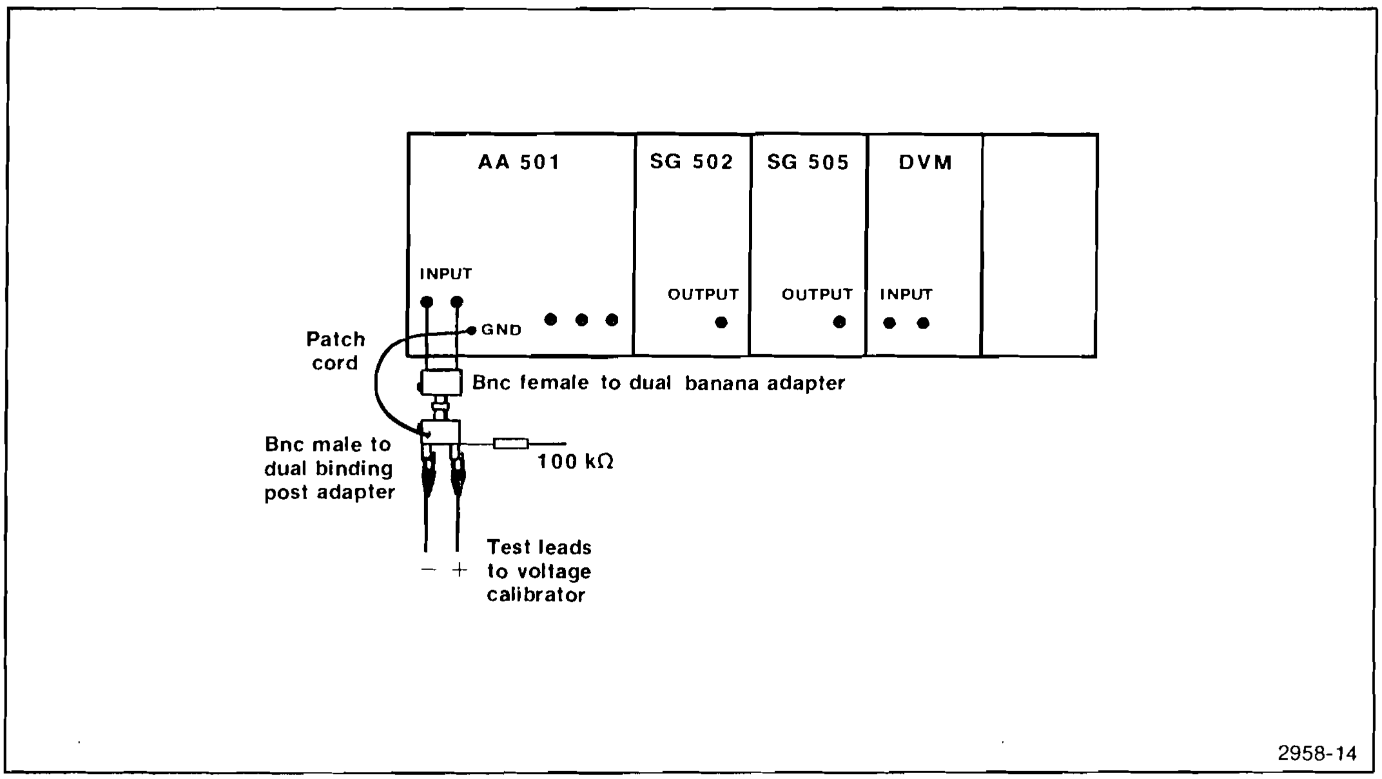


Fig. 4-1. Check step 1. Input impedance.

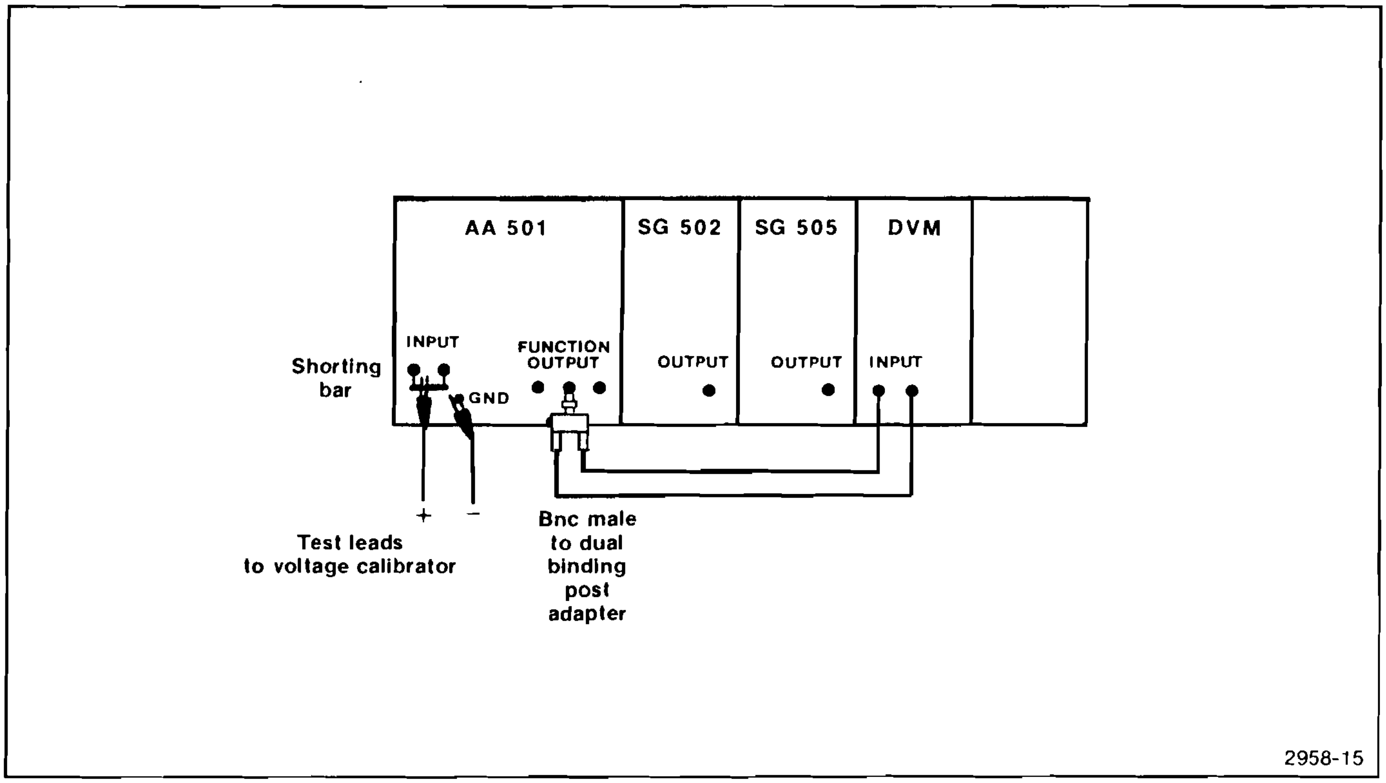


Fig. 4-2. Check step 2. Common mode rejection.

Table 4-2

COMMON MODE REJECTION CHECK

INPUT LEVEL RANGE	Input Voltage @ 50 Hz	Maximum dvm Reading
200 μV	50 mV	1.580 V
2 mV	50 mV	158 mV
20 mV	50 mV	15.8 mV
200 mV	0.1 V	3.2 mV
600 mV	0.3 V	1 mV
2 V	1 V	3.2 mV
6 V	3 V	1.0 mV
20 V	10 V	3.2 mV
60 V	30 V	1.0 mV
200 V	100 V	3.2 mV

Table 4-3

LEVEL FUNCTION ACCURACY

Calibrator	INPUT LEVEL Voltage RANGE	Limits of Reading 20 Hz-20 kHz, ±2%	10 Hz-100 kHz, ±4%
100.0 μV	200 μV	98.0 to 102.0	96.0 to 104.0
1.800 mV	2 mV	1.764 to 1.836	1.728 to 1.872
18 mV	20 mV	17.64 to 18.36	17.28 to 18.72
180 mV	200 mV	176.4 to 183.6	172.8 to 187.2
500 mV	600 mV	490 to 510	480 to 520
1.800 V	2 V	1.764 to 1.836	1.728 to 1.872
5.00 V	6 V	4.90 to 5.10	4.80 to 5.20
18.00 V	20 V	17.64 to 18.36	17.28 to 18.72
50.0 V	60 V	49.0 to 51.0	48.0 to 52.0
180.0 V	200 V	176.4 to 183.6	172.8 to 187.2

[a] 94.0 to 104.0 above 50 kHz.

3. Check Level Function Accuracy

a. Connect the test equipment as shown in Fig. 4-3.

b. Set the voltage output of the ac calibrator and the INPUT LEVEL RANGE switch as listed in Table 4-3.

c. Press the FUNCTION LEVEL and VOLTS pushbuttons. All other pushbuttons out.

NOTE

The specified accuracy of commercially available ac calibrators is not adequate to directly check AA 501 performance at 100 μV. To obtain an accurate 100 μV signal, connect a 1 KΩ 0.1% resistor across the input of the AA 501 and a 100 KΩ 0.1% resistor in series

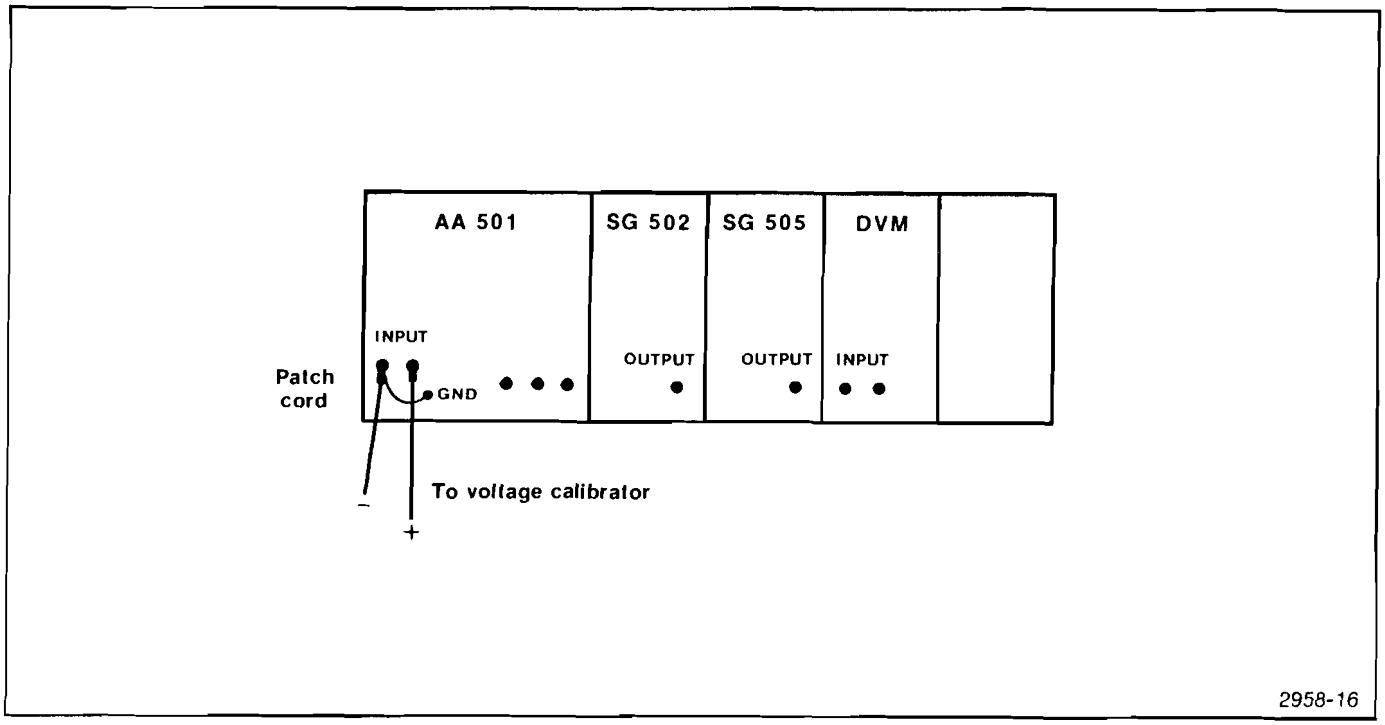


Fig. 4-3. Check step 3. Level function accuracy.

with the ac calibrator. These connections are similar to the test setups shown in Fig. 4-1 except that the + lead from the calibrator is connected to the free end of the 100 KΩ resistor. As this comprises a 102 to 1 voltage divider (including AA 501 input impedance effects) setting the ac calibrator for 10.20 mV will cause the required 100 μV at the AA 501 input terminals.

d. CHECK—that the display reads within the limits as shown in Table 4-2.

e. Set the output of the voltage calibrator to 0.7746 V at any frequency from 20 Hz to 20 kHz.

f. Set the INPUT LEVEL RANGE switch to the 2 V position.

g. Make certain the FUNCTION LEVEL and dBm 600 Ω pushbuttons are pressed.

h. CHECK—that the display reads within +0.3 dBm to −0.3 dBm.

i. Set the input voltage amplitude to any voltage ⩾100 μV at any frequency from 20 Hz to 20 kHz.

j. Set the INPUT LEVEL RANGE switch to the AUTO RANGE position.

k. Calculate the dBm equivalent of the input voltage using the formula

$$\text{dBm} = 20 \times \log_{10} \frac{\text{Input V}}{0.7746}$$

l. CHECK—that the display reads within ±0.3 dB of the calculated result.

m. Repeat parts e through k with the output frequency of the generator set to any frequency between 10 Hz and 100 kHz.

n. CHECK—that the dBm readings are within ±0.5 dB.

o. Remove all connections from the front panel for the next step.

4. Check Bandwidth

a. Set the INPUT LEVEL RANGE switch to the AUTO RANGE position.

b. Press the FUNCTION LEVEL and VOLTS pushbuttons. All other pushbuttons out.

c. Connect the SG 502 as shown in Fig. 4-4.

d. Set the SG 502 output frequency to 1 kHz at any convenient amplitude within the input range of the AA 501 such as 1 V.

e. Press the dB RATIO pushbutton and push and release the PUSH TO SET 0 dB REF pushbutton.

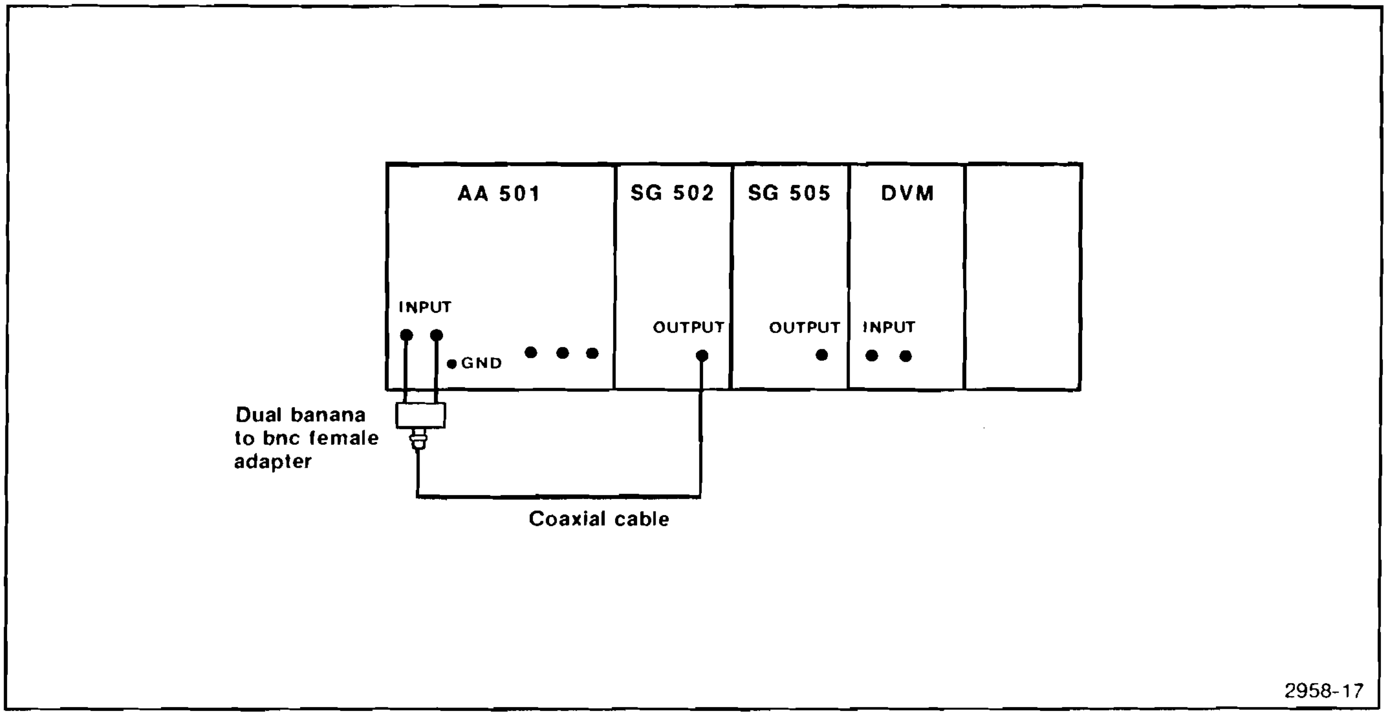


Fig. 4-4. Check step 4. Bandwidth.

f. Increase the frequency of the SG 502 until the display reads -3 dB.

g. CHECK—that the frequency of the SG 502 is ≥300 kHz.

h. Remove all connections from the front panel for the next step.

5. Check Residual Noise

a. Connect the test equipment as shown in Fig. 4-5.

b. Set the INPUT LEVEL RANGE to the 200 μV or the AUTO RANGE position. Press the 80 kHz LO PASS, 400 Hz HI PASS, FUNCTION LEVEL, VOLTS and RESPONSE pushbuttons. All other pushbuttons out.

c. CHECK—that the display reads ≤3.0 μV.

d. Release the 80 kHz LO PASS and 400 Hz HI PASS pushbuttons.

e. Press the 'A' weighting pushbutton.

f. CHECK—that the display reads ≤1.5 μV.

g. Remove the male bnc to dual binding post adapter and 1 kΩ resistor for the next step.

6. Check Total Harmonic Distortion Accuracy

a. Connect the test equipment as shown in Fig. 4-6.

b. Make certain the SG 505 output is off.

c. Set the SG 505 output to any frequency from 20 Hz to 20 kHz.

d. Set the SG 505 output to the floating mode.

e. Set the SG 502 exactly to any harmonic frequency from 40 Hz to 100 kHz.

f. Set the INPUT LEVEL RANGE switch to the 2 mV position.

g. Press the FUNCTION LEVEL and VOLTS pushbuttons. All other pushbuttons out.

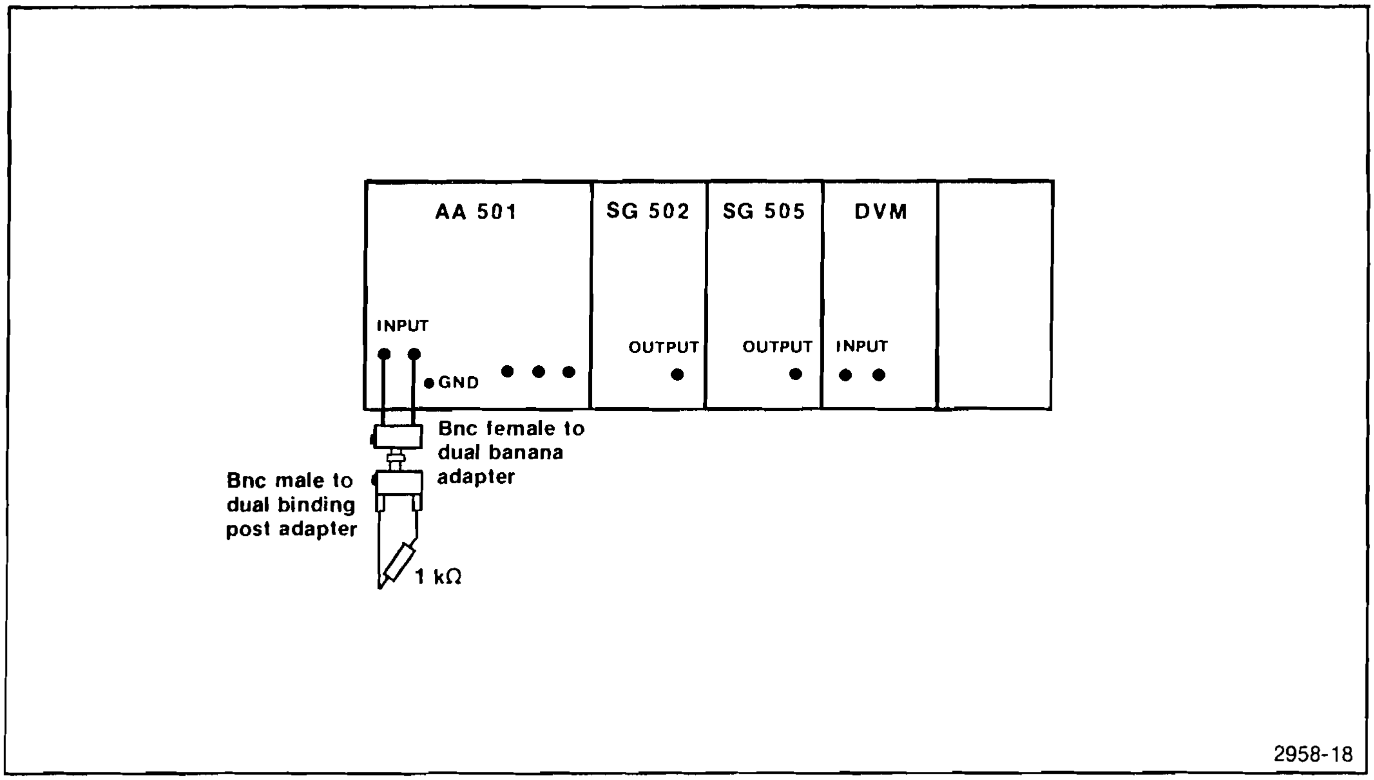


Fig. 4-5. Check step 5. Residual noise.

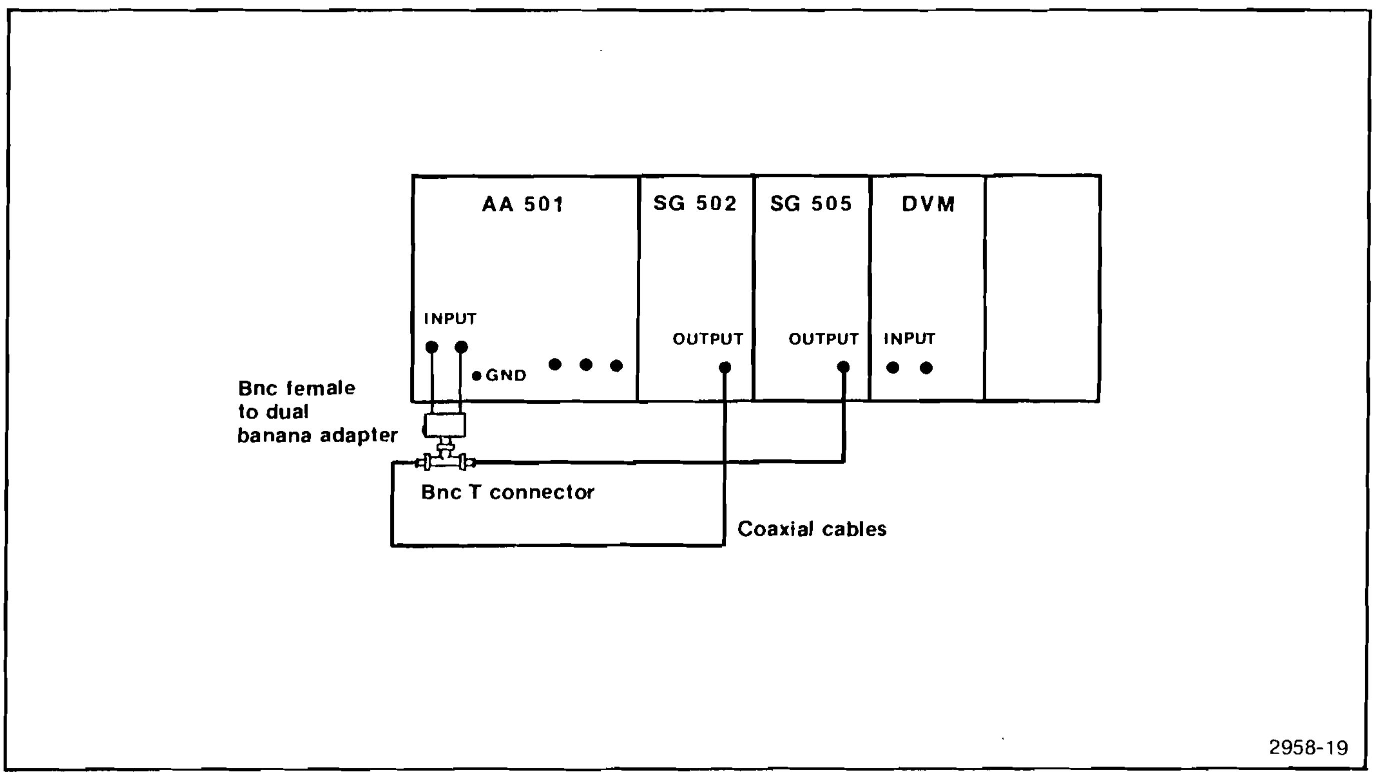


Fig. 4-6. Check steps 6, 9, 10, 11 and adjustment steps 9, 10, and 11. Total harmonic SMPTE and CCIF distortion and CCIF residual IM distortion.

h. Set the output amplitude of the SG 502 for a display reading of .600 (600 μV).

i. Change the INPUT LEVEL RANGE switch to the 200 mV position.

j. Turn on the SG 505 output.

k. Adjust the output amplitude of the SG 505 for a display reading of 60.0 (60 mV).

l. Press the FUNCTION THD+N pushbutton.

m. CHECK—that the display reads from .9 to 1.1%.

n. Change the SG 505 output to any frequency from 10 Hz to 100 kHz.

o. Change the SG 502 to any harmonic frequency of the SG 505 between 20 Hz and 300 kHz.

p. CHECK—that the display reads within .7 to 1.1%.

q. Remove all connections for the next step.

7. Check Residual Total Harmonic Distortion + Noise

NOTE

Care must be taken to minimize common mode signals appearing with signals to be analyzed. The AA 501 and SG 505, used in this step, must be properly installed in the same power module.

a. Connect the test equipment as shown in Fig. 4-7.

b. Press the FUNCTION LEVEL and VOLTS pushbuttons. All other pushbuttons out.

c. Set the INPUT LEVEL RANGE switch to the AUTO RANGE position.

d. Set the SG 505 output amplitude ⩾250 mV, the frequency from 20 Hz to 20 kHz and float the output.

e. Press the THD+N, 80 kHz LO PASS, AUTO RANGE, and VOLTS pushbuttons. All other pushbuttons out.

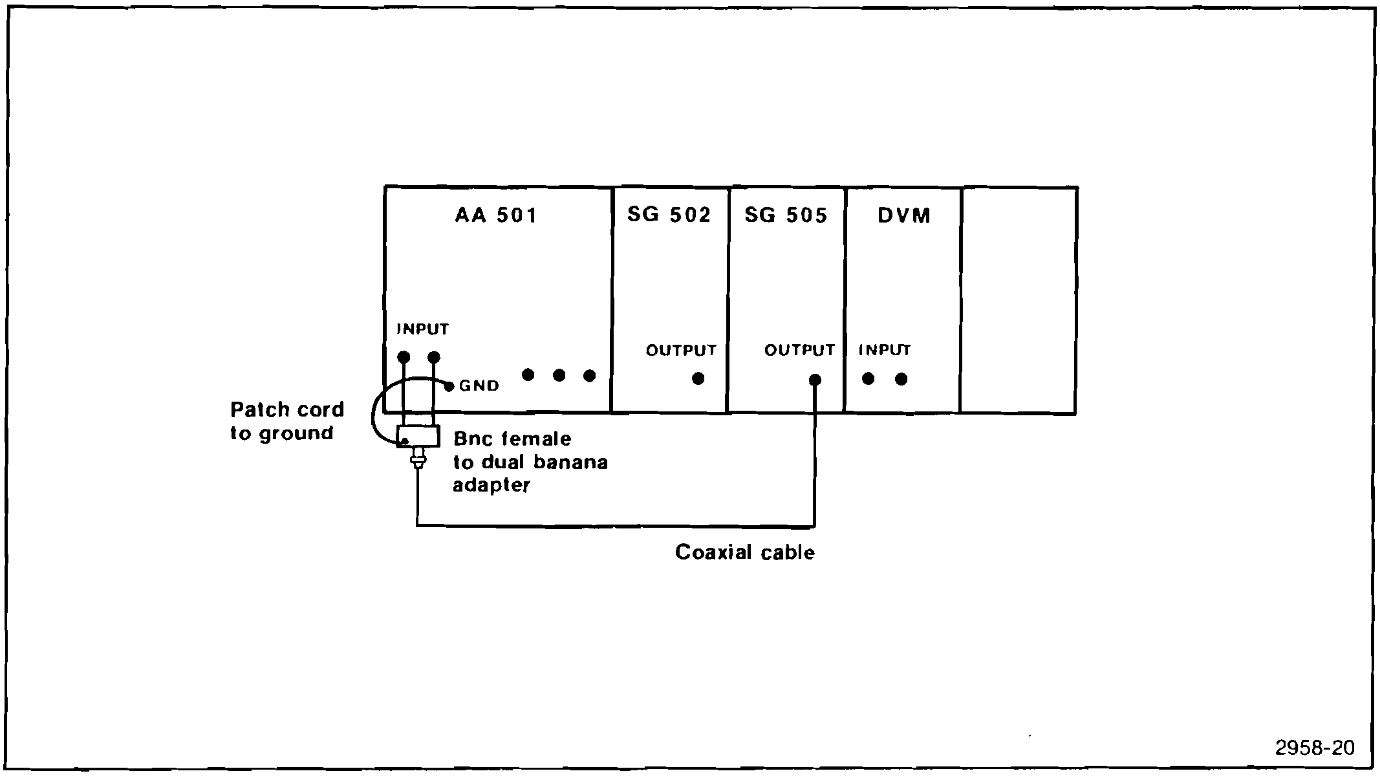


Fig. 4-7. Check step 7. Residual THD+N.

f. CHECK—that the display reads ≤0.0025%.

g. Press the RESPONSE pushbutton.

h. CHECK—that the display reads ≤0.0032%.

i. Release the 80 kHz LO PASS pushbutton.

j. Change the output frequency of the SG 505 to any frequency from 10 Hz to 50 kHz.

k. CHECK—that the display reads ≤.0071%.

l. Change the output frequency of the SG 505 to any frequency from 50 kHz to 100 kHz.

m. CHECK—that the display reads ≤0.010%.

n. Leave this setup for the next step.

8. Check Residual Intermodulation Distortion in the SMPTE/DIN Mode (Option 01 only)

a. Connect the test equipment as shown in Fig. 4-8.

b. Make certain the INPUT LEVEL RANGE switch is in the AUTO RANGE position.

c. Make certain the FUNCTION LEVEL, VOLTS, and AUTO RANGE pushbuttons are pressed. All other pushbuttons out.

d. Set the output of the SG 505 to 7 kHz and turn on the intermodulation test signal set to 60 Hz or the output to 8 kHz and the intermodulation test signal to 250 Hz. See the Maintenance section for jumper selection information.

e. Set the output amplitude of the SG 505 to any value ≥250 mV.

f. Press the IMD pushbutton.

g. CHECK—that the display reads ≤0.0025%.

h. Remove these connections for the next step.

9. Check Residual Intermodulation Distortion in the CCIF Difference Tone Test Mode (Option 01 only)

a. Connect the test equipment as shown in Fig. 4-6.

b. Turn the SG 505 output off.

c. Make certain the 60 Hz or 250 Hz IM test signal is off.

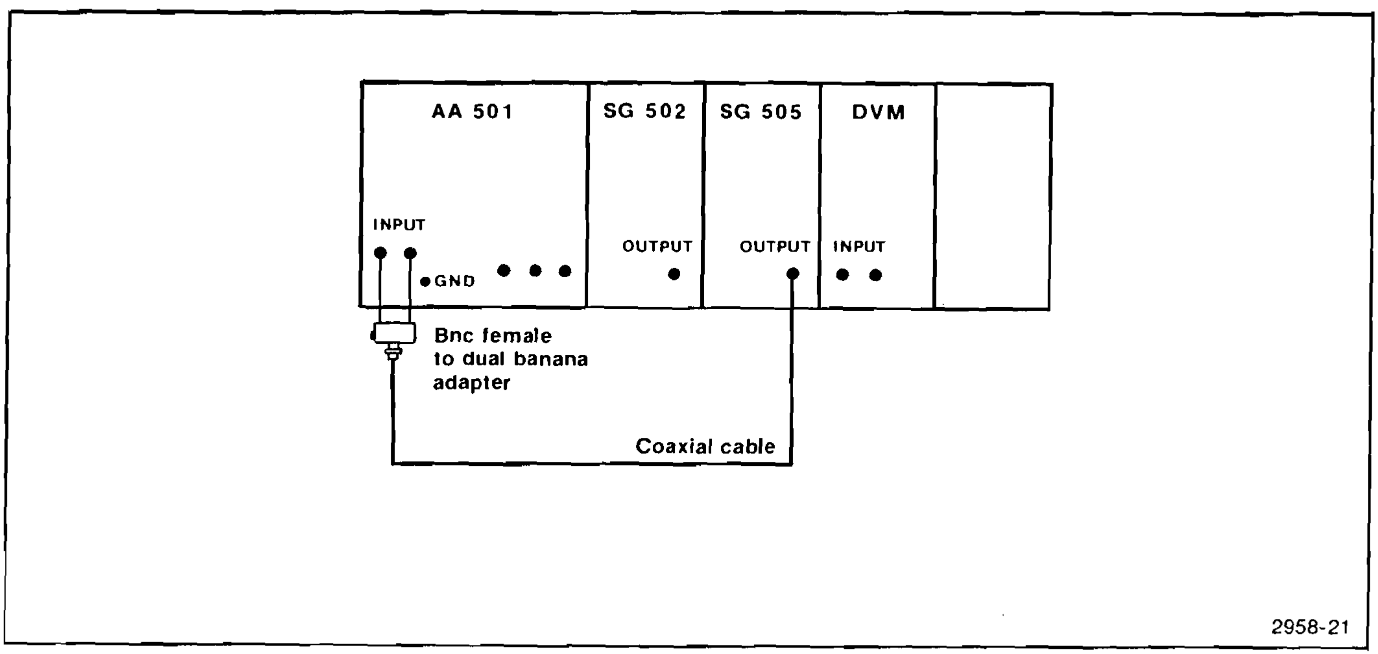


Fig. 4-8. Check step 8 and adjustment step 8. SMPTE residual intermodulation distortion.

d. Set the output frequency of the SG 502 to 14 kHz.

e. Set the INPUT LEVEL RANGE to the AUTO RANGE position.

f. Press the FUNCTION LEVEL, VOLTS, AUTO RANGE and RESPONSE RMS pushbuttons. All other pushbuttons out.

g. Set the output amplitude of the SG 502 to any voltage above 177 mV. Note the output amplitude as read on the AA 501 display.

h. Turn the SG 505 output on.

i. Set the output frequency of the SG 505 to 15 kHz and the output amplitude so the AA 501 display reads 1.414 times the amplitude noted in step g.

j. Press the IMD pushbutton.

k. CHECK—that the display reads ≤0.0025%.

l. Leave these connections for the next step.

10. Check IM Distortion Accuracy, SMPTE Test (Option 01 only)

a. Connect the test equipment as shown in Fig. 4-6.

b. Set the Option 01 SG 505 for a 60 Hz IM test signal. Float the output.

c. Adjust the SG 502 output level for maximum attenuation.

d. Set the INPUT LEVEL RANGE switch to the AUTO RANGE position.

e. Press the VOLTS, FUNCTION LEVEL, AUTO RANGE, and RESPONSE pushbuttons. All other pushbuttons out.

f. Adjust the SG 505 for an output frequency of 7 kHz and a 60 mV or greater composite test signal level as read on the AA 501 display.

g. Press the 400 Hz HI PASS pushbutton.

h. Note the AA 501 display reading.

i. Turn off the SG 505 output.

j. Adjust the SG 502 output frequency to 7.2 kHz with an output amplitude of exactly 10% of the reading noted in step h.

k. Turn on the SG 505 output.

l. Press the IMD pushbutton and release the 400 Hz HI PASS pushbutton.

m. CHECK—that the display reading is 9.00% to 11.00%.

n. Leave this setup for the next step.

11. Check IM Distortion Accuracy, CCIF Difference Tone Test (Option 01 only)

NOTE

CCIF distortion is referenced to the level of either component of two equal amplitude test tones. The following procedure simplifies test instrumentation requirements and minimizes sources of potential error by omitting one of the two test tones. Because only one test tone is present the averaging response of the internal automatic set-level circuitry will cause readings to be high by a factor of exactly 1.273 ($4 \div \pi$). If desired, the alternate procedure given in step 11A may be followed. This procedure provides two equal amplitude test tones. However, it requires an additional SG 505 or equivalent oscillator and extra cabling.

a. Connect the test equipment as shown in Fig. 4-6.

b. Set the INPUT LEVEL RANGE switch to the AUTO RANGE position.

c. Make certain the VOLTS, LEVEL, AUTO RANGE, and RESPONSE pushbuttons are in. All other pushbuttons out.

d. Turn off the SG 505 output. Make certain the IM test signal is off. Float the output.

e. Adjust the SG 502 for a 250 Hz, 6.00 mV output signal as indicated on the AA 501 display.

f. Press the 400 Hz HI PASS pushbutton.

g. Turn on the SG 505 output and adjust for an output frequency of 14 kHz, and a 60 mV output signal amplitude as displayed on the AA 501.

h. Press the IMD pushbutton and release the 400 Hz HI PASS pushbutton.

i. CHECK—that the display reads from 11.46% to 14.00%.

j. Remove all connections for the next step.

11A. Check IM Distortion Accuracy, CCIF Difference Tone Test (alternate procedure, omit if step 11 is performed, Option 01 only)

a. Connect the test equipment as shown in Fig. 4-9.

b. Set the INPUT LEVEL RANGE switch to the AUTO RANGE position.

c. Make certain the VOLTS, LEVEL, AUTO RANGE, and RESPONSE pushbuttons are in. All other pushbuttons out.

d. Turn off both SG 505 outputs. Make certain both outputs are floating.

e. Adjust the SG 502 for a 250 Hz, 4.24 mV output signal as read on the AA 501 display.

f. Press the 400 Hz HI PASS pushbutton.

g. Turn on one SG 505 output and adjust this SG 505 for an output frequency of 14 kHz, with an amplitude of 42.4 mV as displayed on the AA 501.

h. Turn off this SG 505 output and turn on the remaining SG 505 output.

i. Adjust this SG 505 output for a frequency of 15 kHz, with an amplitude of 42.4 mV as displayed on the AA 501.

j. Turn on the first SG 505 output and note that the composite amplitude is approximately 60 mV.

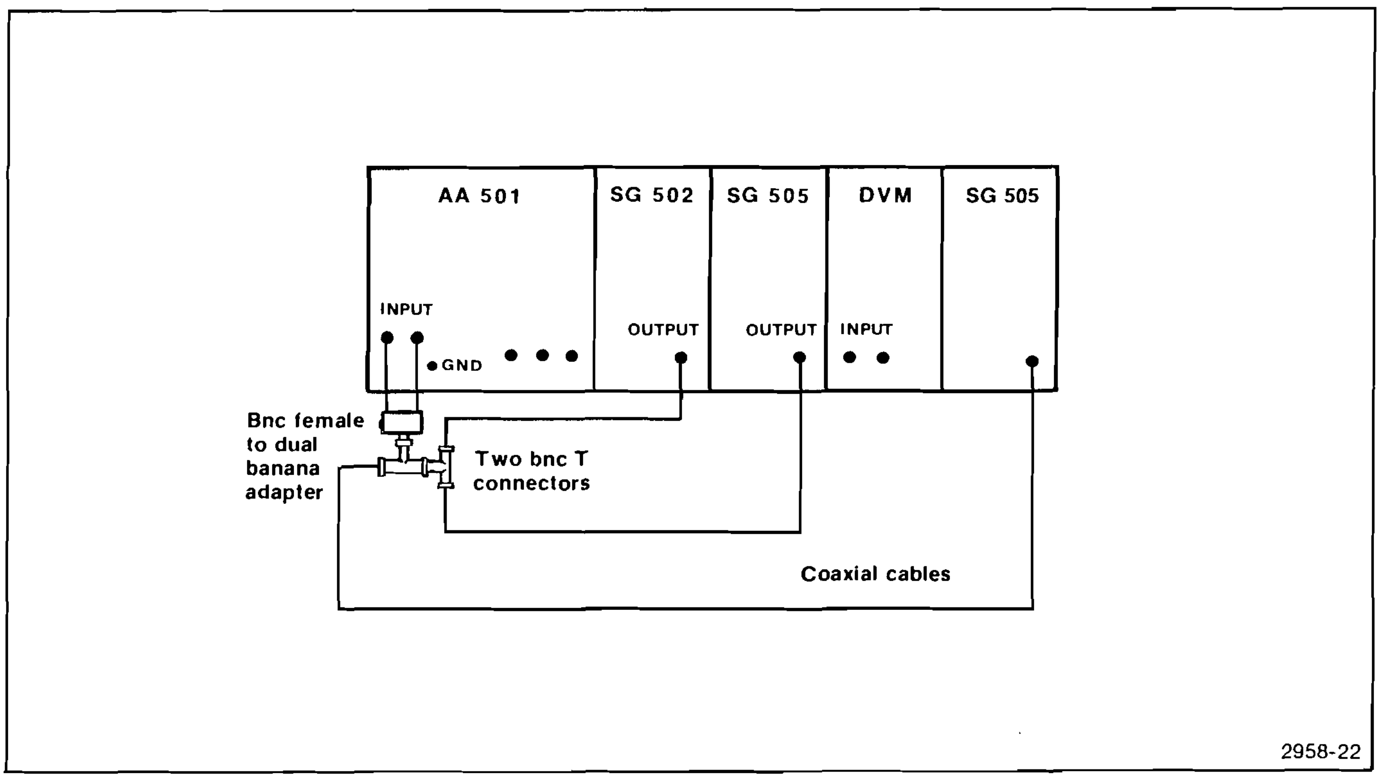


Fig. 4-9. Check step 11A and adjustment step 11A. Alternate CCIF IM distortion accuracy.

k. Press the IMD pushbutton and release the 400 Hz HI PASS pushbutton.

l. CHECK—that the display reads from 9.00% to 11.00%.

m. Remove all connections for the next step.

12. Check Filter Accuracy

a. Connect the test equipment as shown in Fig. 4-10.

b. Adjust the counter to read the input frequency.

c. Set the INPUT LEVEL RANGE switch to the AUTO RANGE position.

d. Press the FUNCTION LEVEL, 400 Hz HI PASS and VOLTS pushbuttons. All other pushbuttons out. Set the output frequency of the SG 505 to 1 kHz and the output amplitude to 1 V.

e. Press the dB RATIO pushbutton.

f. Press and release the PUSH TO SET 0 dB REF pushbutton. Note that the display goes to all zeros.

g. Lower the frequency of the SG 505 until the display reads exactly −3.0 dB.

h. CHECK—that the frequency counter reading is from 380 Hz to 420 Hz.

i. Lower the output frequency of the SG 505 to 60 Hz.

j. CHECK—that the AA 501 display reads −40 dB or greater.

k. Return the SG 505 frequency to 1 kHz.

l. Release the 400 Hz HI PASS pushbutton and press the 30 kHz LO PASS pushbutton.

m. Raise the frequency of the SG 505 until the display reads −3.0 dB.

n. CHECK—that the counter reads from 28.5 kHz to 31.5 kHz.

o. Release the 30 kHz LO PASS pushbutton and press the 80 kHz LO PASS pushbutton.

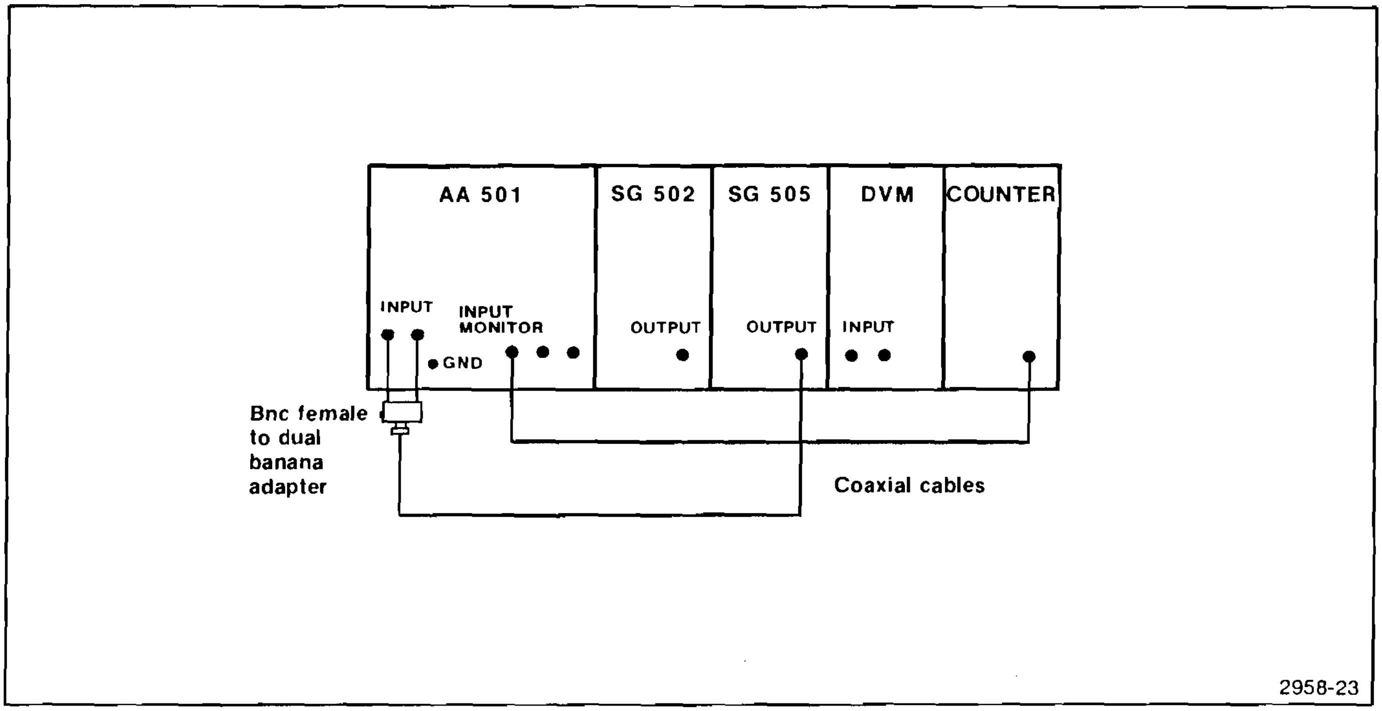


Fig. 4-10. Check step 12. Filter accuracy.

p. Raise the frequency of the SG 505 until the AA 501 display reads −3.0 dB.

q. CHECK—that the oscillator frequency is from 76 kHz to 84 kHz.

r. Leave these connections for the next step.

13. Check INPUT MONITOR

a. Connect the test equipment as shown in Fig. 4-11.

b. Set the output amplitude of the oscillator to any voltage ≥50 mV within the specified range of the instrument.

c. Set the output frequency to 1 kHz.

d. Set the INPUT LEVEL RANGE switch to the AUTO RANGE position.

e. CHECK—that the output voltage is from .9 V to 1.1 V rms.

f. Connect a 1 kΩ 0.1% resistor in parallel with the INPUT MONITOR.

g. CHECK—that the dvm reading is one half of the value noted in step e within ± 2.5%.

h. Leave the connection to the INPUT terminals for the next step.

14. Check FUNCTION OUTPUT

a. Connect the test equipment as shown in Fig. 4-12.

b. Set the INPUT LEVEL RANGE switch to the 2 V position.

c. Press the FUNCTION LEVEL and VOLTS pushbuttons.

d. Adjust the output amplitude of the SG 505 so that the AA 501 display reads 1.000 V.

e. CHECK—that the dvm reads from 0.95 to 1.05 V rms.

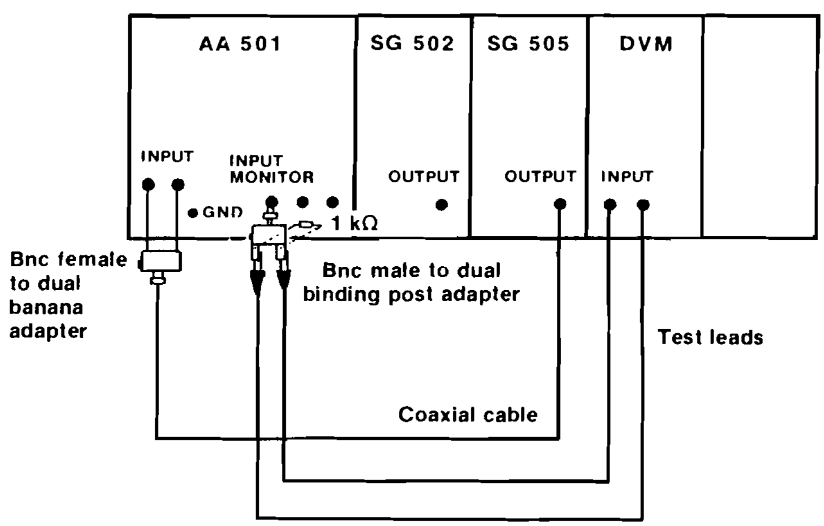


Fig. 4-11. Check step 13. Input monitor.

