Tektronix®
COMMITTED TO EXCELLENCE

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

AA 501A
DISTORTION ANALYZER WITH OPTIONS 01 AND 02

INSTRUCTION MANUAL

Tektronix, Inc.
P.O. Box 500
Beaverton, Oregon 97077
070-6592-00
Product Group 76

Serial Number _____

First Printing JULY 1987

TABLE OF CONTENTS

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. REFER TO OPERATORS SAFETY SUMMARY AND SERVICE SAFETY SUMMARY PRIOR TO PERFORMING ANY SERVICE.

TABLE OF CONTENTS (cont)

LIST OF ILLUSTRATIONS

LIST OF TABLES

OPERATORS SAFETY SUMMARY

This general safety information 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 can result in damage to the equipment or other property.

WARNING statements identify conditions or practices that can 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.

Protective ground (earth) terminal.

ATTENTION—refer to manual.

Refer to manual.

Power Source

This product is designed to operate from a power module that does 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 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 Power Cord

Use only the power cord and connector specified for your product.

Use only a power cord that is in good condition.

Refer cord and connector changes to qualified service personnel.

Use the Proper Fuse

To avoid fire hazard, use only the fuses specified in the parts list for your product, and which is identical in type, voltage rating and current rating.

Refer fuse replacement to qualified service personnel.

Do Not Operate in Explosive Atmospheres

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

Do Not Operate Plug-in Unit 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.

SERVICING 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.

Do Not Wear Jewelry

Remove jewelry prior to servicing. Rings, necklaces, and other metallic objects could come into contact with dangerous voltages and currents.

Power Source

This product is intended to operate from a power module 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.

SPECIFICATION

Instrument Description

The AA 501A 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. In addition, 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 501A 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 instruements provide quasi-peak or true rms detection. This feature permits compariston 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 501A 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 environment section. 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 Requirement		Supplemental Information
INPUT (all functions)			
Impedance	100 k Ω ±2%, each side to ground		Full differential. Each side ac coupled through 1 μF and shunted to ground by approximately 200 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 μV to 200 V Range selection is manual or automatic. Autoranging 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} in ≥100 μV (−78 dBm) with level ranging indicators extinguished (T≤+40°C)	VOLTS	dBm OR dB RATIO	
20 Hz to 20 kHz	Within ±(2% +1 count)	±0.3 dB ±0.5% of reading	
10 Hz to 20 Hz and 20 kHz to 100 kHz	Within ±(4% +2 counts)	±0.5 dB	
Bandwidth (no filters selected)	At least 300 kHz		

Table 1-1 (cont)

Characteristics	Performance Requirement	Supplemental Information
Residual noise (Inputs shorted, T≤+40°C)	≤3.0 μV (−108 dBm) with 80 kHz, 400 Hz filters. Standard and Option 01 instruments only. ≤1.5 μV(−114 dBm) with A weighting filter. Option 02 only. ≤5.0 μV (−104 dBm) with CCIR weighting and quasi-peak response.	DC 510/DC 5010 radiated magnetic interference will degrade residual noise above specifications if installed directly to the left of the AA 501A.
TOTAL HARMONIC DISTORTION PLUS NOISE FUNCTIONS		
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.
Distortion ranges		Auto range, 20%, 2%, 0.2%, and dB. dB is internally autoranging with single effective display range. Auto range allows measurements above 20%.
Accuracy (THD ≤30% and readings ≥4% of selected distortion range).		Accuracy is limited by residual THD+N and filter selection. 100% reference level is total input signal amplitude including distortion and noise components.
20 Hz to 20 kHz	Within ±10% (±1 dB) for harmonics ≤100 kHz.	
10 Hz to 100 kHz	Within +10% −20% (+1 dB, −2 dB) for harmonics ≤300 kHz	
Residual THD+N (V_{in} ≥250 mV, all distortion, noise, and nulling error souces combined, T ≤40°C)		Measured with SG 505 oscillator
20 Hz to 20 kHz with 80 kHz noise limiting filter	<0.0032% rms Response (−90 dB) <0.0025% Average Response (−93 dB)	
10 Hz to 50 kHz, no filter	≤0.0071% rms Response (−83 dB)	
50 kHz to 100 kHz, no filter	<0.010% rms Response (−80 dB)	
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 Requirement	Supplemental Information
INTERMODULATION DISTORTION FUNCTION (OPT 01 and 02)		
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. Internal jumper selects Automatic, CCIF, or SMPTE/DIN.
SMPTE/DIN tests		
Lower frequency range		50 Hz to 250 Hz
Upper frequency range		Useable from 3 kHz to 160 kHz
Level ratio range		1:1 to 4:1, lower:upper
Residual IMD V_{in} ≥250 mV, 60 Hz, and 8 kHz, 4:1 amplitude ratio, T≤+40°C		Measured with SG 505 pair. <.0025% (−92 dB)
CCIF difference tone test		
Frequency range		Useable from 4 kHz to 160 kHz
Difference frequency range		80 Hz to 1 kHz
Minimum input level	60 mV(−22 dBm)	
Residual IMD V_{in} ≥250 mV, 14 kHz and 15 kHz, T≤+40°C	Measured with SG 505 pair. ≤0.0018%) (−92 dB)	
Accuracy (IMD ≤20% and readings ≥4% of selected distortion range)	Within ±10% (±1 dB) for IM components ≤1 kHz (Accuracy is limited by residual IMD and filter selection.)	
FILTERS		
400 Hz high pass	−3 dB at 400 Hz ±5%; at least −40 dB rejection at 60 Hz.	Three pole Butterworth response.
80 kHz low pass	−3 dB at 80 kHz ±5%	Three pole Butterworth response.
30 kHz low Pass	−3 dB at 30 kHz ±5%	Three pole Butterworth response.
A weighting (standard and Option 01 instrument only)		Within specifications for type 1 sound level meters listed in ANSI S 1.4 1971 (revised 1976) and IEC Recommendation 179. Test on 2 V range with V approximately equal to 1 V: 100 kHz: −19.1 ±0.7 dB 1 kHz: +0.3 ±0.4 dB 10 kHz: −2.8 ±1.0 dB