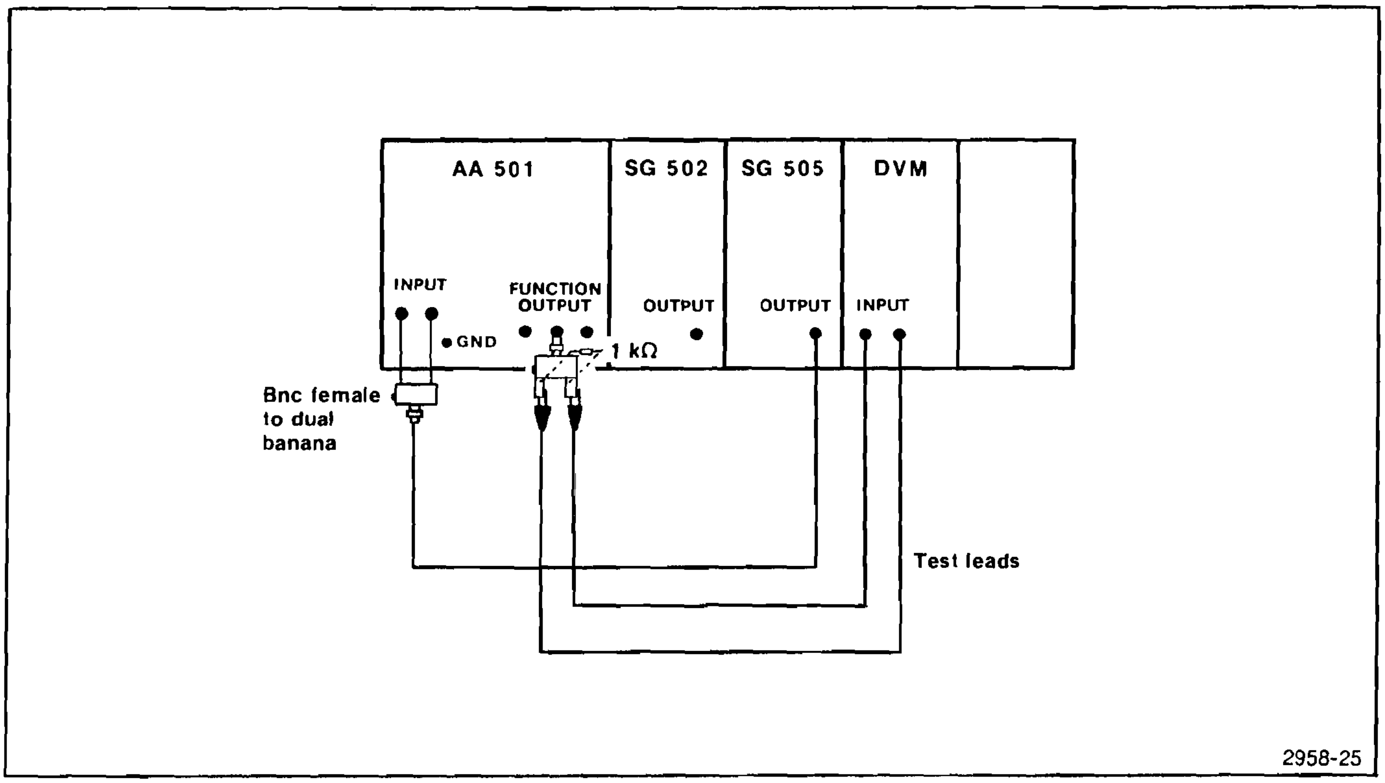


Fig. 4-12. Check step 14. Function output.

f. Connect a 1 kΩ 0.1% resistor in parallel with the FUNCTION OUTPUT.

g. CHECK—that the dvm reading is one half of the value noted in step f within ±2.5%.

h. Remove these connections for the next step.

15. Check AUXILIARY INPUT

a. Connect the test equipment as shown in Fig. 4-13.

b. Press the EXT FILTER pushbutton.

c. Adjust the voltage of the calibrator so that the display reads 1.000 V.

d. CHECK—that the voltage of the calibrator is from 0.97 V to 1.03 V.

e. Connect a 100 kΩ 0.1% resistor in series with the AUXILIARY INPUT.

f. CHECK—that the display reads from 0.488 V to 0.513 V.

g. Remove all connections.

This completes the Performance Check procedure.

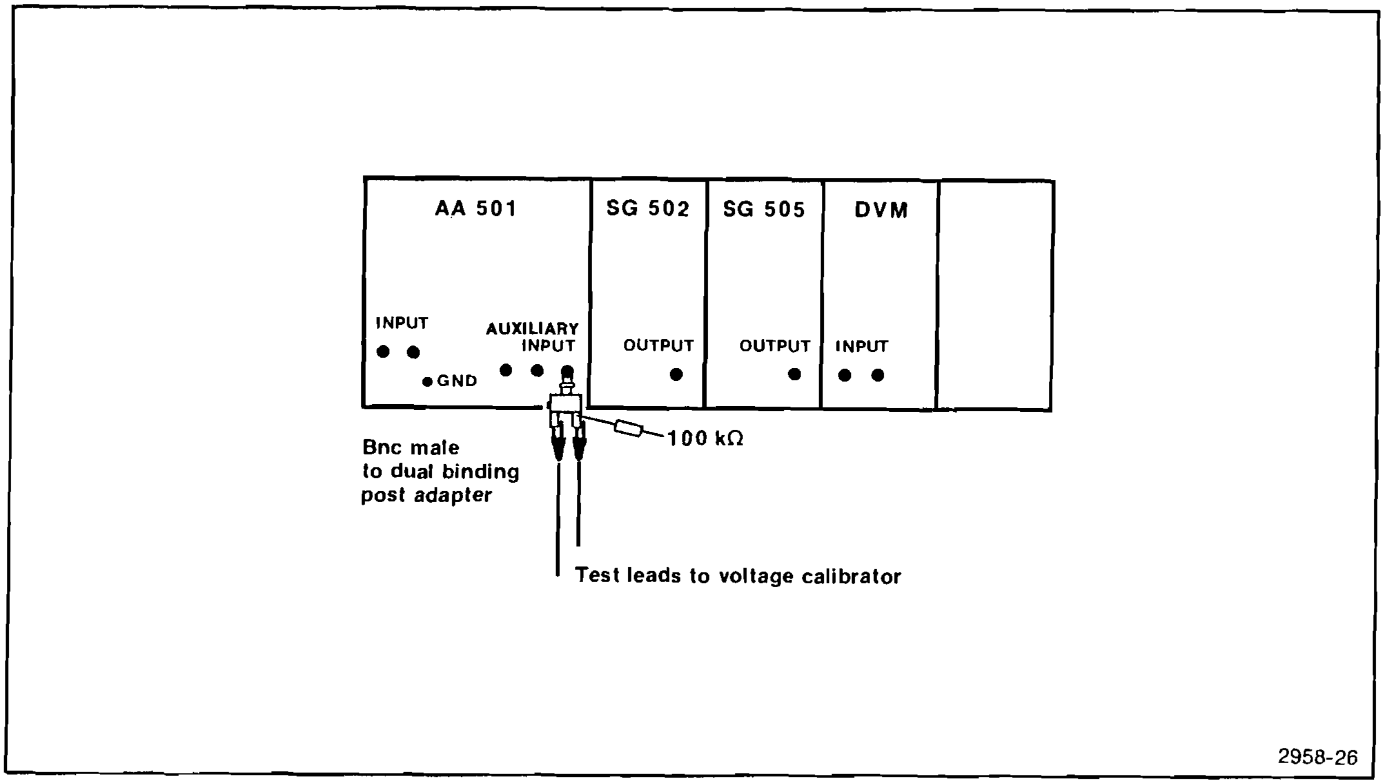


Fig. 4-13. Check step 15. Auxiliary input.

INTERNAL ADJUSTMENT PROCEDURE

Introduction

This procedure should be performed if the instrument fails to meet the performance requirements of the electrical characteristics listed in the Specification section of this manual. To insure continued instrument accuracy it is recommended that adjustment be performed every 1000 hours of operation or every six to twelve months if used infrequently. Adjustment is also recommended following instrument repair or modification. Adjustments must be made at an ambient temperature of +20° C to +30° C.

Services Available

Tektronix, Inc. provides complete instrument repair and adjustment at local field service centers and at the factory service center. Contact your local Tektronix Field Office or representative for further information.

Test Equipment Required

The test equipment (or equivalent) listed in Table 4-1 is required for adjustment of the AA 501. Specifications given for the test equipment are the minimum necessary for accurate adjustment. All test equipment is assumed to be correctly calibrated and operating within specification.

If other test equipment is substituted, the calibration setup may need to be altered to meet the requirements of the equipment used.

Adjustment Access

Use an extender cable (Tektronix Part No. 067-0645-02) to operate the plug-in outside the power module. Remove the top and both side covers of the AA 501 to gain access to the adjustments. All adjustments on the Input board are accessed from the top of the instrument. See the Adjustment Location illustration in the pullout pages at the back of this manual.

1. Adjust Dist Amp Offset

a. Press the FUNCTION LEVEL and VOLTS pushbuttons.

b. Set the INPUT LEVEL RANGE switch to the 200 μV position.

c. Short the INPUT terminals with the dual banana shorting bar. See Fig. 4-14.

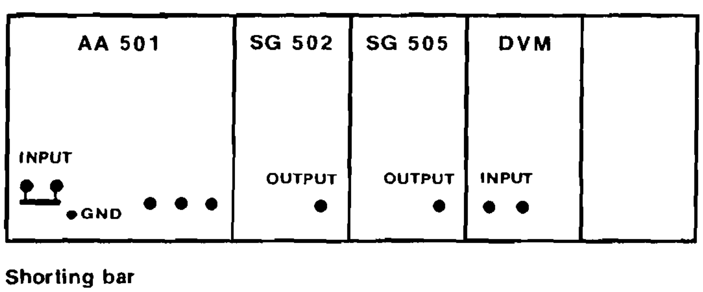


Fig. 4-14. Adjustment test setup for steps 1 and 2.

d. Connect the test dvm set to read 0.0 mV to TP1310.

e. ADJUST—R1320, Dist Amp Offset, for 0.0 mV ±1 mV on the dvm.

f. Leave the shorting bar for the next step.

2. Adjust Rms and Avg Zero

a. Make certain the INPUT is shorted. See Fig. 4-14.

b. Make certain the FUNCTION LEVEL and VOLTS pushbuttons are pressed.

c. Set the INPUT LEVEL RANGE switch to the 2 V position.

d. Press the RESPONSE pushbutton.

e. ADJUST—R1201, Rms Zero, for a reading of exactly .000 on the display.

f. Release the RESPONSE pushbutton.

g. ADJUST—R1300, Avg Zero, for a display reading of exactly .000.

h. Remove the shorting bar for the next step.

3. Adjust Volts and Avg Cal

a. Make certain the FUNCTION LEVEL and VOLTS pushbuttons are pressed.

b. Make certain the INPUT LEVEL RANGE is set to the 2 V position.

c. Press the RESPONSE pushbutton.

d. Apply a 1 kHz sinewave of exactly 1.800 V rms from the ac calibrator to the INPUT terminals. See Fig. 4-15.

e. ADJUST—R1218, Volts Cal, for a display reading of 1.800 ±0.001.

f. Release the RESPONSE pushbutton.

g. ADJUST—R1301, Avg Cal, for a display reading of 1.800 ±0.001.

h. Leave this setup for the next step.

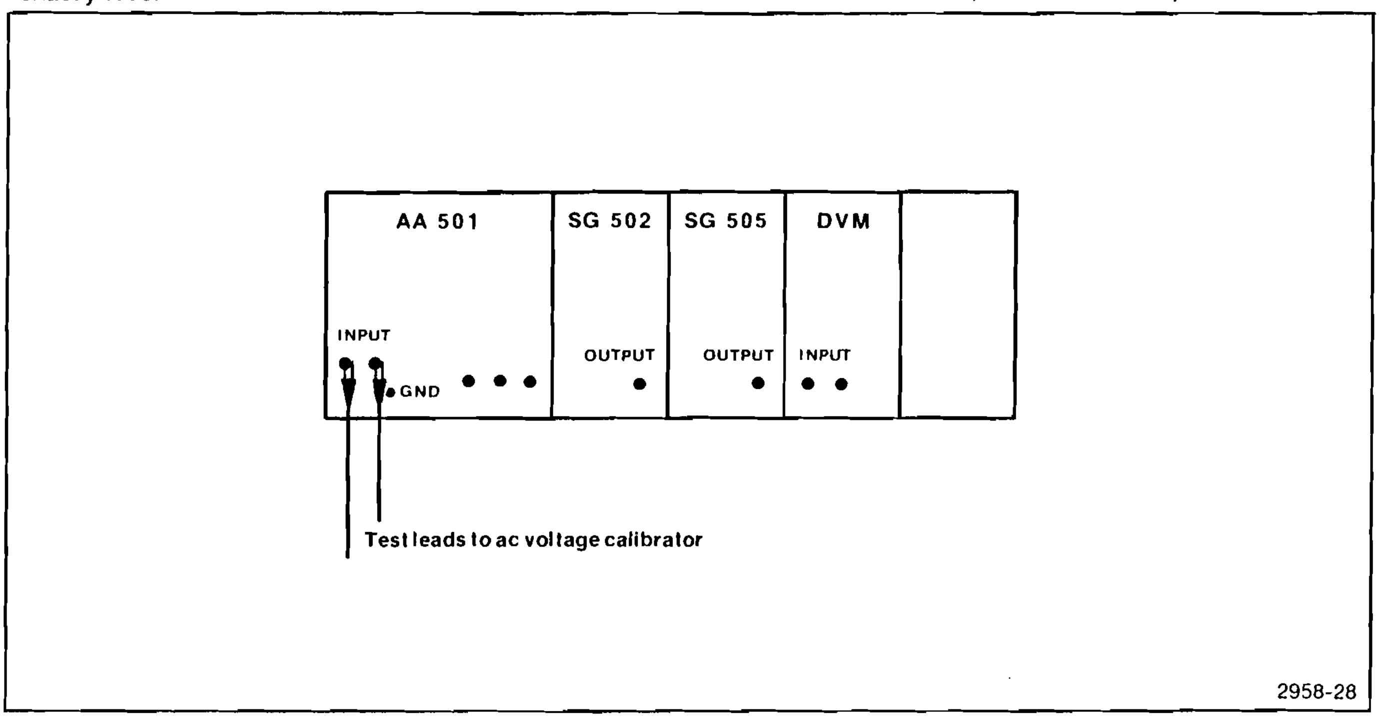


Fig. 4-15. Adjustment test setup for steps 3, 4, 5, 6, and 7.

4. Adjust Attn Comp

a. Make certain the FUNCTION LEVEL and VOLTS pushbuttons are pressed. All other pushbuttons out.

b. Make certain the INPUT LEVEL RANGE is set to the 2 V position.

c. Apply a 1.00 V 50 kHz sinewave from the ac voltage calibrator to the INPUT terminals. See Fig. 4-15.

d. Note the display reading.

e. Select the 20 V INPUT LEVEL RANGE position.

f. Set the ac voltage calibrator for a 10.00 V 50 kHz sinewave.

g. ADJUST—C1400, Attn Comp, for a display reading exactly ten times the reading noted in step d. Use an insulated low capacitance screwdriver for this adjustment.

h. Leave this setup for the next step.

5. Adjust 0 dB Adj, −20 dB Adj and Input Zero

a. Make certain the FUNCTION LEVEL pushbutton is pressed.

b. Press the dBm 600 Ω pushbutton.

c. Make certain the INPUT LEVEL RANGE switch is in the 2 V position.

d. Press the RESPONSE pushbutton.

e. Apply a 0.7746 V rms 1 kHz signal from the ac calibrator to the INPUT terminals. See Fig. 4-15.

f. ADJUST—R1341, 0 dB Adj, for a reading of exactly 00.0.

g. Reduce the calibrator amplitude to 77.46 mV rms.

h. ADJUST—R1501, −20 dB Adj, for a reading of exactly −20.0.

i. Reduce the calibrator amplitude to 7.746 mV rms.

j. ADJUST—R1245, Input Zero, for a reading of −40.0 ±0.2.

k. INTERACTION—Repeat steps e through j until readings are correct.

l. Leave these connections for the next step.

6. Adjust Offset Gain

a. Use the same control settings as in the previous step except change the INPUT LEVEL RANGE switch to the 6 V position.

b. Apply a 0.7746 V rms 1 kHz signal from the ac calibrator to the FRONT PANEL INPUT terminals. See Fig. 4-15.

c. ADJUST—R1246, Offset Gain, for a display reading of exactly 00.0.

d. Leave this setup for the next step.

7. Adjust dBr Zero

a. Use the same front panel control settings as in the previous step except press the dB RATIO pushbutton.

b. Make certain the output of the ac calibrator is 0.7746 V rms at 1 kHz. See Fig. 4-15.

c. Press and release the PUSH TO SET 0 dB REF pushbutton.

d. ADJUST—If the display does not read 00.0 adjust R1445, dBr Zero, slightly clockwise to correct a − error or counterclockwise for a + error.

e. INTERACTION—Repeat steps c and d until the display reads 00.0.

f. Remove all connections for the next step.

8. Adjust Null, Freq Trim and 3 H Null

NOTE

Although not necessary to perform this step, a dual channel oscilloscope may be of help. Connect the INPUT MONITOR to channel 1 and the FUNCTION OUTPUT to channel 2. Trigger on the channel 1 signal. Channel 1 shows the fundamental. R1101 and R1100 are adjusted for minimum fundamental at the FUNCTION OUTPUT while R1038 is adjusted for minimum 3rd harmonic.

a. Use the same AA501 control settings as for the previous step except change the INPUT LEVEL RANGE switch to 2 V. Press the 400 Hz HI PASS, THD + n, 0.2% and 30 KHz LO PASS pushbuttons.

b. Connect the test equipment as shown in Fig. 4-8.

c. Set the output frequency of the SG 505 for 500 Hz.

d. Make certain that the output level control on the SG 505 is at the 0 dBm position (1.55 V rms).

e. ADJUST—R1101, Null Trim, for the lowest display reading.

f. ADJUST—R1100, Freq Trim, for the lowest display reading.

g. Change the SG 505 frequency to 2.5 kHz.

h. ADJUST—R1038, 3 H Null, for the lowest display reading.

i. INTERACTION—repeat steps c,d,e,f,g and h to obtain the lowest possible reading.

j. Disconnect the SG 505 from the AA 501.

9. Adjust Dist Cal

a. Set the INPUT LEVEL RANGE switch to the AUTO RANGE position.

b. Press the FUNCTION LEVEL, VOLTS, and AUTO RANGE pushbuttons. All other pushbuttons out.

c. Connect the test equipment as shown in Fig. 4-6.

d. Turn off the SG 505 output.

e. Adjust the SG 502 for an AA 501 display reading of 10 mV at 7 kHz.

f. Turn on the SG 505 output and set the frequency to 900 Hz.

g. Adjust the SG 505 output level to 1 V as displayed on the AA 501. Press the THD+N pushbutton.

h. ADJUST—R1330, Dist Cal, for a reading of 1.000%.

i. Leave these connections for the next step.

10. Adjust SMPTE Cal (Option 01)

a. Connect the test equipment as shown in Fig. 4-6.

b. Set the Option 01 SG 505 for a 60 Hz IM test signal. Float the output.

c. Adjust the SG 502 output level for maximum attenuation.

d. Set the INPUT LEVEL RANGE switch to the AUTO RANGE position.

e. Press the VOLTS, FUNCTION LEVEL, AUTO RANGE, and RESPONSE pushbuttons. All other pushbuttons out.

f. Adjust the SG 505 for an output frequency of 7 kHz and a 60 mV or greater composite test signal level as read on the AA 501 display.

g. Press the 400 Hz HI PASS pushbutton.

h. Note the AA 501 display reading.

i. Turn off the SG 505 output.

j. Adjust the SG 502 output frequency to 7.2 kHz with an output amplitude of exactly 10% of the reading noted in step h.

k. Turn on the SG 505 output.

l. Press the IMD pushbutton and release the 400 Hz HI PASS pushbutton.

m. ADJUST—R1001, SMPTE Cal, for a display reading of 10.00%.

n. Leave this setup for the next step.

11. Adjust Diff Freq Cal (Option 01)

NOTE

CCIF distortion is referenced to the level of either component of two equal amplitude test tones. The following procedure simplifies test instrumentation requirements and minimizes sources of potential error by omitting one of the two test tones. Because only one test tone is present the averaging response of the internal automatic set-level circuitry will cause readings to be high by a factor of exactly 1.273 ($4 \div \pi$). If desired, the alternate procedure given in step 11A may be followed. This procedure provides two equal amplitude test tones. However, it requires an additional SG 505 or equivalent oscillator and extra cabling.

a. Connect the test equipment as shown in Fig. 4-6.

b. Set the INPUT LEVEL RANGE switch to the AUTO RANGE position.

c. Make certain the VOLTS, LEVEL, 20%, and RESPONSE pushbuttons are in. All other pushbuttons out.

d. Turn off the SG 505 output. Make certain the IM test signal is off. Float the output.

e. Adjust the SG 502 for a 250 Hz, 6.00 mV output signal as indicated on the AA 501 display.

f. Press the 400 Hz HI PASS pushbutton.

g. Turn on the SG 505 output and adjust for an output frequency of 14 kHz, and a 60 mV output signal amplitude as displayed on the AA 501.

h. Press the IMD and release the 400 Hz HI PASS pushbuttons.

i. ADJUST—R1421, Diff Freq Cal, for a display reading of 12.73%.

j. This completes the AA501 Internal Adjustment procedure.

11A. Adjust Diff Freq Cal (alternate procedure, omit if step 11 is performed, Option 01 only)

a. Connect the test equipment as shown in Fig. 4-9.

b. Set the INPUT LEVEL RANGE switch to the AUTO RANGE position.

c. Make certain the VOLTS, LEVEL, 20%, and response pushbuttons are in. All other pushbuttons out.

d. Turn off both SG 505 outputs. Make certain both outputs are floating.

e. Adjust the SG 502 for a 250 Hz, 4.24 mV output signal as read on the AA 501 display.

f. Press the 400 Hz HI PASS pushbutton.

g. Turn on one SG 505 output and adjust this SG 505 for an output frequency of 14 kHz, with an amplitude of 42.4 mV as displayed on the AA 501.

h. Turn off this SG 505 output and turn on the remaining SG 505 output.

i. Adjust this SG 505 output for a frequency of 15 kHz, with an amplitude of 42.4 mV as displayed on the AA 501.

j. Turn on the first SG 505 output and note that the composite amplitude is approximately 60 mV.

k. Press the IMD pushbutton and release the 400 Hz HI PASS pushbutton.

l. ADJUST—R1421, Diff Freq Cal, for a display reading of 10.00%.

m. This completes the AA 501 Internal Adjustment procedure.

MAINTENANCE

GENERAL MAINTENANCE INFORMATION

Static-Sensitive Components

CAUTION

Static discharge can damage any semiconductor component in this instrument.

This instrument contains electrical components that are susceptible to damage from static discharge. See Table 5-1 for relative susceptibility of various classes of semiconductors. Static voltages of 1 kV to 30 kV are common in unprotected environments.

Observe the following precautions to avoid damage:

1. Minimize handling of static-sensitive components.

2. Transport and store static-sensitive components or assemblies in their original containers, on a metal rail, or on conductive foam. Label any package that contains static-sensitive assemblies or components.

3. Discharge the static voltage from your body by wearing a wrist strap while handling these components. Servicing static-sensitive assemblies or components should be performed only at a static-free work station by qualified service personnel.

4. Nothing capable of generating or holding a static charge should be allowed on the work station surface.

5. Keep the component leads shorted together whenever possible.

6. Pick up components by the body, never by the leads.

7. Do not slide the components over any surface.

8. Avoid handling components in areas that have a floor or work surface covering capable of generating a static charge.

9. Use a soldering iron that is connected to earth ground.

10. Use only special antistatic suction type or wick type desoldering tools.

Table 5-1

RELATIVE SUSCEPTIBILITY TO STATIC DISCHARGE DAMAGE

Semiconductor Classes	Relative Susceptibility Levels[a]
MOS or CMOS microcircuits or discretes, or linear microcircuits with MOS inputs. (Most Sensitive)	1
ECL	2
Schottky signal diodes	3
Schottky TTL	4
High-frequency bipolar transistors	5
JFETs	6
Linear microcircuits	7
Low-power Schottky TTL	8
TTL (Least Sensitive)	9

[a] **Voltage equivalent for levels:**

1 = 100 to 500 V	**4 = 500 V**	**7 = 400 to 1000 V (est.)**
2 = 200 to 500 V	**5 = 400 to 600 V**	**8 = 900 V**
3 = 250 V	**6 = 600 to 800 V**	**9 = 1200 V**

(Voltage discharged from a 100 pF capacitor through a resistance of 100 ohms.)

Cleaning

This instrument should be cleaned as often as operating conditions require. Loose dust accumulated on the outside of the instrument can be removed with a soft cloth or small brush. Remove dirt that remains with a soft cloth dampened in a mild detergent and water solution. Do not use abrasive cleaners.

CAUTION

To clean the front panel use freon, isopropyl alcohol, or denatured ethyl alcohol. Do not use petroleum based cleansing agents. Before using any other type of cleaner, consult your Tektronix Service Center or representative.

The best way to clean the interior is to blow off the accumulated dust with dry, low-velocity air (approximately 5 lb/in^2) or use a soft brush or cloth dampened with a mild detergent and water solution.

Hold the board so the cleaning residue runs away from the connectors. Do not scrape or use an eraser to clean the edge connector contacts. Abrasive cleaning can remove the gold plating.

CAUTION

Circuit boards and components must be dry before applying power.

Obtaining Replacement Parts

Electrical and mechanical parts can be obtained through your local Tektronix Field Office or representative. However, it may be possible to obtain many of the standard electronic components from a local commercial source. Before purchasing or ordering a part from a source other than Tektronix, Inc., check the Replaceable Electrical Parts list for the proper value, rating, tolerance, and description.

NOTE

When selecting replacement parts, remember that the physical size and shape of a component may affect its performance in the instrument.

Some parts are manufactured or selected by Tektronix, Inc., to satisfy particular requirements or are manufactured for Tektronix, Inc., to our specifications. Most of the mechanical parts used in this instrument have been manufactured by Tektronix, Inc. To determine the manufacturer, refer to the Replaceable Parts list and the Cross Reference index, Mfr. Code Number to Manufacturer.

When ordering replacement parts from Tektronix, Inc., include the following information:

1. Instrument type and option number.

2. Instrument serial number.

3. A description of the part (if electrical, include complete circuit number).

4. Tektronix part number.

Soldering Techniques

WARNING

To avoid electric-shock hazard, disconnect the instrument from the power source before soldering.

The reliability and accuray of this instrument can be maintained only if proper soldering techniques are used when repairing or replacing parts. General soldering techniques which apply to maintenance of any precision electronic equipment should be used when working on this instrument. Use only 60/40 rosin-core, electronic grade solder. The choice of soldering iron is determined by the repair to be made.

CAUTION

One circuit board in the AA 501 is a multilayer type board with a conductive path laminated between the top and bottom board layers. All soldering on this board should be done with extreme care to prevent breaking the connections to this conductive path. Only experienced maintenance personnel should attempt to repair the Input board. Do not allow solder or solder flux to flow under printed circuit board switches. The printed circuit board is part of the switch contacts; intermittent switch operation can occur if the contacts are contaminated.

When soldering on circuit boards or small wiring, use only a 15 watt, pencil type soldring iron. A higher wattage soldering iron can cause the etched circuit wiring to separate from the board base material and melt the insulation from small wiring. Always keep the soldering iron tip properly tinned to ensure the best head transfer to the solder joint. Apply only enough heat to remove the component or to make a good solder joint. To protect heat sensitive components, hold the component lead with a pair of long-nose pliers between the component body and the solder joint. Use a solder removing wick to remove excess solder from connections or to clean circuit board pads.

Semiconductors

To remove in-line integrated circuits use an extracting tool. This tool is available from Tektronix, Inc.; order Tektronix Part Number 003-0619-00. If an extracting tool is not available, use care to avoid damaging the pins. Pull slowly and evenly on both ends of the integrated circuit. Try to avoid disengaging one end before the other end.

Interconnecting Pins

Several methods of interconnection including square pin and coaxial cable, are used to electrically connect the circuit boards with other boards and components.

Coaxial Cables

If the coaxial cable to the FUNCTION OUTPUT front panel connector is damaged replace the entire cable assembly. Other coaxial cables in the AA 501 can be replaced or repaired as necessary.

Square Pin Assemblies

See Fig. 5-1. These pins are of various lengths. They are attached to each other with a plastic strip. To remove them, simply unsolder from the circuit board.

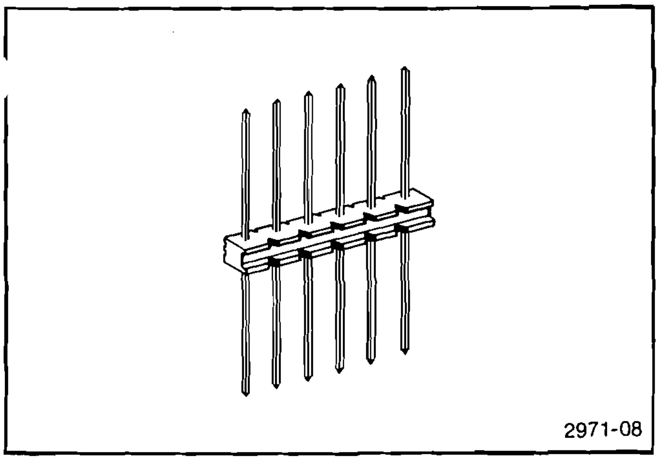


Fig. 5-1. Typical square pin assembly.

Multipin Connectors

The pin connectors used to connect the wires to the interconnecting pins are clamped to the ends of the wires. To replace damaged mutlipin connectors, remove the old pin connector from the holder. Do this by inserting a scribe between the connector and the holder and prying the connector from the holder. Clamp the replacement connector to the wire. Reinstall the connector in the holder.

If the individual end lead pin connectors are removed from the plastic holder, note the order of the individual wires for correct replacement in the holder. For proper replacement see Fig. 5-2.

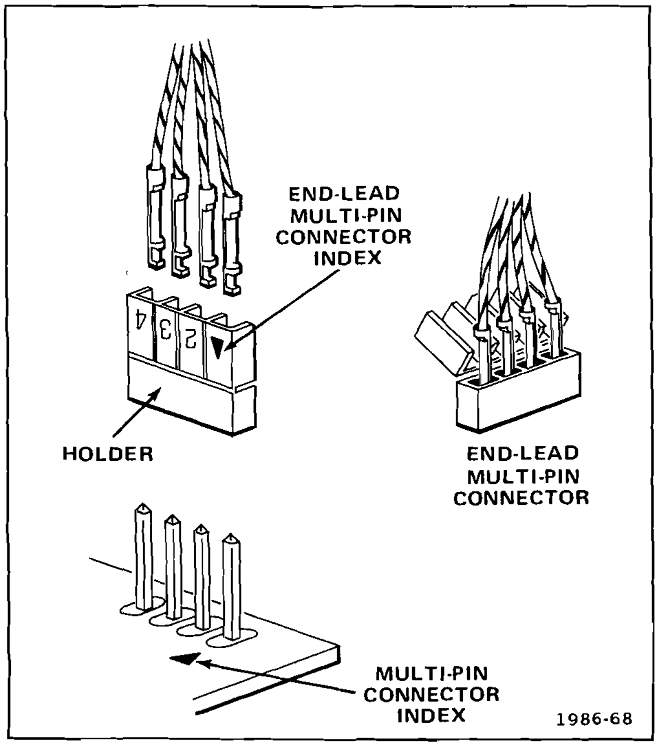


Fig. 5-2. Orientation and disassembly of multipin connectors.

Circuit Board Removal

Fig. 5-3 shows the removal and replacement of instrument side covers. Next remove the six screws attaching the top cover and rear panel as shown in Fig. 5-4. Next unsolder the leads from the circuit board to the INPUT connectors. Remove the INPUT LEVEL RANGE knob.

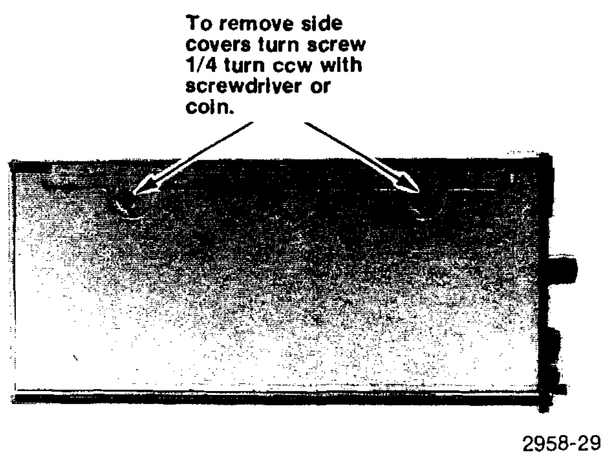


Fig. 5-3. Side cover removal or replacement.

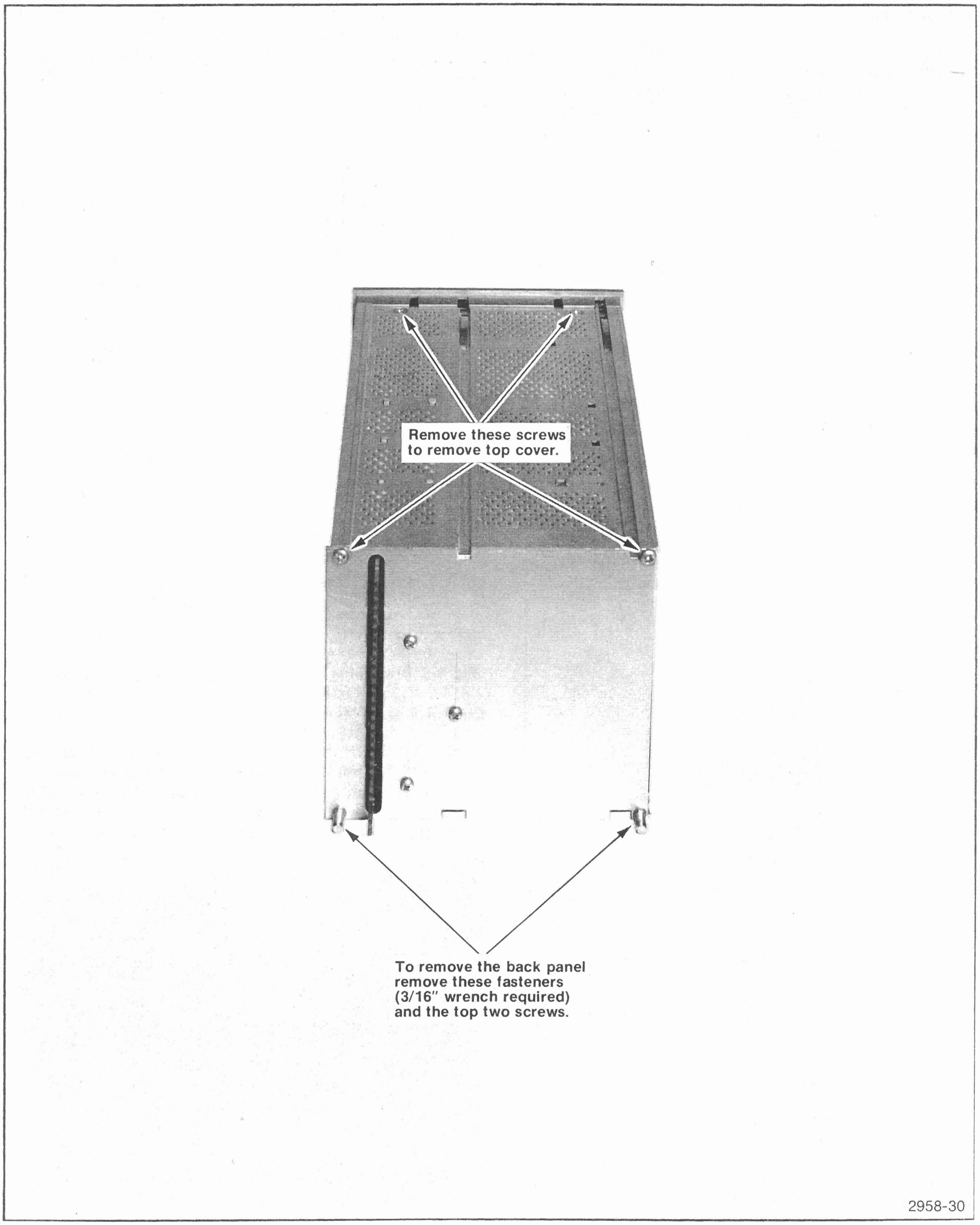


Fig. 5-4. Top and rear panel removal.

Disconnect all cables attached to the front panel display board. Finally, remove the two screws attaching the main board and one screw attaching the logic board to the plug-in frame as shown in Fig. 5-5. After the remaining cables to the front panel have been removed, all boards can now be lifted from the plug-in frame. To further disassemble the boards, remove the interconnecting cables and the screws holding the boards to each other via spacers.

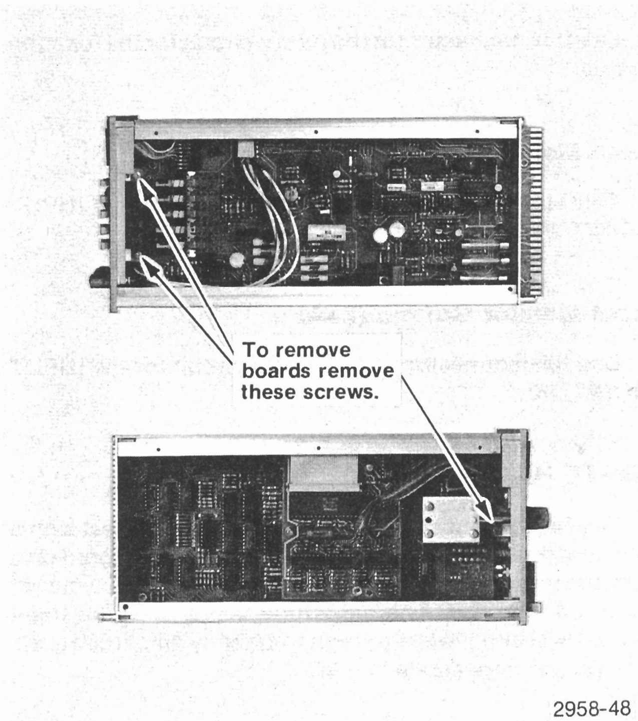


Fig. 5-5. Screws attaching the board assemblies to the plug-in frame.

Assembly is the reverse of disassembly. Make certain that the cables over the tops of the boards are positioned so that the tracks attached to the instrument top do not rest on the cables.

Front Panel Latch Removal

To disassemble the latch, pry up on the pull tab bar attached to the latch assembly. The latch components can now be removed from the instrument.

Magnetic Shield

The shield attached to the rear plate of the AA 501 is heat treated to enhance its magnetic shielding properties. The benefits of this treatment will be destroyed by mechanical stresses applied to this part. As such, care should be taken not to drop or mechanically deform or bend this shield during service operations.

Jumper Selection for CCIF, AUTO, or SMPTE/DIN Measurements

To change the jumper position, remove the left side cover. See Fig. 8-2 for jumper location. With the jumper on the left two pins Option 01 instruments are locked in the CCIF IMD mode. With the jumper on the center two pins, the unit automatically selects either CCIF or SMPTE/DIN modes as determined by the input signals. With the jumper on the right two pins the unit is locked in the SMPTE/DIN mode.

30 kHz Filter Modification

The 3 dB point of the 30 kHz LO PASS can be modified to 22.4 kHz or 20 kHz by changing three resistor values. The 22.4 kHz modification is useful in certain acoustic measurements. The 20 kHz modification is useful in high fidelity audio work. The 30 kHz filter is allowed by the Federal Communications Commission for proof of performance testing of broadcast equipment.

To change the 3 dB point to 22.4 kHz, change the values of R1110, R1112, and R1210 to 21 kΩ 1/8 W, 1% resistors, Tektronix Part Number 321-0320-00. To change the 3 dB point to 20 kHz, change the values of the same three resistors to 23.7 kΩ, 1/8 W, 1% resistors, Tektronix Part Number 321-0325-00.

REAR INTERFACE INFORMATION

FUNCTIONS AVAILABLE AT REAR CONNECTOR

Slots exist between pins 17 and 18 and 6 and 7 on the rear interface connector. The slot between pins 6 and 7 identifies the AA 501 as a member of the TM 500 family. Insert a barrier in the corresponding position of the power module jack to prevent noncompatible plug-ins from being inserted in slots wired for the AA 501. This protects the plug-in if specialized connections are made to that compartment. Consult the Building A System section of the power module manual for further information. Signal inputs, outputs, or other specialized connections may be made to the rear interface connectors as shown in the input output assignments illustration (Fig. 5-6). A description of these connections follows.

+ and − Input Connectors (28B, 28A)

These terminals are connected to the input of the AA 501 when the REAR INTFC INPUT button on the front panel is pressed. The front panel INPUT connectors are disconnected in this mode. The characteristics of these terminals are identical with the front panel INPUT connectors except the maximum input voltage is limited to 42 V peak or 30 V rms. Due to the possibility of crosstalk at the rear interface, noise and distortion performance may be degraded.

Input Common (27B, 27A)

These are the common (ground) connections for the rear interface input.

Auxiliary Input (25B)

This terminal is connected in parallel with the front panel AUXILIARY INPUT connector. Maximum input voltage is 15 V peak and limited to 6 V peak for linear operation.

Auxiliary Input Ground (26B)

Use this connection as a ground return for the auxiliary input.

Function Output (23B)

This connector is in parallel with the front panel FUNCTION OUTPUT connector.

Function Output Ground (24B)

Use this connector for the return circuit for the function output.

Input Monitor (24A)

This terminal is in parallel with the front panel INPUT MONITOR connector.

Input Monitor Ground (23A)

Use this connector as the return circuit for the INPUT MONITOR.

SMPTE HF Output (21B)

The high frequency component of a SMPTE test signal is provided at this jack. This signal can be monitored on a spectrum analyzer or oscilloscope. The range is typically from 0.5 V to 3 V. The amplitude varies with the input signal level and the low to high frequency amplitude ratio. The output impedance is 2 kΩ.

SMPTE HF Output Ground (22B)

Use this connector as the ground return for the SMPTE HF output.

Converter Output (20A)

This connector provides a dc output from the ac to dc converter. This level corresponds to the average or rms output as selected on the front panel. The output level is 1 V ±5% for a 1000 count display. The source resistance is 500 Ω ±5%.

dB Converter Output (19B)

This connector provides a dc output from the logarithmic dB converter. The output voltage is 10 mV ±5% for each 1 dB on the display. The source resistance is 1 kΩ ±5%. Changes in input level range or distortion range will cause brief ac transients.

dB Converter Output Ground (20B)

Use this connector as the ground return for the dB converter output.

FUNCTION	CONTACTS	CONTACTS	FUNCTION
+Input	28B	28A	−Input
Input common (ground)	27B	27A	Input common (ground)
Auxiliary input ground	26B	26A	
Auxiliary input	25B	25A	
Function output ground	24B	24A	Input monitor
Function output	23B	23A	Input monitor ground
SMPTE HF output ground	22B	22A	
SMPTE HF output	21B	21A	
dB converter output ground	20B	20A	Converter output
dB converter output	19B	19A	Converter output ground
	18B	18A	
			Barrier Slot
	17B	17A	
	16B	16A	
	15B	15A	
	14B	14A	
	13B	13A	
+33.5 V filtered dc	*12B	12A*	+33.5 V filtered dc
Collector lead of pnp series-pass	*11B	11A*	Base lead of pnp series-pass
Transformer shield	10B	10A*	Emitter lead of pnp series-pass
±33.5 V common return	*9B	9A*	±33.5 V common return
−33.5 V filtered dc	*8B	8A*	−33.5 V filtered dc
Collector lead of npn series-pass	*7B	7A*	Emitter lead of npn series-pass
			TM 500 Barrier Slot
No connection	6B	6A*	Base lead of npn series-pass
17.5 V ac winding	5B	5A	17.5 V ac winding
+11.5 V common return	*4B	4A*	+11.5 V common return
+11.5 V common return	*3B	3A*	+11.5 V common return
+11.5 V filtered dc	*2B	2A*	+11.5 V filtered dc
25 V ac winding	1B	1A	25 V ac winding

Rear view of plug-in

Assignments listed for pins 1A—13A and 1B—13B are available in all power modules; however, only those pins marked with an asterisk (*) are used in the AA 501.

2958-49

Fig. 5-6. Rear interface connector assignments.

OPTIONS

Option 01 instruments measure SMPTE/DIN intermodulation distortion and CCIF two tone difference frequency distortion. Information about this option is located in the appropriate sections of this manual.

REPLACEABLE ELECTRICAL PARTS

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

LIST OF ASSEMBLIES

A list of assemblies can be found at the beginning of the Electrical Parts List. The assemblies are listed in numerical order. When the complete component number of a part is known, this list will identify the assembly in which the part is located.

CROSS INDEX-MFR. CODE NUMBER TO MANUFACTURER

The Mfr. Code Number to Manufacturer index for the Electrical Parts List is located immediately after this page. The Cross Index provides codes, names and addresses of manufacturers of components listed in the Electrical Parts List.

ABBREVIATIONS

Abbreviations conform to American National Standard Y1.1.

COMPONENT NUMBER (column one of the Electrical Parts List)

A numbering method has been used to identify assemblies, subassemblies and parts. Examples of this numbering method and typical expansions are illustrated by the following:

Example a.

component number

A23R1234 — A23 R1234

Assembly number — Circuit number

Read: Resistor 1234 of Assembly 23

Example b.

component number

A23A2R1234 — A23 A2 R1234

Assembly number — Subassembly number — Circuit number

Read: Resistor 1234 of Subassembly 2 of Assembly 23

Only the circuit number will appear on the diagrams and circuit board illustrations. Each diagram and circuit board illustration is clearly marked with the assembly number. Assembly numbers are also marked on the mechanical exploded views located in the Mechanical Parts List. The component number is obtained by adding the assembly number prefix to the circuit number.

The Electrical Parts List is divided and arranged by assemblies in numerical sequence (e.g., assembly A1 with its subassemblies and parts, precedes assembly A2 with its subassemblies and parts).

Chassis-mounted parts have no assembly number prefix and are located at the end of the Electrical Parts List.

TEKTRONIX PART NO. (column two of the Electrical Parts List)

Indicates part number to be used when ordering replacement part from Tektronix.

SERIAL/MODEL NO. (columns three and four of the Electrical Parts List)

Column three (3) indicates the serial number at which the part was first used. Column four (4) indicates the serial number at which the part was removed. No serial number entered indicates part is good for all serial numbers.

NAME & DESCRIPTION (column five of the Electrical Parts List)

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

MFR. CODE (column six of the Electrical Parts List)

Indicates the code number of the actual manufacturer of the part. (Code to name and address cross reference can be found immediately after this page.)

MFR. PART NUMBER (column seven of the Electrical Parts List)

Indicates actual manufacturers part number.