Table 1-1 (cont)

Characteristics	Performance Requirement	Supplemental Information
CCIR WTG (Option 02 only)		Within specifications of CCIR recommendation 468-2 and DIN 45405 for noise measurements with quasi-peak detector. Rms detector calibration shifted for 0 dB at 2.00 kHz instead of 1.00 kHz. Test on 2 V range with Vin 0.4 V: with quasi-peak response. 1 kHz:0.0 dB ±0.2 dB also test with Vin set for +12.2 dB at 6.3 kHz: 100 Hz: −19.8 dB +0.7 dB 1 kHz: 0.0 dB ±0.4 dB 10 kHz: +8.1 dB ±0.7 dB 20 kHz: −22.2 dB ±1.5 dB
External filter	Selects front panel AUXILIARY INPUT allowing connection of external filter between it and FUNCTION OUTPUT.	
FRONT PANEL SIGNALS		
Input Monitor		
V_{in} ≥50 mV	1 V rms ±10% (10 Hz to 100 kHz)	Constant amplitude (average response) verison of differential input signal. THD is typically ≤0.0010% (−100 dB) from 20 Hz to 20 kHz. Settling time is ≤1.5 seconds.
V_{in} ≤50 mV		Approximately 20 times input signal.
Function Output		
Signal	1 V, ±3%, for 1000 count volts or % display	Selected and filtered ac signal actually 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.
REAR INTERFACE SIGNALS		
Rear interface input		Pins 28B (+), 28A (−), 27B and 27A (common) are front panel selectable and independent of main front panel input. All characteristics are the same as main INPUT except maximum input voltage is limited to 42 V peak, 30 V rms. Due to potential crosstalk at the rear interface, noise and distortion performance may be degraded.
Input monitor		Pins 24A and 23A (gnd) same as front panel INPUT MONITOR

Table 1-1 (cont)

Characteristics	Performance Requirement	Supplemental Information
Function output		Pins 23B and 24B (gnd) same as front panel FUNCTION OUTPUT.
Auxiliary input		Pins 25B and 26B (gnd) same as front panel AUXILIARY INPUT. Maximum input voltage is 15 V peak, 6 V peak for linear operation.
Ac/dc converter output		Pins 20A and 19A (gnd). Dc output of the selected ac to dc converter. 1 V ±5% for 1000 count display with 500 Ω ±5% source resistance.
dB converter output		Pins 19B and 20B (gnd). Dc output of the logarithmic dB converter. 10 mV ±5% equals 1 dB of display with 1 kΩ ±5% source resistance. Changes in level or distortion range will cause brief ac transients.
DETECTORS AND DISPLAYS		
Detectors (Response)		
RMS		True rms detection
AVG (standard and Option 01 only)		Average detection, rms calibrated for sinewaves. Typically reads 1 to 2 dB lower than true rms detection for noise, THD+N, and IMD measurements.
Quasi-peak (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. Test on 2 V range at Vin 1.0 V. Reading with 10 Hz repetition rate 1 cycle tone bursts of 200 Hz triggered at 0° phase, shall be −2.3 dB ±0.3 dB referenced to same amplitude continuous 200 Hz signal.
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.	

Table 1-1 (cont)

Characteristics	Performance Requirement	Supplemental Information
MISCELLANEOUS		
Power consumption		Approximately 24 watts.
Internal power supplies		
+15		Nominally +15.1 V ±3%
−15		Nominally −15.1 V ±5%
+5		Nominally +5.25 V ±5%
Fuse data		
F4060		3 AG, 1 A, 250 V, fast blow
F4061		3 AG, 1 A, 250 V, fast blow
F4062		3 AG, 1.5 A, 250 V, fast blow
Recommended adjustment interval		2000 hours or 12 months, whichever occurs first.
Warm-up time		20 minutes; 60 minutes after storage in high humidity environment.
MTBF		6000 hours.

Table 1-2
ENVIRONMENTAL CHARACTERISTICS

Characteristics	Description	
Temperature		Meets MIL-T-28800C, class 5.
Operating	0°C to +50°C	
Non-operating	−40°C to +75°C	
Humidity	95% RH, 0 to +30°C 75% RH, to +40°C 45% RH, to +50°C	Meets MIL-T-28800C, class 5.
Altitude		Exceeds MIL-T-28800C, class 5.
Operating	4.6 km (15,000 ft)	
Non-operating	15 km (50,000 ft)	
Vibration	0.38 mm (0.015″) peak to peak, 5 Hz to 55 Hz, 75 minutes.	Meets MIL-T-28800C, class 5, when installed in qualified power modules.[b]
Shock	30 g's (1/2 sine), 11 ms duration, 3 shocks in each direction along 3 major axes, 18 total shocks.	Meets MIL-T-28800C, class 5, when installed in qualified power modules.[b] [c].
Bench Handling (plug-in only)	12 drops from 45°, 4″ or equilibrium, whichever occurs first.	Meets MIL-T-28800C, class 5.
Package Product Vibration and Shock (Plug-in only)	Qualified under National Safe Transit Association Preshipment Test Procedures 1A-B-1 and 1A-B-2.	
Electromagnetic Susceptibility	Within limits of MIL-STD-461B (April 1, 1980) Class B.	
Electromagnetic Interference	Within limits of F.C.C. Regulations, Part 15, Subpart J, Class A; VDE 0871 category B, VDE 0875; and MIL-STD-461B (April 1,1980) Class B	
Electrostatic Immunity	At least 15 kV discharge from 500 pF in series with 100 Ω to instrument case or any front panel connector without damage or permanent performance degradation (Input terminals limited to 10 kV).	

[a]With TM 500/5000-Series power moduel. System performance subject to exceptions of power module or other individual plug-ins.

[b]Refer to TM500/5000 power module specifications.

[c]Requires power module retainer bar or clip.

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	Approximately equal to 2.04 kg (4.5 lbs.)
Finish	
Front Panel	Plastic-aluminum laminate
Chassis	Anaodized aluminum

OPERATING INSTRUCTIONS

Preparation For Use

The AA 501A is calibrated and ready for use when received. It operates in any two compartments of a TM 500/TM 5000-Series power module. See the power module instruction manual for line voltage requirements and power module operation. Figure 2-1 shows the AA 501A installation and removal procedure.

CAUTION

Turn the power module off before inserting the AA 501A. 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 501A circuit board edge connector. Align the AA 501A chassis with the upper and lower guides of the selected compartment. Press the AA 501A in, to firmly seat the circuit board in the interconnecting jack.