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
000GS	A P PRODUCTS, INC.	BOX 110	PAINESVILLE, OHIO 44077
00853	SANGAMO ELECTRIC CO., S. CAROLINA DIV.	P O BOX 128	PICKENS, SC 29671
01002	GENERAL ELECTRIC COMPANY, INDUSTRIAL AND POWER CAPACITOR PRODUCTS DEPARTMENT	JOHN STREET	HUDSON FALLS, NY 12839
01121	ALLEN-BRADLEY COMPANY	1201 2ND STREET SOUTH	MILWAUKEE, WI 53204
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P O BOX 5012, 13500 N CENTRAL EXPRESSWAY	DALLAS, TX 75222
02111	SPECTROL ELECTRONICS CORPORATION	17070 EAST GALE AVENUE	CITY OF INDUSTRY, CA 91745
02735	RCA CORPORATION, SOLID STATE DIVISION	ROUTE 202	SOMERVILLE, NY 08876
03508	GENERAL ELECTRIC COMPANY, SEMI-CONDUCTOR PRODUCTS DEPARTMENT	ELECTRONICS PARK	SYRACUSE, NY 13201
04222	AVX CERAMICS, DIVISION OF AVX CORP.	P O BOX 867, 19TH AVE. SOUTH	MYRTLE BEACH, SC 29577
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD,PO BOX 20923	PHOENIX, AZ 85036
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS STREET	MOUNTAIN VIEW, CA 94042
08806	GENERAL ELECTRIC CO., MINIATURE LAMP PRODUCTS DEPARTMENT	NELA PARK	CLEVELAND, OH 44112
12969	UNITRODE CORPORATION	580 PLEASANT STREET	WATERTOWN, MA 02172
13511	AMPHENOL CARDRE DIV., BUNKER RAMO CORP.		LOS GATOS, CA 95030
14433	ITT SEMICONDUCTORS	3301 ELECTRONICS WAY P O BOX 3049	WEST PALM BEACH, FL 33402
14552	MICRO SEMICONDUCTOR CORP.	2830 F FAIRVIEW ST.	SANTA ANA, CA 92704
14752	ELECTRO CUBE INC.	1710 S. DEL MAR AVE.	SAN GABRIEL, CA 91776
17856	SILICONIX, INC.	2201 LAURELWOOD DRIVE	SANTA CLARA, CA 95054
18178	VACTEC, INC.	2423 NORTHLINE INDUSTRIAL BLVD.	MARYLAND HEIGHTS, MO 63043
18324	SIGNETICS CORP.	811 E. ARQUES	SUNNYVALE, CA 94086
19396	ILLINOIS TOOL WORKS, INC. PAKTRON DIV.	900 FOLLIN LANE, SE	VIENNA, VA 22180
21317	ELECTRONIC APPLICATIONS COMPANY	2213 EDWARDS AVENUE	SOUTH EL MONTE, CA 91733
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
24355	ANALOG DEVICES INC.	RT 1 INDUSTRIAL PK,P O BOX 280	NORWOOD, MA 02062
24546	CORNING GLASS WORKS, ELECTRONIC COMPONENTS DIVISION	550 HIGH STREET	BRADFORD, PA 16701
24931	SPECIALITY CONNECTOR CO., INC.	2620 ENDRESS PLACE	GREENWOOD, IN 46142
27014	NATIONAL SEMICONDUCTOR CORP.	2900 SEMICONDUCTOR DR.	SANTA CLARA, CA 95051
32293	INTERSIL, INC.	10900 N. TANTAU AVE.	CUPERTINO, CA 95014
32997	BOURNS, INC., TRIMPOT PRODUCTS DIV.	1200 COLUMBIA AVE.	RIVERSIDE, CA 92507
50157	MIDWEST COMPONENTS INC.	P. O. BOX 787 1981 PORT CITY BLVD.	MUSKEGON, MI 49443
50434	HEWLETT-PACKARD COMPANY	640 PAGE MILL ROAD	PALO ALTO, CA 94304
50522	MONSANTO CO., ELECTRONIC SPECIAL PRODUCTS	3400 HILLVIEW AVENUE	PALO ALTO, CA 94304
50558	ELECTRONIC CONCEPTS, INC.	526 INDUSTRIAL WAY WEST	EATONTOWN, NJ 07724
50579	LITRONIX INC.	19000 HOMESTEAD RD.	CUPERTINO, CA 95014
54473	MATSUSHITA ELECTRIC, CORP. OF AMERICA	1 PANASONIC WAY	SECAUCUS, NJ 07094
55210	GETTIG ENG. AND MFG. COMPANY	PO BOX 85, OFF ROUTE 45	SPRING MILLS, PA 16875
55680	NICHICON/AMERICA/CORP.	6435 N PROESEL AVENUE	CHICAGO, IL 60645
56289	SPRAGUE ELECTRIC CO.	87 MARSHALL ST.	NORTH ADAMS, MA 01247
71400	BUSSMAN MFG., DIVISION OF MCGRAW-EDISON CO.	2536 W. UNIVERSITY ST.	ST. LOUIS, MO 63107
71590	CENTRALAB ELECTRONICS, DIV. OF GLOBE-UNION, INC.	P O BOX 858	FORT DODGE, IA 50501
71744	CHICAGO MINIATURE LAMP WORKS	4433 RAVENSWOOD AVE.	CHICAGO, IL 60640
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
73138	BECKMAN INSTRUMENTS, INC., HELIPOT DIV.	2500 HARBOR BLVD.	FULLERTON, CA 92634
78488	STACKPOLE CARBON CO.		ST. MARYS, PA 15857
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
90201	MALLORY CAPACITOR CO., DIV. OF P. R. MALLORY AND CO., INC.	3029 E. WASHINGTON STREET P. O. BOX 372	INDIANAPOLIS, IN 46206
91637	DALE ELECTRONICS, INC.	P. O. BOX 609	COLUMBUS, NE 68601
95348	GORDOS CORPORATION	250 GLENWOOD AVENUE	BLOOMFIELD, NJ 07003

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A10	670-6525-00			CKT BOARD ASSY:DISPLAY	80009	670-6525-00
A11	670-6524-00			CKT BOARD ASSY:DVM	80009	670-6524-00
A12	----- -----			CKT BOARD ASSY:CONTROL LOGIC		
	----- -----			(NOT REPLACEABLE ORDER 672-0883-00)		
A13	670-6521-00			CKT BOARD ASSY:IMD	80009	670-6521-00
	----- -----			(OPTION 01 AND 02 ONLY)		
A14	670-6522-00			CKT BOARD ASSY:INPUT AND NOTCH FILTER	80009	670-6522-00
A15	670-6520-00			CKT BOARD ASSY:MAIN	80009	670-6520-00
	----- -----			(STANDARD ONLY)		
A15	670-7502-00			CKT BOARD ASSY:MAIN	80009	670-7502-00
	----- -----			(OPTION 02 ONLY)		
A10	----- -----			CKT BOARD ASSY:DISPLAY		
A10DS1010	150-1083-00			LAMP,LED RDOUT:RED 10 ELEM BAR GRAPH	50579	RBG-1000
A10DS1020	150-1053-00			LAMP,LED RDOUT:ORANGE,7 SEG,0.4 DIGIT	58361	Q3411
A10DS1022	150-1053-00			LAMP,LED RDOUT:ORANGE,7 SEG,0.4 DIGIT	58361	Q3411
A10DS1030	150-1053-00			LAMP,LED RDOUT:ORANGE,7 SEG,0.4 DIGIT	58361	Q3411
A10DS1032	150-1053-00			LAMP,LED RDOUT:ORANGE,7 SEG,0.4 DIGIT	58361	Q3411
A10DS1040	150-1053-00			LAMP,LED RDOUT:ORANGE,7 SEG,0.4 DIGIT	58361	Q3411
A10DS1041	150-1061-00			LT EMITTING DIO:RED,660NM,50MA MAX	27014	SJ62775
A10DS1042	150-1061-00			LT EMITTING DIO:RED,660NM,50MA MAX	27014	SJ62775
A10DS1050	150-1061-00			LT EMITTING DIO:RED,660NM,50MA MAX	27014	SJ62775
A10DS1052	150-1061-00			LT EMITTING DIO:RED,660NM,50MA MAX	27014	SJ62775
A10DS2020	150-1061-00			LT EMITTING DIO:RED,660NM,50MA MAX	27014	SJ62775
A10DS2022	150-1061-00			LT EMITTING DIO:RED,660NM,50MA MAX	27014	SJ62775
A10DS2040	150-1061-00			LT EMITTING DIO:RED,660NM,50MA MAX	27014	SJ62775
A10DS2050	150-1061-00			LT EMITTING DIO:RED,660NM,50MA MAX	27014	SJ62775
A10J1012	131-1857-00			TERM. SET,PIN:36/0.025 SQ PIN,ON 0.1 CTRS	22526	65500136
A10J2020	131-1857-00			TERM. SET,PIN:36/0.025 SQ PIN,ON 0.1 CTRS	22526	65500136
A10J2030	131-2238-00			CONN,RCPT,ELEC:CKT BD,2 X 20,MALE	000GS	OBD
A10J2040	131-1857-00			TERM. SET,PIN:36/0.025 SQ PIN,ON 0.1 CTRS	22526	65500136
A10R1040	315-0681-00			RES.,FXD,CMPSN:680 OHM,5%,0.25W	01121	CB6815
A10R2020	315-0681-00			RES.,FXD,CMPSN:680 OHM,5%,0.25W	01121	CB6815

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A11	----- -----			CKT BOARD ASSY:DVM		
A11C1020	285-1098-00			CAP.,FXD,PLSTC:0.22UF,10%,80V	56289	192P2249R8
A11C1021	281-0813-00			CAP.,FXD CER DI:0.047UF,20%,50V	04222	GC705-E-473M
A11C1120	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A11C1220	281-0809-00			CAP.,FXD,CER DI:200PF,5%,100V	72982	8013T2ADDC1G201J
A11J1111	131-2238-00			CONN,RCPT,ELEC:CKT BD,2 X 20,MALE	000GS	OBD
A11J1221	131-1857-00			TERM. SET,PIN:36/0.025 SQ PIN,ON 0.1 CTRS	22526	65500136
A11Q1201	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A11Q1210	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
A11R1001	315-0821-00			RES.,FXD,CMPSN:820 OHM,5%,0.25W	01121	CB8215
A11R1002	315-0821-00			RES.,FXD,CMPSN:820 OHM,5%,0.25W	01121	CB8215
A11R1003	315-0431-00			RES.,FXD,CMPSN:430 OHM,5%,0.25W	01121	CB4315
A11R1004	315-0431-00			RES.,FXD,CMPSN:430 OHM,5%,0.25W	01121	CB4315
A11R1005	315-0821-00			RES.,FXD,CMPSN:820 OHM,5%,0.25W	01121	CB8215
A11R1006	315-0821-00			RES.,FXD,CMPSN:820 OHM,5%,0.25W	01121	CB8215
A11R1021	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A11R1022	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A11R1024	315-0203-00			RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
A11R1025	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
A11R1026	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
A11R1031	315-0335-00			RES.,FXD,CMPSN:3.3M OHM,5%,0.25W	01121	CB3355
A11R1032	315-0335-00			RES.,FXD,CMPSN:3.3M OHM,5%,0.25W	01121	CB3355
A11R1033	315-0474-00			RES.,FXD,CMPSN:470K OHM,5%,0.25W	01121	CB4745
A11R1034	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A11R1035	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A11R1036	315-0514-00			RES.,FXD,CMPSN:510K OHM,5%,0.25W	01121	CB5145
A11R1037	315-0335-00			RES.,FXD,CMPSN:3.3M OHM,5%,0.25W	01121	CB3355
A11R1038	315-0335-00			RES.,FXD,CMPSN:3.3M OHM,5%,0.25W	01121	CB3355
A11R1039	315-0824-00			RES.,FXD,CMPSN:820K OHM,5%,0.25W	01121	CB8245
A11R1040	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A11R1041	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A11R1042	315-0624-00			RES.,FXD,CMPSN:620K OHM,5%,0.25W	01121	CB6245
A11R1102	315-0431-00			RES.,FXD,CMPSN:430 OHM,5%,0.25W	01121	CB4315
A11R1103	315-0431-00			RES.,FXD,CMPSN:430 OHM,5%,0.25W	01121	CB4315
A11R1104	315-0431-00			RES.,FXD,CMPSN:430 OHM,5%,0.25W	01121	CB4315
A11R1105	315-0431-00			RES.,FXD,CMPSN:430 OHM,5%,0.25W	01121	CB4315
A11R1121	315-0474-00			RES.,FXD,CMPSN:470K OHM,5%,0.25W	01121	CB4745
A11R1122	315-0753-00			RES.,FXD,CMPSN:75K OHM,5%,0.25W	01121	CB7535
A11R1125	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
A11R1126	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
A11R1127	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
A11R1128	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
A11R1130	315-0335-00			RES.,FXD,CMPSN:3.3M OHM,5%,0.25W	01121	CB3355
A11R1131	315-0335-00			RES.,FXD,CMPSN:3.3M OHM,5%,0.25W	01121	CB3355
A11R1132	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A11R1133	315-0125-00			RES.,FXD,CMPSN:1.2M OHM,5%,0.25W	01121	CB1255
A11R1134	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A11R1135	315-0225-00			RES.,FXD,CMPSN:2.2M OHM,5%,0.25W	01121	CB2255
A11R1136	315-0335-00			RES.,FXD,CMPSN:3.3M OHM,5%,0.25W	01121	CB3355
A11R1137	315-0335-00			RES.,FXD,CMPSN:3.3M OHM,5%,0.25W	01121	CB3355
A11R1138	315-0305-00			RES.,FXD,CMPSN:3M OHM,5%,0.25W	01121	CB3055
A11R1139	316-0156-00			RES.,FXD,CMPSN:15M OHM,10%,0.25W	01121	CB1561
A11R1201	315-0203-00			RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
A11R1202	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
A11R1212	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
A11R1216	321-0199-00			RES.,FXD,FILM:1.15K OHM,1%,0.125W	91637	MFF1816G11500F
A11R1217	321-0269-00			RES.,FXD,FILM:6.19K OHM,1%,0.125W	91637	MFF1816G61900F

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A11R1218	311-1565-00			RES.,VAR,NONWIR:250 OHM,20%,0.50W	73138	91-87-0
A11R1225	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
A11R1226	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
A11R1227	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
A11R1228	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
A11R1230	315-0335-00			RES.,FXD,CMPSN:3.3M OHM,5%,0.25W	01121	CB3355
A11R1231	315-0335-00			RES.,FXD,CMPSN:3.3M OHM,5%,0.25W	01121	CB3355
A11R1232	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A11R1233	315-0914-00			RES.,FXD,CMPSN:910K OHM,5%,0.25W	01121	CB9145
A11R1234	315-0135-00			RES.,FXD,CMPSN:1.3M OHM,5%,0.25W	01121	CB1355
A11R1235	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A11R1236	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A11R1237	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A11U1030	156-0495-00			MICROCIRCUIT,LI:OPNL AMPL	27014	LM324N
A11U1111	156-1435-00			MICROCIRLCUIT,LI:A/D CONV,3.5 DICIT	32293	ICL7107CPL
A11U1130	156-0495-00			MICROCIRCUIT,LI:OPNL AMPL	27014	LM324N
A11U1201	156-0030-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	01295	SN7400(N OR J)
A11U1230	156-0495-00			MICROCIRCUIT,LI:OPNL AMPL	27014	LM324N

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A12	----- -----			CKT BOARD ASSY:CONTROL LOGIC		
A12C1132	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A12C1204	290-0748-00			CAP.,FXD,ELCTLT:10UF,+50-10%,20V	56289	500D149
A12C1212	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A12C1220	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A12C1312	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A12C1433	281-0772-00			CAP.,FXD,CER DI:0.0047UF,10%,100V	04222	GC701C472K
A12C1434	281-0814-00			CAP.,FXD,CER DI:100PF,10%,100V	04222	GC70-1-A101K
A12C1445	281-0773-00			CAP.,FXD,CER DI:0.01UF,10%,100V	04222	GC70-1C103K
A12CR1021	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A12CR1022	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A12CR1023	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A12CR1024	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A12CR1025	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A12CR1026	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A12CR1027	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A12CR1028	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A12CR1029	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A12CR1121	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A12CR1220	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A12CR1400	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A12CR1401	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A12CR1431	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A12J1001	131-1426-00			CONTACT SET,ELE:R ANGLE,0.250L,STRIP OF 36	22526	65524-136
A12J1002	131-1426-00			CONTACT SET,ELE:R ANGLE,0.250L,STRIP OF 36	22526	65524-136
A12J1101	131-1426-00			CONTACT SET,ELE:R ANGLE,0.250L,STRIP OF 36	22526	65524-136
A12J1102	131-1426-00			CONTACT SET,ELE:R ANGLE,0.250L,STRIP OF 36	22526	65524-136
A12J1201	131-1426-00			CONTACT SET,ELE:R ANGLE,0.250L,STRIP OF 36	22526	65524-136
A12J1301	131-1934-00			TERM. SET,PIN:1 X 36,0.1 CTR,0.9 L	22526	65539-001
A12J1401	131-1857-00			TERM. SET,PIN:36/0.025 SQ PIN,ON 0.1 CTRS	22526	65500136
A12J1503	131-1857-00			TERM. SET,PIN:36/0.025 SQ PIN,ON 0.1 CTRS	22526	65500136
A12J1530	131-1857-00			TERM. SET,PIN:36/0.025 SQ PIN,ON 0.1 CTRS	22526	65500136
A12Q1101	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A12Q1102	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A12Q1103	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A12Q1104	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A12Q1105	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A12Q1106	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A12Q1113	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A12Q1203	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A12Q1204	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A12Q1205	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A12Q1311	151-0301-00			TRANSISTOR:SILICON,PNP	27014	2N2907A
A12Q1447	151-1025-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	01295	SFB8129
A12Q1508	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A12Q1509	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A12R1002	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
A12R1031	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
A12R1041	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A12R1042	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A12R1043	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A12R1101	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A12R1111	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
A12R1112	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
A12R1113	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A12R1114	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A12R1115	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A12R1116	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
A12R1117	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
A12R1118	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A12R1119	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A12R1120	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A12R1130	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A12R1131	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A12R1133	315-0684-00			RES.,FXD,CMPSN:680K OHM,5%,0.25W	01121	CB6845
A12R1134	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A12R1135	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A12R1136	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A12R1137	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A12R1138	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A12R1139	315-0684-00			RES.,FXD,CMPSN:680K OHM,5%,0.25W	01121	CB6845
A12R1201	321-0336-00			RES.,FXD,FILM:30.9K OHM,1%,0.125W	91637	MFF1816G30901F
A12R1202	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
A12R1211	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
A12R1212	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
A12R1213	321-0205-00			RES.,FXD,FILM:1.33K OHM,1%,0.125W	91637	MFF1816G13300F
A12R1214	321-0324-00			RES.,FXD,FILM:23.2K OHM,1%,0.125W	91637	MFF1816G23201F
A12R1215	321-0222-00			RES.,FXD,FILM:2K OHM,1%,0.125W	91637	MFF1816G20000F
A12R1216	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A12R1217	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A12R1218	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A12R1219	321-0023-01			RES.,FXD,FILM:16.9 OHM,0.5%,0.125W	91637	MFF1816G16R90D
A12R1221	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A12R1222	321-0609-07			RES.,FXD,FILM:480 OHM,0.1%,0.125W	91637	MFF1816C480R0B
A12R1223	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A12R1224	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A12R1225	315-0363-00			RES.,FXD,CMPSN:36K OHM,5%,0.25W	01121	CB3635
A12R1226	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A12R1230	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A12R1231	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A12R1232	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A12R1233	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A12R1234	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A12R1235	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A12R1236	321-0153-00			RES.,FXD,FILM:383 OHM,1%,0.125W	91637	MFF1816G383R0F
A12R1237	321-0777-00			RES.,FXD,FILM:5.14K OHM,1%,0.125W	24546	NA55D5141F
A12R1240	321-0222-00			RES.,FXD,FILM:2K OHM,1%,0.125W	91637	MFF1816G20000F
A12R1241	315-0360-00			RES.,FXD,CMPSN:36 OHM,5%,0.25W	01121	CB3605
A12R1242	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A12R1245	311-1556-00			RES.,VAR,NONWIR:50K OHM,20%,0.50W	73138	91-78-0
A12R1246	311-1562-00			RES.,VAR,NONWIR:2K OHM,20%,0.50W	73138	91-84-0
A12R1301	321-0753-06			RES.,FXD,FILM:9K OHM,0.25%,0.125W	91637	MFF1816C90000C
A12R1302	321-0318-07			RES.,FXD,FILM:20K OHM,0.1%,0.125W	24546	NE55E2002B
A12R1311	321-0638-00			RES.,FXD,FILM:7.96K OHM,1%,0.125W	24546	NA55D7961F
A12R1312	315-0475-00			RES.,FXD,CMPSN:4.7M OHM,5%,0.25W	01121	CB4755
A12R1313	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A12R1320	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A12R1332	307-0685-00			RES.,NTWK,FXD FI:OFFSET	80009	307-0685-00
A12R1333	307-0686-00			RES.,NTWK,FXD FI:DBR	80009	307-0686-00
A12R1334	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
A12R1335	315-0241-00			RES.,FXD,CMPSN:240 OHM,5%,0.25W	01121	CB2415
A12R1341	311-1556-00			RES.,VAR,NONWIR:50K OHM,20%,0.50W	73138	91-78-0
A12R1400	321-0995-00			RES.,FXD,FILM:549K OHM,1%,0.125W	24546	NA55D5493F
A12R1401	321-0323-00			RES.,FXD,FILM:22.6K OHM,1%,0.125W	91637	MFF1816G22601F

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A12R1402	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A12R1403	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A12R1404	321-0193-01			RES.,FXD,FILM:1K OHM,0.5%,0.125W	91637	MFF1816G10000D
A12R1405	321-0193-01			RES.,FXD,FILM:1K OHM,0.5%,0.125W	91637	MFF1816G10000D
A12R1406	315-0122-00			RES.,FXD,CMPSN:1.2K OHM,5%,0.25W	01121	CB1225
A12R1407	321-0614-00			RES.,FXD,FILM:10.1K OHM,1%,0.125W	91637	MFF1816G10101F
A12R1409	321-0208-00			RES.,FXD,FILM:1.43K OHM,1%,0.125W	91637	MFF1816G14300F
A12R1410	321-0816-03			RES.,FXD,FILM:5K OHM,0.25%,0.125W	91637	MFF1816D50000C
A12R1411	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
A12R1412	321-0318-07			RES.,FXD,FILM:20K OHM,0.1%,0.125W	24546	NE55E2002B
A12R1413	321-0318-07			RES.,FXD,FILM:20K OHM,0.1%,0.125W	24546	NE55E2002B
A12R1414	321-0312-00			RES.,FXD,FILM:17.4K OHM,1%,0.125W	91637	MFF1816G17401F
A12R1420	321-0316-00			RES.,FXD,FILM:19.1K OHM,1%,0.125W	91637	MFF1816G19101F
A12R1431	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A12R1432	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A12R1435	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A12R1436	315-0224-00			RES.,FXD,CMPSN:220K OHM,5%,0.25W	01121	CB2245
A12R1441	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A12R1442	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A12R1443	315-0131-00			RES.,FXD,CMPSN:130 OHM,5%,0.25W	01121	CB1315
A12R1444	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A12R1445	311-1556-00			RES.,VAR,NONWIR:50K OHM,20%,0.50W	73138	91-78-0
A12R1501	311-1339-00			RES.,VAR,NONWIR:5K OHM,10%,0.50W	73138	89-131-1
A12R1503	321-0397-00			RES.,FXD,FILM:133K OHM,1%,0.125W	91637	MFF1816G13302F
A12R1504	315-0362-00			RES.,FXD,CMPSN:3.6K OHM,5%,0.25W	01121	CB3625
A12R1505	321-0960-07			RES.,FXD,FILM:513 OHM,0.1%,0.125W	24546	NE55E5130B
A12R1506	315-0392-00			RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
A12R1507	315-0362-00			RES.,FXD,CMPSN:3.6K OHM,5%,0.25W	01121	CB3625
A12R1508	315-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
A12R1509	315-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
A12R1510	315-0392-00			RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
A12R1511	321-0294-00			RES.,FXD,FILM:11.3K OHM,1%,0.125W	91637	MFF1816G11301F
A12R1512	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A12R1513	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A12R1514	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A12R1515	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A12S1411	260-1997-00			SWITCH,PUSH:4 BUTTON,2 & 4 POLE,LEVEL M	71590	2KBM0310001302
A12S1531	260-1996-00			SWITCH,PUSH:1 BUTTON,4 POLE,INPUT	71590	2KAB0010001169
A12TP1200	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
A12TP1240	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
A12TP1410	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
A12U1011	156-0756-00			MICROCIRCUIT,DI:BCD TO DECIMAL DECODER	80009	156-0756-00
A12U1012	156-0575-00			MICROCIRCUIT,DI:3 INPUT NOR GATE	80009	156-0575-00
A12U1013	156-0505-00			MICROCIRCUIT,DI:4 BIT AND/OR SEL	04713	MC14519BCL
A12U1021	156-0502-02			MICROCIRCUIT,DI:4 BIT ADDER,SELECTED	80009	156-0502-02
A12U1022	156-0756-00			MICROCIRCUIT,DI:BCD TO DECIMAL DECODER	80009	156-0756-00
A12U1031	156-0582-00			MICROCIRCUIT,DI:BINARY UP/DOWN COUNTER	04713	MC14516BCL
A12U1032	156-0349-01			MICROCIRCUIT,DI:QUAD 2-INPUT NOR GATE	80009	156-0349-01
A12U1033	156-0505-00			MICROCIRCUIT,DI:4 BIT AND/OR SEL	04713	MC14519BCL
A12U1111	156-0577-00			MICROCIRCUIT,DI:QUAD 2 INPUT AND GATE	80009	156-0577-00
A12U1112	156-0350-01			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	80009	156-0350-01
A12U1122	156-0349-01			MICROCIRCUIT,DI:QUAD 2-INPUT NOR GATE	80009	156-0349-01
A12U1123	156-0505-00			MICROCIRCUIT,DI:4 BIT AND/OR SEL	04713	MC14519BCL
A12U1124	156-0756-00			MICROCIRCUIT,DI:BCD TO DECIMAL DECODER	80009	156-0756-00
A12U1131	156-0582-00			MICROCIRCUIT,DI:BINARY UP/DOWN COUNTER	04713	MC14516BCL
A12U1132	156-0349-01			MICROCIRCUIT,DI:QUAD 2-INPUT NOR GATE	80009	156-0349-01
A12U1221	156-0411-00			MICROCIRCUIT,LI:QUAD-COMP,SGL SUPPLY	27014	LM339N

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A12U1222	156-0048-00			MICROCIRCUIT,LI:FIVE NPN TRANSISTOR ARRAY	02735	CA3046
A12U1231	156-0513-00			MICROCIRCUIT,DI:8-CHAN MUX	80009	156-0513-00
A12U1312	156-1200-00			MICROCIRCUIT,LI:OPERATIONAL AMPL	01295	TL074CN
A12U1313	156-1200-00			MICROCIRCUIT,LI:OPERATIONAL AMPL	01295	TL074CN
A12U1321	156-0579-00			MICROCIRCUIT,DI:DUAL 4-BIT BIN COUNTER	04713	MC14520BCL
A12U1331	156-1200-00			MICROCIRCUIT,LI:OPERATIONAL AMPL	01295	TL074CN
A12U1332	156-0579-00			MICROCIRCUIT,DI:DUAL 4-BIT BIN COUNTER	04713	MC14520BCL
A12U1407	156-0515-00			MICROCIRCUIT,DI:TRIPLE 3-CHAN MUX	80009	156-0515-00
A12U1431	156-0350-01			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	80009	156-0350-01
A12U1531	156-0366-00			MICROCIRCUIT,DI:DUAL D-TYPE F-F	80009	156-0366-00
A12VR1203	152-0278-00			SEMICOND DEVICE:ZENER,0.4W,3V,5%	04713	SZG35009K20
A12VR1406	152-0486-00			SEMICOND DEVICE:ZENER,0.25W,6.2V,5%	80009	152-0486-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A13	----- -----			CKT BOARD ASSY:IMD		
A13C1011	290-0804-00			CAP.,FXD,ELCTLT:10UF,+50-10%,25V	55680	25ULA10V-T
A13C1012	283-0167-00			CAP.,FXD,CER DI:0.1UF,10%,100V	72982	8131N145X5R0104K
A13C1021	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
A13C1022	290-0719-00			CAP.,FXD,ELCTLT:47UF,20%,25V	56289	196D476X0025TE3
A13C1023	285-0598-00			CAP.,FXD,PLSTC:0.01UF,5%,100V	01002	61F10AC103
A13C1024	285-0598-00			CAP.,FXD,PLSTC:0.01UF,5%,100V	01002	61F10AC103
A13C1025	283-0067-00			CAP.,FXD,CER DI:0.001UF,10%,200V	72982	835-515B102K
A13C1031	285-1056-00			CAP.,FXD,PLSTC:1UF,2%,50V	14752	650B1A105G
A13C1032	290-0524-00			CAP.,FXD,ELCTLT:4.7UF,20%,10V	90201	TDC475M010EL
A13C1041	285-1050-00			CAP.,FXD,PLSTC:0.1UF,1%,200V	14752	230B1C104F
A13C1111	283-0167-00			CAP.,FXD,CER DI:0.1UF,10%,100V	72982	8131N145X5R0104K
A13C1121	285-1100-00			CAP.,FXD,PLSTC:0.022UF,5%,200V	19396	223J02PT485
A13C1131	285-1130-00			CAP.,FXD,PLSTC:0.22UF,1%,100V	50558	MH12D224F
A13C1145	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A13C1146	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A13C1201	285-0643-00			CAP.,FXD,PLSTC:0.0047UF,5%,100V	56289	410P374
A13C1202	285-0643-00			CAP.,FXD,PLSTC:0.0047UF,5%,100V	56289	410P374
A13C1203	285-0643-00			CAP.,FXD,PLSTC:0.0047UF,5%,100V	56289	410P374
A13C1221	285-1066-00			CAP.,FXD,PLSTC:0.05UF,1%,200V	14752	230B1C503F
A13C1222	285-1130-00			CAP.,FXD,PLSTC:0.22UF,1%,100V	50558	MH12D224F
A13C1223	285-0643-00			CAP.,FXD,PLSTC:0.0047UF,5%,100V	56289	410P374
A13C1224	285-0643-00			CAP.,FXD,PLSTC:0.0047UF,5%,100V	56289	410P374
A13C1231	285-1050-00			CAP.,FXD,PLSTC:0.1UF,1%,200V	14752	230B1C104F
A13C1301	285-0643-00			CAP.,FXD,PLSTC:0.0047UF,5%,100V	56289	410P374
A13C1302	285-0643-00			CAP.,FXD,PLSTC:0.0047UF,5%,100V	56289	410P374
A13C1303	285-1100-00			CAP.,FXD,PLSTC:0.022UF,5%,200V	19396	223J02PT485
A13C1311	281-0763-00			CAP.,FXD,CER DI:47PF,10%,100V	72982	8035D9AADC1G470K
A13C1312	281-0763-00			CAP.,FXD,CER DI:47PF,10%,100V	72982	8035D9AADC1G470K
A13C1321	285-0643-00			CAP.,FXD,PLSTC:0.0047UF,5%,100V	56289	410P374
A13C1331	290-0804-00			CAP.,FXD,ELCTLT:10UF,+50-10%,25V	55680	25ULA10V-T
A13C1401	285-0702-00			CAP.,FXD,PLSTC:0.033UF,5%,100V	56289	410P33351
A13CR1101	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A13CR1211	152-0322-00			SEMICOND DEVICE:SILICON,15V,HOT CARRIER	50434	5082-2672
A13CR1212	152-0322-00			SEMICOND DEVICE:SILICON,15V,HOT CARRIER	50434	5082-2672
A13CR1325	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A13J1041	131-1426-00			CONTACT SET,ELE:R ANGLE,0.250L,STRIP OF 36	22526	65524-136
A13J1101	131-1426-00			CONTACT SET,ELE:R ANGLE,0.250L,STRIP OF 36	22526	65524-136
A13J1131	131-1857-00			TERM. SET,PIN:36/0.025 SQ PIN,ON 0.1 CTRS	22526	65500136
A13J1401	131-1426-00			CONTACT SET,ELE:R ANGLE,0.250L,STRIP OF 36	22526	65524-136
A13J1411	131-1426-00			CONTACT SET,ELE:R ANGLE,0.250L,STRIP OF 36	22526	65524-136
A13Q1011	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A13Q1231	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A13R1001	311-1245-00			RES.,VAR,NONWIR:10K OHM,10%,0.50W	73138	72-28-0
A13R1002	321-0314-01			RES.,FXD,FILM:18.2K OHM,0.5%,0.125W	91637	MFF1816G18201D
A13R1011	321-0371-00			RES.,FXD,FILM:71.5K OHM,1%,0.125W	91637	MFF1816G71501F
A13R1012	315-0163-00			RES.,FXD,CMPSN:16K OHM,5%,0.25W	01121	CB1635
A13R1013	315-0623-00			RES.,FXD,CMPSN:62K OHM,5%,0.25W	01121	CB6235
A13R1030	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A13R1031	321-0237-00			RES.,FXD,FILM:2.87K OHM,1%,0.125W	91637	MFF1816G28700F
A13R1032	321-0237-00			RES.,FXD,FILM:2.87K OHM,1%,0.125W	91637	MFF1816G28700F
A13R1101	301-0361-00			RES.,FXD,CMPSN:360 OHM,5%,0.50W	01121	EB3615
A13R1111	321-0724-00			RES.,FXD,FILM:13.6K OHM,1%,0.125W	91637	CMF110216G13601F
A13R1112	321-0724-00			RES.,FXD,FILM:13.6K OHM,1%,0.125W	91637	CMF110216G13601F
A13R1121	321-0926-07			RES.,FXD,FILM:4K OHM,0.1%,0.125W	91637	MFF1816C40000B
A13R1122	321-0926-07			RES.,FXD,FILM:4K OHM,0.1%,0.125W	91637	MFF1816C40000B
A13R1123	321-0222-07			RES.,FXD,FILM:2K OHM,0.1%,0.125W	91637	MFF1816C20000B

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A13R1124	321-0926-07			RES.,FXD,FILM:4K OHM,0.1%,0.125W	91637	MFF1816C40000B
A13R1131	321-0169-00			RES.,FXD,FILM:562 OHM,1%,0.125W	91637	MFF1816G562R0F
A13R1132	321-0215-00			RES.,FXD,FILM:1.69K OHM,1%,0.125W	91637	MFF1816G16900F
A13R1135	321-0194-00			RES.,FXD,FILM:1.02K OHM,1%,0.125W	91637	MFF1816G10200F
A13R1141	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A13R1142	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A13R1201	321-0331-00			RES.,FXD,FILM:27.4K OHM,1%,0.125W	91637	MFF1816G27401F
A13R1202	321-0291-00			RES.,FXD,FILM:10.5K OHM,1%,0.125W	91637	MFF1816G10501F
A13R1203	321-0291-00			RES.,FXD,FILM:10.5K OHM,1%,0.125W	91637	MFF1816G10501F
A13R1211	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
A13R1212	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A13R1213	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A13R1216	321-0373-00			RES.,FXD,FILM:75K OHM, 1%,0.125W	91637	MFF1816G75001F
A13R1217	321-0249-00			RES.,FXD,FILM:3.83K OHM,1%,0.125W	91637	MFF1816G38300F
A13R1219	315-0820-00			RES.,FXD,CMPSN:82 OHM,5%,0.25W	01121	CB8205
A13R1224	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
A13R1231	321-0219-00			RES.,FXD,FILM:1.87K OHM,1%,0.125W	91637	MFF1816G18700F
A13R1233	321-0213-00			RES.,FXD,FILM:1.62K OHM,1%,0.125W	91637	MFF1816G16200F
A13R1234	321-0171-00			RES.,FXD,FILM:590 OHM,1%,0.125W	91637	MFF1816G590R0F
A13R1241	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
A13R1242	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A13R1320	315-0751-00			RES.,FXD,CMPSN:750 OHM,5%,0.25W	01121	CB7515
A13R1322	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A13R1323	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
A13R1324	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A13R1401	321-0331-00			RES.,FXD,FILM:27.4K OHM,1%,0.125W	91637	MFF1816G27401F
A13R1402	321-0234-00			RES.,FXD,FILM:2.67K OHM,1%,0.125W	91637	MFF1816G26700F
A13R1403	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A13R1411	321-0282-00			RES.,FXD,FILM:8.45K OHM,1%,0.125W	91637	MFF1816G84500F
A13R1412	321-0326-00			RES.,FXD,FILM:24.3K OHM,1%,0.125W	91637	MFF1816G24301F
A13R1413	321-0282-00			RES.,FXD,FILM:8.45K OHM,1%,0.125W	91637	MFF1816G84500F
A13R1421	311-1918-00			RES.,VAR,NONWIR:2K OHM,10%,0.50W	73138	72-199-0
A13U1100	307-0700-00			CPLR,OPTOELECTR:140 OHM,40MA	18178	VTL5C4
A13U1110	156-1191-00			MICROCIRCUIT,LI:DUAL BI-FET OP-AMPL,8 DIP	01295	TL072CP
A13U1115	156-1272-00			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	NE5532 FE-IIB
A13U1130	156-1191-00			MICROCIRCUIT,LI:DUAL BI-FET OP-AMPL,8 DIP	01295	TL072CP
A13U1215	156-1272-00			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	NE5532 FE-IIB
A13U1230	156-1191-00			MICROCIRCUIT,LI:DUAL BI-FET OP-AMPL,8 DIP	01295	TL072CP
A13U1240	156-0515-00			MICROCIRCUIT,DI:TRIPLE 3-CHAN MUX	80009	156-0515-00
A13U1310	156-1446-00			MICROCIRCUIT,LI:OPNL AMPL,DUAL	18324	NE5533N
A13VR1041	152-0127-00			SEMICOND DEVICE:ZENER,0.4W,7.5V,5%	04713	SZG35009K2
A13VR1042	152-0127-00			SEMICOND DEVICE:ZENER,0.4W,7.5V,5%	04713	SZG35009K2

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A14	----- -----			CKT BOARD ASSY:INPUT AND NOTCH FILTER		
A14C1000	290-0808-00			CAP.,FXD,ELCTLT:2.7UF,10%,20V	56289	162D275X9020CD2
A14C1001	283-0051-00			CAP.,FXD,CER DI:0.0033UF,5%,100V	72982	8131N145C0G0332J
A14C1004	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A14C1010	290-0530-00			CAP.,FXD,ELCTLT:68UF,20%,6V	90201	TDC686M006NLF
A14C1011	290-0804-00			CAP.,FXD,ELCTLT:10UF,+50-10%,25V	55680	25ULA10V-T
A14C1013	290-0523-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	56289	196D225X0020HA1
A14C1019	281-0759-00			CAP.,FXD,CER DI:22PF,10%,100V	72982	8035D9AADC1G220K
A14C1021	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A14C1030	281-0722-00			CAP.,FXD,CER DI:7.5PF,+/-1PF,500V	59660	374 018C0H0 759B
A14C1100	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A14C1101	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A14C1102	290-0776-00			CAP.,FXD,ELCTLT:22UF,+50-10%,10V	55680	10ULA22V-T
A14C1104	283-0642-00			CAP.,FXD,MICA D:33PF,+/-0.5PF,300V	00853	D10-5E330G
A14C1115	290-0512-00			CAP.,FXD,ELCTLT:22UF,20%,15V	56289	196D226X0015KA1
A14C1121	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A14C1122	290-0808-00			CAP.,FXD,ELCTLT:2.7UF,10%,20V	56289	162D275X9020CD2
A14C1129	281-0763-00 ----- -----	XB010230		CAP.,FXD,CER DI:47PF,10%,100V (STANDARD ONLY)	72982	8035D9AADC1G470K
A14C1129	281-0763-00 ----- -----	XB010240		CAP.,FXD,CER DI:47PF,10%,100V (OPTION 01 AND 02 ONLY)	72982	8035D9AADC1G470K
A14C1130	290-0808-00			CAP.,FXD,ELCTLT:2.7UF,10%,20V	56289	162D275X9020CD2
A14C1131	281-0763-00 ----- -----	B010100	B010229	CAP.,FXD,CER DI:47PF,10%,100V (STANDARD ONLY)	72982	8035D9AADC1G470K
A14C1131	281-0762-00 ----- -----	B010230		CAP.,FXD,CER DI:27PF,20%,100V (STANDARD ONLY)	72982	8035D9AADC0G270M
A14C1131	281-0763-00 ----- -----	B010100	B010239	CAP.,FXD,CER DI:47PF,10%,100V (OPTION 01 AND 02 ONLY)	72982	8035D9AADC1G470K
A14C1131	281-0762-00 ----- -----	B010240		CAP.,FXD,CER DI:27PF,20%,100V (OPTION 01 AND 02 ONLY)	72982	8035D9AADC0G270M
A14C1132	281-0763-00 ----- -----	B010100	B010229	CAP.,FXD,CER DI:47PF,10%,100V (STANDARD ONLY)	72982	8035D9AADC1G470K
A14C1132	281-0762-00 ----- -----	B010230		CAP.,FXD,CER DI:27PF,20%,100V (STANDARD ONLY)	72982	8035D9AADC0G270M
A14C1132	281-0763-00 ----- -----	B010100	B010239	CAP.,FXD,CER DI:47PF,10%,100V (OPTION 01 AND 02 ONLY)	72982	8035D9AADC1G470K
A14C1132	281-0762-00 ----- -----	B010240		CAP.,FXD,CER DI:27PF,20%,100V (OPTION 01 AND 02 ONLY)	72982	8035D9AADC0G270M
A14C1133	283-0631-00			CAP.,FXD,MICA D:95PF,1%,100V	00853	D151E950F0
A14C1134	283-0631-00			CAP.,FXD,MICA D:95PF,1%,100V	00853	D151E950F0
A14C1135	283-0594-00			CAP.,FXD,MICA D:0.001UF,1%,100V	00853	D151F102F0
A14C1136	283-0594-00			CAP.,FXD,MICA D:0.001UF,1%,100V	00853	D151F102F0
A14C1139	283-0773-00			CAP.,FXD,MICA D:578PF,1%,300V	00853	D15-3F5780F0
A14C1200	290-0755-00			CAP.,FXD,ELCTLT:100UF,+50-10%,10V	56289	502D223
A14C1201	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
A14C1219	281-0763-00			CAP.,FXD,CER DI:47PF,10%,100V	72982	8035D9AADC1G470K
A14C1220	285-1142-00			CAP.,FXD,PLSTC:0.01UF,1%,200VDC	19396	103F02PP580
A14C1221	285-1142-00			CAP.,FXD,PLSTC:0.01UF,1%,200VDC	19396	103F02PP580
A14C1222	285-1056-00			CAP.,FXD,PLSTC:1UF,2%,50V	14752	650B1A105G
A14C1223	285-1056-00			CAP.,FXD,PLSTC:1UF,2%,50V	14752	650B1A105G
A14C1224	285-1221-00			CAP.,FXD,MTLZD:0.1UF,2%,100V	14752	650D1B104G
A14C1225	285-1221-00			CAP.,FXD,MTLZD:0.1UF,2%,100V	14752	650D1B104G
A14C1230	281-0792-00 ----- -----	XB010230		CAP.,FXD,CER DI:82PF,10%,100V (STANDARD ONLY)	72982	8035D2AADC0G820K
A14C1230	281-0792-00 ----- -----	XB010240		CAP.,FXD,CER DI:82PF,10%,100V (OPTION 01 AND 02 ONLY)	72982	8035D2AADC0G820K
A14C1310	281-0759-00			CAP.,FXD,CER DI:22PF,10%,100V	72982	8035D9AADC1G220K

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A14C1311	290-0523-00			CAP.,FXD,ELCTLT:2.2UF,20%,20V	56289	196D225X0020HA1
A14C1330	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A14C1336	281-0823-00			CAP.,FXD,CER DI:470PF,10%,50V	12969	CGB471KDN
A14C1400	281-0096-00			CAP.,VAR,AIR DI:5.5-18PF,350V	72982	538-006-A5.5-18
A14C1411	283-0728-00			CAP.,FXD,MICA D:120PF,1%,500V	00853	D155F121F03
A14C1412	283-0642-00			CAP.,FXD,MICA D:33PF,+/-0.5PF,300V	00853	D10-5E330G
A14C1413	283-0728-00			CAP.,FXD,MICA D:120PF,1%,500V	00853	D155F121F03
A14C1420	290-0525-00			CAP.,FXD,ELCTLT:4.7UF,20%,50V	56289	196D475X0050KA1
A14C1421	290-0848-00			CAP.,FXD,ELCTLT:47UF,-20+100%,16 WVDC	56289	OBD
A14C1422	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A14C1423	281-0819-00			CAP.,FXD,CER DI:33PF,5%,50V	72982	8035BC0G330
A14C1424	281-0763-00			CAP.,FXD,CER DI:47PF,10%,100V	72982	8035D9AADC1G470K
A14C1431	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A14C1432	283-0625-00			CAP.,FXD,MICA D:220PF,1%,500V	00853	D105F221F0
A14C1434	283-0766-00			CAP.,FXD,MICA D:47PF,1%,500V	00853	D155E470D0
A14C1435	283-0159-00 ----- -----	XB010230		CAP.,FXD,CER DI:18PF,5%,50V (STANDARD ONLY)	72982	8111B065C0G0180J
A14C1435	283-0159-00 ----- -----	XB010240		CAP.,FXD,CER DI:18PF,5%,50V (OPTION 01 AND 02 ONLY)	72982	8111B065C0G0180J
A14C1500	283-0672-00			CAP.,FXD,MICA D:200PF,1%,500V	00853	D155F2010F0
A14C1510	283-0672-00			CAP.,FXD,MICA D:200PF,1%,500V	00853	D155F2010F0
A14C1520	281-0819-00			CAP.,FXD,CER DI:33PF,5%,50V	72982	8035BC0G330
A14C1521	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A14C1522	281-0763-00			CAP.,FXD,CER DI:47PF,10%,100V	72982	8035D9AADC1G470K
A14C1523	281-0823-00			CAP.,FXD,CER DI:470PF,10%,50V	12969	CGB471KDN
A14C1530	290-0415-00			CAP.,FXD,ELCTLT:5.6UF,10%,35V	56289	150D565X9035B2
A14C1531	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A14C1533	290-0284-00			CAP.,FXD,ELCTLT:4.7UF,10%,35V	56289	150D475X9035B2
A14C1534	290-0808-00			CAP.,FXD,ELCTLT:2.7UF,10%,20V	56289	162D275X9020CD2
A14C1535	290-0512-00			CAP.,FXD,ELCTLT:22UF,20%,15V	56289	196D226X0015KA1
A14C1630	285-1219-00			CAP.,FXD,MTLZD:1UF,5%,400V	14752	230D1E105J
A14C1631	285-1219-00			CAP.,FXD,MTLZD:1UF,5%,400V	14752	230D1E105J
A14CR1001	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A14CR1002	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A14CR1011	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A14CR1012	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A14CR1013	152-0246-00			SEMICOND DEVICE:SW,SI,40V,200MA	03508	DE140
A14CR1020	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A14CR1022	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A14CR1032	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A14CR1033	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A14CR1100	152-0246-00			SEMICOND DEVICE:SW,SI,40V,200MA	03508	DE140
A14CR1110	152-0246-00			SEMICOND DEVICE:SW,SI,40V,200MA	03508	DE140
A14CR1221	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A14CR1222	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A14CR1223	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A14CR1300	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A14CR1330	152-0322-00			SEMICOND DEVICE:SILICON,15V,HOT CARRIER	50434	5082-2672
A14CR1331	152-0322-00			SEMICOND DEVICE:SILICON,15V,HOT CARRIER	50434	5082-2672
A14CR1332	152-0322-00			SEMICOND DEVICE:SILICON,15V,HOT CARRIER	50434	5082-2672
A14CR1333	152-0322-00			SEMICOND DEVICE:SILICON,15V,HOT CARRIER	50434	5082-2672
A14CR1400	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A14CR1401	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A14CR1500	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A14CR1501	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A14CR1502	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A14CR1531	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A14CR1600	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A14CR1601	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A14CR1602	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A14CR1620	152-0066-00			SEMICOND DEVICE:SILICON,400V,750MA	14433	LG4016
A14CR1621	152-0066-00			SEMICOND DEVICE:SILICON,400V,750MA	14433	LG4016
A14CR1624	152-0066-00			SEMICOND DEVICE:SILICON,400V,750MA	14433	LG4016
A14CR1625	152-0066-00			SEMICOND DEVICE:SILICON,400V,750MA	14433	LG4016
A14DS1520	150-0131-00			LAMP,INCAND:120V,0.025A	71744	120PS
A14DS1521	150-0131-00			LAMP,INCAND:120V,0.025A	71744	120PS
A14E1139	276-0596-00	B010100	B010229X	CORE,TOROID,FER:0.09 ID X 0.19 OD X 0.08"H	78488	57-1657
	----- -----			(STANDARD ONLY)		
A14E1139	276-0596-00	B010100	B010239X	CORE,TOROID,FER:0.09 ID X 0.19 OD X 0.08"H	78488	57-1657
	----- -----			(OPTION 01 AND 02 ONLY)		
A14E1140	276-0596-00	B010100	B010229X	CORE,TOROID,FER:0.09 ID X 0.19 OD X 0.08"H	78488	57-1657
	----- -----			(STANDARD ONLY)		
A14E1140	276-0596-00	B010100	B010239X	CORE,TOROID,FER:0.09 ID X 0.19 OD X 0.08"H	78488	57-1657
	----- -----			(OPTION 01 AND 02 ONLY)		
A14J1200	131-1857-00			TERM. SET,PIN:36/0.025 SQ PIN,ON 0.1 CTRS	22526	65500136
A14J1201	131-1426-00			CONTACT SET,ELE:R ANGLE,0.250L,STRIP OF 36	22526	65524-136
A14J1300	131-1426-00			CONTACT SET,ELE:R ANGLE,0.250L,STRIP OF 36	22526	65524-136
A14J1301	131-1857-00			TERM. SET,PIN:36/0.025 SQ PIN,ON 0.1 CTRS	22526	65500136
A14J1311	131-1857-00			TERM. SET,PIN:36/0.025 SQ PIN,ON 0.1 CTRS	22526	65500136
A14J1430	131-1857-00			TERM. SET,PIN:36/0.025 SQ PIN,ON 0.1 CTRS	22526	65500136
A14J1500	131-1857-00			TERM. SET,PIN:36/0.025 SQ PIN,ON 0.1 CTRS	22526	65500136
A14J1600	131-1857-00			TERM. SET,PIN:36/0.025 SQ PIN,ON 0.1 CTRS	22526	65500136
A14J1620	131-1939-00			TERM. SET,PIN:1 X 14,0.15 SPACING	22526	65561-114
A14K1030	148-0134-00			RELAY,REED:2 FORM A,5VDCCOIL,100MA AT	21317	2A05X250BIAA
A14K1230	148-0134-00			RELAY,REED:2 FORM A,5VDCCOIL,100MA AT	21317	2A05X250BIAA
A14K1231	148-0134-00			RELAY,REED:2 FORM A,5VDCCOIL,100MA AT	21317	2A05X250BIAA
A14K1232	148-0134-00			RELAY,REED:2 FORM A,5VDCCOIL,100MA AT	21317	2A05X250BIAA
A14K1410	148-0122-00			RELAY,REED:1 FORM A,200V,0.5A,COIL,5VD	95348	F81-1050-4
A14K1411	148-0122-00			RELAY,REED:1 FORM A,200V,0.5A,COIL,5VD	95348	F81-1050-4
A14K1412	148-0134-00			RELAY,REED:2 FORM A,5VDCCOIL,100MA AT	21317	2A05X250BIAA
A14K1510	148-0134-00			RELAY,REED:2 FORM A,5VDCCOIL,100MA AT	21317	2A05X250BIAA
A14K1511	148-0134-00			RELAY,REED:2 FORM A,5VDCCOIL,100MA AT	21317	2A05X250BIAA
A14K1512	148-0134-00			RELAY,REED:2 FORM A,5VDCCOIL,100MA AT	21317	2A05X250BIAA
A14K1610	148-0134-00			RELAY,REED:2 FORM A,5VDCCOIL,100MA AT	21317	2A05X250BIAA
A14Q1000	151-1025-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	01295	SFB8129
A14Q1001	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A14Q1010	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
A14Q1011	151-1021-00			TRANSISTOR:SILICON,JFE	17856	FN815
A14Q1012	151-1025-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	01295	SFB8129
A14Q1013	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
A14Q1014	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
A14Q1110	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A14Q1200	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
A14Q1300	151-1021-00			TRANSISTOR:SILICON,JFE	17856	FN815
A14Q1320	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A14Q1321	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A14Q1322	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A14Q1330	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A14Q1400	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A14Q1401	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A14Q1402	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A14Q1500	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A14Q1501	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A14Q1502	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A14Q1520	151-0198-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	04713	SPS8802-1
A14Q1530	151-0342-00			TRANSISTOR:SILICON,PNP	07263	S035928
A14Q1600	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A14Q1601	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A14Q1602	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
A14Q1622	151-0198-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	04713	SPS8802-1
A14Q1623	151-0198-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	04713	SPS8802-1
A14Q1626	151-0198-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	04713	SPS8802-1
A14R1000	315-0683-00			RES.,FXD,CMPSN:68K OHM,5%,0.25W	01121	CB6835
A14R1001	315-0274-00			RES.,FXD,CMPSN:270K OHM,5%,0.25W	01121	CB2745
A14R1002	315-0243-00			RES.,FXD,CMPSN:24K OHM,5%,0.25W	01121	CB2435
A14R1003	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A14R1004	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A14R1005	315-0561-00			RES.,FXD,CMPSN:560 OHM,5%,0.25W	01121	CB5615
A14R1006	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A14R1007	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A14R1008	315-0204-00			RES.,FXD,CMPSN:200K OHM,5%,0.25W	01121	CB2045
A14R1009	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A14R1010	315-0182-00			RES.,FXD,CMPSN:1.8K OHM,5%,0.25W	01121	CB1825
A14R1011	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A14R1012	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
A14R1013	315-0243-00			RES.,FXD,CMPSN:24K OHM,5%,0.25W	01121	CB2435
A14R1014	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
A14R1015	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
A14R1016	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A14R1017	315-0122-00			RES.,FXD,CMPSN:1.2K OHM,5%,0.25W	01121	CB1225
A14R1018	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A14R1019	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A14R1020	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A14R1021	315-0272-00			RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	01121	CB2725
A14R1022	315-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
A14R1023	321-0222-00 ----- -----	B010100	B020369	RES.,FXD,FILM:2K OHM,1%,0.125W (STANDARD ONLY)	91637	MFF1816G20000F
A14R1023	321-0222-07 ----- -----	B020370		RES.,FXD,FILM:2K OHM,0.1%,0.125W (STANDARD ONLY)	91637	MFF1816C20000B
A14R1023	321-0222-00 ----- -----	B010100	B020389	RES.,FXD,FILM:2K OHM,1%,0.125W (OPTION 01 AND 02 ONLY)	91637	MFF1816G20000F
A14R1023	321-0222-07 ----- -----	B020390		RES.,FXD,FILM:2K OHM,0.1%,0.125W (OPTION 01 AND 02 ONLY)	91637	MFF1816C20000B
A14R1024	321-0336-00			RES.,FXD,FILM:30.9K OHM,1%,0.125W	91637	MFF1816G30901F
A14R1025	321-0299-00			RES.,FXD,FILM:12.7K OHM,1%,0.125W	91637	MFF1816G12701F
A14R1026	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A14R1030	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
A14R1031	321-1617-06			RES.,FXD,FILM:5.85K OHM,0.25%,0.125W	91637	MFF1816C58500C
A14R1032	321-0233-00			RES.,FXD,FILM:2.61K OHM,1%,0.125W	91637	MFF1816G26100F
A14R1033	321-0197-00			RES.,FXD,FILM:1.1K OHM,1%,0.125W	91637	MFF1816G11000F
A14R1034	321-0307-00			RES.,FXD,FILM:15.4K OHM,1%,0.125W	91637	MFF1816G15401F
A14R1035	315-0181-00			RES.,FXD,CMPSN:180 OHM,5%,0.25W	01121	CB1815
A14R1036	315-0181-00			RES.,FXD,CMPSN:180 OHM,5%,0.25W	01121	CB1815
A14R1037	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A14R1038	311-1240-00			RES.,VAR,NONWIR:25K OHM,10%,0.50W	73138	72-30-0
A14R1039	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	91637	MFF1816G37401F
A14R1100	311-1240-00			RES.,VAR,NONWIR:25K OHM,10%,0.50W	73138	72-30-0
A14R1101	311-1240-00			RES.,VAR,NONWIR:25K OHM,10%,0.50W	73138	72-30-0
A14R1103	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
A14R1104	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
A14R1105	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A14R1106	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
A14R1111	301-0431-00			RES.,FXD,CMPSN:430 OHM,5%,0.50W	01121	EB4315
A14R1112	315-0182-00			RES.,FXD,CMPSN:1.8K OHM,5%,0.25W	01121	CB1825
A14R1113	315-0561-00			RES.,FXD,CMPSN:560 OHM,5%,0.25W	01121	CB5615
A14R1114	315-0241-00			RES.,FXD,CMPSN:240 OHM,5%,0.25W	01121	CB2415
A14R1115	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A14R1116	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A14R1120	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A14R1121	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
A14R1122	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
A14R1123	315-0433-00			RES.,FXD,CMPSN:43K OHM,5%,0.25W	01121	CB4335
A14R1125	321-0259-00 ----- -----	B010100	B020369	RES.,FXD,FILM:4.87K OHM,1%,0.125W (STANDARD ONLY)	91637	MFF1816G48700F
A14R1125	321-0259-03 ----- -----	B020370		RES.,FXD,FILM:4.87K OHM,0.25%,0.125W (STANDARD ONLY)	91637	MFF1816D48700C
A14R1125	321-0259-00 ----- -----	B010100	B020389	RES.,FXD,FILM:4.87K OHM,1%,0.125W (OPTION 01 AND 02 ONLY)	91637	MFF1816G48700F
A14R1125	321-0259-03 ----- -----	B020390		RES.,FXD,FILM:4.87K OHM,0.25%,0.125W (OPTION 01 AND 02 ONLY)	91637	MFF1816D48700C
A14R1126	321-0368-00			RES.,FXD,FILM:66.5K OHM,1%,0.125W	91637	MFF1816G66501F
A14R1130	321-0117-00			RES.,FXD,FILM:162 OHM,1%,0.125W	91637	MFF1816G162R0F
A14R1131	321-0202-00			RES.,FXD,FILM:1.24K OHM,1%,0.125W	91637	MFF1816G12400F
A14R1132	321-0131-00			RES.,FXD,FILM:226 OHM,1%,0.125W	91637	MFF1816G226R0F
A14R1133	321-0099-00			RES.,FXD,FILM:105 OHM,1%,0.125W	91637	MFF1816G105R0F
A14R1134	315-0101-00 ----- -----	XB010230		RES.,FXD,CMPSN:100 OHM,5%,0.25W (STANDARD ONLY)	01121	CB1015
A14R1134	315-0101-00 ----- -----	XB010240		RES.,FXD,CMPSN:100 OHM,5%,0.25W (OPTION 01 AND 02 ONLY)	01121	CB1015
A14R1135	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A14R1136	321-0343-00 ----- -----	B010100	B020369	RES.,FXD,FILM:36.5K OHM,1%,0.125W (STANDARD ONLY)	91637	MFF1816G36501F
A14R1136	321-0622-00 ----- -----	B020370		RES.,FXD,FILM:37.96K OHM,0.25%,0.125W (STANDARD ONLY)	91637	MFF1816D37961C
A14R1136	321-0343-00 ----- -----	B010100	B020389	RES.,FXD,FILM:36.5K OHM,1%,0.125W (OPTION 01 AND 02 ONLY)	91637	MFF1816G36501F
A14R1136	321-0622-00 ----- -----	B020390		RES.,FXD,FILM:37.96K OHM,0.25%,0.125W (OPTION 01 AND 02 ONLY)	91637	MFF1816D37961C
A14R1139	321-0380-00 ----- -----	B010100	B020369	RES.,FXD,FILM:88.7K OHM,1%,0.125W (STANDARD ONLY)	91637	MFF1816G88701F
A14R1139	321-0831-03 ----- -----	B020370		RES.,FXD,FILM:92.5K OHM,0.25%,0.125W (STANDARD ONLY)	24546	NC55C9252C
A14R1139	321-0380-00 ----- -----	B010100	B020389	RES.,FXD,FILM:88.7K OHM,1%,0.125W (OPTION 01 AND 02 ONLY)	91637	MFF1816G88701F
A14R1139	321-0831-03 ----- -----	B020390		RES.,FXD,FILM:92.5K OHM,0.25%,0.125W (OPTION 01 AND 02 ONLY)	24546	NC55C9252C
A14R1201	321-0754-07			RES.,FXD,FILM:900 OHM,0.1%,0.125W	91637	MFF1816C900R0B
A14R1202	321-0991-03			RES.,FXD,FILM:18K OHM,0.25%,0.125W	24546	NC55C1802C
A14R1203	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A14R1204	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A14R1205	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A14R1206	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A14R1207	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
A14R1210	321-0774-03			RES.,FXD,FILM:4.5K OHM,0.25%,0.125W	91637	MFF1816D45000C
A14R1211	321-0612-03			RES.,FXD,FILM:500 OHM,0.25%,0.125W	91637	MFF1816D500R0C
A14R1212	321-1600-07			RES.,FXD,FILM:1.851K OHM,0.1%,0.125W	24546	NE55E18150B
A14R1213	321-0926-07			RES.,FXD,FILM:4K OHM,0.1%,0.125W	91637	MFF1816C40000B
A14R1214	321-0238-00			RES.,FXD,FILM:2.94K OHM,1%,0.125W	91637	MFF1816G29400F