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

Check that the AA 501A is fully inserted in the power module. Turn the power module power switch ON. 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 showing the owner (with address) and the name of an indi-

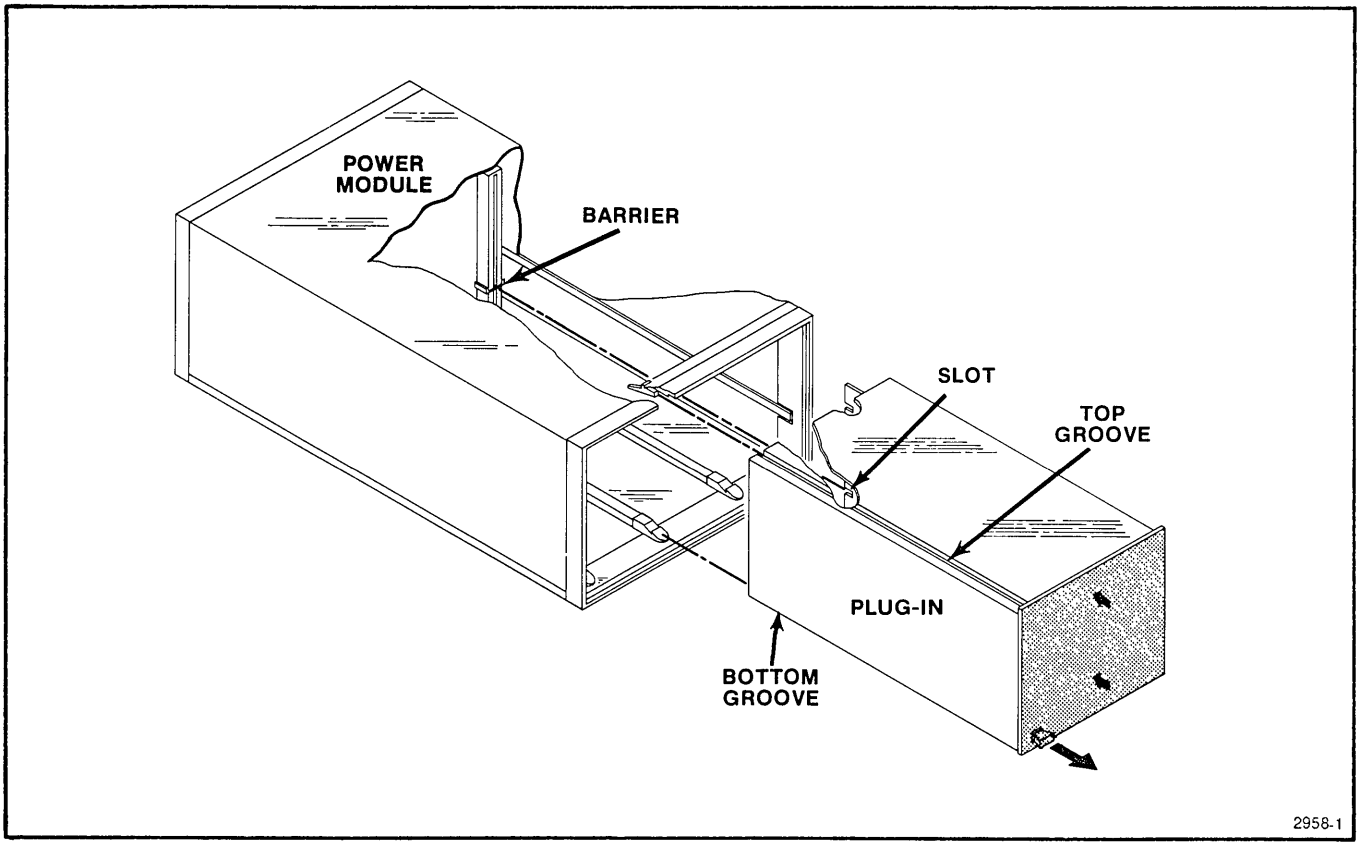


Fig. 2-1. Installation and removal.

vidual 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 501A are located on the front panel. Fig. 2-2 provides a brief description of all front panel controls, connectors, and indicators.

(1) **INPUT 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. If the FUNCTION selected is THD+N or IMD (on Option 01 or 02 instruments) a flashing light indicates insufficient input signal level for distortion measurements.

(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 units for level function. 0 dB reference is 0.7746 V corresponding to 1 mW into 600 Ω.

(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 or quasi-peak detection (option 02 instruments) both are rms calibrated for sinewaves.

(14) **THD+N**
Button in selects total harmonic distortion function.

(15) **IMD (Option 01 and 02 only)**
Button in selects intermodulation distortion function.

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

(17) **20%**
Button in selects full scale distortion readout of 20% with 0.01% resolution.

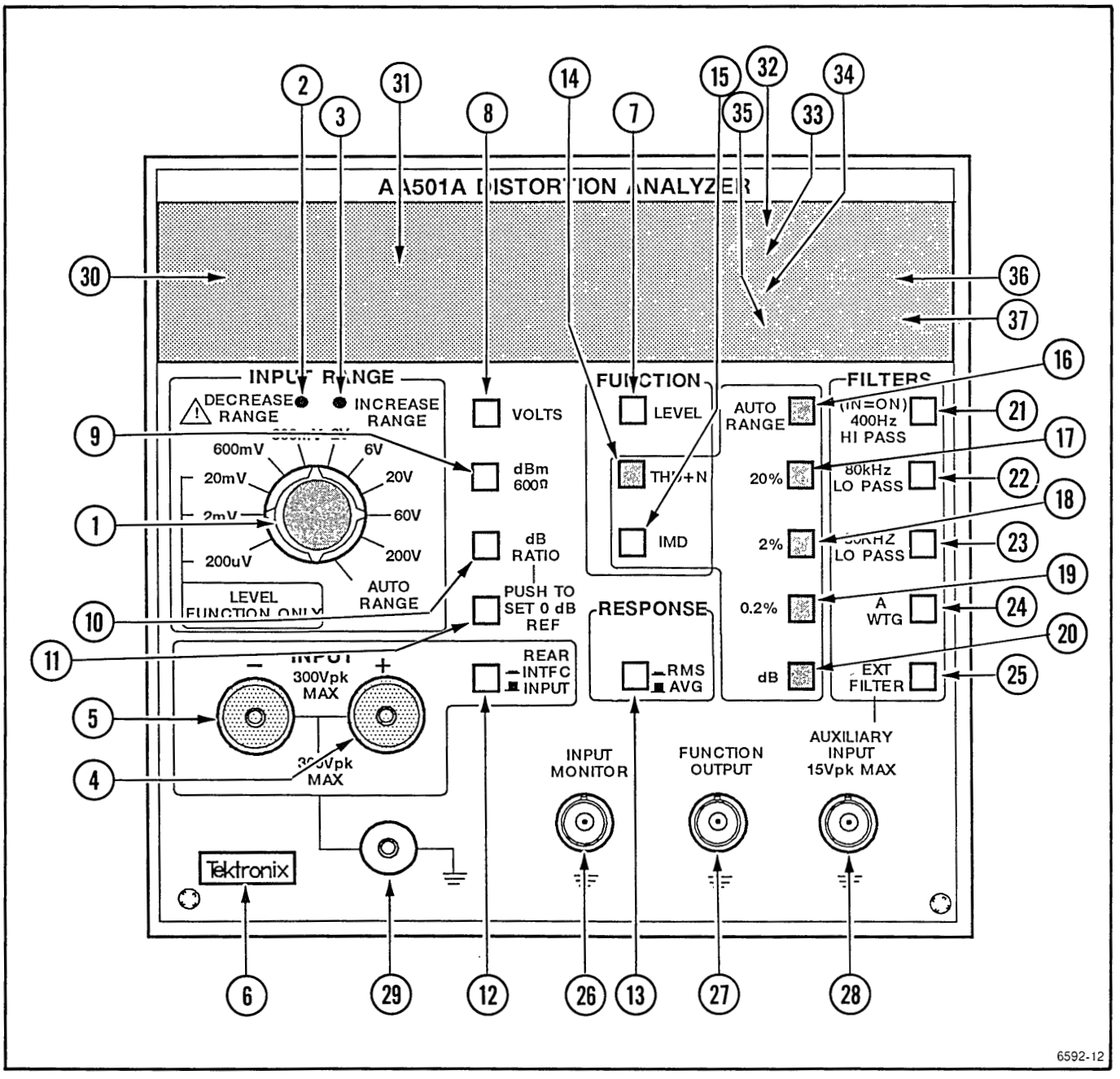


Fig. 2-2. Front panel controls and connectors.

(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; AUDIO BANDPASS, 22.4 Hz to 22.4 kHz in Option 02**
Button in connects filter before detector circuit in all functions.

(24) **'A' WEIGHTING (CCIR WEIGHTING In Option 02 Instruments)**
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 buffered sample of the input signal.

(27) **FUNCTION OUTPUT**
Provides a sample of the selected FUNCTION signal additionally processed by selected filters.

(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 approximately 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) **V**
Illuminated when display units are volts.