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A14R1215	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A14R1216	321-0771-03			RES.,FXD,FILM:50 OHM,0.25%,0.125W	91637	MFF1816D50R00C
A14R1217	321-0749-06			RES.,FXD,FILM:450 OHM,0.25%,0.125W	91637	MFF1816C450R0C
A14R1218	321-0774-03			RES.,FXD,FILM:4.5K OHM,0.25%,0.125W	91637	MFF1816D45000C
A14R1219	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A14R1220	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A14R1228	315-0431-00 ----- -----	XB010230		RES.,FXD,CMPSN:430 OHM,5%,0.25W (STANDARD ONLY)	01121	CB4315
A14R1228	315-0431-00 ----- -----	XB010240		RES.,FXD,CMPSN:430 OHM,5%,0.25W (OPTION 01 AND 02 ONLY)	01121	CB4315
A14R1229	315-0431-00 ----- -----	XB010230		RES.,FXD,CMPSN:430 OHM,5%,0.25W (STANDARD ONLY)	01121	CB4315
A14R1229	315-0431-00 ----- -----	XB010240		RES.,FXD,CMPSN:430 OHM,5%,0.25W (OPTION 01 AND 02 ONLY)	01121	CB4315
A14R1239	315-0221-00 ----- -----	XB010230		RES.,FXD,CMPSN:220 OHM,5%,0.25W (STANDARD ONLY)	01121	CB2215
A14R1239	315-0221-00 ----- -----	XB010240		RES.,FXD,CMPSN:220 OHM,5%,0.25W (OPTION 01 AND 02 ONLY)	01121	CB2215
A14R1300	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A14R1301	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A14R1302	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A14R1303	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A14R1305	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A14R1306	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A14R1307	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
A14R1308	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A14R1309	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A14R1310	315-0751-00			RES.,FXD,CMPSN:750 OHM,5%,0.25W	01121	CB7515
A14R1311	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
A14R1320	311-1241-00			RES.,VAR,NONWIR:100K OHM,10%,0.5W	32997	3386X-T07-104
A14R1321	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A14R1322	321-0322-00			RES.,FXD,FILM:22.1K OHM,1%,0.125W	91637	MFF1816G22101F
A14R1323	321-0260-00			RES.,FXD,FILM:4.99K OHM,1%,0.125W	91637	MFF1816G49900F
A14R1324	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A14R1325	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A14R1326	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A14R1327	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
A14R1330	311-1246-00			RES.,VAR,NONWIR:50K OHM,10%,0.50W	02111	63X-503-T602
A14R1331	321-0401-00			RES.,FXD,FILM:147K OHM,1%,0.125W	91637	MFF1816G14702F
A14R1332	321-0239-00			RES.,FXD,FILM:3.01K OHM,1%,0.125W	91637	MFF1816G30100F
A14R1333	321-0318-00			RES.,FXD,FILM:20K OHM,1%,0.125W	91637	MFF1816G20001F
A14R1334	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A14R1335	321-0239-00			RES.,FXD,FILM:3.01K OHM,1%,0.125W	91637	MFF1816G30100F
A14R1336	315-0270-00			RES.,FXD,CMPSN:27 OHM,5%,0.25W	01121	CB2705
A14R1337	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A14R1338	317-0182-00			RES.,FXD,CMPSN:1.8K OHM,5%,0.125W	01121	BB1825
A14R1339	317-0182-00			RES.,FXD,CMPSN:1.8K OHM,5%,0.125W	01121	BB1825
A14R1400	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A14R1401	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A14R1402	321-0409-00			RES.,FXD,FILM:178K OHM,1%,0.125W	91637	MFF1816G17802F
A14R1404	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A14R1420	307-0683-00			RES.,NTWK,FXD FI:GAIN SET	80009	307-0683-00
A14R1430	321-0318-00			RES.,FXD,FILM:20K OHM,1%,0.125W	91637	MFF1816G20001F
A14R1431	321-0256-00			RES.,FXD,FILM:4.53K OHM,1%,0.125W	91637	MFF1816G45300F
A14R1432	321-0204-00			RES.,FXD,FILM:1.3K OHM,1%,0.125W	91637	MFF1816G13000F
A14R1433	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
A14R1434	315-0132-00			RES.,FXD,CMPSN:1.3K OHM,5%,0.25W	01121	CB1325

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A14R1435	315-0151-00			RES.,FXD,CMPSN:150 OHM,5%,0.25W	01121	CB1515
A14R1436	315-0151-00			RES.,FXD,CMPSN:150 OHM,5%,0.25W	01121	CB1515
A14R1500	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A14R1501	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A14R1502	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A14R1503	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A14R1504	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A14R1510	307-0684-00			RES.,NTWK,FXD FI:INPUT ATTENUATOR	80009	307-0684-00
A14R1520	315-0270-00			RES.,FXD,CMPSN:27 OHM,5%,0.25W	01121	CB2705
A14R1530	321-0322-00			RES.,FXD,FILM:22.1K OHM,1%,0.125W	91637	MFF1816G22101F
A14R1531	321-0322-00			RES.,FXD,FILM:22.1K OHM,1%,0.125W	91637	MFF1816G22101F
A14R1533	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A14R1600	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A14R1601	315-0273-00			RES.,FXD,CMPSN:27K OHM,5%,0.25W	01121	CB2735
A14R1610	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A14R1611	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A14R1620	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A14R1621	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A14RT1030	307-0124-00			RES.,THERMAL:5K OHM,10%	50157	1D1618
A14S1600	260-1998-00			SWITCH,PUSH:4 BUTTON,2 & 4 POLE,FUNCTION	71590	2KBM0400001303
A14TP1310	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
A14U1000	156-0515-00			MICROCIRCUIT,DI:TRIPLE 3-CHAN MUX	80009	156-0515-00
A14U1001	156-1191-00			MICROCIRCUIT,LI:DUAL BI-FET OP-AMPL,8 DIP	01295	TL072CP
A14U1002	156-1191-00			MICROCIRCUIT,LI:DUAL BI-FET OP-AMPL,8 DIP	01295	TL072CP
A14U1020	156-1272-00			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	NE5532 FE-IIB
A14U1030	307-0700-00			CPLR,OPTOELETR:140 OHM,40MA	18178	VTL5C4
A14U1031	307-0700-00			CPLR,OPTOELETR:140 OHM,40MA	18178	VTL5C4
A14U1032	307-0700-00			CPLR,OPTOELETR:140 OHM,40MA	18178	VTL5C4
A14U1100	156-1191-00			MICROCIRCUIT,LI:DUAL BI-FET OP-AMPL,8 DIP	01295	TL072CP
A14U1101	156-1446-00			MICROCIRCUIT,LI:OPNL AMPL,DUAL	18324	NE533N
A14U1120	156-1191-00			MICROCIRCUIT,LI:DUAL BI-FET OP-AMPL,8 DIP	01295	TL072CP
A14U1130	156-1338-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	18324	NE5534N
A14U1131	156-1338-01			MICROCIRCUIT,LI:OPNL AMPL,SELECTED	18324	NE5534AN
A14U1210	156-0514-00			MICROCIRCUIT,DI:DIFF 4-CHAN MUX	80009	156-0514-00
A14U1300	156-0513-00			MICROCIRCUIT,DI:8-CHAN MUX	80009	156-0513-00
A14U1310	156-1338-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	18324	NE5534N
A14U1320	156-0742-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	27014	LM318N
A14U1330	156-1191-00			MICROCIRCUIT,LI:DUAL BI-FET OP-AMPL,8 DIP	01295	TL072CP
A14U1331	307-0700-00			CPLR,OPTOELETR:140 OHM,40MA	18178	VTL5C4
A14U1420	156-1446-01			MICROCIRCUIT,LI:OPERATIONAL AMP,SCREENED	18324	NE5533AN
A14U1430	156-1338-01			MICROCIRCUIT,LI:OPNL AMPL,SELECTED	18324	NE5534AN
A14U1431	307-0700-00			CPLR,OPTOELETR:140 OHM,40MA	18178	VTL5C4
A14U1432	156-1338-01			MICROCIRCUIT,LI:OPNL AMPL,SELECTED	18324	NE5534AN
A14U1530	156-0158-00			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	MC1458V
A14VR1000	152-0226-00			SEMICOND DEVICE:ZENER,0.4W,5.1V,5%	14552	TD3810980
A14VR1112	152-0647-00			SEMICOND DEVICE:ZENER,0.4W,6.8V,5%	80009	152-0647-00
A14VR1220	152-0647-00			SEMICOND DEVICE:ZENER,0.4W,6.8V,5%	80009	152-0647-00
A14VR1320	152-0647-00			SEMICOND DEVICE:ZENER,0.4W,6.8V,5%	80009	152-0647-00
A14VR1430	152-0395-00			SEMICOND DEVICE:ZENER,0.4W,4.3V,5%	14552	TD332317
A14VR1620	152-0149-00			SEMICOND DEVICE:ZENER,0.4W,10V,5%	04713	SZG35009K3
A14VR1621	152-0149-00			SEMICOND DEVICE:ZENER,0.4W,10V,5%	04713	SZG35009K3
A14W1304	131-0566-00			BUS CONDUCTOR:DUMMY RES,2.375,22 AWG	55210	L-2007-1
A14W1500	131-0566-00			BUS CONDUCTOR:DUMMY RES,2.375,22 AWG	55210	L-2007-1
A14W1501	131-0566-00			BUS CONDUCTOR:DUMMY RES,2.375,22 AWG	55210	L-2007-1

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A15	----- -----			CKT BOARD ASSY:MAIN		
A15C1021	290-0782-00			CAP.,FXD,ELCTLT:4.7UF,+75-10%,35V	55680	35ULA4R7V-T
A15C1022	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A15C1030	283-0696-00 ----- -----			CAP.,FXD,MICA D:2300PF,1%,500V (OPTION 02 ONLY)	00853	D19-5E232F0
A15C1031	283-0696-00 ----- -----			CAP.,FXD,MICA D:2300PF,1%,500V (OPTION 02 ONLY)	00853	D19-5E232F0
A15C1032	283-0696-00 ----- -----			CAP.,FXD,MICA D:2300PF,1%,500V (OPTION 02 ONLY)	00853	D19-5E232F0
A15C1033	283-0696-00 ----- -----			CAP.,FXD,MICA D:2300PF,1%,500V (OPTION 02 ONLY)	00853	D19-5E232F0
A15C1100	283-0730-00			CAP.,FXD,MICA D:274PF,1%,500V	00853	D155E2740F0
A15C1101	283-0620-00			CAP.,FXD,MICA D:470PF,1%,300V	00853	D153F471F0
A15C1102	283-0620-00			CAP.,FXD,MICA D:470PF,1%,300V	00853	D153F471F0
A15C1103	283-0635-00			CAP.,FXD,MICA D:51PF,1%,100V	00853	D151E510F0
A15C1110	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
A15C1111	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M020FL
A15C1112	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M020FL
A15C1121	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A15C1122	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A15C1123	290-0746-00 ----- -----			CAP.,FXD,ELCTLT:47UF,+50-10%,16V (STANDARD ONLY)	55680	16U-47V-T
A15C1123	290-0776-00 ----- -----			CAP.,FXD,ELCTLT:22UF,+50-10%,10V (OPTION 02 ONLY)	55680	10ULA22V-T
A15C1130	290-0804-00 ----- -----			CAP.,FXD,ELCTLT:10UF,+50-10%,25V (OPTION 02 ONLY)	55680	25ULA10V-T
A15C1131	283-0696-00 ----- -----			CAP.,FXD,MICA D:2300PF,1%,500V (OPTION 02 ONLY)	00853	D19-5E232F0
A15C1132	283-0696-00 ----- -----			CAP.,FXD,MICA D:2300PF,1%,500V (OPTION 02 ONLY)	00853	D19-5E232F0
A15C1133	283-0696-00 ----- -----			CAP.,FXD,MICA D:2300PF,1%,500V (OPTION 02 ONLY)	00853	D19-5E232F0
A15C1134	281-0601-00 ----- -----			CAP.,FXD,CER DI:7.5PF,500V (OPTION 02 ONLY)	59660	301-00C-0H0759D
A15C1135	283-0596-00 ----- -----			CAP.,FXD,MICA D:528PF,1%,300V (OPTION 02 ONLY)	00853	D153F5280F0
A15C1201	290-0267-00			CAP.,FXD,ELCTLT:1UF,20%,35V	56289	162D105X0035CD2
A15C1210	283-0623-00 ----- -----			CAP.,FXD,MICA D:1200PF,1%,100V (STANDARD ONLY)	00853	D191F122F0
A15C1210	283-0693-00 ----- -----			CAP.,FXD,MICA D:1730PF,1%,500V (OPTION 02 ONLY)	00853	D19-5F1731F0
A15C1211	283-0623-00			CAP.,FXD,MICA D:1200PF,1%,100V	00853	D191F122F0
A15C1212	285-0702-00			CAP.,FXD,PLSTC:0.033UF,5%,100V	56289	410P33351
A15C1213	290-0284-00			CAP.,FXD,ELCTLT:4.7UF,10%,35V	56289	150D475X9035B2
A15C1220	285-0702-00			CAP.,FXD,PLSTC:0.033UF,5%,100V	56289	410P33351
A15C1221	285-0702-00			CAP.,FXD,PLSTC:0.033UF,5%,100V	56289	410P33351
A15C1230	285-0702-00 ----- -----			CAP.,FXD,PLSTC:0.033UF,5%,100V (OPTION 02 ONLY)	56289	410P33351
A15C1231	285-0702-00 ----- -----			CAP.,FXD,PLSTC:0.033UF,5%,100V (OPTION 02 ONLY)	56289	410P33351
A15C1232	285-0702-00 ----- -----			CAP.,FXD,PLSTC:0.033UF,5%,100V (OPTION 02 ONLY)	56289	410P33351
A15C1233	285-1056-00 ----- -----			CAP.,FXD,PLSTC:1UF,2%,50V (OPTION 02 ONLY)	14752	650B1A105G
A15C1234	285-1056-00 ----- -----			CAP.,FXD,PLSTC:1UF,2%,50V (OPTION 02 ONLY)	14752	650B1A105G
A15C1235	290-0804-00 ----- -----			CAP.,FXD,ELCTLT:10UF,+50-10%,25V (OPTION 02 ONLY)	55680	25ULA10V-T

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A15C1236	290-0804-00			CAP.,FXD,ELCTLT:10UF,+50-10%,25V	55680	25ULA10V-T
	----- -----			(OPTION 02 ONLY)		
A15C1237	281-0758-00			CAP.,FXD,CER DI:15PF,20%,100V	72982	314022C0G0150M
	----- -----			(OPTION 02 ONLY)		
A15C1300	290-0512-00			CAP.,FXD,ELCTLT:22UF,20%,15V	56289	196D226X0015KA1
A15C1301	290-0517-00			CAP.,FXD,ELCTLT:6.8UF,20%,35V	56289	196D685X0035KA1
A15C1310	285-1051-00			CAP.,FXD,PLSTC:1UF,1%,200V	14752	230B1C105F
	----- -----			(STANDARD ONLY)		
A15C1310	285-1056-00			CAP.,FXD,PLSTC:1UF,2%,50V	14752	650B1A105G
	----- -----			(OPTION 02 ONLY)		
A15C1311	281-0509-00			CAP.,FXD,CER DI:15PF,+/-1.5PF,500V	59660	301-000C0G0150K
A15C1315	290-0580-00			CAP.,FXD,ELCTLT:0.27UF,20%,50V	56289	196D274X0050HA1
A15C1320	285-0650-00			CAP.,FXD,PLSTC:0.027UF,5%,100V	56289	410P104
A15C1321	285-0683-00			CAP.,FXD,PLSTC:0.022UF,5%,100V	56289	410P22351
A15C1322	285-0683-00			CAP.,FXD,PLSTC:0.022UF,5%,100V	56289	410P22351
A15C1323	285-0598-00			CAP.,FXD,PLSTC:0.01UF,5%,100V	01002	61F10AC103
A15C1330	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
	----- -----			(OPTION 02 ONLY)		
A15C1331	281-0616-00			CAP.,FXD,CER DI:6.8PF,+/-0.5PF,200V	59660	374001C0H0689D
	----- -----			(OPTION 02 ONLY)		
A15C1332	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
	----- -----			(OPTION 02 ONLY)		
A15C1333	281-0786-00			CAP.,FXD,CER DI:150PF,10%,100V	72982	8035D2AADX5P151K
	----- -----			(OPTION 02 ONLY)		
A15C1334	290-0244-00			CAP.,FXD,ELCTLT:0.47UF,5%,35V	56289	162D474X5035BC2
	----- -----			(OPTION 02 ONLY)		
A15C1335	290-0246-00			CAP.,FXD,ELCTLT:3.3UF,10%,15V	56289	162D335X9015CD2
	----- -----			(OPTION 02 ONLY)		
A15C1400	283-0198-00			CAP.,FXD,CER DI:0.22UF,20%,50V	72982	8121N083Z5U0224M
A15C1410	285-1049-00			CAP.,FXD,PLSTC:0.01UF,1%,200V	14752	230B1C103F
A15C1411	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A15C1412	290-0846-00			CAP.,FXD,ELCTLT:47UF,-10+75%,35 WVDC	54473	ECE-A35V47LU
	----- -----			(STANDARD ONLY)		
A15C1412	290-0943-00			CAP.,FXD,ELCTLT:47UF,+50-10%,25V	55680	25ULB47V0T
	----- -----			(OPTION 02 ONLY)		
A15C1413	281-0813-00			CAP.,FXD CER DI:0.047UF,20%,50V	04222	GC705-E-473M
A15C1421	290-0846-00			CAP.,FXD,ELCTLT:47UF,-10+75%,35 WVDC	54473	ECE-A35V47LU
	----- -----			(STANDARD ONLY)		
A15C1421	290-0943-00			CAP.,FXD,ELCTLT:47UF,+50-10%,25V	55680	25ULB47V0T
	----- -----			(OPTION 02 ONLY)		
A15C1423	281-0813-00			CAP.,FXD CER DI:0.047UF,20%,50V	04222	GC705-E-473M
A15C1424	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A15C1430	290-0891-00			CAP.,FXD,ELCTLT:1UF,+75-10%,50V	55680	25U1A10V-T
	----- -----			(OPTION 02 ONLY)		
A15C1431	290-0525-00			CAP.,FXD,ELCTLT:4.7UF,20%,50V	56289	196D475X0050KA1
	----- -----			(OPTION 02 ONLY)		
A15C1501	285-1050-00			CAP.,FXD,PLSTC:0.1UF,1%,200V	14752	230B1C104F
A15C1502	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A15C1510	281-0813-00			CAP.,FXD CER DI:0.047UF,20%,50V	04222	GC705-E-473M
A15C1520	281-0813-00			CAP.,FXD CER DI:0.047UF,20%,50V	04222	GC705-E-473M
A15C1521	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A15C1600	283-0594-00			CAP.,FXD,MICA D:0.001UF,1%,100V	00853	D151F102F0
A15C1601	283-0594-00			CAP.,FXD,MICA D:0.001UF,1%,100V	00853	D151F102F0
A15C1602	290-0804-00			CAP.,FXD,ELCTLT:10UF,+50-10%,25V	55680	25ULA10V-T
A15C1610	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A15C1620	281-0775-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8005D9AABZ5U104M
A15CR1121	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A15CR1122	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A15CR1230	152-0141-02 ----- -----			SEMICOND DEVICE:SILICON,30V,150MA (OPTION 02 ONLY)	01295	1N4152R
A15CR1231	152-0141-02 ----- -----			SEMICOND DEVICE:SILICON,30V,150MA (OPTION 02 ONLY)	01295	1N4152R
A15CR1232	152-0322-00 ----- -----			SEMICOND DEVICE:SILICON,15V,HOT CARRIER (OPTION 02 ONLY)	50434	5082-2672
A15CR1233	152-0322-00 ----- -----			SEMICOND DEVICE:SILICON,15V,HOT CARRIER (OPTION 02 ONLY)	50434	5082-2672
A15CR1301	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A15CR1302	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A15CR1303	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A15CR1304	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A15CR1331	152-0246-00 ----- -----			SEMICOND DEVICE:SW,SI,40V,200MA (OPTION 02 ONLY)	03508	DE140
A15CR1332	152-0141-02 ----- -----			SEMICOND DEVICE:SILICON,30V,150MA (OPTION 02 ONLY)	01295	1N4152R
A15CR1401	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A15CR1411	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A15CR1412	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A15CR1413	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A15CR1414	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A15CR1420	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A15CR1501	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A15CR1502	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A15CR1503	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A15CR1521	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A15DS1610	150-0077-01			LAMP,INCAND:14V,0.08A	08806	2182D
A15DS1611	150-0077-01			LAMP,INCAND:14V,0.08A	08806	2182D
A15F1610	159-0022-00			FUSE,CARTRIDGE:3AG,1A,250V,FAST-BLOW	71400	AGC 1
A15F1620	159-0022-00			FUSE,CARTRIDGE:3AG,1A,250V,FAST-BLOW	71400	AGC 1
A15F1621	159-0022-00			FUSE,CARTRIDGE:3AG,1A,250V,FAST-BLOW	71400	AGC 1
A15J1100	131-1426-00			CONTACT SET,ELE:R ANGLE,0.250L,STRIP OF 36	22526	65524-136
A15J1200	131-1426-00			CONTACT SET,ELE:R ANGLE,0.250L,STRIP OF 36	22526	65524-136
A15J1300	131-1426-00			CONTACT SET,ELE:R ANGLE,0.250L,STRIP OF 36	22526	65524-136
A15J1400	131-1426-00			CONTACT SET,ELE:R ANGLE,0.250L,STRIP OF 36	22526	65524-136
A15J1401	131-1426-00			CONTACT SET,ELE:R ANGLE,0.250L,STRIP OF 36	22526	65524-136
A15J1500	131-1426-00			CONTACT SET,ELE:R ANGLE,0.250L,STRIP OF 36	22526	65524-136
A15J1600	131-1426-00			CONTACT SET,ELE:R ANGLE,0.250L,STRIP OF 36	22526	65524-136
A15Q1310	151-1025-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	01295	SFB8129
A15Q1330	151-0192-00 ----- -----			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521 (OPTION 02 ONLY)	04713	SPS8801
A15Q1400	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A15Q1401	151-0254-00			TRANSISTOR:SILICON,NPN	03508	X38L3118
A15Q1510	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A15Q1511	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A15Q1513	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A15Q1520	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
A15Q1521	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
A15Q1522	151-0301-00			TRANSISTOR:SILICON,PNP	27014	2N2907A
A15R1000	315-0101-00 ----- -----			RES.,FXD,CMPSN:100 OHM,5%,0.25W (OPTION 02 ONLY)	01121	CB1015
A15R1021	321-0326-00			RES.,FXD,FILM:24.3K OHM,1%,0.125W	91637	MFF1816G24301F
A15R1022	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A15R1023	321-0260-00			RES.,FXD,FILM:4.99K OHM,1%,0.125W	91637	MFF1816G49900F
A15R1030	321-0240-00 ----- -----			RES.,FXD,FILM:3.09K OHM,1%,0.125W (OPTION 02 ONLY)	91637	MFF1816630900F

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A15R1031	321-0290-00			RES.,FXD,FILM:10.2K OHM,1%,0.125W	91637	MFF1816G10201F
	----- -----			(OPTION 02 ONLY)		
A15R1032	321-0222-00			RES.,FXD,FILM:2K OHM,1%,0.125W	91637	MFF1816G20000F
	----- -----			(OPTION 02 ONLY)		
A15R1033	321-0293-00			RES.,FXD,FILM:11K OHM,1%,0.125W	91637	MFF1816G11001F
	----- -----			(OPTION 02 ONLY)		
A15R1034	321-0293-00			RES.,FXD,FILM:11K OHM,1%,0.125W	91637	MFF1816G11001F
	----- -----			(OPTION 02 ONLY)		
A15R1035	321-0222-00			RES.,FXD,FILM:2K OHM,1%,0.125W	91637	MFF1816G20000F
	----- -----			(OPTION 02 ONLY)		
A15R1036	321-0316-00			RES.,FXD,FILM:19.1K OHM,1%,0.125W	91637	MFF1816G19101F
	----- -----			(OPTION 02 ONLY)		
A15R1037	321-0316-00			RES.,FXD,FILM:19.1K OHM,1%,0.125W	91637	MFF1816G19101F
	----- -----			(OPTION 02 ONLY)		
A15R1038	321-0316-00			RES.,FXD,FILM:19.1K OHM,1%,0.125W	91637	MFF1816G19101F
	----- -----			(OPTION 02 ONLY)		
A15R1039	321-0291-00			RES.,FXD,FILM:10.5K OHM,1%,0.125W	91637	MFF1816G10501F
	----- -----			(OPTION 02 ONLY)		
A15R1100	321-0222-00			RES.,FXD,FILM:2K OHM,1%,0.125W	91637	MFF1816G20000F
A15R1101	321-0222-00			RES.,FXD,FILM:2K OHM,1%,0.125W	91637	MFF1816G20000F
A15R1102	321-0222-00			RES.,FXD,FILM:2K OHM,1%,0.125W	91637	MFF1816G20000F
A15R1103	321-0222-00			RES.,FXD,FILM:2K OHM,1%,0.125W	91637	MFF1816G20000F
A15R1104	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A15R1105	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A15R1106	321-0240-00			RES.,FXD,FILM:3.09K OHM,1%,0.125W	91637	MFF1816G30900F
A15R1110	321-0308-00			RES.,FXD,FILM:15.8K OHM,1%,0.125W	91637	MFF1816G15801F
A15R1111	321-0265-00			RES.,FXD,FILM:5.62K OHM,1%,0.125W	91637	MFF1816G56200F
A15R1112	321-0308-00			RES.,FXD,FILM:15.8K OHM,1%,0.125W	91637	MFF1816G15801F
A15R1113	321-0265-00			RES.,FXD,FILM:5.62K OHM,1%,0.125W	91637	MFF1816G56200F
A15R1114	321-0240-00			RES.,FXD,FILM:3.09K OHM,1%,0.125W	91637	MFF1816G30900F
A15R1121	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A15R1122	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A15R1130	321-0651-00			RES.,FXD,FILM:15.8K OHM,0.25%,0.125W	91637	MFF1816C15801C
	----- -----			(OPTION 02 ONLY)		
A15R1131	315-0364-00			RES.,FXD,CMPSN:360K OHM,5%,0.25W	01121	CB3645
	----- -----			(OPTION 02 ONLY)		
A15R1132	311-1557-00			RES.,VAR,NONWIR:25K OHM,20%,0.50W	73138	91-79-0
	----- -----			(OPTION 02 ONLY)		
A15R1133	321-0237-00			RES.,FXD,FILM:2.87K OHM,1%,0.125W	91637	MFF1816G28700F
	----- -----			(OPTION 02 ONLY)		
A15R1134	321-0290-00			RES.,FXD,FILM:10.2K OHM,1%,0.125W	91637	MFF1816G10201F
	----- -----			(OPTION 02 ONLY)		
A15R1135	321-0222-00			RES.,FXD,FILM:2K OHM,1%,0.125W	91637	MFF1816G20000F
	----- -----			(OPTION 02 ONLY)		
A15R1136	321-0222-00			RES.,FXD,FILM:2K OHM,1%,0.125W	91637	MFF1816G20000F
	----- -----			(OPTION 02 ONLY)		
A15R1137	321-0249-00			RES.,FXD,FILM:3.83K OHM,1%,0.125W	91637	MFF1816G38300F
	----- -----			(OPTION 02 ONLY)		
A15R1200	321-0312-00			RES.,FXD,FILM:17.4K OHM,1%,0.125W	91637	MFF1816G17401F
	----- -----			(OPTION 02 ONLY)		
A15R1201	311-1556-00			RES.,VAR,NONWIR:50K OHM,20%,0.50W	73138	91-78-0
A15R1202	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
A15R1203	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
A15R1204	315-0243-00			RES.,FXD,CMPSN:24K OHM,5%,0.25W	01121	CB2435
A15R1210	321-0308-00			RES.,FXD,FILM:15.8K OHM,1%,0.125W	91637	MFF1816G15801F
A15R1211	321-0265-00			RES.,FXD,FILM:5.62K OHM,1%,0.125W	91637	MFF1816G56200F
A15R1212	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A15R1220	321-0363-00			RES.,FXD,FILM:59K OHM,1%,0.125W	91637	MFF1816G59001F
A15R1221	321-0244-00			RES.,FXD,FILM:3.4K OHM,1%,0.125W	91637	MFF1816G34000F
A15R1222	321-0283-00			RES.,FXD,FILM:8.66K OHM,1%,0.125W	91637	MFF1816G86600F
A15R1223	321-0374-00			RES.,FXD,FILM:76.8K OHM,1%,0.125W	91637	MFF1816G76801F
A15R1224	321-0405-00			RES.,FXD,FILM:162K OHM,1%,0.125W	91637	MFF1816G16202F
A15R1230	321-0296-00 ----- -----			RES.,FXD,FILM:11.8K OHM,1%,0.125W (OPTION 02 ONLY)	91637	MFF1816G11801F
A15R1231	321-0344-00 ----- -----			RES.,FXD,FILM:37.4K OHM,1%,0.125W (OPTION 02 ONLY)	91637	MFF1816G37401F
A15R1232	321-0261-00 ----- -----			RES.,FXD,FILM:5.11K OHM,1%,0.125W (OPTION 02 ONLY)	91637	MFF1816G51100F
A15R1233	321-0308-00 ----- -----			RES.,FXD,FILM:15.8K OHM,1%,0.125W (OPTION 02 ONLY)	91637	MFF1816G15801F
A15R1234	321-0400-00 ----- -----			RES.,FXD,FILM:143K OHM,1%,0.125W (OPTION 02 ONLY)	91637	MFF1816G14302F
A15R1235	321-0289-07 ----- -----			RES.,FXD,FILM:10K OHM,0.1%,0.125W (OPTION 02 ONLY)	91637	MFF1816C10001B
A15R1236	321-0306-00 ----- -----			RES.,FXD,FILM:15K OHM,1%,0.125W (OPTION 02 ONLY)	91637	MFF1816G15001F
A15R1237	321-0277-00 ----- -----			RES.,FXD,FILM:7.5K OHM,1%,0.125W (OPTION 02 ONLY)	91637	MFF1816G75000F
A15R1238	321-0289-07 ----- -----			RES.,FXD,FILM:10K OHM,0.1%,0.125W (OPTION 02 ONLY)	91637	MFF1816C10001B
A15R1300	311-1556-00			RES.,VAR,NONWIR:50K OHM,20%,0.50W	73138	91-78-0
A15R1301	311-1749-00			RES.,VAR,NONWIR:TRMR,1.5K OHM,0.75W	73138	91-97-0
A15R1302	321-0291-00			RES.,FXD,FILM:10.5K OHM,1%,0.125W	91637	MFF1816G10501F
A15R1303	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
A15R1306	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A15R1310	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A15R1311	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A15R1312	321-0260-00			RES.,FXD,FILM:4.99K OHM,1%,0.125W	91637	MFF1816G49900F
A15R1313	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A15R1314	315-0244-00 ----- -----			RES.,FXD,CMPSN:240K OHM,5%,0.25W (STANDARD ONLY)	01121	CB2445
A15R1314	315-0684-00 ----- -----			RES.,FXD,CMPSN:680K OHM,5%,0.25W (OPTION 02 ONLY)	01121	CB6845
A15R1315	315-0243-00			RES.,FXD,CMPSN:24K OHM,5%,0.25W	01121	CB2435
A15R1320	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
A15R1321	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A15R1322	321-0318-00			RES.,FXD,FILM:20K OHM,1%,0.125W	91637	MFF1816G20001F
A15R1323	321-0432-00			RES.,FXD,FILM:309K OHM,1%,0.125W	91637	MFF1816G30902F
A15R1324	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A15R1325	321-0312-00 ----- -----			RES.,FXD,FILM:17.4K OHM,1%,0.125W (STANDARD ONLY)	91637	MFF1816G17401F
A15R1325	321-0405-00 ----- -----			RES.,FXD,FILM:162K OHM,1%,0.125W (OPTION 02 ONLY)	91637	MFF1816G16202F
A15R1330	311-1557-00 ----- -----			RES.,VAR,NONWIR:25K OHM,20%,0.50W (OPTION 02 ONLY)	73138	91-79-0
A15R1331	315-0512-00 ----- -----			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W (OPTION 02 ONLY)	01121	CB5125
A15R1332	315-0302-00 ----- -----			RES.,FXD,CMPSN:3K OHM,5%,0.25W (OPTION 02 ONLY)	01121	CB3025
A15R1333	321-0423-00 ----- -----			RES.,FXD,FILM:249K OHM,1%,0.125W (OPTION 02 ONLY)	91637	MFF1816G24902F
A15R1334	311-1557-00 ----- -----			RES.,VAR,NONWIR:25K OHM,20%,0.50W (OPTION 02 ONLY)	73138	91-79-0
A15R1335	321-0382-00 ----- -----			RES.,FXD,FILM:93.1K OHM,1%,0.125W (OPTION 02 ONLY)	91637	MFF1816G93101F

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A15R1336	315-0225-00			RES.,FXD,CMPSN:2.2M OHM,5%,0.25W	01121	CB2255
	----- -----			(OPTION 02 ONLY)		
A15R1337	321-0156-00			RES.,FXD,FILM:412 OHM,1%,0.125W	91637	MFF1816G412R0F
	----- -----			(OPTION 02 ONLY)		
A15R1338	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
	----- -----			(OPTION 02 ONLY)		
A15R1339	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
	----- -----			(OPTION 02 ONLY)		
A15R1400	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A15R1401	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
A15R1402	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
A15R1403	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A15R1404	315-0432-00			RES.,FXD,CMPSN:4.3K OHM,5%,0.25W	01121	CB4325
A15R1405	321-0414-00			RES.,FXD,FILM:200K OHM,1%,0.125W	91637	MFF1816G20002F
A15R1406	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
A15R1407	315-0122-00			RES.,FXD,CMPSN:1.2K OHM,5%,0.25W	01121	CB1225
A15R1420	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A15R1421	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A15R1424	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
A15R1425	321-0283-00			RES.,FXD,FILM:8.66K OHM,1%,0.125W	91637	MFF1816G86600F
A15R1426	321-0268-00			RES.,FXD,FILM:6.04K OHM,1%,0.125W	91637	MFF1816G60400F
A15R1430	315-0474-00			RES.,FXD,CMPSN:470K OHM,5%,0.25W	01121	CB4745
	----- -----			(OPTION 02 ONLY)		
A15R1501	321-0414-00			RES.,FXD,FILM:200K OHM,1%,0.125W	91637	MFF1816G20002F
A15R1502	321-0312-00			RES.,FXD,FILM:17.4K OHM,1%,0.125W	91637	MFF1816G17401F
A15R1503	321-0416-00			RES.,FXD,FILM:210K OHM,1%,0.125W	91637	MFF1816G21002F
A15R1510	315-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.25W	01121	CB1065
A15R1511	315-0203-00			RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
A15R1512	315-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.25W	01121	CB1065
A15R1513	315-0203-00			RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
A15R1514	315-0106-00			RES.,FXD,CMPSN:10M OHM,5%,0.25W	01121	CB1065
A15R1515	315-0226-00			RES.,FXD,CMPSN:22M OHM,5%,0.25W	01121	CB2265
A15R1516	315-0203-00			RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
A15R1517	315-0203-00			RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
A15R1518	315-0245-00			RES.,FXD,CMPSN:2.4M OHM,5%,0.25W	01121	CB2455
A15R1519	307-0093-00			RES.,FXD,CMPSN:1.2 OHM,5%,0.50W	01121	EB12G5
A15R1520	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A15R1521	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A15R1522	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A15R1523	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A15R1524	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A15R1525	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A15R1526	307-0093-00			RES.,FXD,CMPSN:1.2 OHM,5%,0.50W	01121	EB12G5
A15R1600	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A15R1601	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A15R1602	321-0256-00			RES.,FXD,FILM:4.53K OHM,1%,0.125W	91637	MFF1816G45300F
A15R1603	315-0132-00			RES.,FXD,CMPSN:1.3K OHM,5%,0.25W	01121	CB1325
A15R1610	321-0174-00			RES.,FXD,FILM:634 OHM,1%,0.125W	91637	MFF1816G634R0F
A15R1611	321-0661-00			RES.,FXD,FILM:600 OHM,1%,0.125W	91637	MFF1816G600R0F
A15R1612	321-0131-00			RES.,FXD,FILM:226 OHM,1%,0.125W	91637	MFF1816G226R0F
A15R1620	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A15R1621	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A15S1000	260-1999-00			SWITCH,PUSH:5 BUTTON,4,2 & 0 POILE,DISTOR	71590	2KBC1310001304
A15S1100	260-2000-00			SWITCH,PUSH:5 BUTTON,2 & 4 POLE,FILTER	71590	2KBB0500001305
A15TP1411	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
A15U1121	156-1191-00			MICROCIRCUIT,LI:DUAL BI-FET OP-AMPL,8 DIP	01295	TL072CP

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A15U1201	156-1457-00			MICROCIRCUIT,LI:TRUE RMS CONVERTER	24355	AD536AJH
A15U1210	156-1191-00			MICROCIRCUIT,LI:DUAL BI-FET OP-AMPL,8 DIP	01295	TL072CP
A15U1220	156-1149-00			MICROCIRCUIT,LI:OPERATIONAL AMP,JFET INPUT	27014	LF351N
A15U1230	156-1200-00			MICROCIRCUIT,LI:OPERATIONAL AMPL	01295	TL074CN
	----- -----			(OPTION 02 ONLY)		
A15U1231	156-1338-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	18324	NE5534N
	----- -----			(OPTION 02 ONLY)		
A15U1301	156-1149-00			MICROCIRCUIT,LI:OPERATIONAL AMP,JFET INPUT	27014	LF351N
A15U1310	156-1191-00			MICROCIRCUIT,LI:DUAL BI-FET OP-AMPL,8 DIP	01295	TL072CP
	----- -----			(STANDARD ONLY)		
A15U1310	156-1149-00			MICROCIRCUIT,LI:OPERATIONAL AMP,JFET INPUT	27014	LF351N
	----- -----			(OPTION 02 ONLY)		
A15U1321	156-1149-00			MICROCIRCUIT,LI:OPERATIONAL AMP,JFET INPUT	27014	LF351N
A15U1330	156-1200-00			MICROCIRCUIT,LI:OPERATIONAL AMPL	01295	TL074CN
	----- -----			(OPTION 02 ONLY)		
A15U1400	156-0763-00			MICROCIRCUIT,DI:HEX CONT BOUNCE ELIMINATOR	80009	156-0763-00
A15U1410	156-0931-00			MICROCIRCUIT,DI:QUAD D FF	80009	156-0931-00
A15U1420	156-0158-00			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	MC1458V
A15U1500	156-0931-00			MICROCIRCUIT,DI:QUAD D FF	80009	156-0931-00
A15U1523	156-0277-00			MICROCIRCUIT,LI:VOLTAGE REGULATOR	07263	MICROA7805UC
A15U1600	156-0513-00			MICROCIRCUIT,DI:8-CHAN MUX	80009	156-0513-00
A15U1610	156-0411-00			MICROCIRCUIT,LI:QUAD-COMP,SGL SUPPLY	27014	LM339N
A15VR1021	152-0647-00			SEMICOND DEVICE:ZENER,0.4W,6.8V,5%	80009	152-0647-00
A15VR1401	152-0486-00			SEMICOND DEVICE:ZENER,0.25W,6.2V,5%	80009	152-0486-00
A15VR1520	152-0590-00			SEMICOND DEVICE:ZENER,18V,5% AT 7MA	80009	152-0590-00
A15VR1521	152-0590-00			SEMICOND DEVICE:ZENER,18V,5% AT 7MA	80009	152-0590-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
				CHASSIS PARTS		
J500	131-0955-00			CONN,RCPT,ELEC:BNC,FEMALE	13511	31-279
J510	131-1315-01			CONN,RCPT,ELEC:BNC,FEMALE	24931	28JR 306-1
J520	131-0955-00			CONN,RCPT,ELEC:BNC,FEMALE	13511	31-279
J530	136-0731-00			JACK,TIP:BLACK	80009	136-0731-00
J540	136-0731-00			JACK,TIP:BLACK	80009	136-0731-00
S1521	263-1187-00			SW CAM ACTR AS:LEVEL RANGE	80009	263-1187-00

DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

Symbols

Graphic symbols and class designation letters are based on ANSI Standard Y32.2-1975.

Logic symbology is based on ANSI Y32.14-1973 in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

The overline on a signal name indicates that the signal performs its intended function when it is in the low state.

Abbreviations are based on ANSI Y1.1-1972.

Other ANSI standards that are used in the preparation of diagrams by Tektronix, Inc. are:

Y14.15, 1966	Drafting Practices.
Y14.2, 1973	Line Conventions and Lettering.
Y10.5, 1968	Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering.

American National Standard Institute
1430 Broadway
New York, New York 10018

Component Values

Electrical components shown on the diagrams are in the following units unless noted otherwise:

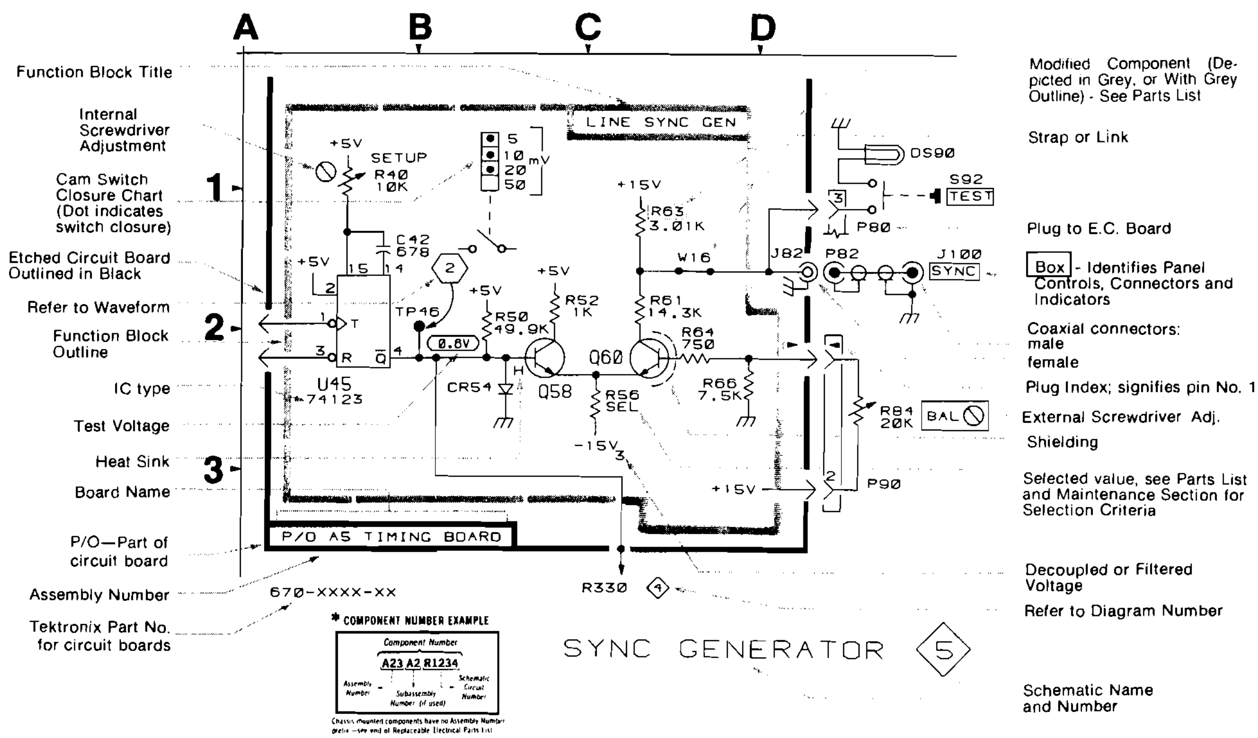
Capacitors = Values one or greater are in picofarads (pF). Values less than one are in microfarads (μF).
Resistors = Ohms (Ω).