(33) **mV**
Illuminated when display units are millivolts.

(34) **μV**
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 501A, refer to Fig. 2-3. Connections can be made to the rear interface connector. However, low level or distortion measurements made through the rear interface may be degraded due to crosstalk. 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.

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 501A 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 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 501A 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, to avoid possible ground loops, if the device under test has one side of the input grounded, float the output of the external oscillator. If the input to the device under test is floating (not chassis grounded) 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.

Figure 2-3 shows an optional oscilloscope for visual monitoring. If connected as shown, 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 501A operates as a wide band ac voltmeter. The Specification section of this manual contains the operating parameters. The meter is rms calibrated and either rms or average (quasi-peak in option 02 instruments) responding, depending on the position of the RESPONSE pushbutton.

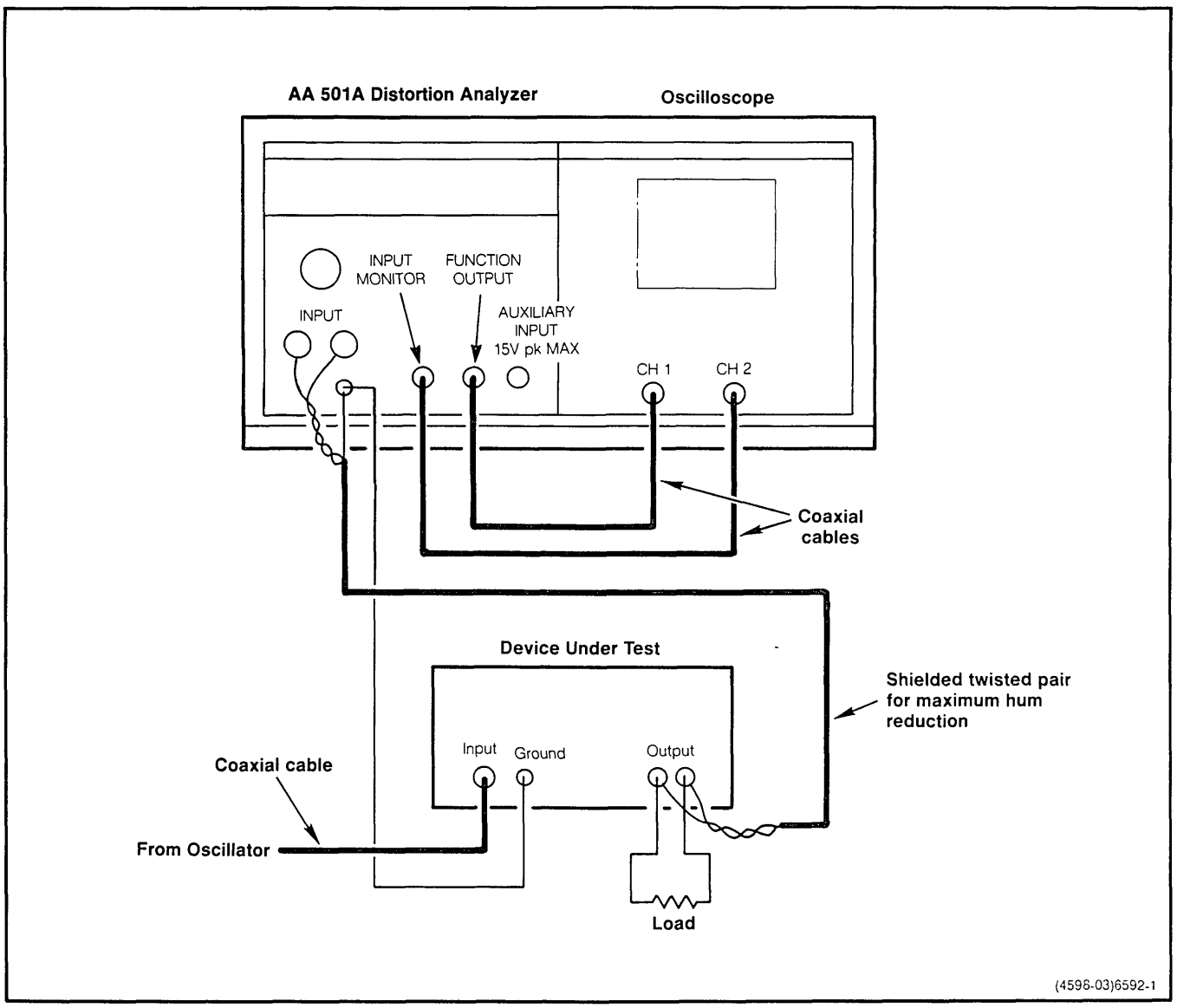


Fig. 2-3. Typical connections for distortion measurements.