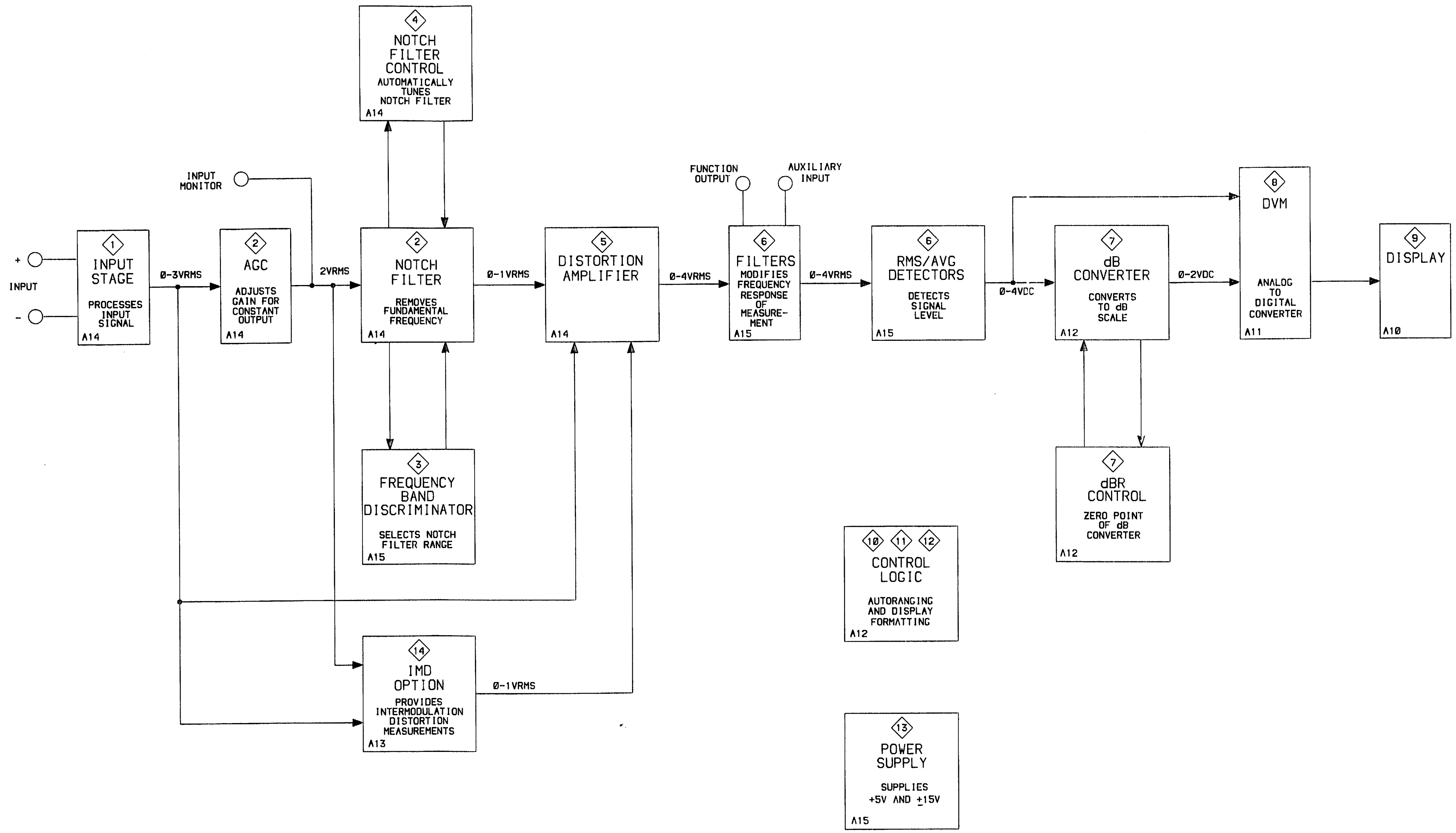
The information and special symbols below may appear in this manual.

Assembly Numbers and Grid Coordinates

Each assembly in the instrument is assigned an assembly number (e.g., A20). The assembly number appears on the circuit board outline on the diagram, in the title for the circuit board component location illustration, and in the lookup table for the schematic diagram and corresponding component locator illustration. The Replaceable Electrical Parts list is arranged by assemblies in numerical sequence; the components are listed by component number *(see following illustration for constructing a component number).

The schematic diagram and circuit board component location illustration have grids. A lookup table with the grid coordinates is provided for ease of locating the component. Only the components illustrated on the facing diagram are listed in the lookup table. When more than one schematic diagram is used to illustrate the circuitry on a circuit board, the circuit board illustration may only appear opposite the first diagram on which it was illustrated; the lookup table will list the diagram number of other diagrams that the circuitry of the circuit board appears on.

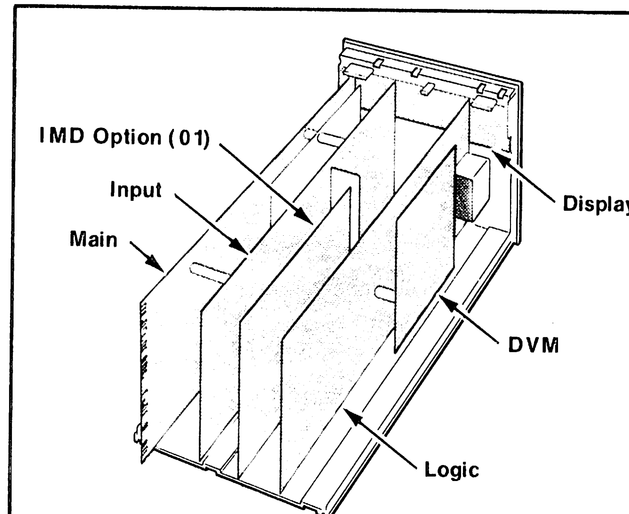




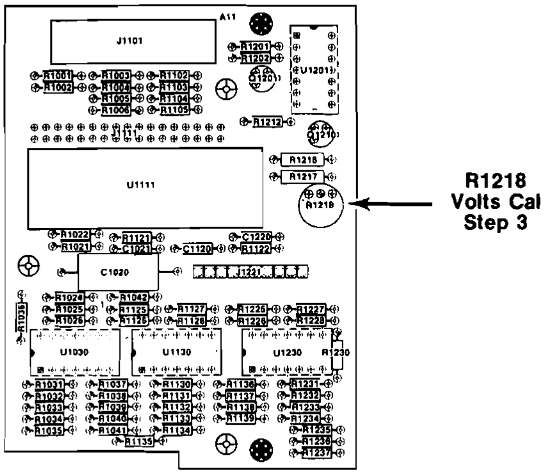
AA 5Ø1

2958-45

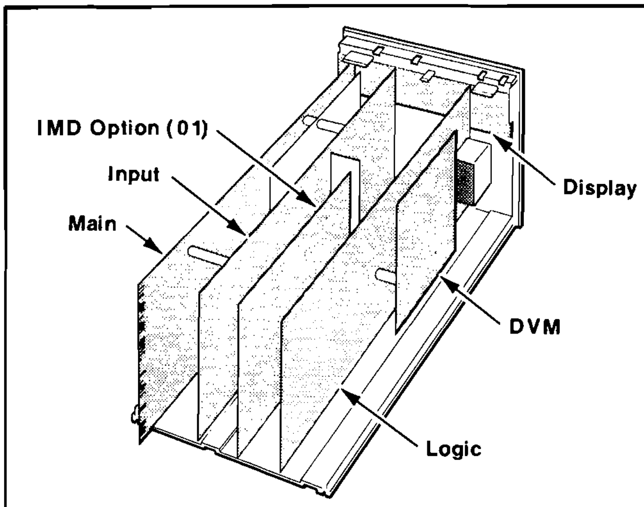
BLOCK DIAGRAM



AA 501 Circuit Boards



DVM Section



AA 501 Circuit Boards

Scans by ARTEK MEDIA =>

ADJUSTMENT LOCATIONS

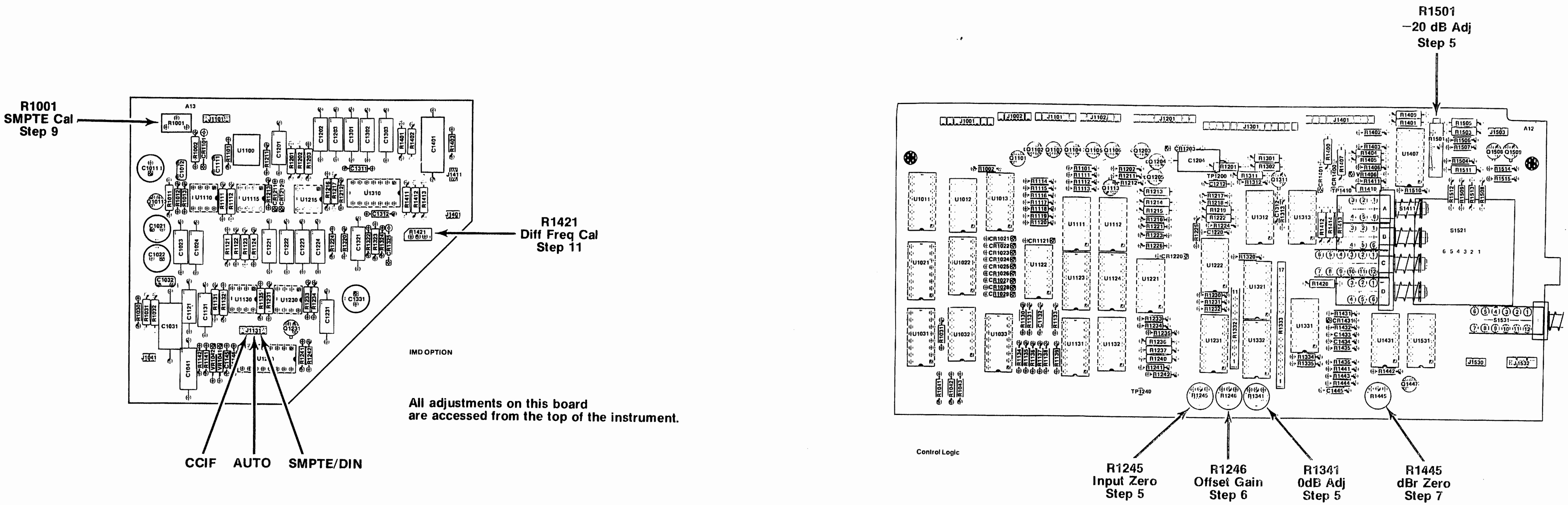
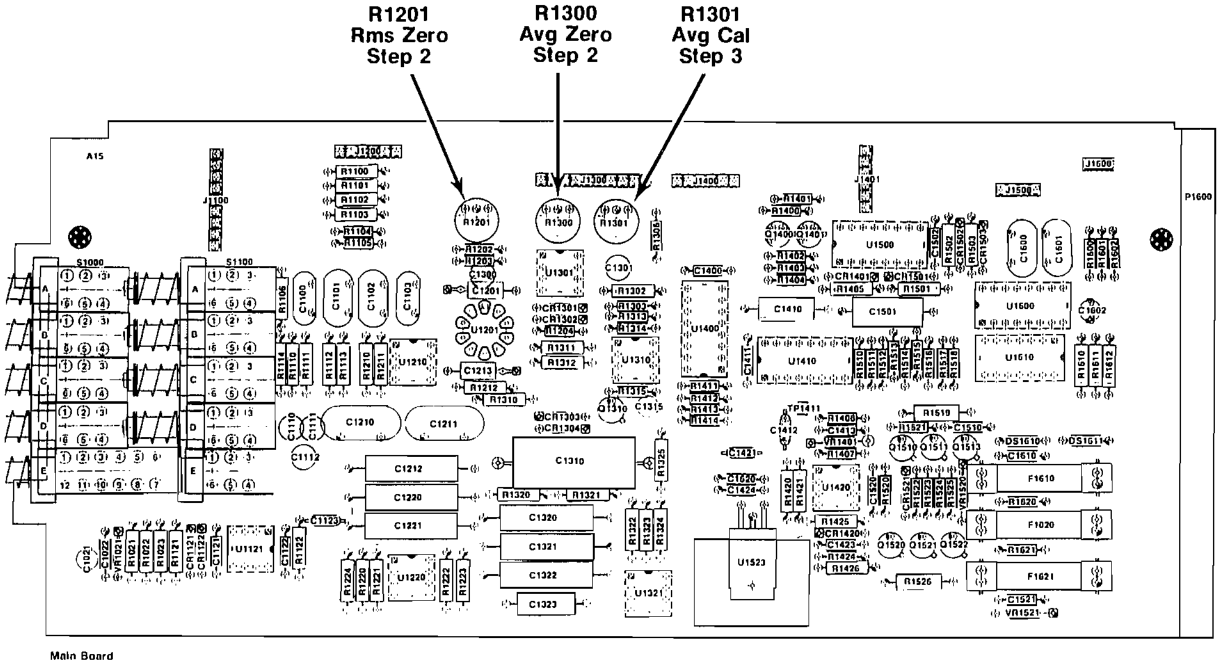
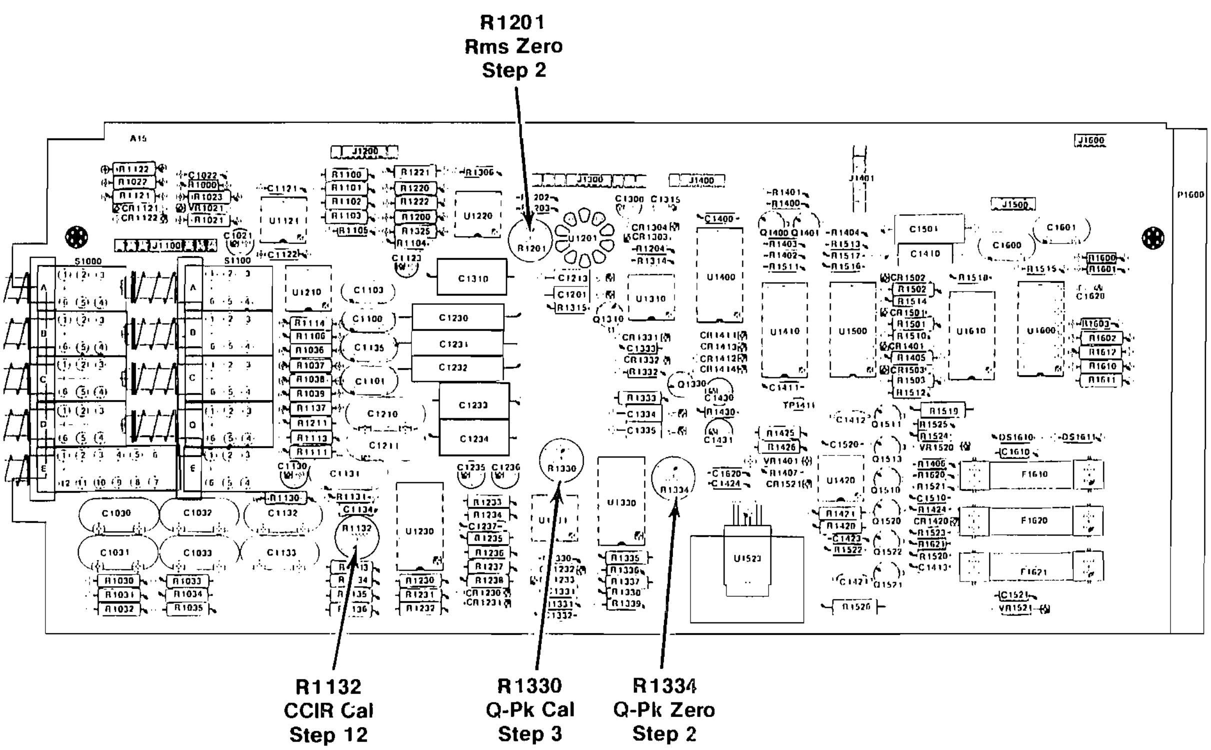


Fig. 8-2. Adjustment and CCIF-AUTO-SMPTE/DIN Jumper Position Location for Control & IMD Option Boards.



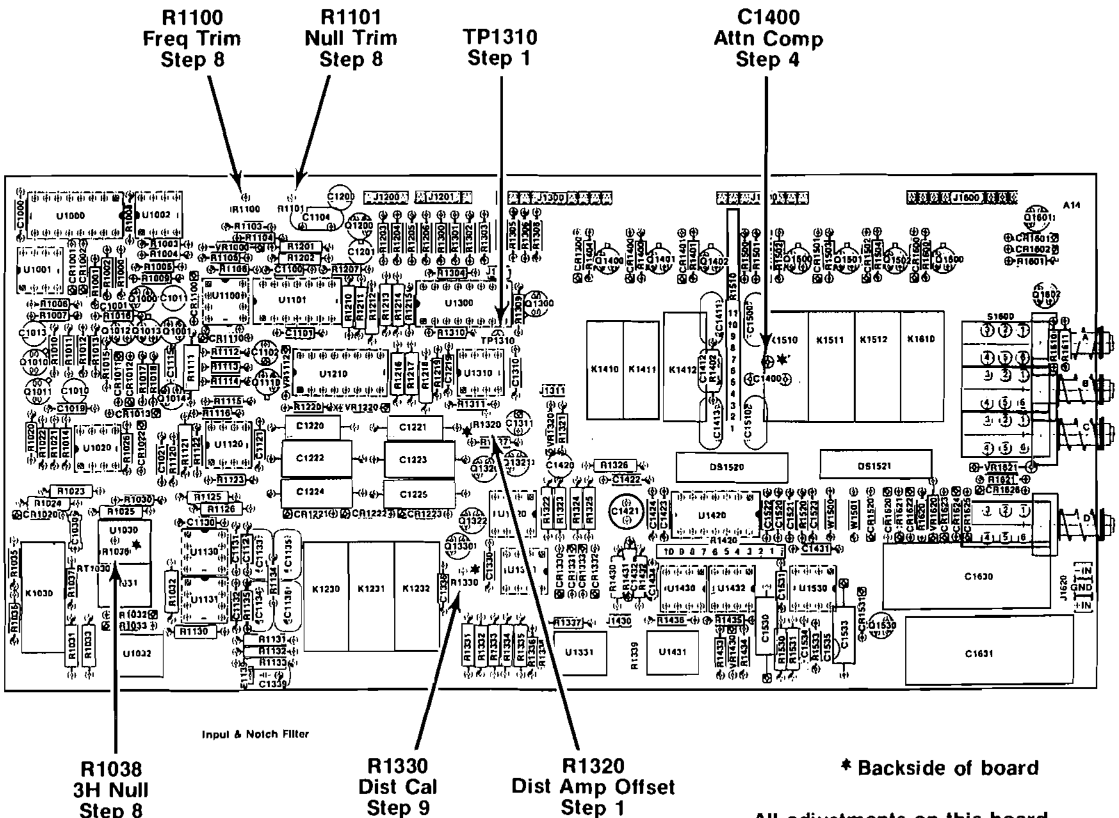


Adjustment locations for Option 02 Main Board

2958-50A

Scans by ARTEK MEDIA =>

ADJUSTMENT LOCATIONS

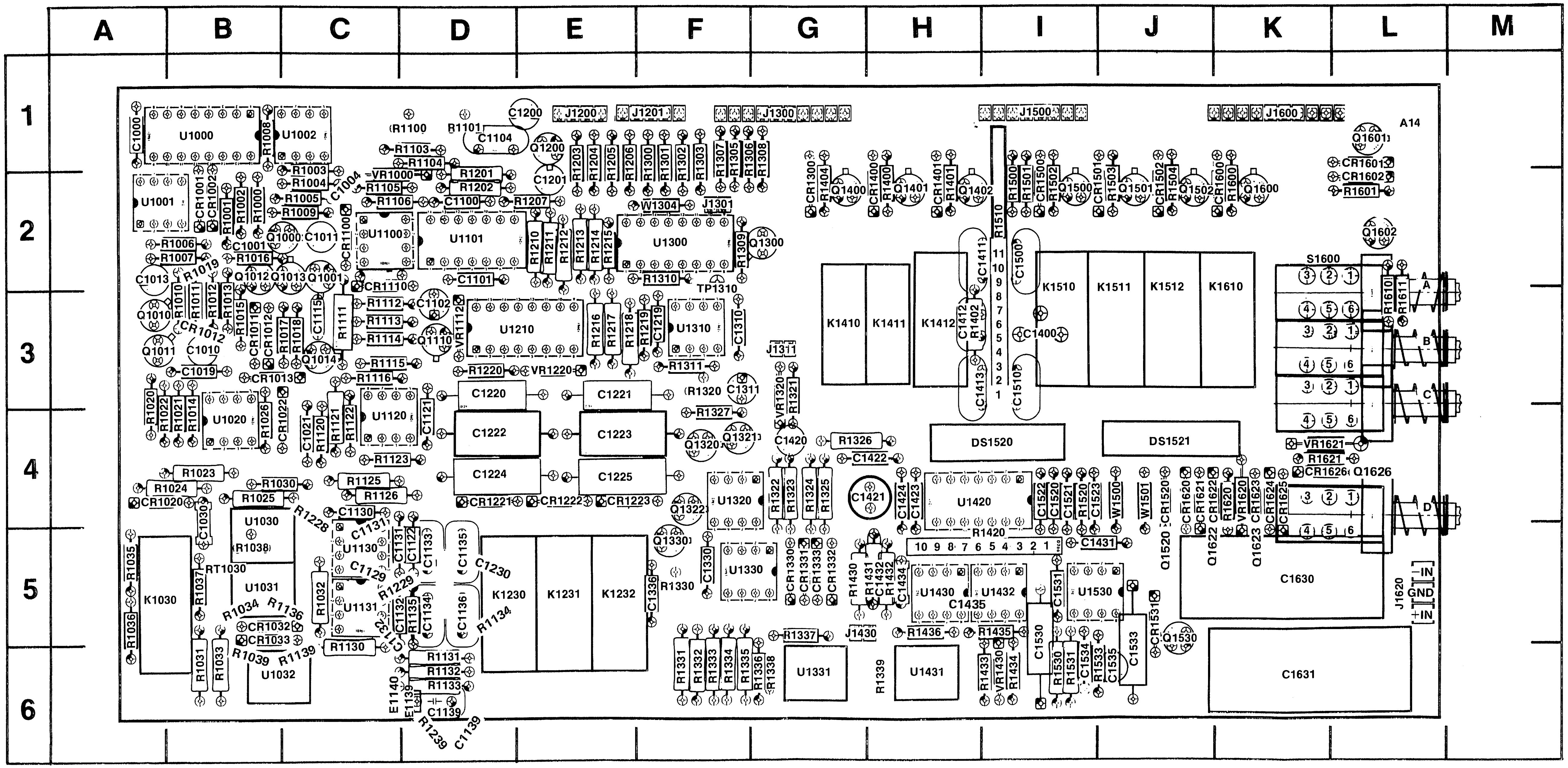


* Backside of board

All adjustments on this board
are accessed from the top of the instrument.

Fig. 8-1. Adjustment Location Illustration for Main, Input & Notch and DVM Boards.

PARTS LOCATION GRID



2958-52A

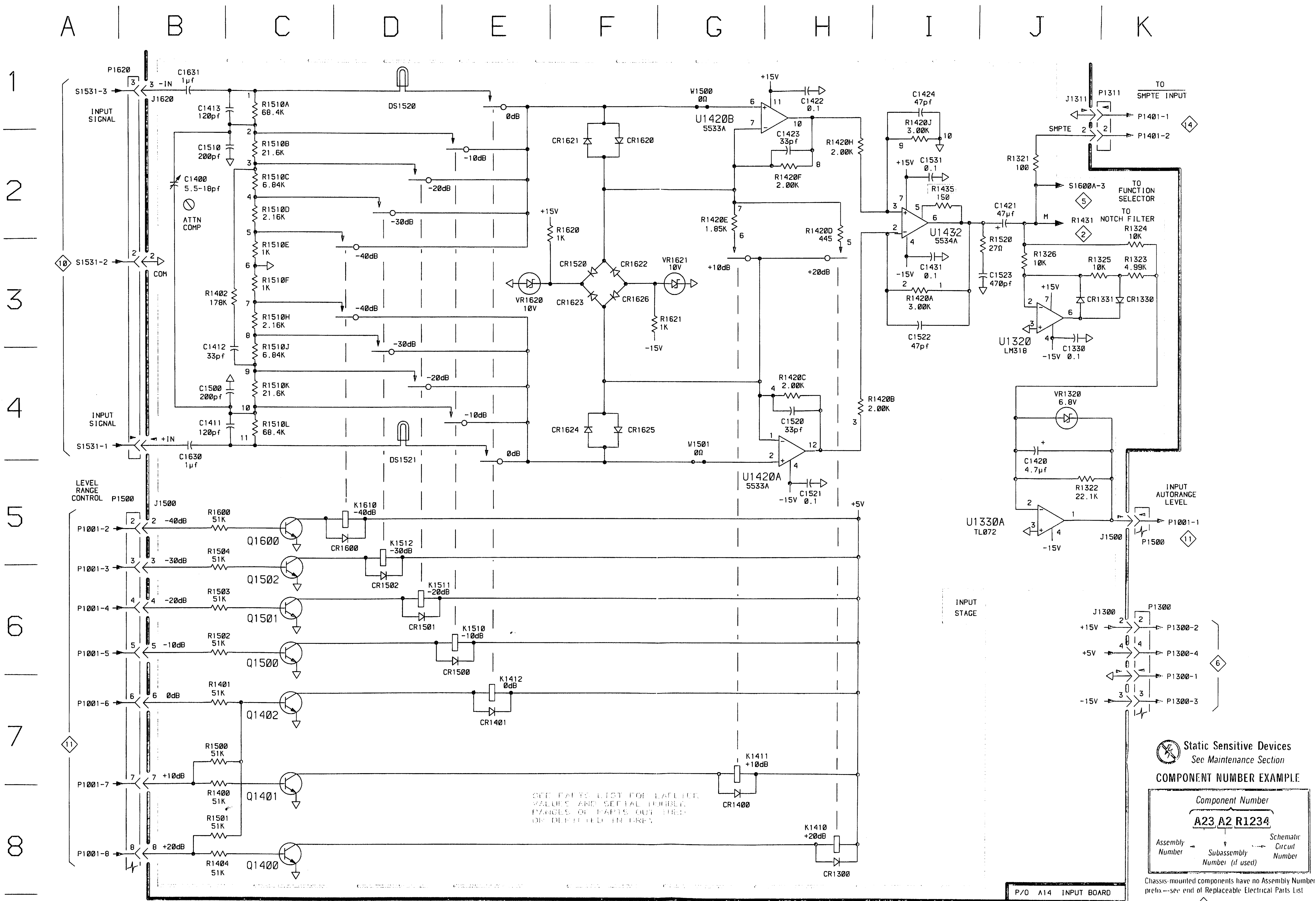
Fig. 8-3. Input Board (A14 Assy).

COMPONENT NUMBER EXAMPLE

Component Number
A23 A2 R1234
Assembly Number — Subassembly Number (if used) — Schematic Circuit Number

Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List

Static Sensitive Devices
See Maintenance Section



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2958-31

INPUT AMPLIFIER 1

Table 8-2
COMPONENT REFERENCE CHART (see Fig. 8-3)

P/O A14 ASSY — INPUT BOARD 2

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1021	J4	C4
C1030	H5	B4
C1122	K7	D5
C1129*	J4	C5
C1130	K5	C4
C1131	J3	C5
C1132	K7	C5
C1133	F3	D5
C1134	H2	D5
C1135	F4	D5
C1136	H2	D5
C1139	F6	D6
C1220	H3	D3
C1221	F4	E3
C1222	H3	D4
C1223	F4	E4
C1224	H3	D4
C1225	F4	E4
C1230*	C5	J4
C1336	D6	F5
C1431†	C6	H5
C1432	B5	H5
C1434	C5	H5
C1530	D8	I5
C1533	E7	J6
C1534	D7	I6
C1535	B7	J6
CR1020	J1	A4
CR1032	J7	B5
CR1033	K7	B5
CR1221	H1	D4
CR1222	H2	E4
CR1223	F2	E4
CR1332	H8	G5
CR1333	F8	G5
CR1531	E7	J5
E1139*	F6	D6
E1140*	F6	C6
J1201	L5	F1
J1201	D1	F1
J1300	D4	G1
J1430	E6	G5
K1030	J1	A5
K1230	H2	D5
K1231	H2	E5
K1232	F2	E5
P1201	L5	F1
P1201	D1	F1
P1300	D4	G1
P1430	E6	G5
Q1320	F2	F4
Q1321	F2	F4
Q1322	F2	F4
Q1330	F1	F5
Q1530	B7	J5
R1023	K4	B4
R1024	J3	A4
R1025	F5	B4
R1030	F5	B4
R1031	F6	B6
R1032	J7	C5

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
R1033	J7	B6
R1034*	J7	B5
R1037	J6	B5
R1038	J6	B5
R1039*	J7	B6
R1115	L5	C3
R1116	L5	C3
R1120	K5	C4
R1121	K4	C4
R1122	K6	C4
R1123	K6	C4
R1125	K4	C4
R1126	J3	C4
R1130	J8	C6
R1131	F6	D6
R1132	L7	D6
R1133	H6	D6
R1134*	K4	D5
R1135	K8	D5
R1136	J7	C5
R1139*	K7	C6
R1228*	K4	B5
R1229*	K7	C6
R1239*	F6	D6
R1300	E2	F1
R1301	E2	F1
R1302	E1	F1
R1303	E2	F1
R1308	D5	G1
R1330	E8	F5
R1331	E8	F6
R1332	F7	F6
R1333	F7	F6
R1334	H7	F6
R1335	F7	F6
R1336	D6	G6
R1337	B7	G5
R1338	C6	G6
R1339	C6	H6
R1430	C5	G5
R1431	B5	H5
R1432	C5	H5
R1433	B7	I6
R1434	B7	I6
R1436	C5	H5
R1530	D7	I6
R1531	D7	I6
R1533	C7	I6
U1020A	K4	B4
U1030	E5	B5
U1031	J6	B5
U1032	J6	B6
U1120A	K6	C4
U1120B	L5	C4
U1130	J4	C5
U1131	K7	C5
U1330B	H8	F5
U1331	B6	G6
U1430	C6	H5
U1431	B6	H6
U1530A	E8	I5
U1530B	C7	I5
VR1430	B7	I6

P/O A14 ASSY also shown on 1 4 5 10

*See Parts List for serial number ranges.

†Located on back of board.

REV JUN 1981

Table 8-1
COMPONENT REFERENCE CHART (see Fig. 8

P/O A14 ASSY — INPUT BOARD 1

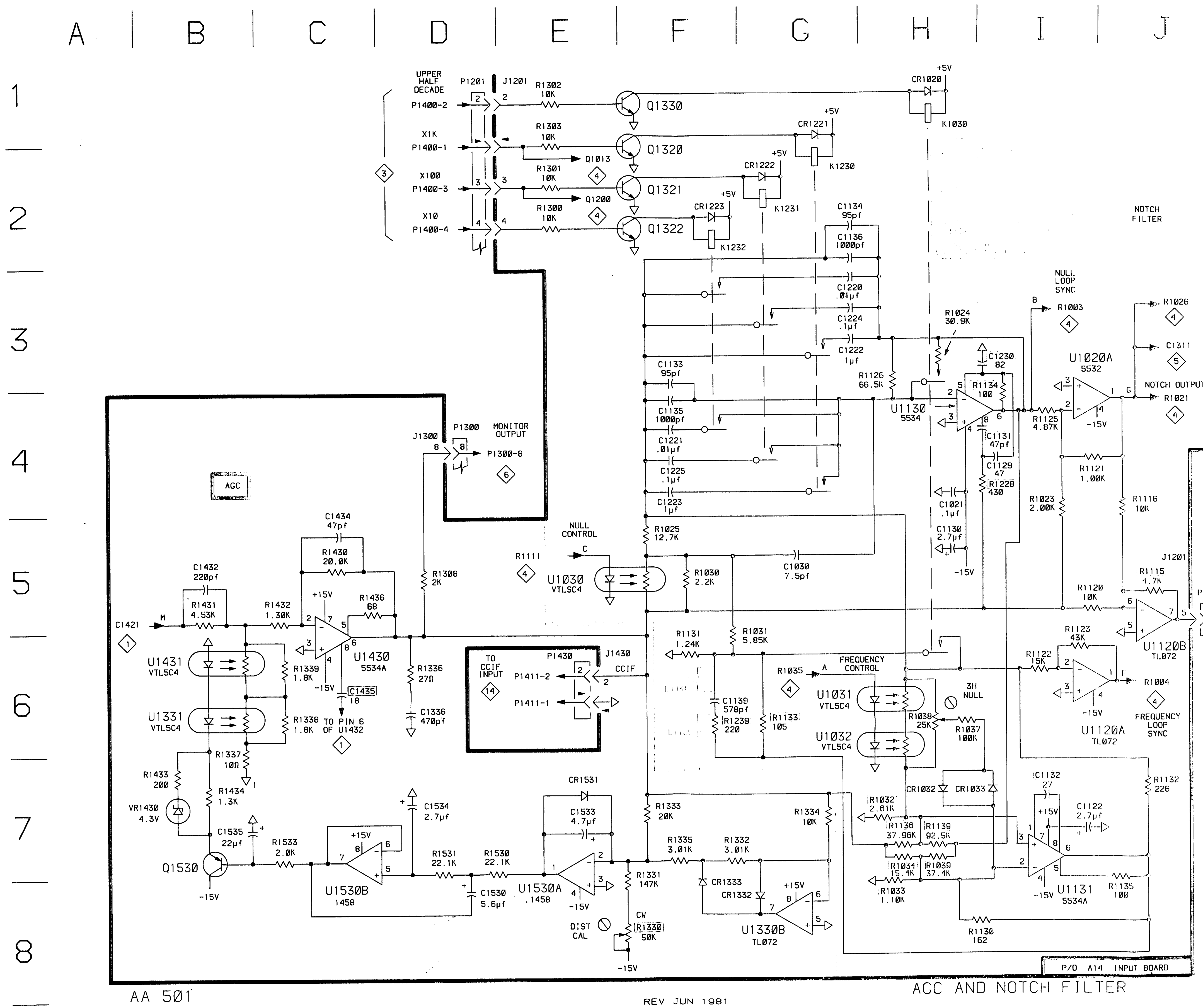
CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1330	L3	F5
C1400	B2	I3
C1411	C4	H2
C1412	C4	H3
C1413	C1	H3
C1420	L4	G4
C1421	L2	G4
C1422	J1	G4
C1423	J2	H4
C1424	K1	H4
C1431	K3	I5
C1435†	C6	H5
C1500	C4	I2
C1510	C2	I3
C1520	J4	I4
C1521	J5	I4
C1522	K3	I4
C1523	L3	I4
C1531	K2	I5
C1630	B4	K5
C1631	B1	K6
CR1300	J8	G2
CR1330	M3	G5
CR1331	L3	G5
CR1400	H8	H2
CR1401	E7	H2
CR1500	E6	I2
CR1501	D6	J2
CR1502	D6	J2
CR1520*	F3	J4
CR1600	D5	K2
CR1620	F2	J4
CR1621	F2	J4
CR1622*	F3	J4
CR1623*	F3	K4
CR1624	F4	K4
CR1625	F4	K4
CR1626*	F3	K4
DS1520	D1	I4
DS1521	D4	J4
J1300	M6	G1
J1311	L1	G3
J1500	M5	I1
J1500	B5	I1
J1620	B1	L5
K1410	J8	G3
K1411	H7	H3
K1412	E7	H3
K1510	E6	I3
K1511	D6	J3
K1512	D5	J3
K1610	D5	K3
P1300	M6	G1
P1311	L1	G3
P1500	M5	I1
P1500	B5	I1
P1620	B1	L5
Q1400	C8	G2
Q1401	C8	H2
Q1402	C7	H2
Q1500	C6	I2

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
Q1501	C6	J2
Q1502	C6	J2
Q1520*	F3	J4
Q1622*	F3	J4
Q1623*	F3	K4
Q1626*	F3	K4
Q1600	C5	K2
R1321	L2	G3
R1322	L5	G4
R1323	M3	G4
R1324	M3	G4
R1325	L3	G4
R1326	L3	G4
R1400	B8	H2
R1401	B7	H2
R1402	C3	H3
R1404	B8	G2
R1420A	K3	H5
R1420B	J4	H5
R1420C	J4	H5
R1420E	H2	H5
R1420F	J2	H5
R1420H	J2	H5
R1420J	K2	H5
R1420P	J2	H5
R1435	K2	I5
R1500	B7	I2
R1501	B8	I2
R1502	B6	I2
R1503	B6	J2
R1504	B6	J2
R1510A	C1	I3
R1510B	C2	I3
R1510C	C2	I3
R1510D	C2	I3
R1510E	C3	I3
R1510F	C3	I3
R1510H	C3	I3
R1510J	C4	I3
R1510K	C4	I3
R1510L	C4	I3
R1520	L3	I4
R1600	B5	K2
R1620	E2	K4
R1621	F3	K4
U1320	L3	F4
U1330A	L5	F5
U1420A	J5	H4
U1420B	J1	H4
U1432	K2	I5
VR1320	L4	G3
VR1620	E3	K4
VR1621	H3	K4
W1500	H1	J4
W1501	H5	J4

P/O A14 ASSY also shown on 2 4 5 10

† Located on back of board.

*See Parts List for serial number ranges.



AA 501

REV JUN 1981
2958-32

AGC AND NOTCH FILTER ②

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE

Component Number
A23 A2 R1234
Assembly Number — Subassembly Number (if used) — Schematic Circuit Number

Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List

JS

AGC AND NOTCH FILTER ②

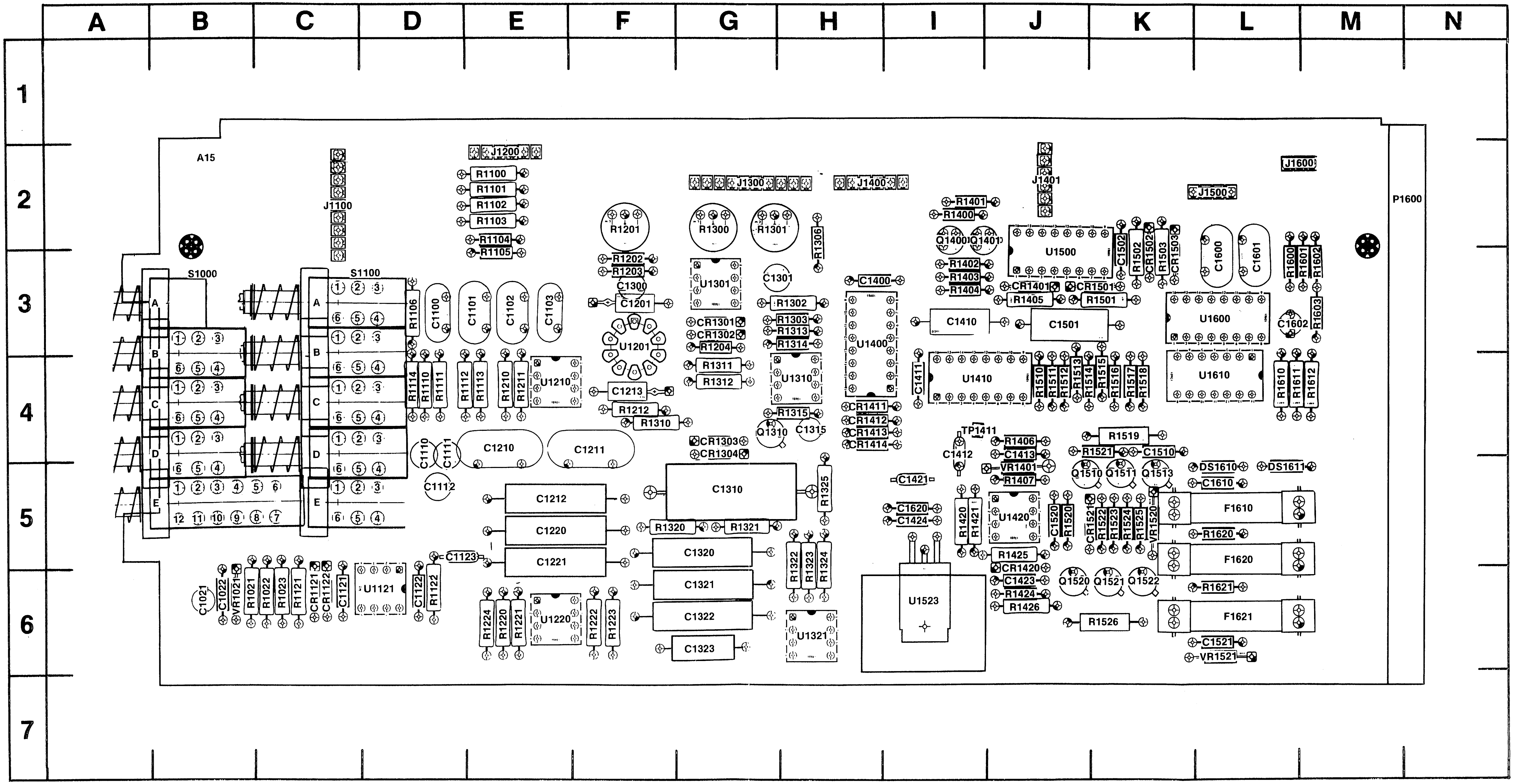
Table 8-3
COMPONENT REFERENCE CHART (see Fig. 8-4)

P/O A15 ASSY — MAIN BOARD 3

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1400	L6	H3
C1410	E6	I3
C1411	L8	I4
C1501	E7	J3
C1502	K8	K3
C1600	E2	L3
C1601	E4	L3
C1602	B5	L3
CR1401	E5	J3
CR1411	L2	H4
CR1412	L5	H4
CR1413	L3	H4
CR1414	L7	H4
CR1501	E7	J3
CR1502	E2	K3
CR1503	E4	K3
J1400	A6	H2
J1400	M2	H2
P1400	A6	H2
P1400	M2	H2
Q1400	B6	I2
Q1401	B6	I2
R1400	B6	I2
R1401	B7	I2
R1402	B5	I3
R1403	C6	I3
R1404	C6	I3
R1405	E5	J3
R1501	E7	J3
R1502	E2	K3
R1503	E3	K3
R1510	J6	J4
R1511	J3	J4
R1512	J4	J4
R1513	J5	J4
R1514	J8	J4
R1515	J1	K4
R1516	J2	K4
R1517	J7	K4
R1518	F1	K4
R1610	H2	L4
R1611	H7	L4
R1612	H2	M4
U1400	L2	H3
U1410A	K2	I4
U1410B	K7	I4
U1410C	K3	I4
U1410D	K5	I4
U1500A	D5	J3
U1500B	D7	J3
U1500C	D2	J3
U1500D	D4	J3
U1600	H1	L3
U1610A	J7	L4
U1610B	J2	L4
U1610C	J3	L4
U1610D	J5	L4

P/O A15 ASSY also shown on 6 10 13 14

PARTS LOCATION GRID



2958-53

COMPONENT NUMBER EXAMPLE

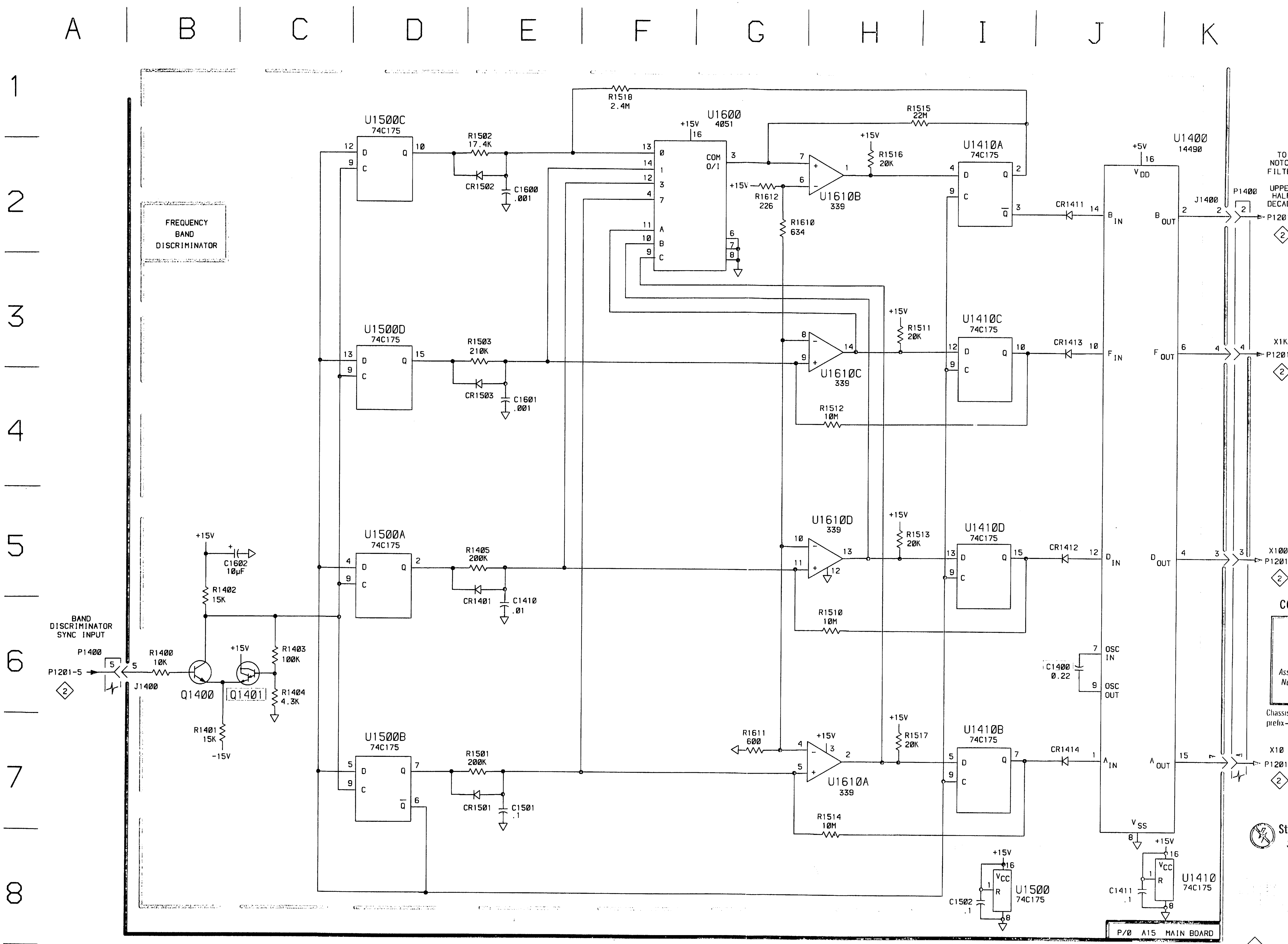
Component Number
A23 A2 R1234
Assembly Number — Subassembly Number (if used) — Schematic Circuit Number

Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

Static Sensitive Devices
See Maintenance Section

Fig. 8-4. Main Board (A15 Assy).

@



COMPONENT NUMBER EXAMPLE

Component Number

A23 A2 R1234

Assembly Number — Subassembly Number (if used) — Schematic Circuit Number

Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

Static Sensitive Devices
See Maintenance Section

FREQUENCY BAND DISCRIMINATOR ③

AA 501

REV JUN 1981
2958-33

FREQUENCY BAND DISCRIMINATOR ③

JS

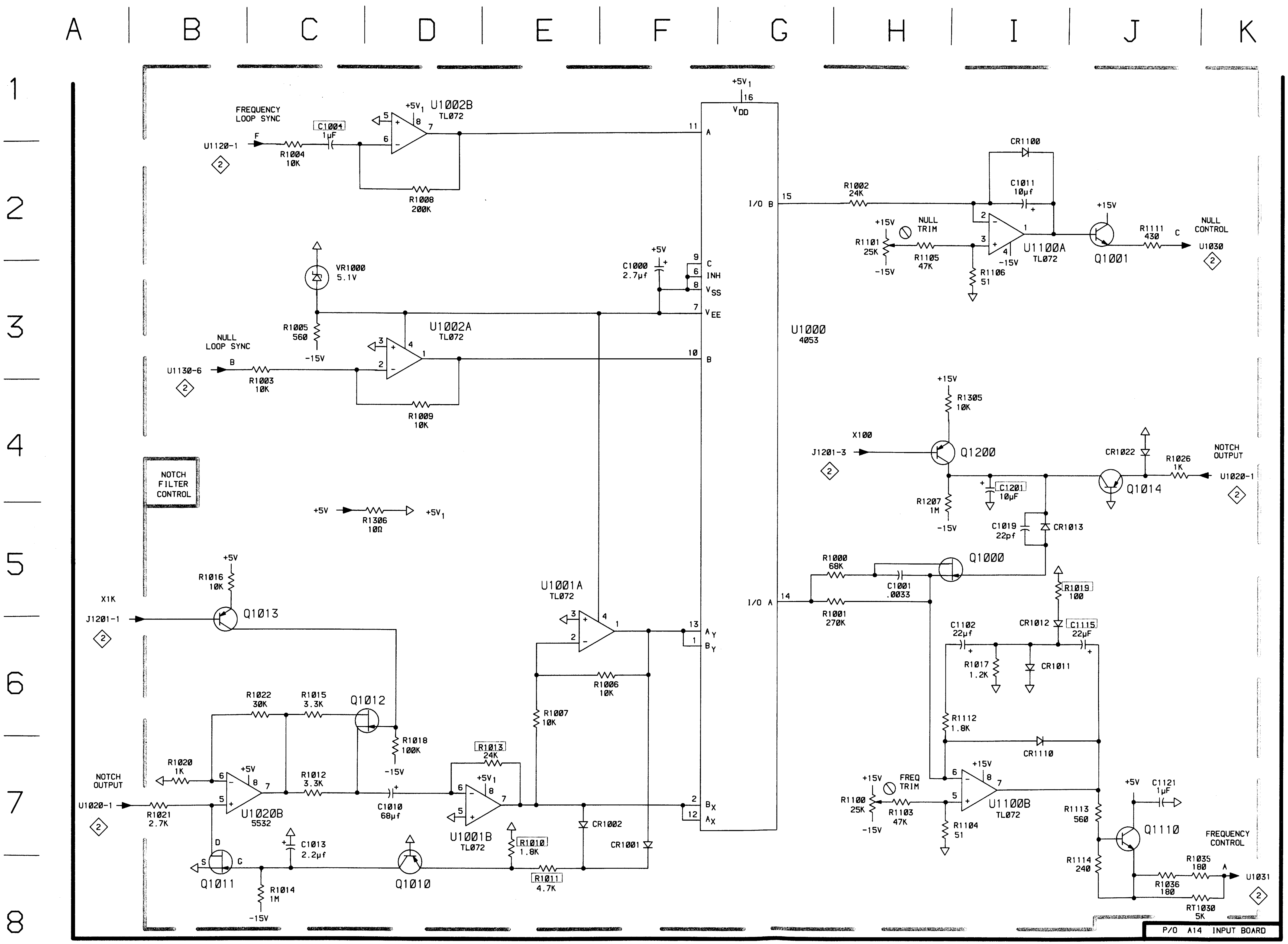
Table 8-4
COMPONENT REFERENCE CHART (see Fig. 8-3)

P/O A14 ASSY — INPUT BOARD ⟨4⟩

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1000	F3	A1	R1010	E8	B3
C1001	J5	B2	R1011	E8	B3
C1004*	C2	C2	R1012	C7	B3
C1010	D7	B3	R1013	E7	B3
C1011	K2	C2	R1014	C8	B4
C1013	C7	A2	R1015	C6	B3
C1019	K5	B3	R1016	B5	B2
C1102	K6	D3	R1017	K6	B3
C1115	L6	C3	R1018	D7	C3
C1121	L7	D4	R1019*	K6	B3
C1201	K4	E2	R1020	B7	A3
			R1021	B7	B4
CR1001	F7	B2	R1022	C6	A4
CR1002	E7	B2	R1026	L4	B4
CR1011	K6	B3	R1035	L7	A5
CR1012	K6	B3	R1036	L7	A5
CR1013	K5	B3	R1100	J7	D1
CR1022	L4	B4	R1101	J2	D1
CR1100	K2	C2	R1103	J7	D1
CR1110	K7	C2	R1104	J7	D1
			R1105	J2	C2
Q1000	J5	C2	R1106	K3	C2
Q1001	L2	C2	R1111	L2	C3
Q1010	D8	A3	R1112	J6	C3
Q1011	B8	A3	R1113	L7	C3
Q1012	C6	B2	R1114	L8	C3
Q1013	B6	C2	R1207	J5	E2
Q1014	L4	C3	R1305	J4	F1
Q1110	L7	D3	R1306	D5	F1
Q1200	J4	E1			
			RT1030	L7	B5
R1000	H5	B2	U1000	H1	B1
R1001	H5	B2	U1001A	E6	A2
R1002	J2	B2	U1001B	E7	A2
R1003	C3	C1	U1002A	D3	C1
R1004	C2	C2	U1002B	D1	C1
R1005	C3	C2	U1020B	B7	B4
R1006	F6	B2	U1100A	K2	C2
R1007	E6	B2	U1100B	K7	C2
R1008	D2	B1			
R1009	D4	C2	VR1000	C3	C2

P/O A ASSY also shown on ⟨1⟩ ⟨2⟩ ⟨5⟩ ⟨10⟩

INPUT BOARD (A14)
COMPONENT REFERENCE CHART



Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE

Component Number
A23 A2 R1234
Assembly Number — Subassembly Number (if used) — Schematic Circuit Number

Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN GREY

REV JUN 1981
2958-34

NOTCH FILTER CONTROL

4 JS

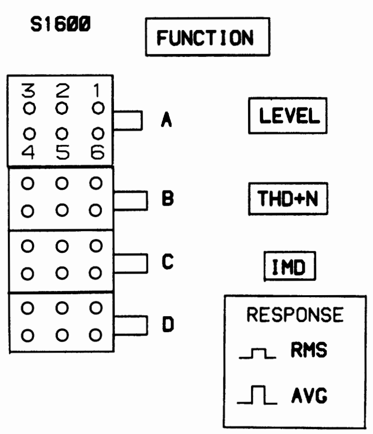
Table 8-5
COMPONENT REFERENCE CHART (see Fig. 8-3)

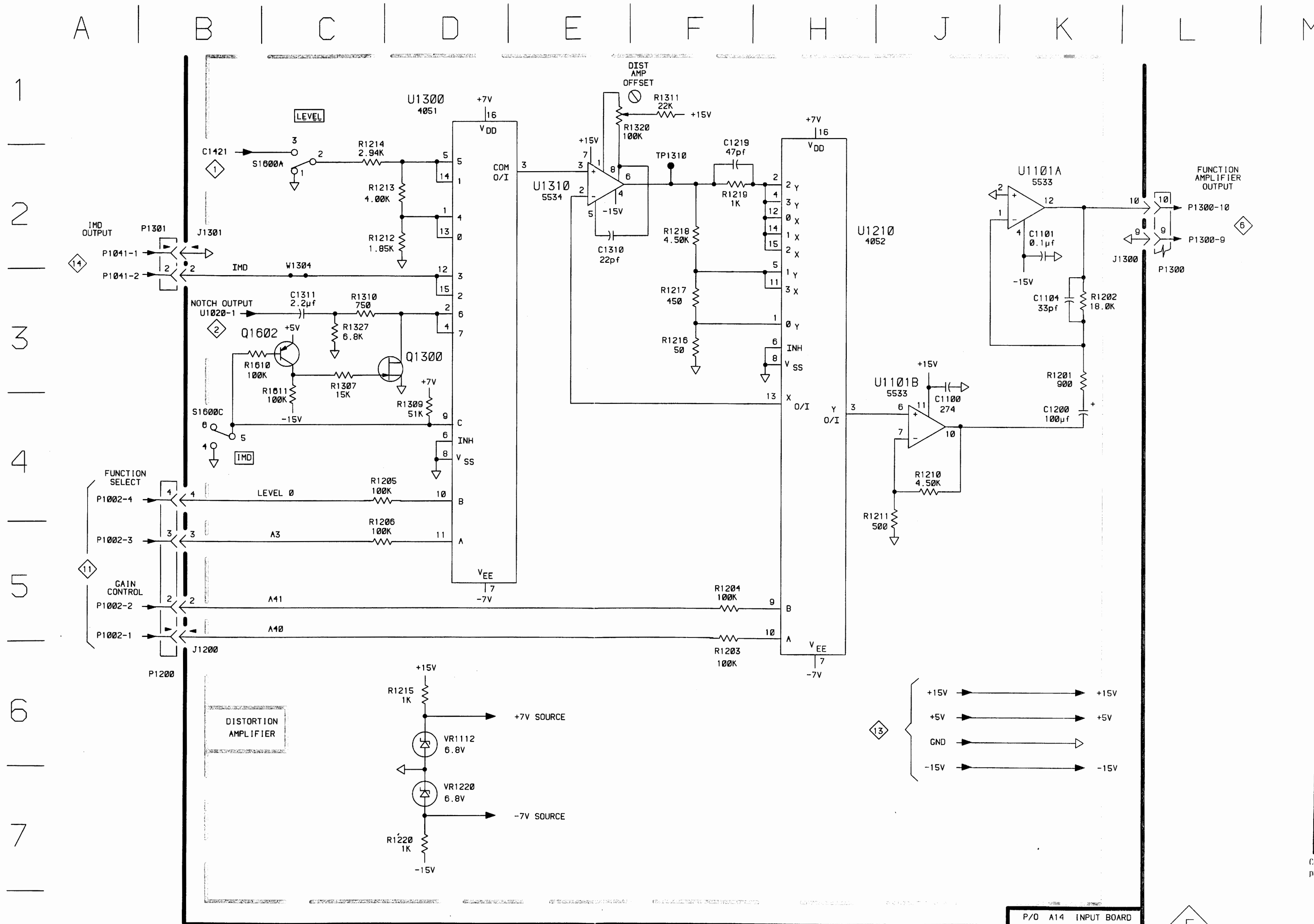
P/O A14 ASSY — INPUT BOARD ⟨5⟩

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1100	J3	D2	R1215	D6	E2
C1101	K2	D2	R1216	F3	E3
C1104	K3	D1	R1217	F3	E3
C1200	K4	E1	R1218	F2	E3
C1219	F2	F3	R1219	F2	F3
C1310	E2	F3	R1220	D7	D3
C1311	C3	F3	R1307	C3	F1
			R1309	D4	F2
J1200	B6	E1	R1310	C3	F2
J1300	L2	G1	R1311	F1	F3
J1301	B2	F2	R1320	E1	F3
			R1327	C3	F4
P1300	L2	G1	R1610	B3	L3
P1301	B2	G1	R1611	C4	L3
Q1300	D3	G2	S1600A	C2	L3
Q1602	C3	L2	S1600C	B4	L3
			TP1310	F2	F2
R1201	K3	D2			
R1202	K3	D2	U1101A	K2	D2
R1203	F5	E1	U1101B	J4	D2
R1204	F5	E1	U1210	H2	D3
R1205	D4	E1	U1300	D1	F2
R1206	D5	E1	U1310	E2	F3
R1210	J4	E2			
R1211	J4	E2	VR1112	D6	D3
R1212	D2	E2	VR1220	D7	E3
R1213	D2	E2			
R1214	C2	E2	W1304	C3	F2

P/O A14 ASSY also shown on ⟨1⟩ ⟨2⟩ ⟨4⟩ ⟨10⟩

INPUT BOARD (A14)
COMPONENT REFERENCE CHART





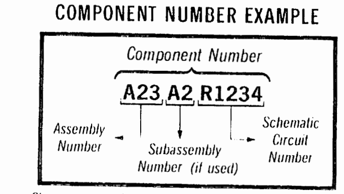
AA 501

REV A FEB 1981
2958-35

DISTORTION AMPLIFIER

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

Table 8-6
COMPONENT REFERENCE CHART (see Fig. 8-4)

P/O A15 ASSY — MAIN BOARD ⟨6⟩

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1021	E2	B6	R1103	K8	E2
C1022	D3	B6	R1104	L7	E2
C1100	C5	D3	R1105	K7	E3
C1101	B6	E3	R1106	C5	D3
C1102	B6	E3	R1110	B6	D4
C1103	D6	E6	R1111	B7	D4
C1110	H4	D4	R1112	C6	E4
C1111	H4	D4	R1113	C7	E4
C1112	H5	D5	R1114	C5	D4
C1121	C4	C6	R1121	D3	C6
C1122	C3	D6	R1122	B3	D6
C1123	B5	D5	R1201	H2	F2
C1201	J3	F3	R1202	H2	F3
C1210	C6	E4	R1203	J2	F3
C1211	C6	F4	R1204	K2	G3
C1212	F6	E5	R1210	C6	E4
C1213	K1	F4	R1211	C7	E4
C1220	F6	E5	R1212	J4	F4
V1221	H6	E5	R1220	H6	E6
C1300	J2	F3	R1221	H6	E6
C1301	L4	G3	R1222	F6	F6
C1310	J7	G5	R1223	E8	F6
C1311	H5	F3	R1224	H7	E6
C1315	K2	H4	R1300	K4	G2
C1320	D7	G5	R1301	L3	G2
C1321	D7	G6	R1302	L3	H3
C1322	D7	G6	R1303	K4	H3
C1323	E7	G6	R1306	K6	H2
			R1310	H5	F4
CR1121	D3	C6	R1311	K4	G4
CR1122	D3	C6	R1312	K4	G4
CR1301	K5	G3	R1313	L5	H3
CR1302	J5	G3	R1314	K2	H3
CR1303	K1	G4	R1315	L3	H4
CR1304	K1	G4	R1320	D7	F5
			R1321	D8	G5
J1200	M7	E2	R1322	F8	H6
J1300	M2	G2	R1323	E8	H6
J1300	B6	G2	R1324	F7	H6
J1300	M4	G2	R1325	J7	H5
J1401	E4	G2	R1600	L1	L3
J1600	B8	L2	R1601	L1	M3
J1600	M6	L2	R1602	E4	M3
J1600	E5	L2	R1603	E5	M3
J1600	M3	L2			
J1600	M1	L2	S1100A	H5	C3
J1600	D6	L2	S1100B	C5	C3
J1600	M8	L2	S1100C	D6	C4
			S1100D	F6	C4
P1200	M7	E2	S1100D	D6	C4
P1300	B6	G2	S1100E	J6	C5
P1300	M2	G2			
P1300	M4	G2	U1121A	E3	D6
P1401	E4	J2	U1121B	C4	D6
P1600	B8	L2	U1201	J1	F3
P1600	M6	L2	U1210A	E6	E4
P1600	E5	L2	U1210B	K7	E4
P1600	M3	L2	U1220	H6	E6
P1600	M1	L2	U1301	J5	G3
P1600	B8	L2	U1310A	L4	H4
P1600	M8	L2	U1310B	K2	H4
			U1321	E7	H6
Q1301	K3	G4			
R1021	E2	B6	VR1021	E3	B6
R1022	C2	C6			
R1023	D3	C6	J500	M6	Chassis
R1100	K6	E2	J510	M6	Chassis
R1101	K7	E2	J520	M7	Chassis
R1102	K8	E2			

P/O A15 ASSY also shown on ⟨3⟩ ⟨10⟩ ⟨13⟩ ⟨14⟩

PARTS LOCATION GRID

OPTION 02 MAIN BD (A15)
PARTS LOCATION GRID

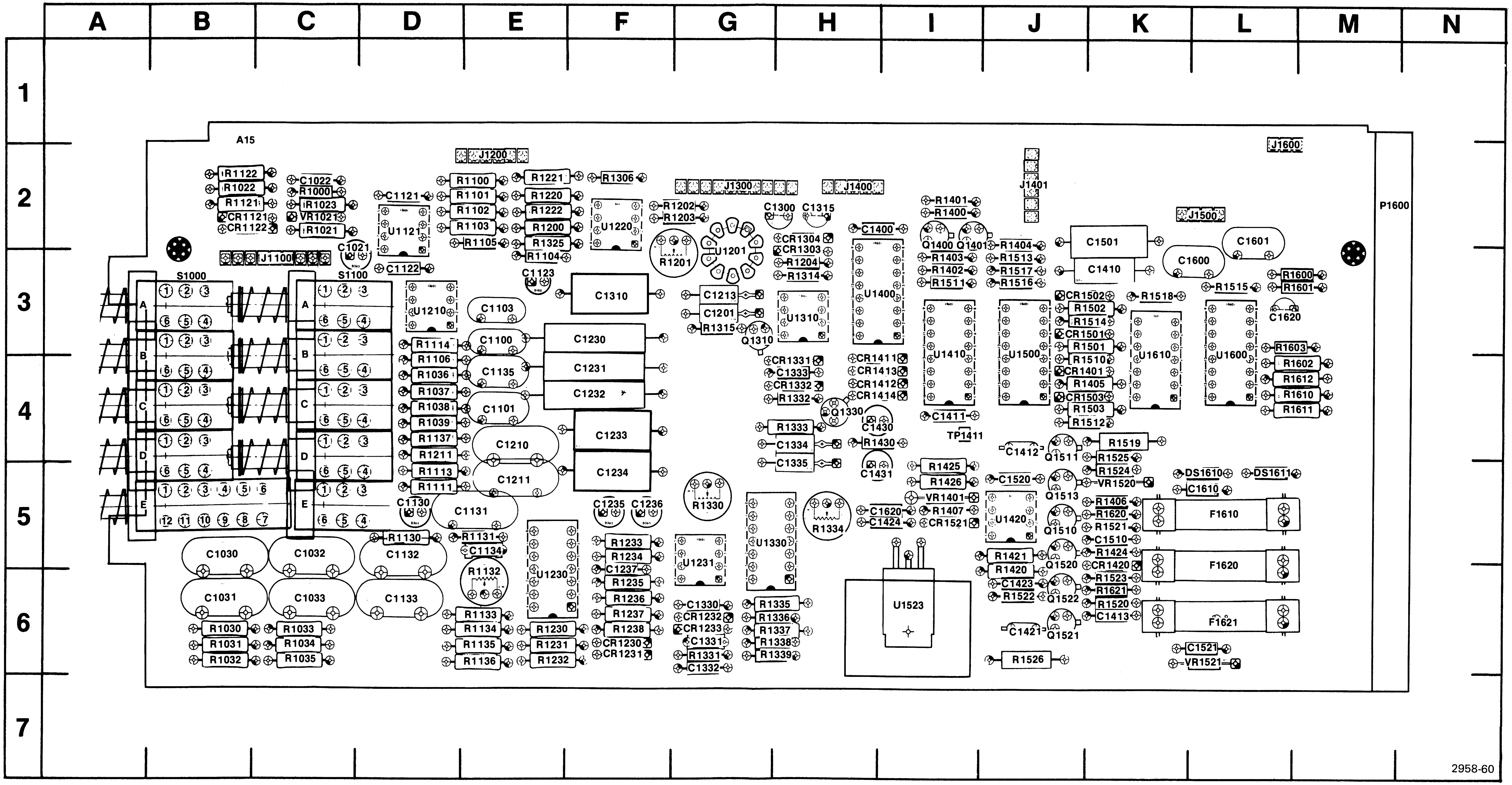


Fig. 8-4A. Option 02 Main Board (A15 Assy).

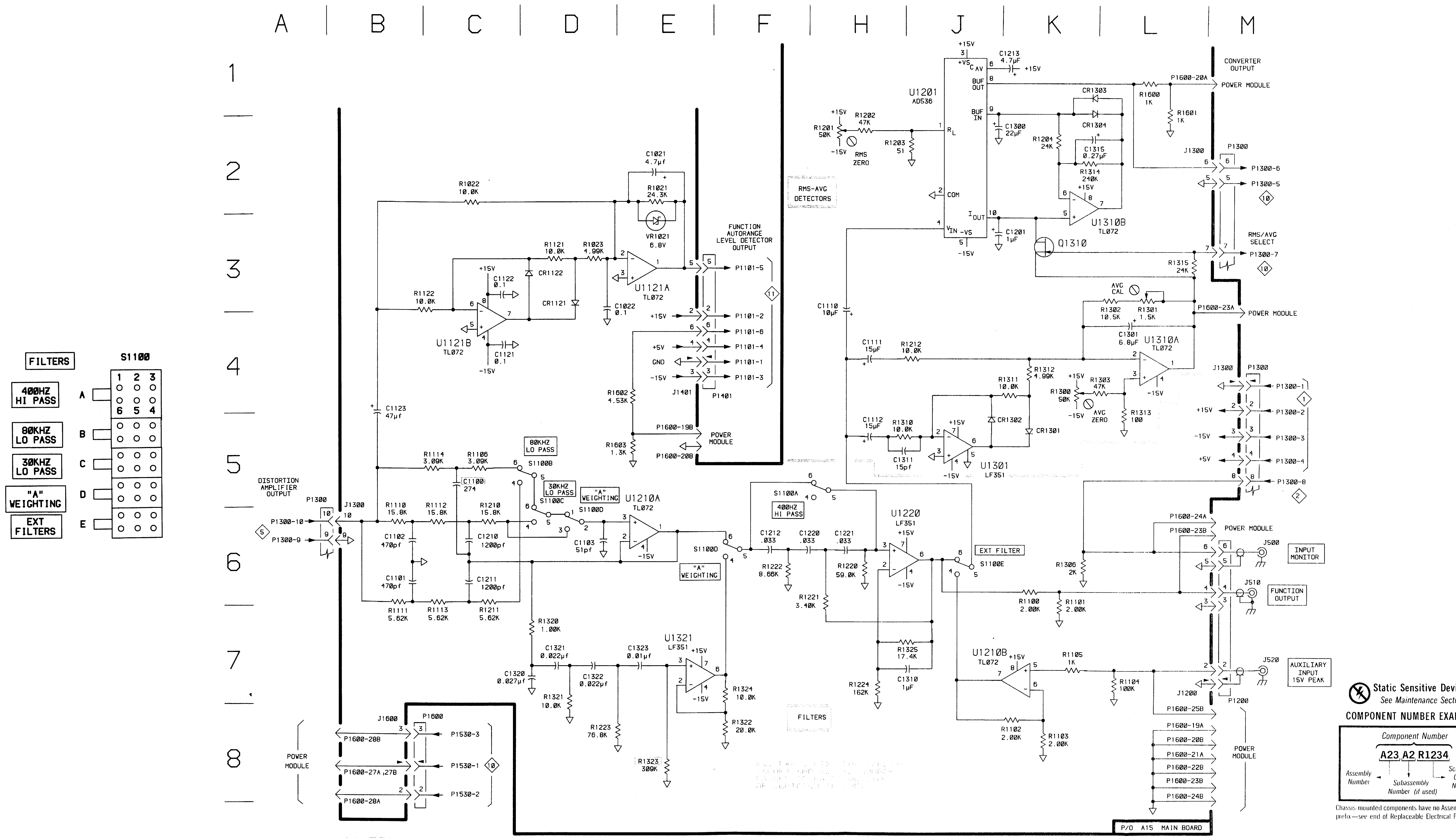
COMPONENT NUMBER EXAMPLE

Component Number
A23 A2 R1234
Assembly Number — Subassembly Number (if used) — Schematic Circuit Number

Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

Static Sensitive Devices
See Maintenance Section

FILTERS AND AC/DC CONVERTERS ⑥



Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE

Component Number

A23 A2 R1234

Assembly Number — *Subassembly Number (if used)* — *Schematic Circuit Number*

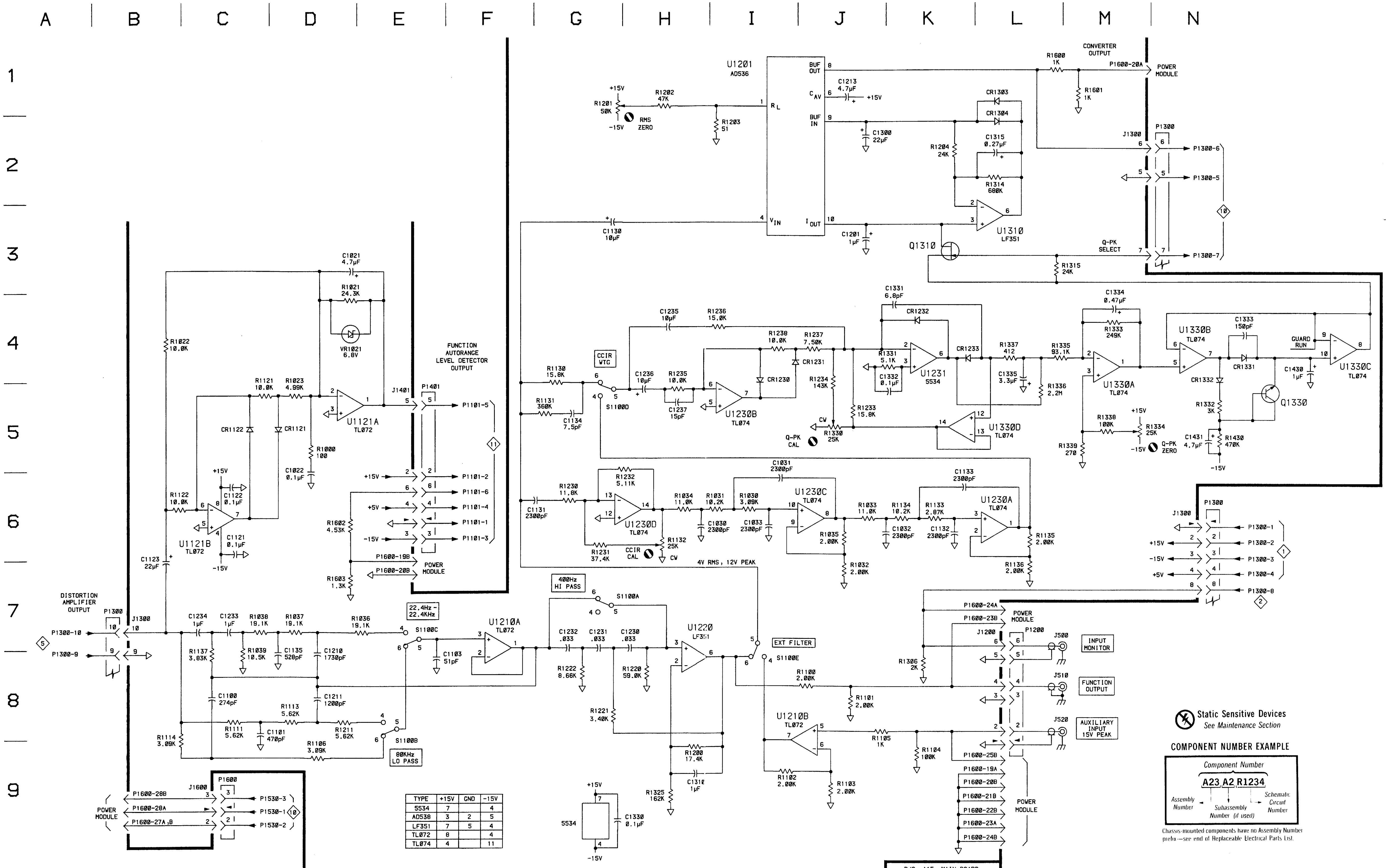
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

OPTION 02 MAIN BD (A15)
PARTS LOCATION GRID

Table 8-6A
COMPONENT REFERENCE CHART (see Fig. 8-4A)

P/O A15 ASSY — MAIN BOARD (OPTION 02) 6A

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1021	D3	C2	J1300	N6	G2	R1232	H6	E6
C1022	D5	C2	J1401	E5	J2	R1233	J5	F5
C1030	I6	B5	J1600	C9	L2	R1234	J4	F5
C1031	I5	B6				R1235	H4	F6
C1032	K6	C5	Q1310	K3	G3	R1236	I4	F6
C1033	I6	C6	Q1330	N5	H4	R1237	J4	F6
C1103	F8	E3				R1238	I5	F6
C1121	B6	D2	R1000	D5	C2	R1306	K8	F2
C1122	B6	D3	R1021	D3	C2	R1314	L2	H3
C1123	B6	E3	R1022	B4	B2	R1315	M3	G3
C1130	G3	D5	R1023	D5	C2	R1325	H9	E2
C1131	G6	E5	R1030	I6	B6	R1330	J5	G5
C1132	K6	D5	R1031	I6	B6	R1331	K4	G5
C1133	K6	D6	R1032	J7	B6	R1332	N5	H5
C1134	G5	E5	R1033	J6	C6	R1333	M4	H4
C1135	D8	E4	R1034	H6	C6	R1334	N5	H5
C1201	J3	G3	R1035	J6	C6	R1335	L4	H6
C1210	D8	E4	R1036	E7	D3	R1336	L5	H6
C1211	D8	E5	R1037	D7	D3	R1337	L4	H6
C1213	J1	G3	R1038	C7	D3	R1338	M5	H6
C1230	H7	F3	R1039	C8	D3	R1339	M5	H6
C1231	G7	F4	R1100	J8	E2	R1430	N5	H4
C1232	G7	F4	R1101	J8	E2	R1600	L1	M3
C1233	C7	F4	R1102	I9	E2	R1601	M1	M3
C1234	C7	F5	R1103	J9	E2	R1602	D6	M4
C1235	H4	F5	R1104	K9	E3	R1603	D7	M3
C1236	H4	F5	R1105	J8	E2	S1100A	H7	C3
C1237	H5	E6	R1106	D9	D3	S1100B	E8	
C1300	J2	H3	R1111	C8	D5	S1100C	E7	
C1310	H9	F3	R1113	D8	D5	S1100D	G5	
C1315	L2	H3	R1114	B8	D3	S1100E	I8	
C1330	H9	G6	R1121	C5	B2			
C1331	K3	G6	R1122	B6	B2	U1121A	E5	D2
C1332	K4	G6	R1130	G4	D5	U1121B	B6	
C1333	K4	H4	R1131	G5	E5	U1201	I1	G3
C1334	M3	H4	R1132	H6	E6	U1210A	F7	D3
C1335	L4	H5	R1133	K6	E6	U1210B	I9	
C1430	N4	H4	R1134	K6	E6	U1220	H7	F3
C1431	N5	H5	R1135	L6	E6	U1230A	L6	E5
			R1136	L6	E6	U1230B	I5	
CR1121	D5	B2	R1137	C8	D4	U1230C	J6	
CR1122	C5	B2	R1200	H9	E3	U1230D	H6	
CR1230	I5	F6	R1201	G1	G3	U1231	K4	G5
CR1231	J4	F6	R1202	H1	G2	U1310	L1	H3
CR1232	K4	G6	R1203	I2	G2	U1330A	M5	G5
CR1233	K4	G6	R1204	K2	H3	U1330B	N4	
CR1303	L1	H3	R1211	D8	D4	U1330C	N4	
CR1304	L1	H4	R1220	H7	E2	U1330D	L5	
CR1331	N4	H4	R1221	G7	E2			
CR1332	N4	H4	R1222	G7	E2	VR1521	D4	L6
			R1230	G6	E6			
J1200	L7	E2	R1231	G6	E6			



TYPE	+15V	GND	-15V
5534	7		4
AD536	3	2	5
LF351	7	5	4
TL072	8		4
TL074	4		11

2958-59
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LOGIC BOARD (A12)
PARTS LOCATION GRID

Table 8-7
COMPONENT REFERENCE CHART (see Fig. 8-5)

P/O A12 ASSY — LOGIC BOARD ⟨7⟩

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1212	C3	G2	R1411	J4	I2
C1220	E2	G3	R1412	D4	I3
C1312	H2	H3	R1413	C4	I3
C1433	K8	I5	R1414	L1	I3
C1434	J8	I5	R1420	H4	I4
C1445	E8	I6	R1431	K6	I4
			R1432	E8	I5
CR1220	F3	F3	R1435	J8	I5
CR1400	H2	I2	R1436	K8	I5
CR1401	L1	I2	R1441	E8	I5
CR1431	M6	I4	R1442	J8	J5
			R1443	K6	I5
J1301	M1	G1	R1444	J5	I5
J1401	F4	I1	R1445	J5	J6
J1401	B2	I1	R1501	F2	K1
			R1503	F2	K1
P1301	M1	G1	R1504	J2	K2
P1401	F4	I1	R1505	C7	K1
P1401	B2	I1	R1506	K3	K1
			R1507	K2	K1
Q1311	H3	H2	R1508	K2	K2
Q1447	K8	J5	R1509	K3	K2
			R1510	J2	J2
R1201	E2	G2	R1511	F3	K2
R1219	D3	G3			
R1222	C3	G3	S1411C	H5	I3
R1224	F2	G3			
R1225	C2	F3	TP1200	C3	G2
R1230	F4	G4	TP1240	B3	F6
R1231	F4	G4	TP1410	H2	I2
R1232	F4	G4			
R1241	C4	F5	U1222	E3	G3
R1242	B3	F5	U1231	C5	G5
R1245	B3	G6	U1312A	D4	H3
R1246	E5	G6	U1312B	H2	H3
R1301	J4	H2	U1312C	C3	H3
R1302	E4	H2	U1312D	E2	H3
R1311	C2	G2	U1313A	C7	H3
R1312	D2	G2	U1313B	L1	H3
R1313	F2	H3	U1313C	J4	H3
R1320	E4	G3	U1313D	D6	H3
R1332	E6	G4	U1321	H5	H4
R1333	J5	H4	U1331A	L5	H4
R1334	L5	H5	U1331B	K5	H4
R1335	L5	H5	U1331C	J7	H4
R1341	C2	H6	U1331D	J6	H4
R1400	F4	I2	U1332	H7	H5
R1401	C7	J1	U1407	K1	J2
R1402	K1	J1	U1431A	K8	J5
R1403	J4	J1	U1431B	J8	J5
R1404	H1	I2	U1431C	D8	J5
R1405	J2	I2	U1431D	D8	J5
R1406	C7	I2	U1531A	F8	J5
R1407	L1	I2	U1531B	L7	J5
R1409	K4	J1			
R1410	J4	I2	VR1406	C8	I2

P/O A12 ASSY also shown on ⟨10⟩ ⟨11⟩ ⟨12⟩

PARTS LOCATION GRID

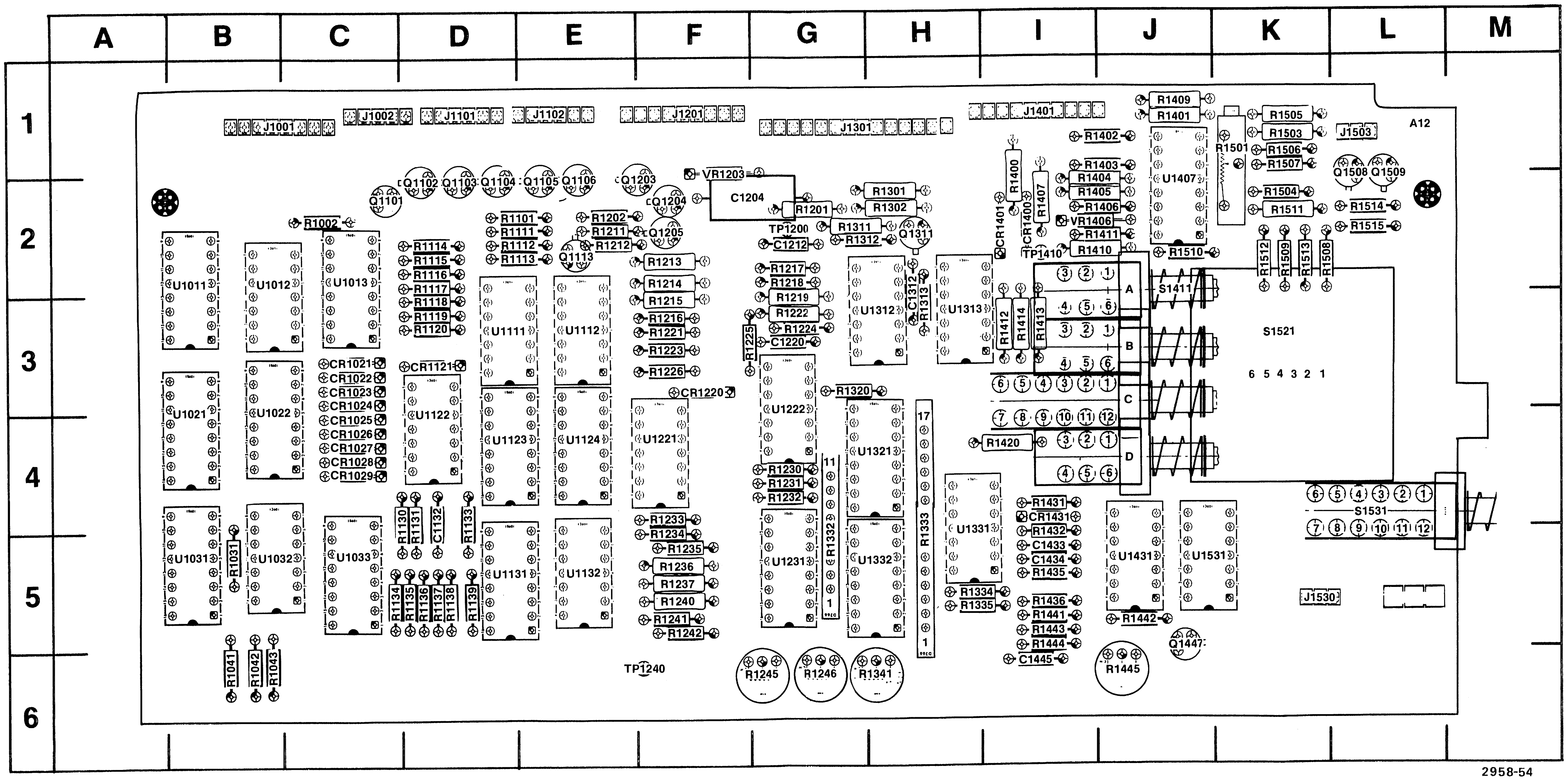
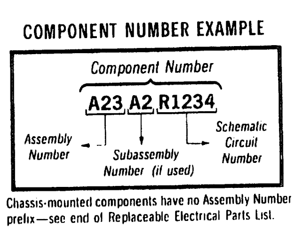
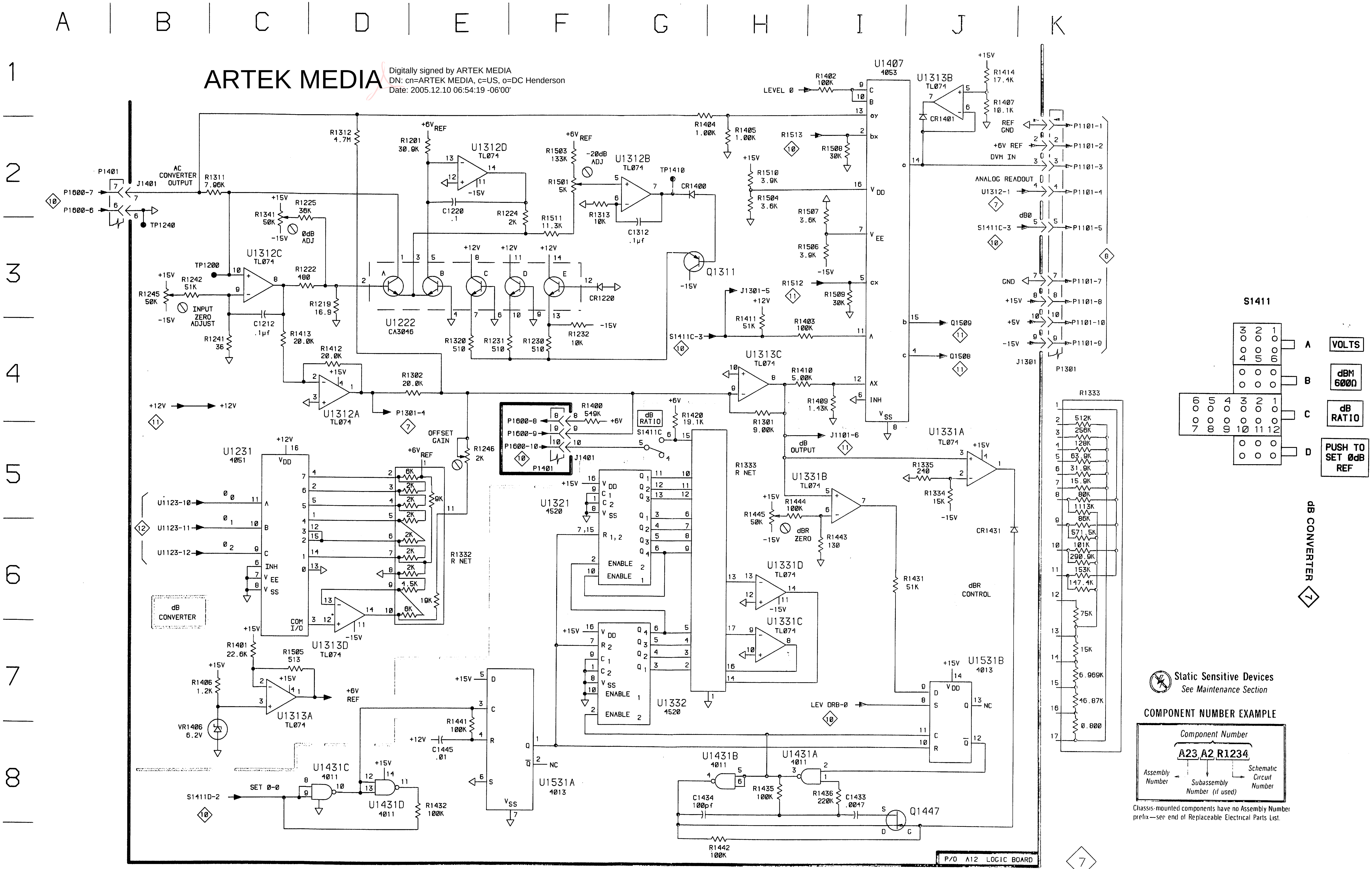


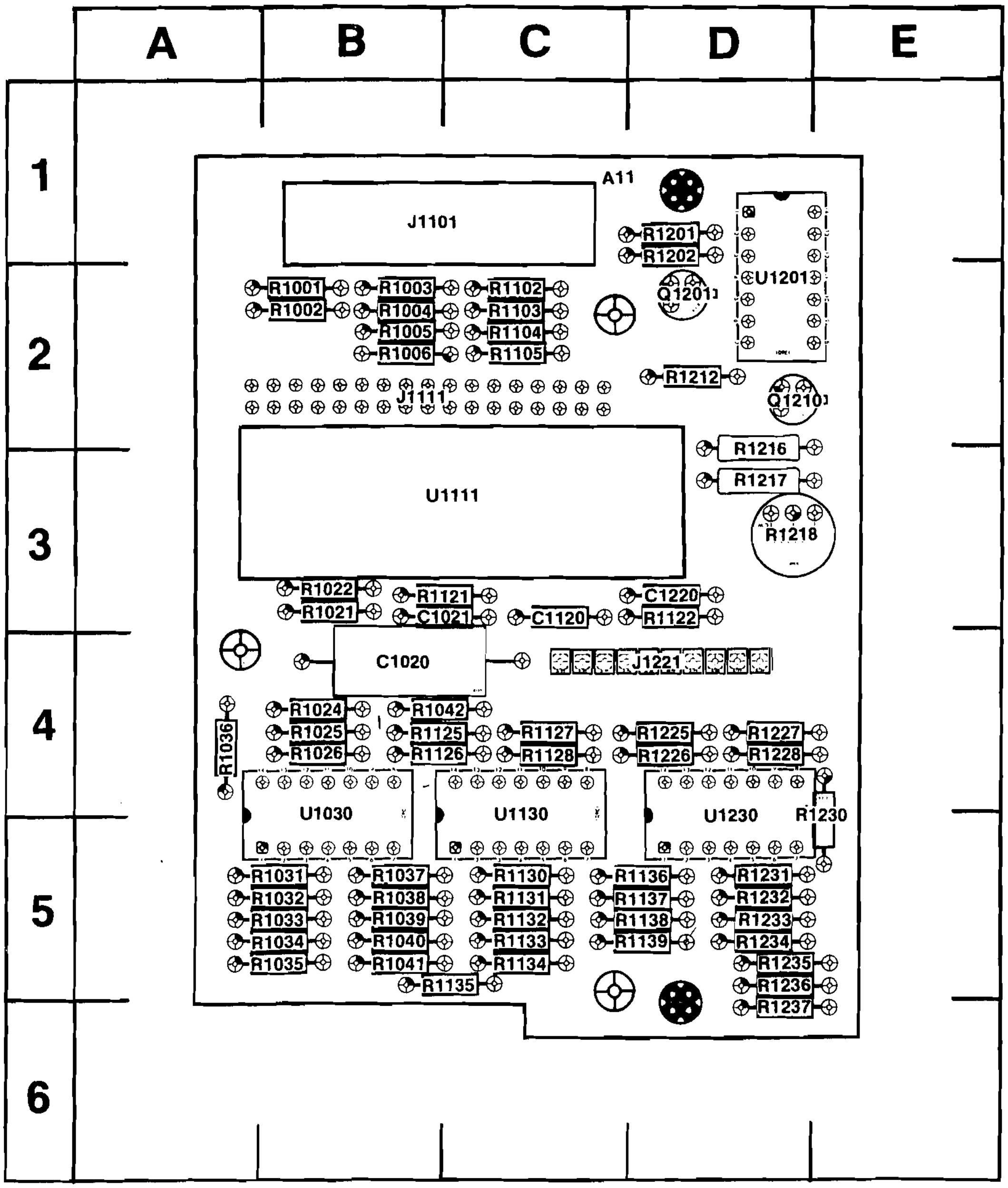
Fig. 8-5. Logic Board (A12 Assy).



Static Sensitive Devices
See Maintenance Section

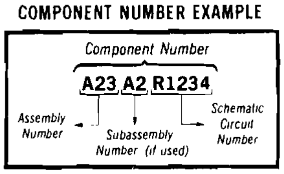

A
B
C
D
E
F
G
H
I
J
K
1
2
3
4
5
6
7
8
U1407
4053
U1313B
TL074
LEVEL 0
R1402
100K
R1414
17.4K
R1407
10.1K
CR1401
REF GND
+6V REF
DVM IN
ANALOG READOUT
U1312-1
dB0
S1411C-3
GND
+15V
+5V
-15V
J1301
P1301
P1101-1
P1101-2
P1101-3
P1101-4
P1101-5
P1101-7
P1101-8
P1101-10
P1101-9
P1401
J1401
AC CONVERTER OUTPUT
R1311
7.96K
P1600-7
P1600-6
TP1240
R1312
4.7M
R1201
30.9K
U1312D
TL074
C1220
.1
R1224
2K
R1503
133K
-20dB ADJ
U1312B
TL074
TP1410
CR1400
R1501
5K
R1313
10K
R1511
11.3K
C1312
.1µf
R1404
1.00K
R1405
1.00K
R1513
R1508
30K
R1510
3.9K
R1504
3.6K
R1507
3.6K
R1506
3.9K
R1512
R1509
30K
Q1311
R1341
50K
R1225
30K
0dB ADJ
U1312C
TL074
TP1200
R1242
51K
R1245
50K
INPUT ZERO ADJUST
R1222
480
R1219
16.9
C1212
.1µf
R1241
36
R1413
20.0K
U1222
CA3046
CR1220
R1320
510
R1231
510
R1230
510
R1232
10K
J1301-5
R1411
51K
R1403
100K
S1411C-3
Q1509
Q1508
U1313C
TL074
R1410
5.00K
R1409
1.43K
R1301
9.00K
R1412
20.0K
U1312A
TL074
R1302
20.0K
P1301-4
OFFSET GAIN
R1246
2K
P1600-8
P1600-9
P1600-10
R1400
549K
dB RATIO
S1411C
R1420
19.1K
J1101-6
dB OUTPUT
U1331A
TL074
R1335
240
R1334
15K
U1331B
TL074
R1444
100K
R1445
50K
dBR ZERO
R1443
130
CR1431
R1333
R NET
U1231
4051
U1123-10
U1123-11
U1123-12
R1332
R NET
U1313D
TL074
U1321
4520
U1332
4520
ENABLE
U1331D
TL074
U1331C
TL074
R1431
51K
dBR CONTROL
dB CONVERTER
R1401
22.6K
R1505
513
R1406
1.2K
U1313A
TL074
VR1406
6.2V
+6V REF
U1531A
4013
R1441
100K
C1445
.01
U1431C
4011
U1431D
4011
S1411D-2
SET 0-0
R1432
100K
U1531B
4013
LEV DRB-0
U1431B
4011
U1431A
4011
C1434
100pf
R1435
100K
R1436
220K
C1433
.0047
Q1447
R1442
100K
512K
256K
128K
63.9K
31.9K
15.9K
80K
1113K
86K
571.5K
101K
290.9K
153K
147.4K
75K
15K
6.969K
46.87K
0.800
S1411
VOLTS
dBM 600Ω
dB RATIO
PUSH TO SET 0dB REF
dB CONVERTER
Static Sensitive Devices
See Maintenance Section
COMPONENT NUMBER EXAMPLE
Component Number
A23 A2 R1234
Assembly Number
Subassembly Number (if used)
Schematic Circuit Number
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.
P/O A12 LOGIC BOARD
7

PARTS LOCATION GRID



2958-55

COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

Fig. 8-6. DVM Board (A11 Assy).

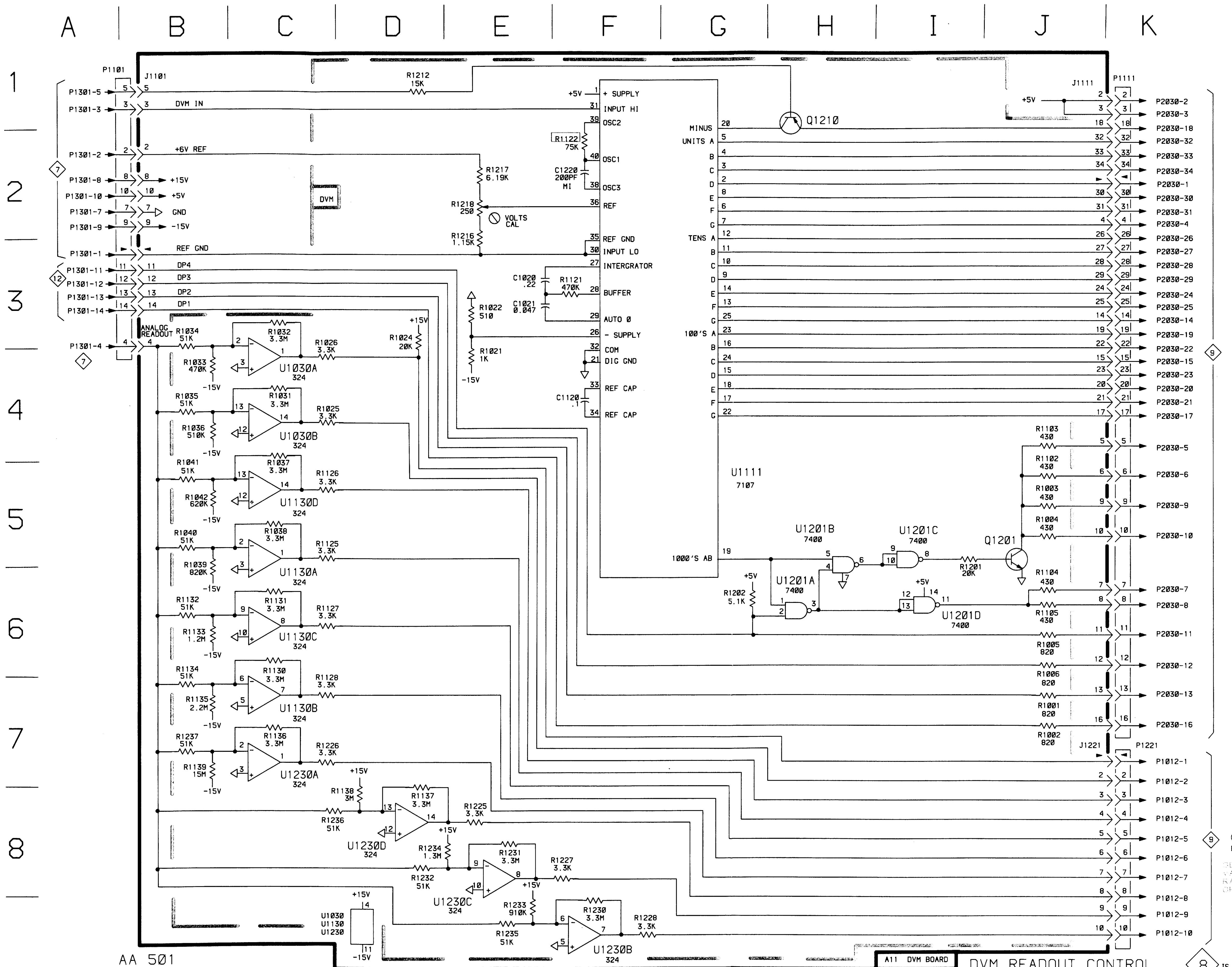
Static Sensitive Devices
See Maintenance Section

Table 8-8
COMPONENT REFERENCE CHART (see Fig. 8-6)

P/O A11 ASSY — DVM BOARD ⟨8⟩

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1020	E3	B4	R1126	C5	B4
C1021	E3	B3	R1127	C6	C4
C1120	F4	C4	R1128	C7	C4
C1220	F2	D3	R1130	C6	C5
			R1131	C6	C5
J1101	B1	B1	R1132	B6	C5
J1111	M1	B2	R1133	B6	C5
J1221	M7	D4	R1134	B7	C5
			R1135	B7	B5
P1101	B1	B1	R1136	C7	D5
P1111	M1	B2	R1137	D7	D5
P1221	M7	D4	R1138	D8	D5
			R1139	B7	D5
Q1201	L5	D2	R1201	K5	D1
Q1210	J1	D2	R1202	H6	D1
			R1212	D1	D2
R1001	L7	B2	R1216	E2	D3
R1002	L7	B2	R1217	E2	D3
R1003	L5	B2	R1218	E2	D3
R1004	L5	B2	R1225	E8	D4
R1005	L6	B2	R1226	C7	D4
R1006	L6	B2	R1227	F8	D4
R1021	E4	B3	R1228	F8	D4
R1022	E3	B3	R1230	F8	E5
R1024	D3	B4	R1231	E8	D5
R1025	C4	B4	R1232	D8	D5
R1026	C4	B4	R1233	E8	D5
R1031	C4	B5	R1234	E8	D5
R1032	C3	B5	R1235	E8	D5
R1033	B4	B5	R1236	C8	D5
R1034	B3	B5	R1237	B7	D6
R1035	B4	B5			
R1036	B4	A4	U1030A	C4	B4
R1037	C4	B5	U1030B	C4	B4
R1038	C5	B5	U1111	H5	C3
R1039	B5	B5	U1130A	C5	C4
R1040	B5	B5	U1130B	C7	C4
R1041	B5	B5	U1130C	C6	C4
R1042	B5	B4	U1130D	C5	C4
R1102	L5	C2	U1201A	J6	D2
R1103	L4	C2	U1201B	J5	D2
R1104	L6	C2	U1201C	K5	D2
R1105	L6	C2	U1201D	K6	D2
R1121	F3	B3	U1230A	C7	D4
R1122	F2	D3	U1230B	F8	D4
R1125	C5	B4	U1230C	E8	D4
			U1230D	D8	D4

@



AA 501

DVM READOUT CONTROL

8 JS

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2958-38

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE

Component Number

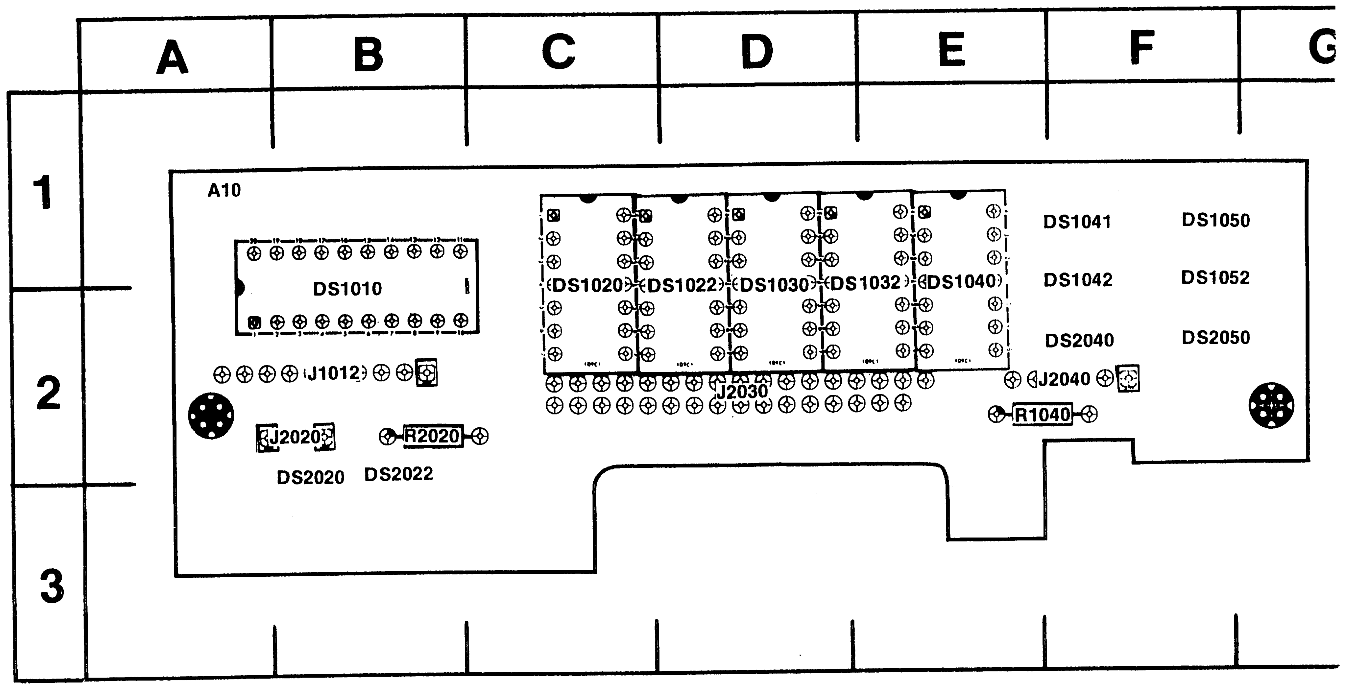
A23 A2 R1234

Assembly Number — *Subassembly Number (if used)* — *Schematic Circuit Number*

Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEFINED BY SHADING

PARTS LOCATION GRID



2958-56

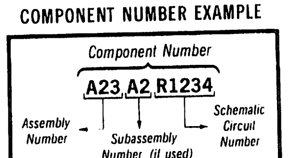
Fig. 8-7. Display Board (A10 Assy).