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. For example, to measure voltage, press the VOLTS pushbutton. If the INCREASE RANGE LED is illuminated, adjust the INPUT LEVEL RANGE control to the higher ranges until the LED goes out. If the DECREASE RANGE LED is illuminated, turn the INPUT RANGE control counterclockwise until the DECREASE RANGE LED goes out. Readings are usable as long as the display is not overranged however for specified accuracy the DECREASE RANGE LED must also be off. 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 is adjusted automatically. The LED's (VOLTS, mVOLTS or uVOLTS) 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 0.7746 V corresponding to 1 mW dissipated in 600 ohms. The INPUT LEVEL RANGE switch operates as previously described.

The dB RATIO mode permits direct amplitude ratio measurements of two input signals. When the dB RATIO pushbutton is pressed, the LED opposite the dB nomenclature on the display illuminates. 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. Release the 0 dB REF pushbutton. As the amplitude of the input signal is changed, the display reads 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 simplified by using this feature. Set the device to be tested as desired and connect the AA 501A input to the input of the device under test. Press the PUSH TO SET 0 dB REF pushbutton. Then connect the input of the AA 501A to the device output and read the gain or loss directly from the display.

When measuring signal to noise ratio or making noise level measurements, it is often desireable to employ a frequency dependent weighting network. The AA 501A 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 this 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. 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 investigated and measures the remainder. See Fig. 2-4. Because of the notch filter response, any signal other than the fundamental influences the measurement.

A total harmonic distortion measurement inevitably includes 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.