Table 8-9
COMPONENT REFERENCE CHART (see Fig. 8-7)

P/O A10 ASSY					DISPLAY BOARD 9
CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
DS1010	C2	B2	J1012	B2	B2
DS1020	D5	C2	J2020	B1	B2
DS1022	E5	D2	J2020	L2	B2
DS1030	F5	D2	J2030	K7	D2
DS1032	H5	D2	J2030	B4	D2
DS1040	K5	E2	J2040	L3	F2
DS1041	L3	F1			
DS1042	L3	F2	P1012	B2	B2
DS1050	L4	F1	P2020	L2	B2
DS1052	L4	F2	P2020	B1	B2
DS2020	L2	B2	P2030	K7	D2
DS2022	L2	B2	P2030	B4	D2
DS2040	L3	F2	P2040	L3	F2
DS2050	L4	F2			
			R1040	K4	E2
			R2020	K2	B2

DISPLAY BOARD (A10)
PARTS LOCATION GRID

COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

Static Sensitive Devices
See Maintenance Section

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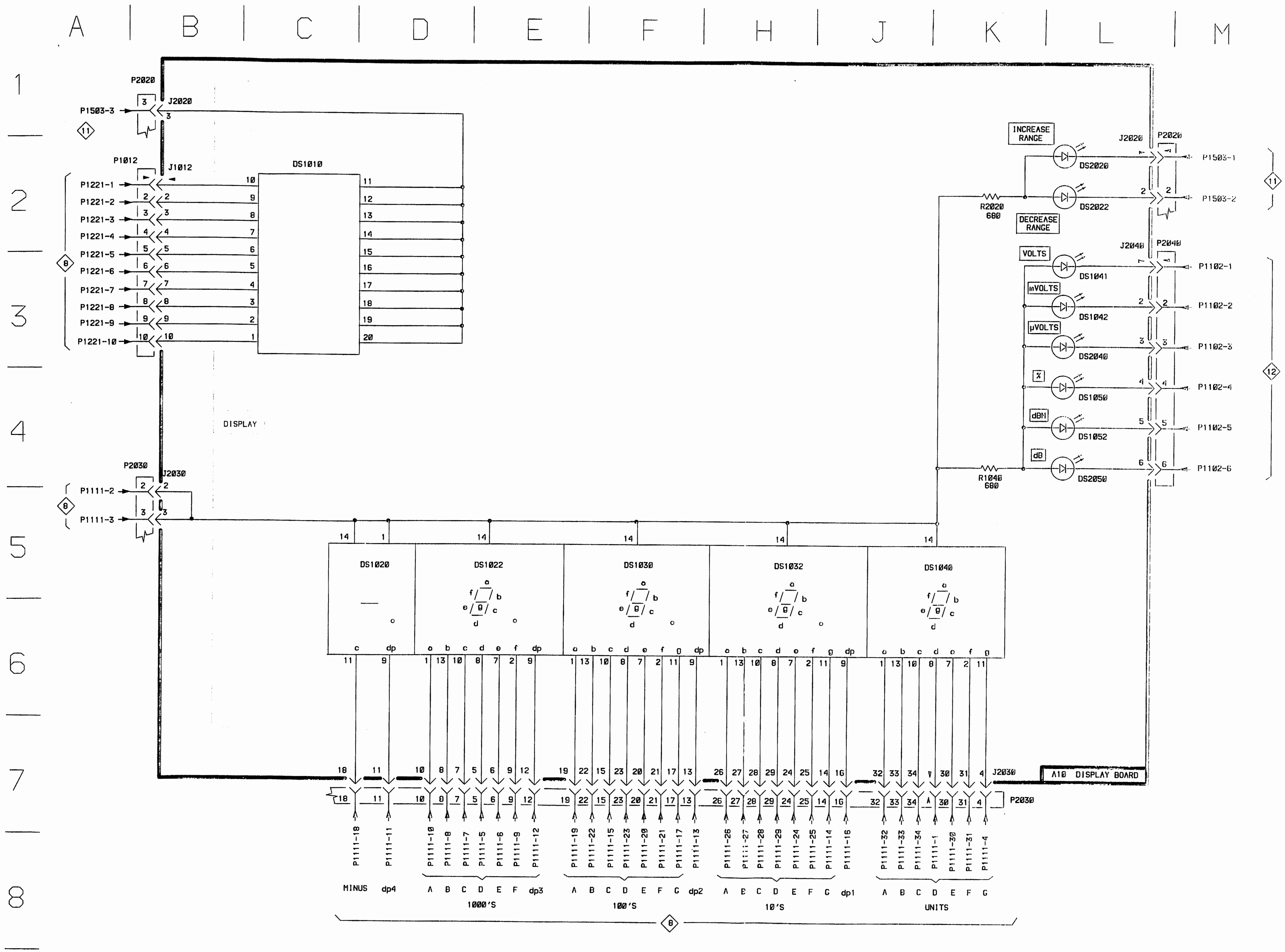
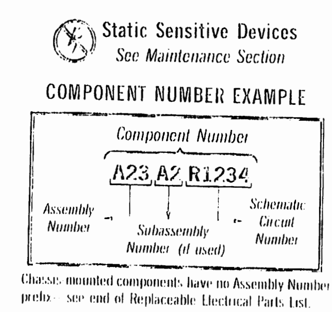

A B C D E F H J K L M
1 2 3 4 5 6 7 8
P2020
J2020
P1503-3
P1012
J1012
P1221-1
P1221-2
P1221-3
P1221-4
P1221-5
P1221-6
P1221-7
P1221-8
P1221-9
P1221-10
DS1010
DISPLAY
P2030
J2030
P1111-2
P1111-3
INCREASE RANGE
DS2020
DECREASE RANGE
DS2022
R2020 680
J2020
P2020
P1503-1
P1503-2
J2040
P2040
VOLTS
DS1041
mVOLTS
DS1042
μVOLTS
DS2040
%
DS1050
dBM
DS1052
dB
DS2050
R1040 680
P1102-1
P1102-2
P1102-3
P1102-4
P1102-5
P1102-6
DS1020
DS1022
DS1030
DS1032
DS1040
A10 DISPLAY BOARD
J2030
P2030
MINUS
dp4
A B C D E F dp3
1000'S
A B C D E F G dp2
100'S
A B C D E F G dp1
10'S
A B C D E F G
UNITS


Static Sensitive Devices
See Maintenance Section
COMPONENT NUMBER EXAMPLE
Component Number
A23 A2 R1234
Assembly Number
Subassembly Number (if used)
Schematic Circuit Number
Chassis mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

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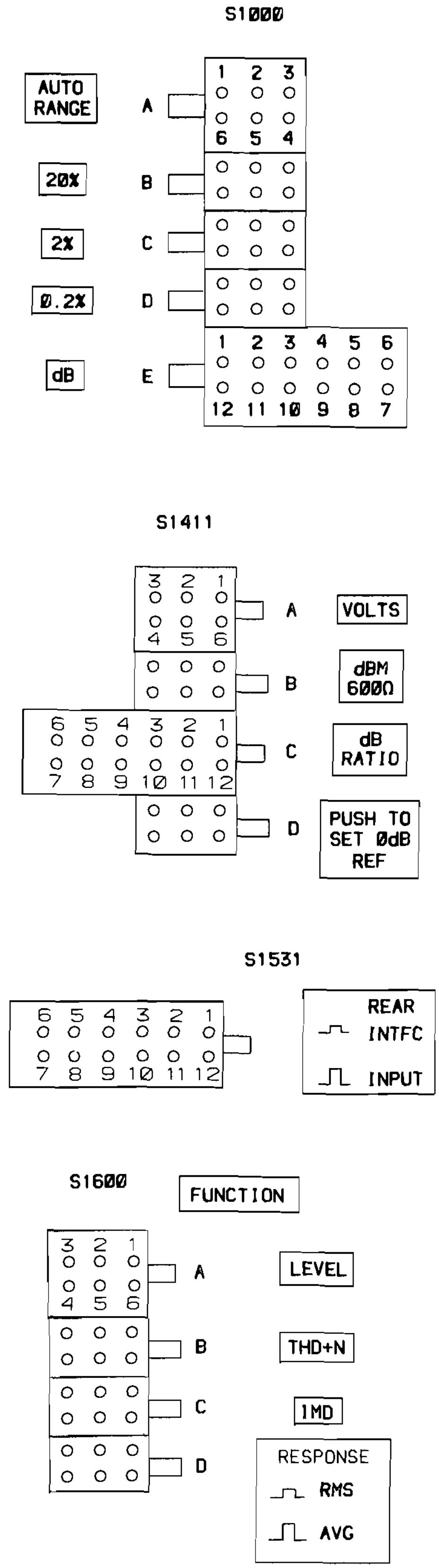
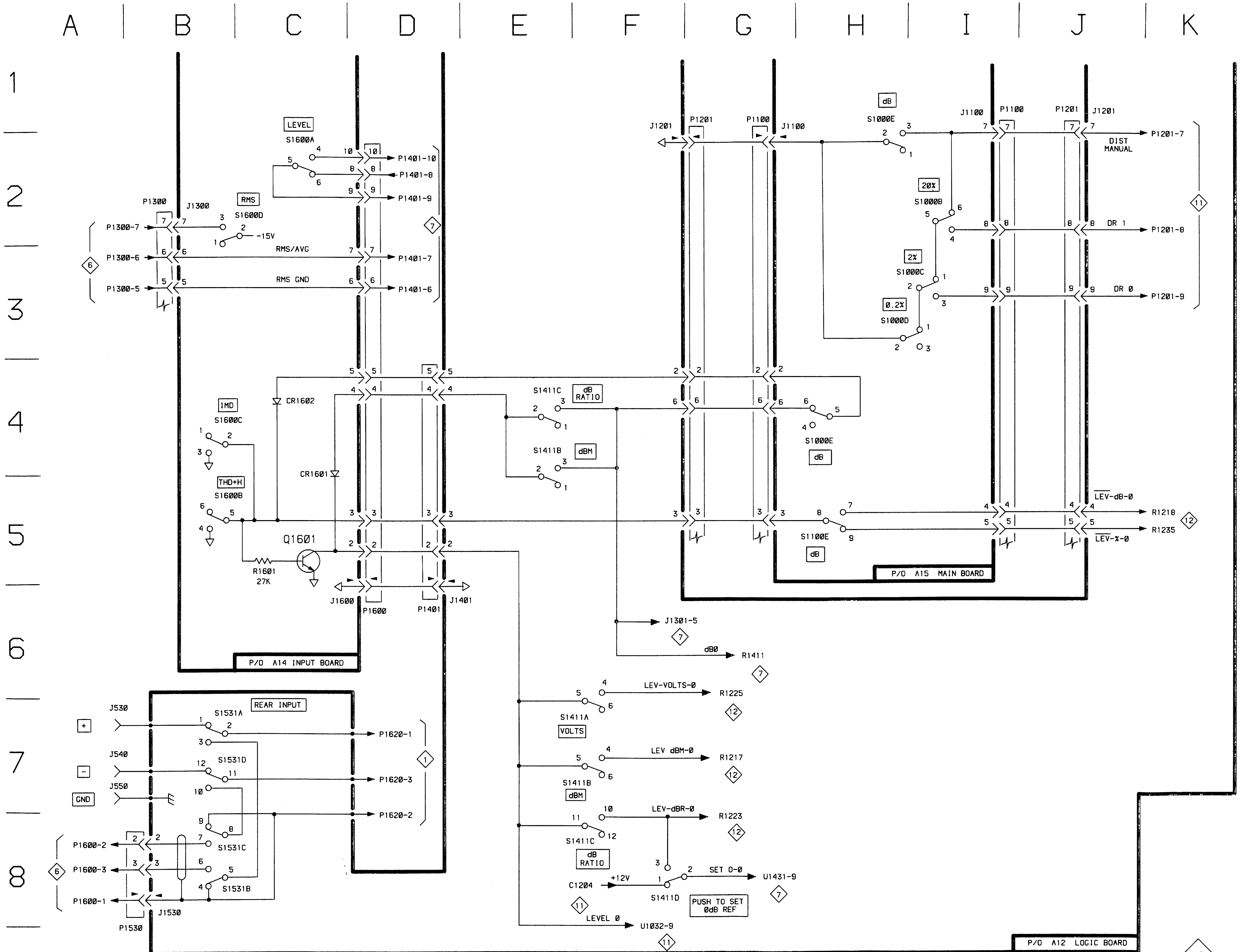
2958-39

Table 8-10
COMPONENT REFERENCE CHART
(see Fig. 8-3, 8-4, 8-5)

P/O A12 ASSY	LOGIC BOARD ⟨10⟩	
CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
J1201	L1	F1
J1201	F2	F1
J1401	D6	I1
J1530	A8	K5
P1100	H2	C2
P1100	K1	C2
P1201	L1	F1
P1201	H2	F1
P1300	B2	G1
P1401	D6	I1
P1530	A8	L1
P1600	D6	L2
S1411A	F7	I2
S1411B	E4	I3
S1411B	F7	I3
S1411C	F8	I3
S1411C	E4	I3
S1411D	F8	I4
S1531A	A7	L4
S1531B	A8	L4
S1531C	A8	L4
S1531D	A7	L4
J530	A7	Chassis
J540	A7	Chassis
J550	A7	Chassis
P/O A12 ASSY also shown on ⟨7⟩ ⟨11⟩ ⟨12⟩		
P/O A14 ASSY		INPUT BOARD
CR1601	C4	L1
CR1602	C4	L2
J1300	B2	G1
J1600	D6	K1
Q1601	C5	L1
R1601	C5	L2
S1600A	C2	L3
S1600B	B5	L3
S1600C	B4	L3
S1600D	B2	L4
P/O A14 ASSY also shown on ⟨1⟩ ⟨2⟩ ⟨4⟩ ⟨5⟩		
P/O A15 ASSY		MAIN BOARD
J1100	K1	C2
J1100	H2	C2
S1000A	K2	B3
S1000B	K2	B3
S1000C	K3	B4
S1000D	K3	B4
S1000E	J2	B5
S1000E	J4	B5
S1100E	J5	C5
P/O A15 ASSY also shown on ⟨3⟩ ⟨6⟩ ⟨13⟩ ⟨14⟩		


S1000
AUTO RANGE
20%
2%
0.2%
dB
A
B
C
D
E
S1411
VOLTS
dBM 600Ω
dB RATIO
PUSH TO SET 0dB REF
A
B
C
D
S1531
REAR
INTFC
INPUT
S1600
FUNCTION
LEVEL
THD+N
IMD
RESPONSE
RMS
AVG
A
B
C
D



Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE

Component Number
A23 A2 R1234
Assembly Number — Subassembly Number (if used) — Schematic Circuit Number

Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

LOGIC BOARD (A12)
COMPONENT REFERENCE CHART

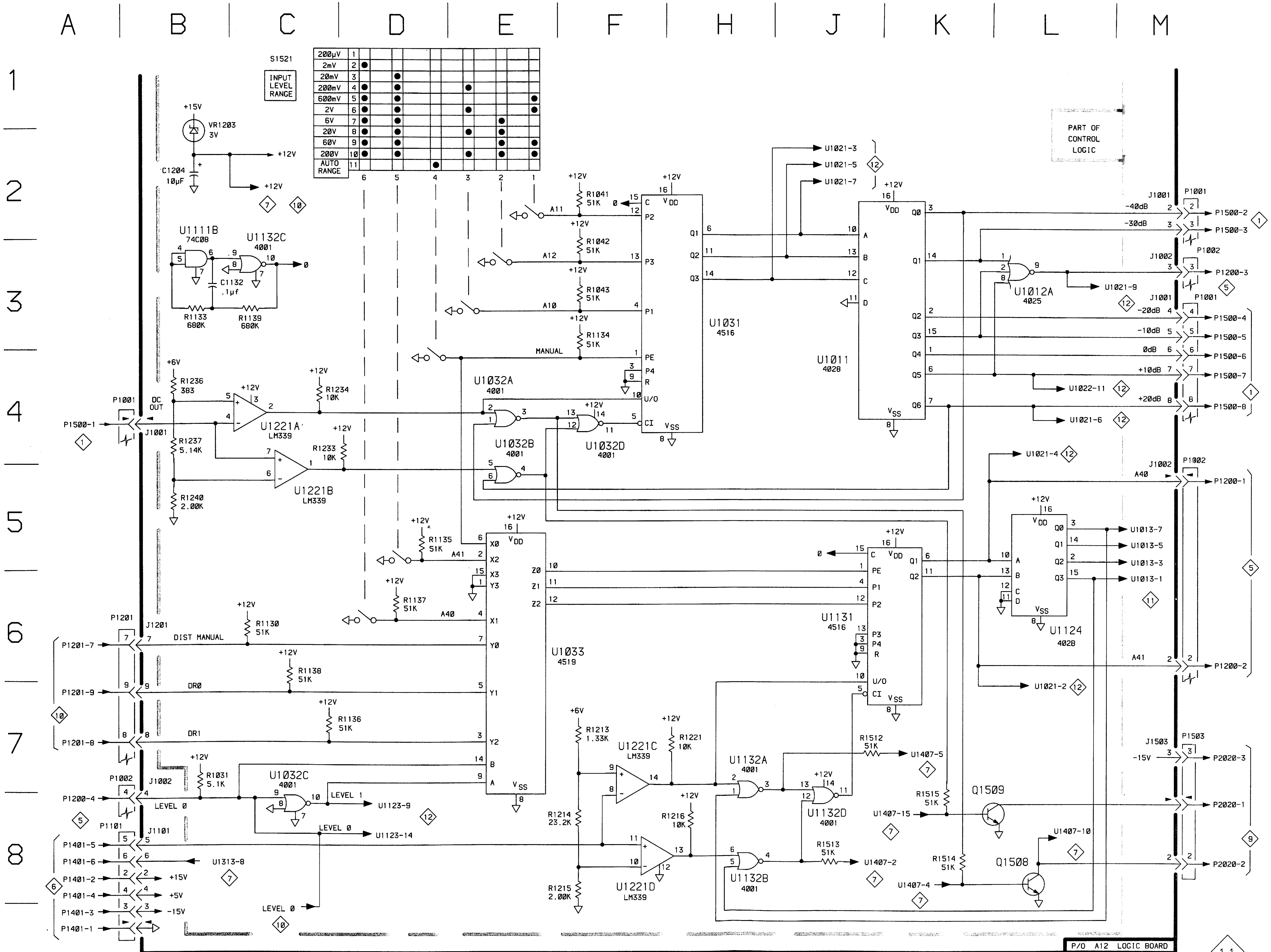
Table 8-11
COMPONENT REFERENCE CHART (see Fig. 8-5)

P/O A12 ASSY — LOGIC BOARD ⟨11⟩

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1132	B3	D4
C1204	B2	F2
CR1203	B2	F1
J1001	B4	B1
J1001	M3	B1
J1001	M2	B1
J1002	M3	C1
J1002	M5	C1
J1002	B8	C1
J1101	B8	D1
J1201	B6	F1
J1503	M7	L1
P1001	M3	B1
P1001	M2	B1
P1001	B4	B1
P1002	M5	C1
P1002	B8	C1
P1002	M3	C1
P1101	B8	D1
P1201	B6	F1
P1503	M7	L1
Q1508	L8	L2
Q1509	K8	L2
R1031	B7	B5
R1041	F2	B6
R1042	F3	B6
R1043	F3	B6
R1130	C6	D4
R1133	B3	D4
R1134	F3	C5
R1135	D5	D5
R1136	C7	D5
R1137	D6	D5

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
R1138	C6	D5
R1139	C3	D5
R1213	F7	F2
R1214	F8	F2
R1215	F8	F3
R1216	H8	F3
R1221	F7	F3
R1230	F9	E5
R1233	D4	F4
R1234	C4	F5
R1236	B4	F5
R1237	B4	F5
R1240	B5	F5
R1512	J7	K2
R1513	J8	K2
R1514	K8	L2
R1515	K8	L2
S1521	C1	K3
U1011	J3	B2
U1012A	L3	B2
U1031	H3	B5
U1032A	E4	B5
U1032B	E5	B5
U1032C	C8	B5
U1032D	F4	B5
U1033	E6	C5
U1111B	B3	D3
U1124	L6	E4
U1131	J6	D5
U1132A	H7	E5
U1132B	H8	E5
U1132C	C3	E5
U1132D	J8	E5
U1221A	C4	F4
U1221B	C5	F4
U1221C	F7	F4
U1221D	F8	F4

P/O A12 ASSY also shown on ⟨7⟩ ⟨10⟩ ⟨12⟩



AUTORANGE CONTROL LOGIC 11

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE

Component Number
A23 A2 R1234
Assembly Number — Subassembly Number (if used) — Schematic Circuit Number

Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

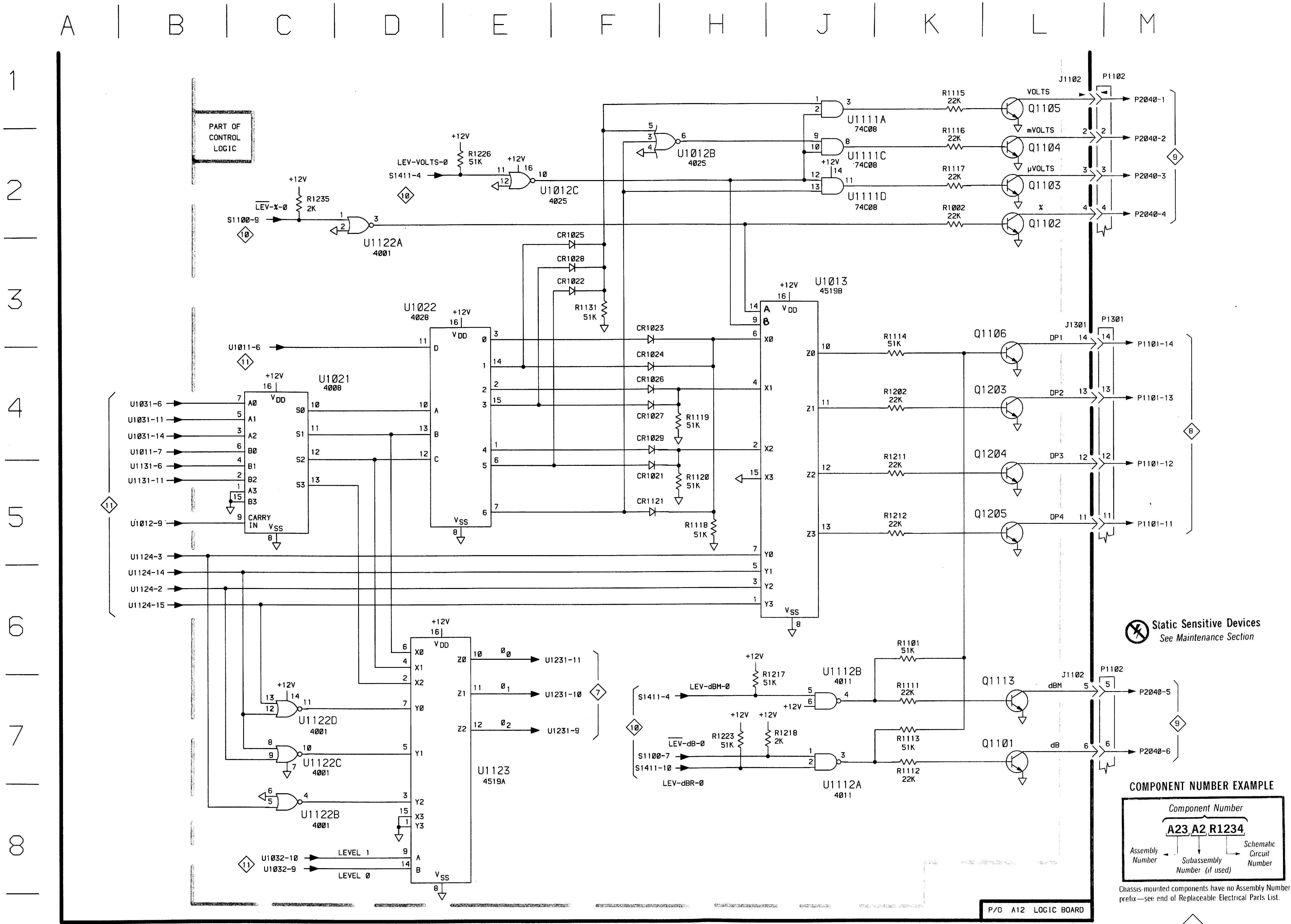
Table 8-12
COMPONENT REFERENCE CHART (see Fig. 8-5)

P/O A12 ASSY — LOGIC BOARD ⟨12⟩

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
CR1021	F5	C3	R1113	K7	D2
CR1022	F3	C3	R1114	K4	D2
CR1023	F3	C3	R1115	K1	D2
CR1024	F4	C3	R1116	K2	D2
CR1025	F3	C4	R1117	K2	D2
CR1026	F4	C4	R1118	H5	D3
CR1027	F4	C4	R1119	H4	D3
CR1028	F3	C4	R1120	H5	D3
CR1029	F4	C4	R1131	F3	D4
CR1121	F5	D3	R1202	K4	E2
			R1211	K5	E2
J1102	L1	E1	R1212	K5	E2
J1102	L7	E1	R1217	H7	G2
J1301	L4	G1	R1218	J7	G2
			R1223	H7	F3
P1102	M1	E1	R1226	E2	F3
P1102	M1	E1	R1235	C2	F5
P1301	M3	G1			
			U1012B	H2	B2
Q1101	L7	C2	U1012C	E2	B2
Q1102	L2	D2	U1013	J3	C2
Q1103	L2	D2	U1021	C3	B4
Q1104	L2	D2	U1022	D4	B4
Q1105	L1	E2	U1111A	J1	D3
Q1106	L4	E2	U1111C	J2	D3
Q1113	L7	E2	U1111D	J2	D3
Q1203	L4	E2	U1112A	J7	E3
Q1204	L5	F1	U1112B	J7	E3
Q1205	L5	F1	U1122A	D2	D4
			U1122B	C8	D4
R1002	K2	C2	U1122C	C7	D4
R1101	K6	D2	U1122D	C7	D4
R1111	K7	D2	U1123	D7	D4
R1112	K7	D2			

P/O A12 ASSY also shown on ⟨7⟩ ⟨10⟩ ⟨11⟩

LOGIC BOARD (A12)
COMPONENT REFERENCE CHART



A B C D E F H J K L M
1 2 3 4 5 6 7 8
PART OF CONTROL LOGIC
LEV-X-Ø
S1100-9
R1235 2K
U1122A 4001
LEV-VOLTS-Ø
S1411-4
R1226 51K
U1Ø12C 4025
U1Ø12B 4025
U1111A 74C08
U1111C 74C08
U1111D 74C08
R1115 22K
R1116 22K
R1117 22K
R1002 22K
Q1105
Q1104
Q1103
Q1102
VOLTS
mVOLTS
μVOLTS
%
J1102
P1102
P2040-1
P2040-2
P2040-3
P2040-4
CR1025
CR1028
CR1022
R1131 51K
U1Ø22 4028
U1Ø11-6
U1Ø21 4008
U1Ø31-6
U1Ø31-11
U1Ø31-14
U1Ø11-7
U1131-6
U1131-11
U1Ø12-9
CARRY IN
CR1023
CR1024
CR1026
CR1027
CR1029
CR1021
CR1121
R1119 51K
R1120 51K
R1118 51K
U1Ø13 4519B
R1114 51K
R1202 22K
R1211 22K
R1212 22K
Q1106
Q1203
Q1204
Q1205
DP1
DP2
DP3
DP4
J1301
P1301
P1101-14
P1101-13
P1101-12
P1101-11
U1124-3
U1124-14
U1124-2
U1124-15
U1123 4519A
U1122D 4001
U1122C 4001
U1122B 4001
U1231-11
U1231-10
U1231-9
U1Ø32-10
U1Ø32-9
LEVEL 1
LEVEL Ø
Static Sensitive Devices
See Maintenance Section
R1217 51K
LEV-dBM-Ø
S1411-4
U1112B 4011
U1112A 4011
R1223 51K
R1218 2K
LEV-dB-Ø
S1100-7
S1411-10
LEV-dBR-Ø
R1101 51K
R1111 22K
R1113 51K
R1112 22K
Q1113
Q1101
dBM
dB
P2040-5
P2040-6
COMPONENT NUMBER EXAMPLE
Component Number
A23 A2 R1234
Assembly Number
Subassembly Number (if used)
Schematic Circuit Number
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.
P/O A12 LOGIC BOARD

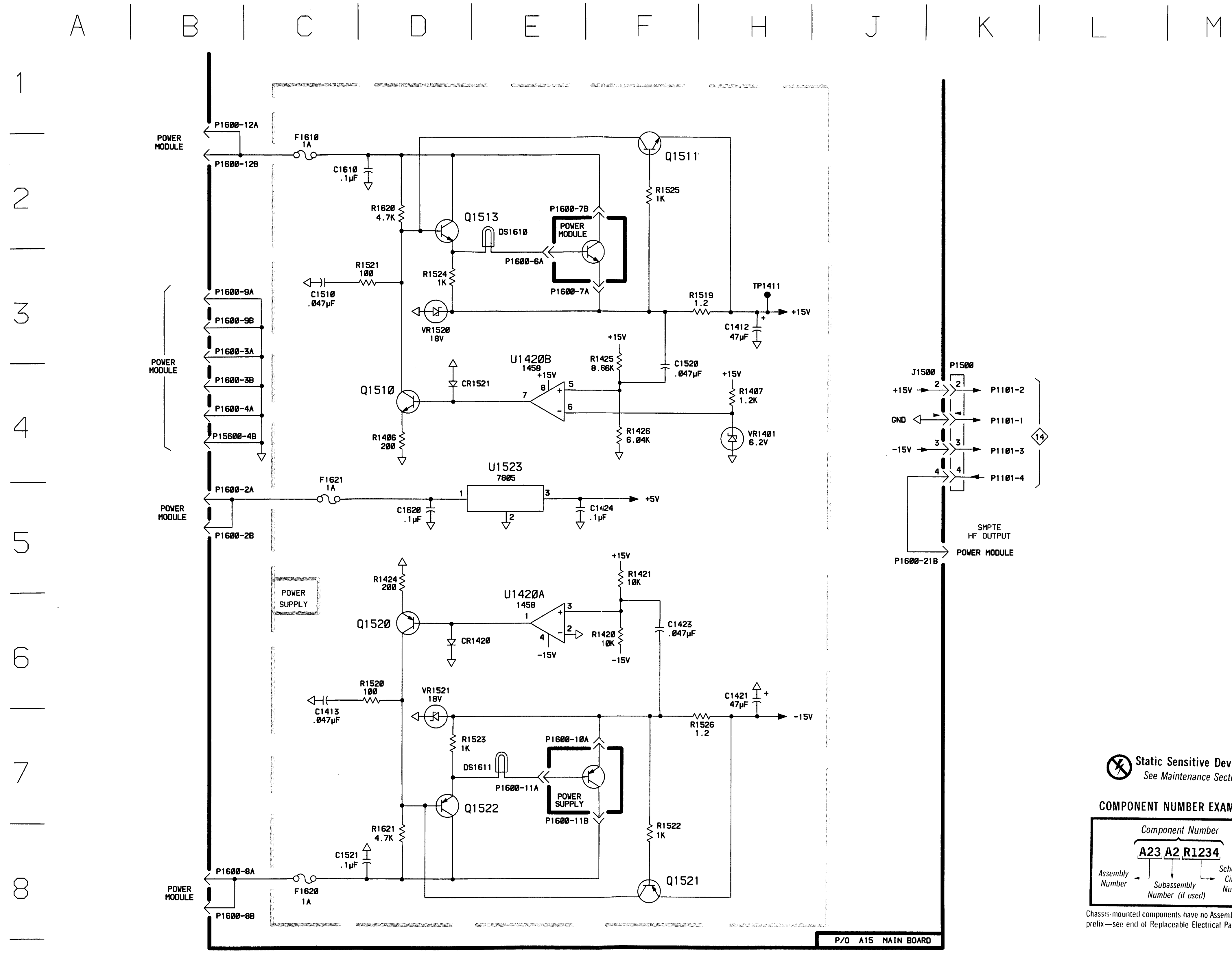
Table 8-13
COMPONENT REFERENCE CHART (see Fig. 8-4)

P/O A15 ASSY — MAIN BOARD ⟨13⟩

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1412	H3	I4	Q1510	D4	J5
C1413	C6	J4	Q1511	F2	K5
C1421	H6	I5	Q1513	D2	K5
C1423	F6	J6	Q1520	D6	J6
C1424	E5	I5	Q1521	F8	K6
C1510	C3	K4	Q1522	D7	K6
C1520	F3	J5	R1406	D4	J4
C1521	D8	L6	R1407	H4	J5
C1610	D2	L5	R1420	F6	I5
C1620	D5	I5	R1421	F5	I5
CR1420	D6	J6	R1424	D5	J6
CR1521	D4	J5	R1425	F3	J5
DS1610	E2	L5	R1426	F4	J6
DS1611	E7	L5	R1519	H3	K4
F1610	C2	L5	R1520	D6	J5
F1620	C8	L5	R1521	D3	J4
F1621	C5	L6	R1522	F8	K5
J1500	K4	L2	R1523	D7	K5
P1500	K4	L2	R1524	D3	K5
P1600	F2	M4	R1525	F2	K5
P1600	B8	M4	R1526	H6	K6
P1600	E7	M4	R1620	D2	L5
P1600	B3	M4	R1621	D8	L6
P1600	B1	M4	TP1411	H3	I4
P1600	K5	M4	U1420A	E6	J5
P1600	F7	M4	U1420B	E4	J5
P1600	E3	M4	U1523	E5	I6
			VR1401	H4	J5
			VR1520	D3	K5
			VR1521	D6	L6

P/O A15 ASSY also shown on ⟨3⟩ ⟨6⟩ ⟨10⟩ ⟨14⟩

MAIN BOARD (A15)
COMPONENT REFERENCE CHART



Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE

Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

PARTS LOCATION GRID

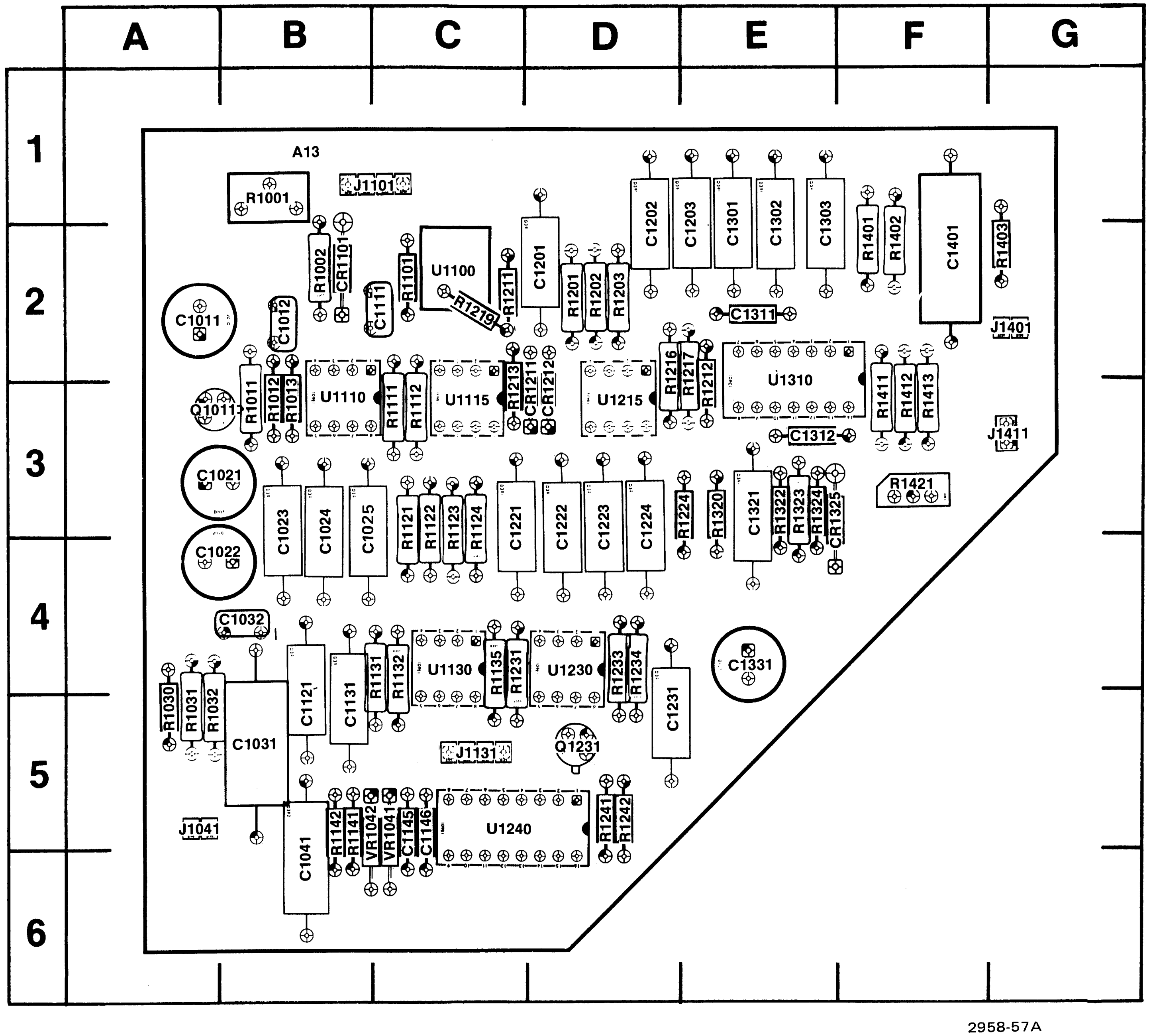


Fig. 8-8. IMD Option Board (A13 Assy).

COMPONENT NUMBER EXAMPLE

Component Number
A23 A2 R1234
Assembly Number
Subassembly Number (if used)
Schematic Circuit Number

Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

Static Sensitive Devices
See Maintenance Section

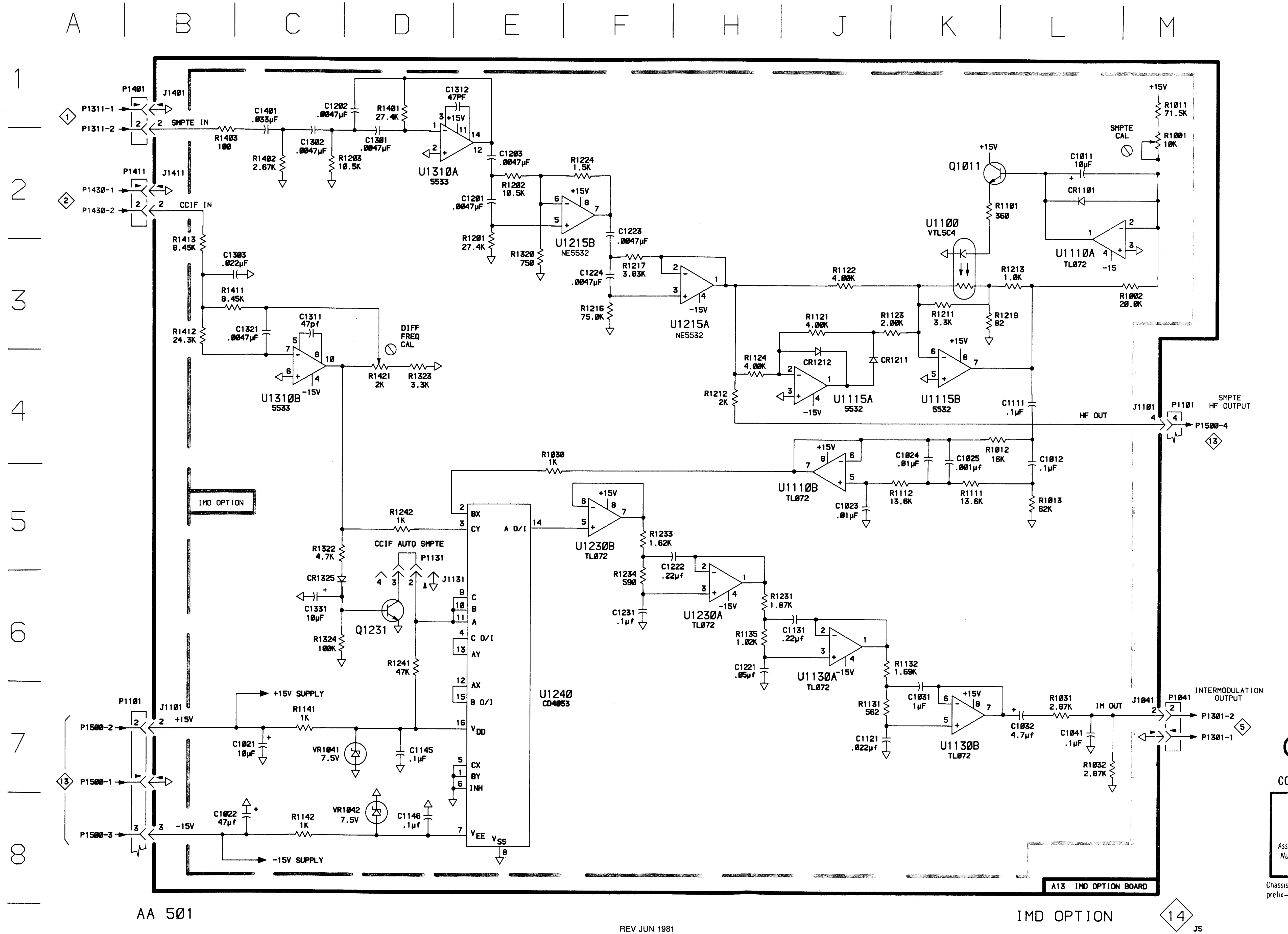
REV A MAR 1981

Table 8-14
COMPONENT REFERENCE CHART (see Fig. 8-8)

P/O A13 ASSY — IMD OPTION BOARD (14)

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1011	L2	A2
C1012	L4	B2
C1021	C7	A3
C1022	C8	A4
C1023	J5	B3
C1024	K4	B3
C1025	K4	B3
C1031	K7	B5
C1032	L7	B4
C1041	L7	B5
C1111	L4	C2
C1121	J7	B4
C1131	J6	B5
C1145	D7	C5
C1146	D8	C5
C1201	E2	D2
C1202	D1	D2
C1203	E2	E2
C1221	H6	C3
C1222	H5	D3
C1223	F2	D3
C1224	F3	D3
C1231	F6	D5
C1301	D2	E2
C1302	C2	E2
C1303	B3	E2
C1311	C3	E2
C1312	E1	E3
C1321	C3	E3
C1331	C6	E4
C1401	C2	F2
CR1101	L2	B2
CR1211	J4	D3
CR1212	J4	D3
CR1325	C6	E3
J1041	M7	A5
J1101	M4	B1
J1101	B7	B1
J1131	D6	C5
J1401	B1	G2
J1411	B2	G3
P1041	M7	A5
P1101	M4	B1
P1101	B7	B1
P1131	D5	C5
P1401	B1	G3
P1411	B2	G2
Q1011	K2	A3
Q1231	D6	D5
R1001	M2	B1
R1002	M3	B2

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
R1011	M1	B3
R1012	K4	B3
R1013	L5	B3
R1030	E5	A5
R1031	L7	A5
R1032	L7	A5
R1101	K2	C2
R1111	K5	C3
R1112	K5	C3
R1121	J3	C3
R1122	J3	C3
R1123	K3	C3
R1124	H4	C3
R1131	J7	C4
R1132	J6	C4
R1135	H6	C4
R1141	C7	B5
R1142	C8	B5
R1201	E2	D2
R1202	E2	D2
R1203	C2	D2
R1211	K3	C2
R1212	H4	E3
R1213	L3	C3
R1216	F3	D3
R1217	F3	E3
R1219	K3	C2
R1224	F2	E3
R1231	H6	C4
R1233	F5	D4
R1234	F6	D4
R1241	D6	D5
R1242	D5	D5
R1320	E3	E3
R1322	C5	E3
R1323	D4	E3
R1324	C6	E3
R1401	D1	F2
R1402	C2	F2
R1403	B2	G2
R1411	B3	F3
R1412	B3	F3
R1413	B3	F3
R1421	D4	F3
U1100	K3	C2
U1110A	L2	B3
U1110B	J5	B3
U1115A	J4	C3
U1115B	K4	C3
U1310A	D2	E3
U1310B	C4	E3
VR1041	D7	C5
VR1042	D8	B5



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IMD OPTION 14

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2958-44

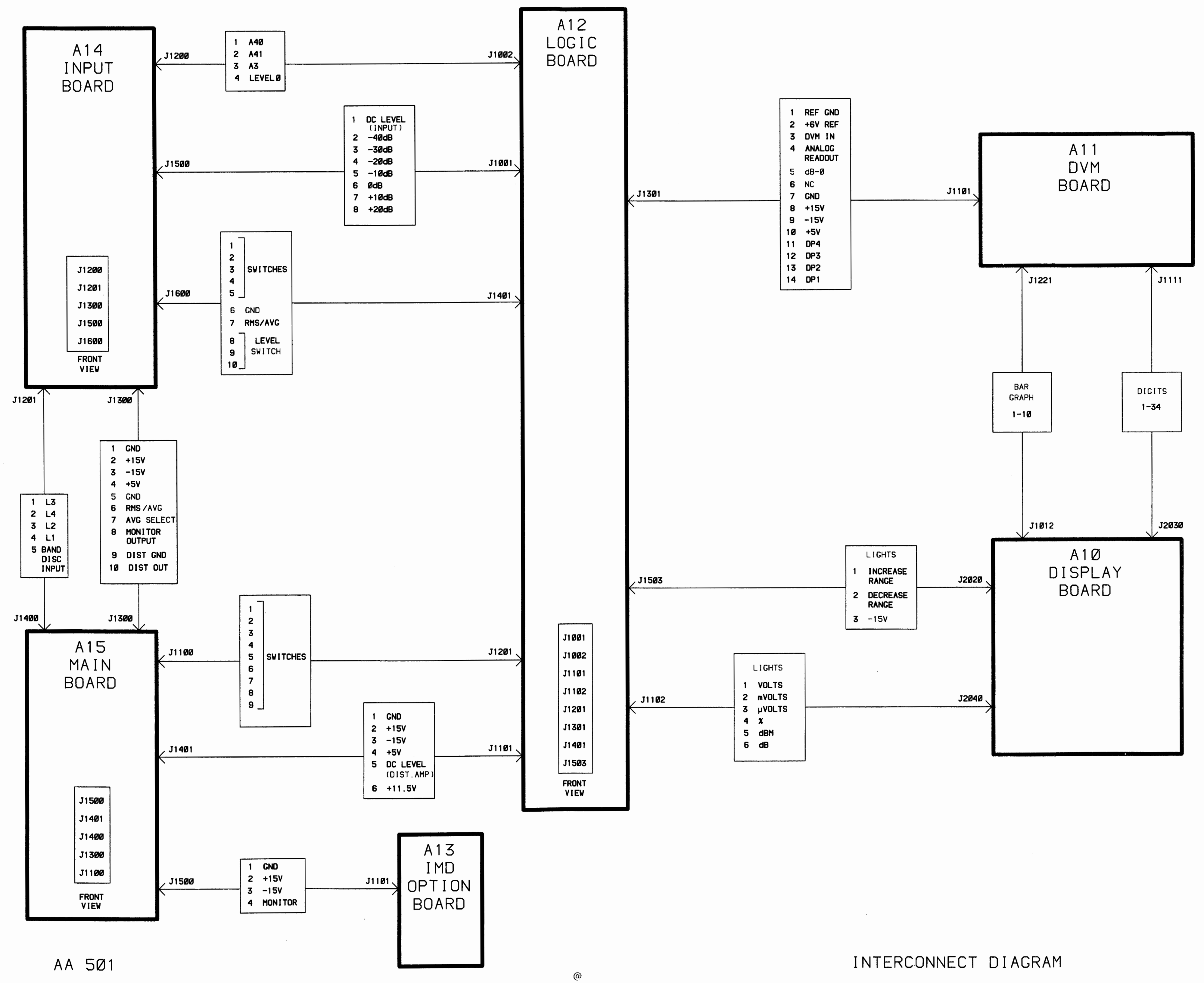
IMD OPTION 14

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE

Component Number
A23 A2 R1234
Assembly Number — Subassembly Number (if used) — Schematic Circuit Number

Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.



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INTERCONNECT DIAGRAM

@
2958-46

REPLACEABLE MECHANICAL PARTS

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

SPECIAL NOTES AND SYMBOLS

X000	Part first added at this serial number
00X	Part removed after this serial number

FIGURE AND INDEX NUMBERS

Items in this section are referenced by figure and index numbers to the illustrations.

INDENTATION SYSTEM

This mechanical parts list is indented to indicate item relationships. Following is an example of the indentation system used in the description column.

1 2 3 4 5 — Name & Description

Assembly and/or Component
Attaching parts for Assembly and/or Component
--- * ---
  Detail Part of Assembly and/or Component
  Attaching parts for Detail Part
--- * ---
    Parts of Detail Part
    Attaching parts for Parts of Detail Part
--- * ---

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation. The separation symbol --- * --- indicates the end of attaching parts.

Attaching parts must be purchased separately, unless otherwise specified.

ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

ABBREVIATIONS

"	INCH	ELCTRN	ELECTRON	IN	INCH	SE	SINGLE END
#	NUMBER SIZE	ELEC	ELECTRICAL	INCAND	INCANDESCENT	SECT	SECTION
ACTR	ACTUATOR	ELCTLT	ELECTROLYTIC	INSUL	INSULATOR	SEMICOND	SEMICONDUCTOR
ADPTR	ADAPTER	ELEM	ELEMENT	INTL	INTERNAL	SHLD	SHIELD
ALIGN	ALIGNMENT	EPL	ELECTRICAL PARTS LIST	LPHLDR	LAMPHOLDER	SHLDR	SHOULDERED
AL	ALUMINUM	EQPT	EQUIPMENT	MACH	MACHINE	SKT	SOCKET
ASSEM	ASSEMBLED	EXT	EXTERNAL	MECH	MECHANICAL	SL	SLIDE
ASSY	ASSEMBLY	FIL	FILLISTER HEAD	MTG	MOUNTING	SLFLKG	SELF-LOCKING
ATTEN	ATTENUATOR	FLEX	FLEXIBLE	NIP	NIPPLE	SLVG	SLEEVING
AWG	AMERICAN WIRE GAGE	FLH	FLAT HEAD	NON WIRE	NOT WIRE WOUND	SPR	SPRING
BD	BOARD	FLTR	FILTER	OBD	ORDER BY DESCRIPTION	SQ	SQUARE
BRKT	BRACKET	FR	FRAME or FRONT	OD	OUTSIDE DIAMETER	SST	STAINLESS STEEL
BRS	BRASS	FSTNR	FASTENER	OVH	OVAL HEAD	STL	STEEL
BRZ	BRONZE	FT	FOOT	PH BRZ	PHOSPHOR BRONZE	SW	SWITCH
BSHG	BUSHING	FXD	FIXED	PL	PLAIN or PLATE	T	TUBE
CAB	CABINET	GSKT	GASKET	PLSTC	PLASTIC	TERM	TERMINAL
CAP	CAPACITOR	HDL	HANDLE	PN	PART NUMBER	THD	THREAD
CER	CERAMIC	HEX	HEXAGON	PNH	PAN HEAD	THK	THICK
CHAS	CHASSIS	HEX HD	HEXAGONAL HEAD	PWR	POWER	TNSN	TENSION
CKT	CIRCUIT	HEX SOC	HEXAGONAL SOCKET	RCPT	RECEPTACLE	TPG	TAPPING
COMP	COMPOSITION	HLCPS	HELICAL COMPRESSION	RES	RESISTOR	TRH	TRUSS HEAD
CONN	CONNECTOR	HLEXT	HELICAL EXTENSION	RGD	RIGID	V	VOLTAGE
COV	COVER	HV	HIGH VOLTAGE	RLF	RELIEF	VAR	VARIABLE
CPLG	COUPLING	IC	INTEGRATED CIRCUIT	RTNR	RETAINER	W/	WITH
CRT	CATHODE RAY TUBE	ID	INSIDE DIAMETER	SCH	SOCKET HEAD	WSHR	WASHER
DEG	DEGREE	IDENT	IDENTIFICATION	SCOPE	OSCILLOSCOPE	XFMR	TRANSFORMER
DWR	DRAWER	IMPLR	IMPELLER	SCR	SCREW	XSTR	TRANSISTOR

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
000BH	FAB-TEK	17 SUGAR HALLOW ROAD	DANBURY, CT 06810
000EX	O'HARA METAL PRODUCT COMPANY	542 BRANNAN STREET	SAN FRANCISCO, CA 94107
00779	AMP, INC.	P O BOX 3608	HARRISBURG, PA 17105
11897	PLASTIGLIDE MFG. CORPORATION	P O BOX 867, 1757 STANFORD ST.	SANTA MONICA, CA 90406
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
23740	AMUNEAL MFG., CORP.	4737 DARRAH	PHILADELPHIA, PA 19124
49671	RCA CORPORATION	30 ROCKEFELLER PLAZA	NEW YORK, NY 10020
70318	ALLMETAL SCREW PRODUCTS CO., INC.	821 STEWART AVE.	GARDEN CITY, NY 11530
71785	TRW, CINCH CONNECTORS	1501 MORSE AVENUE	ELK GROVE VILLAGE, IL 60007
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
73803	TEXAS INSTRUMENTS, INC., METALLURGICAL MATERIALS DIV.	34 FOREST STREET	ATTLEBORO, MA 02703
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120
78471	TILLEY MFG. CO.	900 INDUSTRIAL RD.	SAN CARLOS, CA 94070
79136	WALDES, KOHINOOR, INC.	47-16 AUSTEL PLACE	LONG ISLAND CITY, NY 11101
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153
86928	SEASTROM MFG. COMPANY, INC.	701 SONORA AVENUE	GLENDALE, CA 91201
93907	TEXTRON INC. CAMCAR DIV	600 18TH AVE	ROCKFORD, IL 61101

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
1-	337-2807-01			2	SHIELD,ELEC:SIDE,PLUG-IN UNIT W/INSUL	80009	337-2807-01
					(ATTACHING PARTS)		
-2	105-0869-00			2	LATCH,PANEL:SIDE,1/4 TURN,PLASTIC	80009	105-0869-00
					- - - * - - -		
	----- -----			-	SHIELD INCLUDES:		
-3	342-0540-00			1	. INSULATOR,PLATE:SHIELD	80009	342-0540-00
-4	366-1190-02			1	KNOB:0.252 ID X0.706 OD,0.6H	80009	366-1190-02
-5	358-0029-00			1	BSHG,MACH.THD:HEX,0.375-32 X 0.438"LONG	80009	358-0029-00
					(ATTACHING PARTS)		
-6	210-0590-00			1	NUT,PLAIN,HEX.:0.375 X 0.438 INCH,STL	73743	2X28269-402
-7	210-0978-00			1	WASHER,FLAT:0.375 ID X 0.50 INCH OD,STL	78471	OBD
					- - - * - - -		
-8	366-1851-00			1	KNOB,LATCH:SIL GY,0.625 X 0.25 X 1.09	80009	366-1851-00
-9	----- -----			2	JACK,TIP:(SEE J530,J540 REPL)		
					(ATTACHING PARTS)		
-10	210-0465-00			2	NUT,PLAIN,HEX.:0.25-32 X 0.375 INCH BRS	73743	3095-402
-11	210-0223-00			2	TERMINAL,LUG:0.25 INCH DIA,SE	86928	A313-136
-12	210-0905-00			2	WASHER,FLAT:0.256 ID X 0.05 THK,BRS	83385	OBD
-13	342-0137-00			2	WASHER,NONMETAL:0.266 ID X0.50 OD	80009	342-0137-00
					- - - * - - -		
-14	200-0103-00			1	NUT,PLAIN,KNURL:0.25-28 X 0.375" OD,BRASS	80009	200-0103-00
-15	355-0507-00			1	STUD,SHOULDERED:BINDING POST	80009	355-0507-00
					(ATTACHING PARTS)		
-16	210-0455-00			1	NUT,PLAIN,HEX.:0.25-28 X 0.375 INCH,BRASS	73743	3089-402
-17	210-0046-00			1	WASHER,LOCK:0.261 ID,INTL,0.018 THK,BRS	78189	1214-05-00-0541C
					- - - * - - -		
-18	----- -----			2	CONNECTOR,RCPT:(SEE J500,J520 REPL)		
-19	----- -----			1	CONN,RCPT,ELEC:(SEE J510 REPL)		
-20	333-2631-01			1	PANEL,FRONT:	80009	333-2631-01
	----- -----			-	(STANDARD ONLY)		
	333-2631-00			1	PANEL,FRONT:	80009	333-2631-00
	----- -----			-	(OPTION 01 ONLY)		
	333-2631-04			1	PANEL,FRONT:	80009	333-2631-04
	----- -----			-	(OPTION 02 ONLY)		
					(ATTACHING PARTS)		
-21	213-0875-00			2	SCR ASSEM WSHR:6-32 X 0.5,TAPTITE,PNH	93907	OBD
					- - - * - - -		
-22	334-3807-00			1	MARKER,IDENT:MKD AA501 AVOID ANALYZER	80009	334-3807-00
-23	378-0159-02			1	LENS,LED,DSPL:RED,W/MARKING	80009	378-0159-02
-24	407-2496-00			1	BRACKET,CKT BD:MAIN,AL	80009	407-2496-00
					(ATTACHING PARTS)		
-25	211-0101-00			2	SCREW,MACHINE:4-40 X 0.25,100 DEG,FLH STL	83385	OBD
-26	211-0008-00			2	SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-27	210-0054-00			2	WASHER,LOCK:SPLIT,0.118 ID X 0.212"OD STL	83385	OBD
					- - - * - - -		
-28	407-2495-00			1	BRACKET,CKT BD:LOGIC,AL	80009	407-2495-00
					(ATTACHING PARTS)		
-29	211-0101-00			2	SCREW,MACHINE:4-40 X 0.25,100 DEG,FLH STL	83385	OBD
-30	211-0601-00			1	SCR,ASSEM WSHR:6-32 X 0.312,DOUBLE SEMS	83385	OBD
					- - - * - - -		
-31	386-4348-01			1	SUBPANEL,FRONT:	80009	386-4348-01
					(ATTACHING PARTS)		
-32	211-0541-00			2	SCREW,MACHINE:6-32 X 0.25"100 DEG,FLH STL	83385	OBD
					- - - * - - -		
-33	366-1512-00			6	PUSH BUTTON:GRAY,0.18 SQ X 0.83 INCH LG	80009	366-1512-00
-34	384-1341-00			4	EXTENSION SHAFT:2.183 INCH LONG,OFFSET	80009	384-1341-00
-35	366-1559-01			1	PUSH BUTTON:GRAY,0.43 L X0.18 W X 0.18 H	80009	366-1559-01
-36	366-1512-01			1	PUSH BUTTON:CHARCOAL GY,0.18 SQ X 0.8	80009	366-1512-01
	----- -----			-	(STANDARD ONLY)		
	366-1512-01			2	PUSH BUTTON:CHARCOAL GY,0.18 SQ X 0.8	80009	366-1512-01
	----- -----			-	(OPTION 01 AND 02 ONLY)		
-37	366-1559-02			5	PUSH BUTTON:CHARCOAL,0.18SQ X 0.43	80009	366-1559-02
-38	366-1559-00			5	PUSH BUTTON:SIL GY,0.18 SQ X 0.43	80009	366-1559-00
-39	384-1099-00			5	EXTENSION SHAFT:PUSH BUTTON,1.54 INCH LONG	80009	384-1099-00
-40	255-0334-00			FT	PLASTIC CHANNEL:12.75 X 0.175X 0.155,NYL	11897	122-37-2500

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
1-41	386-4392-01			1	PANEL,REAR:	80009	386-4392-01
					(ATTACHING PARTS)		
-42	213-0789-00			2	SCREW,TPG,TF:6-32 X 0.375,TAPTITE,PNH	93907	OBD
-43	386-3657-01			2	SUPPORT,PLUG IN:	93907	OBD
					- - - * - - -		
	337-2917-00			1	SHIELD,ELEC:TRANSFORMER	23740	OBD
					(ATTACHING PARTS)		
	211-0147-00			3	SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
	210-1178-00			2	WSHR,SHOULDERED:FOR MTG TO-220 TRANSISTOR	49671	DF 137A
	220-0438-00			3	NUT,PLAIN,HEX:4-40 X 0.25 HEX,SST	70318	OBD
	210-0058-00			3	WASHER,LOCK:#4 EXT,0.015 THK SST	70318	OBD
					- - - * - - -		
-44	426-1716-00			1	FR SECT,PLUG-IN:TOP,AL	80009	426-1716-00
-45	351-0672-00			2	GUIDE CKT BOARD:PLASTIC	80009	351-0672-00
-46	351-0604-00			2	GUIDE,CKT BOARD:PLASTIC	80009	351-0604-00
-47	214-1061-00			2	SPRING,GROUND:FLAT	80009	214-1061-00
-48	343-0687-00		B010100X	1	RETAINER,CKT CD:5.11 L,0.124 DIA,SST	80009	343-0687-00
-49	----- -----			1	CKT BOARD ASSY:DISPLAY(SEE A10 REPL)		
					(ATTACHING PARTS)		
-50	211-0244-00			2	SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH STL	78189	OBD
					- - - * - - -		
	----- -----			-	CKT BOARD ASSY INCLUDES:		
-51	----- -----			1	. CONN,RCPT,ELEC:(SEE A10J2030 REPL)		
-52	----- -----			1	. TERM SET,PINI(SEE A10J1012,J2020,J2040 REPL)		
-53	175-5137-00			1	CA ASSY,SP,ELEC:34,28 AWG,8.5 L,RIBBON	22526	OBD
	----- -----			-	(FROM A11J1111 TO A10J2030)		
-54	----- -----			1	CKT BOARD ASSY:DVM(SEE A11 REPL)		
					(ATTACHING PARTS)		
-55	211-0244-00			3	SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH STL	78189	OBD
					- - - * - - -		
	----- -----			-	CKT BOARD ASSY INCLUDES:		
-56	136-0269-02			4	. SKT,PL-IN ELEK:MICROCIRCUIT,14 DIP,LOW CLE	73803	CS9002-14
-57	----- -----			1	. TERM SET,PIN:(SEE A11J1221 REPL)		
-58	----- -----			1	. CONN,RCPT,ELEC:(SEE A11J1111 REPL)		
-59	136-0623-00			1	. SOCKET,PLUG-IN:40 DIP,LOW PROFILE	73803	CS9002-40
-60	136-0499-14			1	. CONNECTOR,RCPT,:14 CONTACT	00779	4-380949-4
-61	129-0420-00			3	POST,ELEC-MECH:0.575 LONG X 0.188 I HEX	80009	129-0420-00
					(ATTACHING PARTS)		
-62	211-0244-00			3	SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH STL	78189	OBD
					- - - * - - -		
	672-0883-00			1	CKT BOARD ASSY:CONTROL LOGIC W/CAM SW	80009	672-0883-00
	----- -----			1	. SW CAM ACTR AS:(SEE S1521 REPL)		
					(ATTACHING PARTS)		
-63	211-0678-00			4	. SCR,ASSEM WSHR:4-40 X 0.281 L,PNH STEEL	01536	OBD
					- - - * - - -		
-64	131-0963-00			1	. CONTACT,ELEC:GROUNDING	000EX	OBD
	----- -----			-	. . SWITCH ASSY INCLUDES:		
-65	200-2488-00			1	. . COVER,CAM SW:ALUMINUM	80009	200-2488-00
					(ATTACHING PARTS)		
-66	211-0678-00			4	. . SCR,ASSEM WSHR:4-40 X 0.281 L,PNH STEEL	01536	OBD
					- - - * - - -		
-67	354-0390-00			1	. . RING,RETAINING:0.338 ID X 0.025" THK,STL	79136	5100-37MD
-68	131-0963-00			1	. . CONTACT,ELEC:GROUNDING	000EX	OBD
-69	210-0406-00			2	. . NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-70	214-1139-02			2	. . SPRING,FLAT:GREEN COLORED	80009	214-1139-02
-71	214-1752-00			2	. . ROLLER,DETENT:	80009	214-1752-00
-72	401-0178-01			1	. . BEARING,CAM SW:CENTER/REAR	80009	401-0178-01
-73	210-0406-00			4	. . NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-74	401-0180-00			1	. . BEARING,CAM SW:FRONT & REAR	80009	401-0180-00
-75	105-0850-00			1	. . ACTUATOR,CAM SW:LEVEL RANGE	80009	105-0850-00
-76	384-0878-30			1	. . SHAFT,CA SW:OUTER CONCENTRIC W/DR	80009	384-0878-30
-77	----- -----			1	. CKT BOARD ASSY:CONTROL LOGIC(SEE A12 REPL)		
-78	----- -----			1	. . CONTACT ASSY,EL:(SEE A12J1301 REPL)		
-79	----- -----			3	. . TERM,TEST POINT:(SEE A12TP1200,TP1240,		
	----- -----			-	. . TP1410 REPL)		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
1-80	136-0269-02			13	. . SKT,PL-IN ELEK:MICROCIRCUIT,14 DIP,LOW CLE	73803	CS9002-14
-81	136-0260-02			13	. . SKT,PL-IN ELEK:MICROCIRCUIT,16 DIP,LOW CLE	71785	133-51-92-008
-82	----- -----			1	. . TERM SET,PIN:(SEE A12J1401,J1503,J1530 REPL)		
-83	----- -----			1	. . CONTACT,SET ELE:(SEE A12J1001,J1002,J1101,		
	----- -----			-	. . J1102,J1201 REPL)		
-84	----- -----			1	. . SWITCH,PUSH:(SEE A12S1411 REPL)		
-85	361-0385-00			6	. . SPACER,PB SW:0.164 INCH LONG	80009	361-0385-00
-86	361-0382-00			6	. . SPACER,PB SW:BROWN,0.275 INCH LONG	80009	361-0382-00
-87	----- -----			1	. . SWITCH,PUSH:(SEE A12S1531 REPL)		
-88	131-0604-00			6	. . CONTACT,ELEC:CKT BD SW,SPR,CU BE	80009	131-0604-00
-89	----- -----			1	CKT BOARD ASSY:IMD(SEE A13 REPL)		
	----- -----			-	(OPTION 01 AND 02 ONLY)		
					(ATTACHING PARTS)		
-90	211-0244-00			3	SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH STL	78189	OBD
-91	129-0457-00			3	SPACER,POST:1.07L,W/4-40 TAP 1 END	80009	129-0457-00
-92	210-0406-00			1	NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-93	210-0054-00			1	WASHER,LOCK:SPLIT,0.118 ID X 0.212"OD STL	83385	OBD
					- - - * - - -		
	----- -----			-	CKT BOARD ASSY INCLUDES:		
-94	----- -----			1	. CONT SET,ELE:(SEE A13J1041,J1401,J1411 REPL)		
-95	136-0260-02			1	. SKT,PL-IN ELEK:MICROCIRCUIT,16 DIP,LOW CLE	71785	133-51-92-008
-96	136-0269-02			1	. SKT,PL-IN ELEK:MICROCIRCUIT,14 DIP,LOW CLE	73803	CS9002-14
-97	136-0514-00			5	. SKT,PL-IN ELEC:MICROCIRCUIT,8 DIP	73803	CS9002-8
-98	131-0993-00			1	. BUS,CONDUCTOR:2 WIRE BLACK	00779	530153-2
-99	----- -----			1	. TERM SET,PIN:(SEE A13J1101,J1131 REPL)		
-100	----- -----			1	CKT BOARD ASSY:INPUT/NOTCH FILTER(SEE A14 REPL)		
					(ATTACHING PARTS)		
-101	211-0661-00			2	SCREW,MACHINE:4-40 X 0.25 INCH,PNH,STL	83385	OBD
					- - - * - - -		
	----- -----			-	CKT BOARD ASSY INCLUDES:		
-102	----- -----			1	. TERM SET,PIN:(SEE A14J1620 REPL)		
-103	----- -----			1	. SWITCH,PUSH:(SEE A14S1600 REPL)		
-104	361-0385-00			4	. SPACER,PB SW:0.164 INCH LONG	80009	361-0385-00
-105	361-0383-00			4	. SPACER,PB SW:CHARCOAL,0.33 INCH LONG	80009	361-0383-00
-106	344-0154-00			4	. CLIP,ELECTRICAL:FUSE,CKT BD MT	80009	344-0154-00
-107	----- -----			1	. TERM,TEST POINT:(SEE A14TP1310 REPL)		
-108	136-0269-02			2	. SKT,PL-IN ELEK:MICROCIRCUIT,14 DIP,LOW CLE	73803	CS9002-14
-109	337-2139-00			2	. SHIELD,ELEC:INPUT COUPLING SWITCH	80009	337-2139-00
-110	----- -----			1	. TERM SET,PIN:(SEE A14J1200,J1301,J1311,J1430,		
	----- -----			-	. J1500,J1600 REPL)		
-111	----- -----			1	. CONTACT SET,ELE:(SEE A14J1201,J1300 REPL)		
-112	136-0514-00			13	. SKT,PL-IN ELEC:MICROCIRCUIT,8 DIP	73803	CS9002-8
-113	136-0260-02			3	. SKT,PL-IN ELEK:MICROCIRCUIT,16 DIP,LOW CLE	71785	133-51-92-008
-114	337-2806-00			1	SHIELD,ELEC:CIRCUIT BOARD	80009	337-2806-00
					(ATTACHING PARTS)		
-115	211-0012-00			3	SCREW,MACHINE:4-40 X 0.375,PNH STL CD PL	83385	OBD
-116	129-0420-00			2	POST,ELEC-MECH:0.575 LONG X 0.188 I HEX	80009	129-0420-00
-117	361-0548-00			3	SPACER,RING:0.125 ID X 0.25 OD X 0.110 ID	80009	361-0548-00
	210-0004-00			2	WASHER,LOCK:#4 INTL,0.015THK,STL CD PL	78189	1204-00-00-0541C
-118	210-0406-00			1	NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-119	210-0054-00			1	WASHER,LOCK:SPLIT,0.118 ID X 0.212"OD STL	83385	OBD
					- - - * - - -		
-120	385-0107-00			2	SPACER,POST:0.75 L W/4-40 THD THRU,NYL	80009	385-0107-00
					(ATTACHING PARTS)		
-121	211-0244-00			2	SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH STL	78189	OBD
					- - - * - - -		
-122	----- -----			1	CKT BOARD ASSY:MAIN(SEE A15 REPL)		
-123	----- -----			1	. CONTACT SET,ELE:(SEE A15J1100,J1200,J1300,		
	----- -----			-	. J1400,J1401,J1500,J1600 REPL)		
-124	136-0269-02			1	. SKT,PL-IN ELEK:MICROCIRCUIT,14 DIP,LOW CLE	73803	CS9002-14
-125	344-0154-00			6	. CLIP,ELECTRICAL:FUSE,CKT BD MT	80009	344-0154-00
-126	136-0260-02			4	. SKT,PL-IN ELEK:MICROCIRCUIT,16 DIP,LOW CLE	71785	133-51-92-008
-127	214-2518-00			1	. HEAT SINK,XSTR:TO-220 OR TO-202	000BH	106B-B-HT
-128	136-0514-00			7	. SKT,PL-IN ELEC:MICROCIRCUIT,8 DIP	73803	CS9002-8
-129	----- -----			1	. SWITCH,PUSH:(SEE A15S1100 REPL)		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
1-130	361-0573-00			4	. SPACER,SLEEVE:0.234 L,BLACKPP	80009	361-0573-00
-131	136-0241-00			1	. SOCKET,PLUG-IN:10 CONTACT,ROUND	71785	133-99-12-064
-132	----- -----			1	. TERM,TEST POINT:(SEE A15TP1411 REPL)		
-133	----- -----			1	. SWITCH,PUSH:(SEE A15S1000 REPL)		
-134	361-0385-00			4	. SPACER,PB SW:0.164 INCH LONG	80009	361-0385-00
-135	214-3143-00			1	SPRING,HLEXT:0.125 OD X 0.545 L, X LOOP	80009	214-3143-00
-136	105-0865-00			1	BAR,LATCH RLSE:	80009	105-0865-00
-137	105-0866-00			1	LATCH,RETAINING:SAFETY	80009	105-0866-00
-138	351-0604-00			3	GUIDE,CKT BD:PLASTIC	80009	351-0604-00
-139	426-1717-01			1	FR SECT,PLUG-IN:BOTTOM,AL	80009	426-1717-01

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
					STANDARD WIRE ASSEMBLIES		
	175-5136-00			1	CA ASSY,SP,ELEC:10,26 AWG,5.0 L,RIBBON	80009	175-5136-00
	----- -----			-	(FROM A10J1012 TO A11J1221)		
	352-0168-09			1	. CONN BODY,PL,EL:10 WIRE WHITE	80009	352-0168-09
	175-3264-00			1	CA ASSY,SP,ELEC:5,26 AWG,7.0 L,RIBBON	80009	175-3264-00
	----- -----			-	(FROM A10J2020 TO A12J1503)		
	352-0161-08			2	. CONN BODY,PL,EL:3 WIRE GRAY	80009	352-0161-08
	175-5137-00			1	CA ASSY,SP,ELEC:9,26 AWG,8.5 L,RIBBON	80009	175-5137-00
	----- -----			-	(FROM A10J2030 TO A11J1111)		
	175-3262-00			1	CA ASSY,SP,ELEC:9,26 AWG,8.0 L,RIBBON	80009	175-3262-00
	----- -----			-	(FROM A10J2040 TO A12J1102)		
	352-0164-03			2	. CONN BODY,PL,EL:6 WIRE ORANGE	80009	352-0164-03
	198-4302-00			1	WIRE SET ELEC:	80009	198-4302-00
	----- -----			-	(FROM A12 TO A14J1620. SUBPART OF A12)		
	352-0199-03			1	. CONN BODY,PL,EL:3 WIRE ORANGE	80009	352-0199-03
	175-3261-00			1	CA ASSY,SP,ELEC:9,26 AWG,10.0 L,RIBBON	80009	175-3261-00
	----- -----			-	(FROM A12J1001 TO A14J1500)		
	352-0166-00			2	. CONN BODY,PL,EL:8 WIRE BLACK	80009	352-0166-00
	175-5152-00			1	CA ASSY,SP,ELEC:4,26 AWG,3.0 L,RIBBON	80009	175-5152-00
	----- -----			-	(FROM A12J1002 TO A14J1200)		
	352-0162-01			2	. CONN BODY,PL,EL:4 WIRE BROWN	80009	352-0162-01
	175-3263-00			1	CA ASSY,SP,ELEC:6,26 AWG,9.0 L,RIBBON	80009	175-3263-00
	----- -----			-	(FROM A12J1101 TO A15J1401)		
	352-0164-02			2	. CONN BODY,PL,EL:6 WIRE RED	80009	352-0164-02
	175-3260-00			1	CA ASSY,SP,ELEC:9,26 AWG,10.0 L,RIBBON	80009	175-3260-00
	----- -----			-	(FROM A12J1201 TO A15J1100)		
	352-0167-04			2	. CONN BODY,PL,EL:9 WIRE YELLOW	80009	352-0167-04
	175-3259-00			1	CA ASSY,SP,ELEC:10,26 AWG,4.0 L,RIBBON	80009	175-3259-00
	----- -----			-	(FROM A12J1401 TO A14J1600)		
	352-0168-05			2	. CONN BODY,PL,EL:10 WIRE GREEN	80009	352-0168-05
	175-3636-00			1	CA ASSY,SP,ELEC:2,26 AWG,14.0 L,RIBBON	80009	175-3636-00
	----- -----			-	(FROM A12J1530 TO A15J1600)		
	352-0161-00			1	. HLDR,TERM CONN:3 WIRE BLACK	80009	352-0161-00
	352-0161-02			1	. CONN BODY,PL,EL:3 WIRE RED	80009	352-0161-02
	175-5134-00			1	CA ASSY,SP,ELEC:5,26 AWG,3.0 L,RIBBON	80009	175-5134-00
	----- -----			-	(FROM A14J1201 TO A15J1400)		
	352-0163-06			2	. CONN BODY,PL,EL:5 WIRE BLUE	80009	352-0163-06
	175-5135-00			1	CA ASSY,SP,ELEC:10,26 AWG,4.0 L,RIBBON	80009	175-5135-00
	----- -----			-	(FROM A14J1300 TO A15J1300)		
	352-0168-06			2	. CONN BODY,PL,EL:10 WIRE BLUE	80009	352-0168-06
	198-4299-00			1	WIRE SET ELEC:		
	----- -----			-	(FROM A15J1200 TO J520,J510,J500)		
	352-0164-00			1	. CONN BODY,PL,EL:6 WIRE BLACK	80009	352-0164-00

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
					OPTION 01 WIRE ASSEMBLIES		
	175-3374-00			1	CABLE ASSY,RF:50 OHM COAX,7.0 L	80009	175-3374-00
	----- -----			-	(FROM A13J1041 TO A14J1301)		
	352-0169-02			2	. CONN BODY,PL,EL:2 WIRE RED	80009	352-0169-00
	175-3373-00			1	CA ASSY,SP,ELEC:4,26 AWG,4.0 L,RIBBON	80009	175-3373-00
	----- -----			-	(FROM A13J1101 TO A15J1500)		
	352-0162-07			2	. CONN BODY,PL,EL:4 WIRE VIOLET	80009	352-0162-07
	175-3375-00			2	CABLE ASSY,RF:50 OHM COAX,3.0 L	80009	175-3375-00
	----- -----			-	(FROM A13J1401 TO A14J1430)		
	----- -----			-	(FROM A13J1411 TO A14J1311)		
	352-0169-01			4	. HLDR TERM CONN:2 WIRE,BROWN	80009	352-0169-01
					OPTION 02 WIRE ASSEMBLIES		
	175-3373-00			1	CA ASSY,SP,ELEC:4,26 AWG,4.0 L,RIBBON	80009	175-3373-00
	----- -----			-	(FROM A11J1101 TO A15J1500)		
	352-0162-07			2	. CONN BODY,PL,EL:4 WIRE VIOLET	80009	352-0162-07
	175-3374-00			1	CABLE ASSY,RF:50 OHM COAX,7.0 L	80009	175-3374-00
	----- -----			-	(FROM A11J1041 TO A14J1301)		
	352-0169-02			2	. CONN BODY,PL,EL:2 WIRE RED	80009	352-0169-02
	175-3375-00			2	CABLE ASSY,RF:50 OHM COAX,3.0 L	80009	175-3375-00
	----- -----			-	(FROM A11J1401 TO A11J1430)		
	----- -----			-	(FROM A11J1411 TO A14J1311)		
	352-0169-01			4	. HLDR TERM CONN:2 WIRE,BROWN	80009	352-0169-01

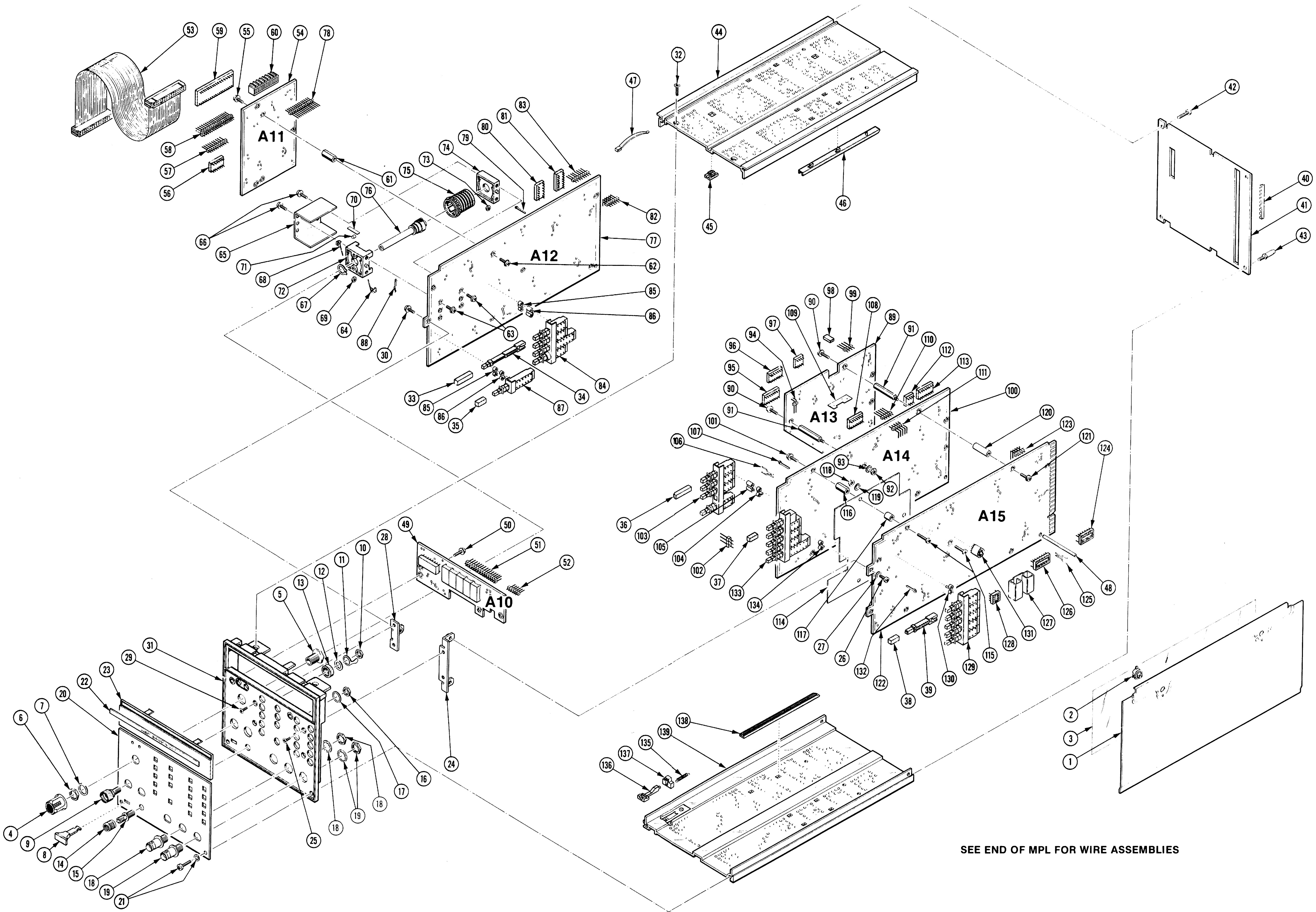

FIG. 1 EXPLODED

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
					ACCESSORIES		
	070-2958-00			1	MANUAL,TECH:INSTRUCTION	80009	070-2958-00

ACCESSORIES

MANUAL CHANGE INFORMATION

At Tektronix, we continually strive to keep up with latest electronic developments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on following pages.

A single change may affect several sections. Since the change information sheets are carried in the manual until all changes are permanently entered, some duplication may occur. If no such change pages appear following this page, your manual is correct as printed.

Tektronix
COMMITTED TO EXCELLENCE

MANUAL CHANGE INFORMATION

Date: 7-1-81 Change Reference: C7/781

Product: AA501 DISTORTION ANALYZER Manual Part No.: 070-2958-00

DESCRIPTION

TEXT CORRECTION

Page 4-12 Step 9 k.

CHANGE TO READ:

k. CHECK--that the display reads ≤0.0018%.

Change the following on page 2-2:

1 INPUT LEVEL RANGE to 1 *INPUT RANGE*

Add the following on page 2-2:

13 RESPONSE

...(rms calibrated for sinewaves) *or quasi-peak in Option 02.*

Add the following on page 2-2:

15 ...(Option 01 *or 02* instruments only)

Add the following on page 2-4:

23 30 kHz LO PASS, *22.4 Hz to 22.4 kHz in Option 02*

24 'A' WEIGHTING, ⚠ *CCIR WTG in Option 02*

...all functions. *Operates only with Q-PK RESPONSE in Option 02 instruments.*

Add to page 2-5, paragraph one under heading LEVEL MEASUREMENTS:

...depending on the position of the RESPONSE pushbutton. *Option 02 instruments provide an rms or Q-PK response. This is useful for noise measurements.*

Add to page 2-6, paragraph six:

...frequency dependent weighting network. *Option 02 instruments provide filters corresponding to CCIR and DIN standards. These instruments employ a quasi-peak detector useful in measuring peak noise amplitudes at audio frequencies.* The AA 501 provides several...

Add to page 2-11, before FILTERS section:

NOISE MEASUREMENTS USING THE Q-PK DETECTOR

To make noise measurements, select an INPUT RANGE that adequately covers the expected peak noise voltage. As the peak noise may be considerably greater than the average noise level in the circuitry the DECREASE RANGE light may be illuminated for most measurements. Do not use the AUTO RANGE position for these noise measurements as the instrument responds to the peak measurements. Select either the 22.4 Hz to 22.4 kHz unweighted response or the CCIR WTG filters. The response curves for these filters are shown in Fig. 2-9. The CCIR WTG filter is useful when measuring subjective noisiness of audio equipment. For more information, refer to the previously mentioned CCIR and DIN standards.

Add to page 2-11, after the la$t paragraph on the page:

...standards for class 1 sound level meters.

Option 02 instruments provides CCIR WTG and 22.4 Hz to 22.4 kHz unweighted response limits. These are shown in Fig. 2-9. The CCIR WTG response is a subjective response for noise measurements in audio equipment. The 22.4 Hz to 22.4 kHz response limits are essentially flat from 30 Hz to 16 kHz.

Fig. 2-9. Response curves for AA 501 filters.

Fig. 2-9. Response curves for AA 501 filters.

(This figure replaces Fig. 2-9 in the manual.)

THEORY OF OPERATION Section 3

Add to page 3-5, second paragraph:

...U1220 and U1321. *U1321 and associated components are eliminated in Option 02 instruments.* Switch S1100B routes the signal...comprise the 30 kHz low pass filter. *In Option 02 instruments pressing S1100C places the 22.4 Hz to 22.4 kHz filter in the signal path. In the standard and Option 01 instruments switch S1100D* connects...

Add to page 3-5, after the fourth paragraph:

Option 02 instruments have a high-pass filter composed of C1131 and R1230 which drives two 3-pole filters in cascade. This high-pass filter is driven through S1100E from the output of U1220 or U1210B. The 3-pole filters are composed of U1230D and U1230C with associated components. U1230A provides the necessary gain. The output of this filter is switched to the input of U1230B, an active full-wave rectifier, via S1100D. These active filters provide the proper response for the CCIR WTG filter. The output from full-wave rectifier U1230B passes to pin 2 of U1231. This circuitry rapidly charges C1331 to the peak value of the input waveform. This peak voltage passes through U1330A, a low-pass filter with associated components and to the + input of U1330B. The peak positive voltage charges C1431 through CR1332. C1430 is also charged through CR1331. As the peak voltage disappears, C1431 slowly discharges through R1430. The voltage across C1430 remains constant until the voltage across C1431 decays to about 6.1 V below the level on C1430. Now C1430 discharges through transistor Q1330 operating as a zener diode. This circuitry serves to delay a minimum width peak pulse for at least 0.5 s. The purpose of this circuitry is to allow peak pulses to be displayed on the digital readout. The peak voltage is amplified via U1330C and connected to the converter output through Q1310 and U1310.

CALIBRATION Section 4

Add to Table 4-1, page 4-1:

Under PERFORMANCE CHECK STEP column, first equipment listed (Low distortion...) add:

...12,13,14,*16*

After second equipment listed (Sinewave oscillator...) add:

Function generator	*Triggerable, 2 V rms 200 Hz sinewave output*	*16*		*TEKTRONIX FG 501A*

Add to Table 4-1, page 4-2:

Under PERFORMANCE CHECK STEP column, first equipment listed (50 Ω coaxial...) add:

...12,13,14,*16*

Under PERFORMANCE CHECK STEP column, second equipment listed (Bnc female...) add:

...13,14,*16*

Page 4-3, change the following steps under Performance Check Steps to read:

3. ...Function Accuracy *and Input Ranges*
6. ...Distortion Accuracy, *Minimum Input Level and Fundamental Frequency Range*
8. ...SMPTE/DIN Mode (Option 01 *or 02* only)
9. ...Tone Test Mode (Option 01 *or 02* only)
10. ...SMPTE Test (Option 01 *or 02* only)
11. ...Tone Test (Option 01 *or 02* only)

11A. ...step 11 is performed, Option 01 *or 02* only)

Add:

16. Check Q-Pk Response Dynamic Characteristics (Option 02 only)

Page 4-3, change the following steps under Adjustment Procedure Steps to read:

2. ...Rms, Avg *Zero and (Option 02) Q-Pk Zero*

10. ...SMPTE Cal (Option 01 *or 02* only)

11. ...Freq Cal (Option 01 *or 02* only)

11A. ...step 11 is performed, Option 01 *or 02* only)

Delete the NOTE on page 4-3.

Add to page 4-6, step #3:

3. ...Function Accuracy *and Input Ranges*

   c. ...other pushbuttons out, *except the RESPONSE pushbutton may be either in or out.*

Add to page 4-7, step #3d:

d. ...Table 4-3. *(Level accuracy in Option 02 instruments, Q-PK response, is applicable from 20 Hz to 50 kHz only.)*

Add the following to page 4-8:

NOTE

For Standard and Option 01, perform steps 5e and f. For Option 02, perform steps 5g, h, and i.

(5)e. ...weighting pushbutton, *(standard and Option 01 instruments only).*

g. Press the CCIR WTG pushbutton.

h. Release the RESPONSE pushbutton.

i. CHECK — that the display reads ≤ 5.0 μV.

j. Remove the male bnc to dual binding post adapter and 1 kΩ resistor for the next step.

Change step 6, page 4-8, to read:

6. ...Distortion Accuracy, *Minimum Input Level and Fundamental Frequency Range*

Insert the following step on page 4-10, after step m:

n. *On Option 02 instruments press the* RESPONSE *pushbutton.*

Change steps n, o, p, and q on page 4-10 to "*o, p, q, and r*".

Delete the NOTE on page 4-10.

Add the following to step 7b, page 4-10:

b. ...pushbuttons out. *On Option 02 instruments press the* RESPONSE *pushbutton.*

Change the following steps on page 4-11 to read:

f. ...display reads ≤ 0.0025%. (*Disregard this step for Option 02 instruments.*)

k. ...display reads ≤ *0.0071%*.

Change step 8 to read:

8. ...in the SMPTE/DIN Mode (Option 01 *or 02*)

Add to step 8c, page 4-11:

c. ...other pushbuttons out. *On Option 02 instruments press the* REPSONSE *push-button.*

Add to step 9, page 4-11:

9. ...Tone Test Mode (Option 01 *or 02*)

Change step 9k on page 4-12 to read:

k. ...display reads ≤ *0.0018%*.

Add to step 10 on page 4-12:

10. ...SMPTE Test (Option 01 *or 02*)

Add to step 11 on page 4-12:

11. ...Tone Test (Option 01 *or 02)*

Add to step 11A on page 4-13:

11A. ...step 11 is performed, Option 01 *or 02)*

Change step 12c on page 4-14 to read:

c. ...*INPUT RANGE* switch to the *2 V* RANGE position.

After step 12j on page 4-14, add the following NOTE:

NOTE

Steps k through n apply to the standard and Option 01 instruments only.

After step 12q on page 4-15, add the following NOTE:

NOTE

Steps r through v apply to Option 02 instruments only.

Delete step 12r on page 4-15, and add the following steps:

r. Release the 80 kHz LO PASS pushbutton and press the 22.4 Hz to 22.4 kHz pushbutton.

s. Lower the frequency of the SG 505 until the display reads -3 dB.

t. CHECK — that the counter reads from 21.28 Hz to 23.52 Hz.

u. Raise the frequency of the SG 505 until the display reads -3 dB.

v. CHECK — that the counter reads from 21.28 kHz to 23.52 kHz.

NOTE

Steps w through cc spot check the response of the A weighting filter (standard and Option 01 instruments only). For more information, refer to ANSI S 1.4 1971 (revised 1976) or IEC Recommendation 179 for type 1 sound level meters.

w. Press the "A" WEIGHT pushbutton. Make certain all other FILTERS pushbuttons are released.

x. Set the output frequency of the SG 505 to 1 kHz.

y. CHECK — that the AA 501 display reads from -1.0 dB to +1.0 dB.

z. Set the SG 505 output frequency to 100 Hz.

aa. CHECK — that the AA 501 display reads from -20.1 dB to -18.1 dB.

bb. Set the SG 505 output frequency to 10 kHz.

cc. CHECK — that the AA 501 display reads from -6.5 dB to -0.5 dB.

NOTE

Steps dd through qq spot check the response of the CCIR weighting filter (Option 02 instruments only). For more information refer to CCIR Recommendation 468-2 or DIN 45405.

dd. Release all FILTERS pushbuttons and select Q-PK RESPONSE.

ee. Set the SG 505 output frequency to 1 kHz and the output amplitude to 0.4 V.

ff. Press the dB RATIO pushbutton. Press and release the PUSH TO SET 0 dB REF pushbutton.

gg. Press the CCIR WTG pushbutton.

hh. CHECK — that the AA 501 display reads from -0.2 dB to +0.2 dB.

ii. Set the SG 505 output frequency to 6.3 kHz. Adjust the output amplitude to obtain an AA 501 display reading of +12.2 dB.

jj. Set the SG 505 output frequency to 100 Hz.

kk. CHECK — that the AA 501 display reads from -20.8 dB to -18.8 dB.

ll. Set the SG 505 output frequency to 1 kHz.

mm. CHECK — that the AA 501 display reads from -0.5 dB to +0.5 dB.

nn. Set the SG 505 output frequency to 10 kHz.

oo. CHECK — that the AA 501 display reads from +7.3 dB to +8.9 dB.

pp. Set the SG 505 output frequency to 20 kHz.

qq. CHECK — that the AA 501 display reads from -24.2 dB to -20.2 dB.

rr. Leave these connections for the next step.

Add the following step to page 4-16:

16. *Check Q-pk Response Dynamic Characteristic (Option 02 only)*

NOTE

The following procedure is optional. It checks the peak-hold dynamic characteristic of the Q-PK detector circuitry. It is generally sufficient to verify proper operation and is provided in lieu of the complex procedures defined in CCIR Recommendation 468-2 or DIN 45405.

a. *Select the 2 V INPUT RANGE, LEVEL FUNCTION, VOLTS, and Q-PK RESPONSE. Make certain all FILTERS pushbuttons are out.*

b. *Connect the output of the FG 501A triggerable function generator to the INPUT of the AA 501. Connect the output of the SG 505 oscillator to the trigger input of the FG 501A.*

c. *Set the sinewave output frequency of the FG 501A to 200 Hz in the free run mode.*

d. *Adjust the FG 501A output amplitude until the AA 501 displays approximately 1.6 V.*

e. *Push the dB RATIO pushbutton and push and release the PUSH TO SET 0 dB REF pushbutton. Note that the AA 501 displays a reading of 0.0 dB.*

f. *Set the output frequency of the SG 505 to 10 Hz with maximum output amplitude (approximately 6 V rms).*

g. *Change the FG 501A to the triggered mode. Make certain the phase control setting is near 0°. (The FG 501A output signal should be a single cycle burst of 200 Hz starting at 0° phase at a 10 Hz repetition rate.)*

h. CHECK — *that the AA 501 display reads from -2.7 dB to -1.9 dB.*

Change step 2 on page 4-19 to read:

2. Adjust Rms, Avg Zero, *and (Option 02) Q-Pk Zero*

Add the following to step 2g on page 4-19:

g. ...Avg Zero, *(Option 02, R1334, Q-Pk Zero)*, for a display...

Change step 3g on page 4-19 to read:

g. *(standard and Option 01 instruments)* ADJUST — R1301,...

Insert the following steps after step 3g on page 4-19:

h. *(Option 02 instruments) ADJUST — R1330, Q-Pk Cal, for a display reading of 1.800 ±0.001.*

Change step 3h on page 4-19 to:

i. Leave this....

Add the following to step 11 on page 4-22:

11. ...Freq Cal (Option 01 *or 02*)

Add the following to step 11A on page 4-22:

11A. ...step 11 is performed, Option 01 *or 02* only)

Change 11A, step c on page 4-22 to read:

c. ...20%, and *RESPONSE* pushbuttons...

Delete step m of 11A on page 4-22 and add the following:

12. *Adjust CCIR Cal (Option 02)*

    a. *Connect the test equipment as shown in Fig. 4-15.*

    b. *Apply a 1 kHz 0.400 V rms sinewave to the AA 501 input.*

    c. *Make certain the INPUT RANGE switch is on the 2 V position.*

    d. *Press the FUNCTION LEVEL, and dB RATIO pushbuttons, all other pushbuttons out.*

    e. *Press the PUSH TO SET 0 dB REF pushbutton.*

    f. *Press the CCIR WTG pushbutton.*

    g. *ADJUST — R1132, CCIR Cal, for a display of 0.0 dB.*

    h. *Remove all connections.*

    i. *This completes the AA 501 Internal Adjustment procedure.*

OPTIONS Section 6

Add the following on page 6-1:

Option 01 *and 02* instruments...of this manual. *Option 02 instruments provide quasi-peak detection with 22.4 Hz to 22.4 kHz and CCIR weighted filters in place of the 30 kHz LO PASS and "A" WEIGHT filters.*