[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

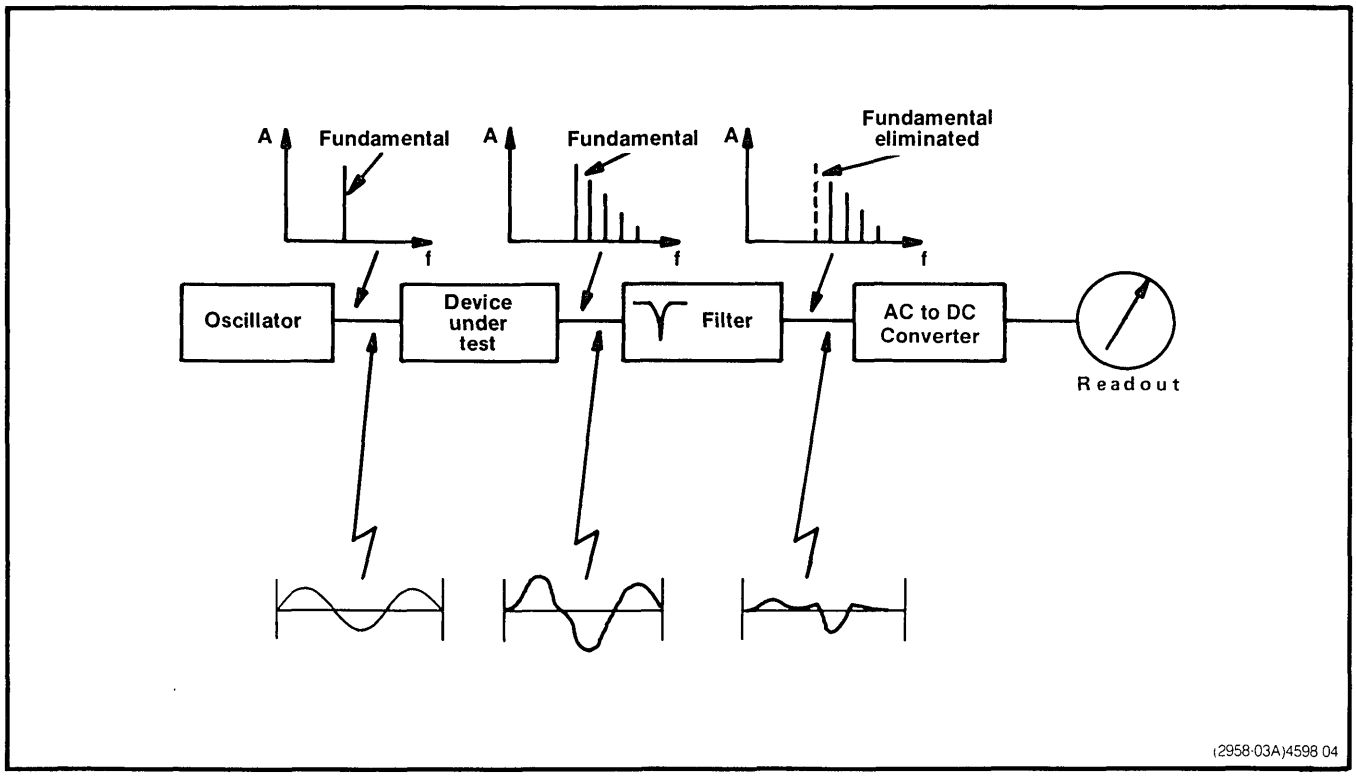


Fig. 2-4. Block diagram of a basic harmonic distortion analyzer.

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 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 analysis 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 501A. It is only necessary to set the INPUT RANGE and distortion range switches to AUTO RANGE. Press THD+N and wait briefly for a reading.

Minimum input signal amplitude for valid distortion measurements is 60 mV. To provide greater flexibility, the instrument may be manually operated as described in the following paragraphs.

Adjustment of the input level range control is the same as for level measurements. Manually setting the INPUT 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 LED's 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 and a flashing Decrease Range LED indicates insufficient input signal level for distortion measurements.

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 may 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.

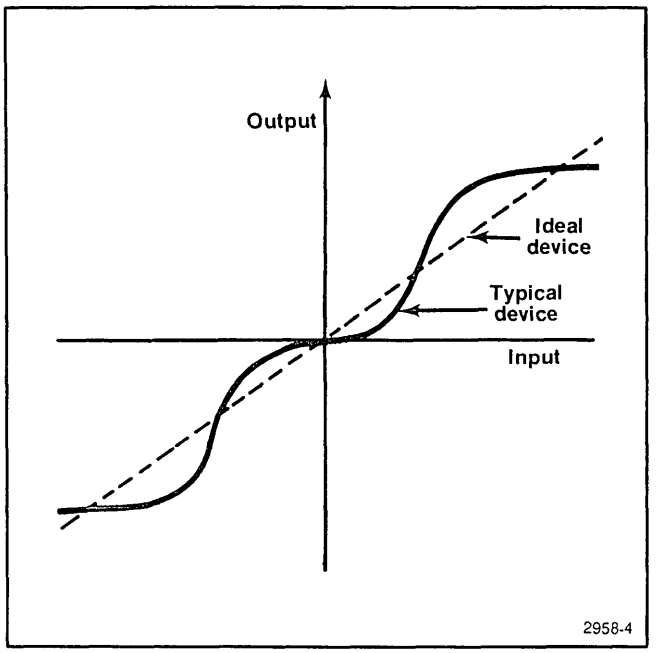


Fig. 2-5. Transfer characteristics of an audio device.

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 response may be used when making comparisons with readings taken with older distortion analyzers. However, it may read up to 25% (2 dB) lower than rms response when noise is significant and even lower with high crest factor distortion signals (characteristic of crossover or hard-clipping non-linearities).

For frequencies below 20 kHz, the residual wideband noise in the measurement may be reduced by activating the 80 kHz LO PASS filter. If hum (line related components) are interfering with the measurement, they may be reduced with the 400 Hz HI PASS filter. This filter should not be employed with fundamental frequencies below approximately 400 Hz because of additional error due to rolloff. For more information see text under Filters in this section of this manual.

High Distortion Measurement Limitations

NOTE

Care must be taken to ensure proper locking for input signals with 10% or greater noise or non-harmonic components, because the AA 501A automatically tunes and nulls out the fundamental frequency prior to making a THD+N measurement.

In those applications which require higher THD+N measurements (for example, SINAD[2] testing) the internal circuitry will remain locked to noise levels of approximately 30%, after it is initially given a clean signal. To perform a SINAD test, the receiver under test is first given a high level modulated rf input. The AA 501A will lock onto the audio signal at the demodulated output. The rf level feeding the receiver is then reduced until a −12 dB (25%) THD+N reading is obtained on the AA 501A and becomes a measure of the receiver's sensitivity.

IM Distortion Measurements (Option 01 and Option 02)

Another measurement of distortion investigates the interaction of two or more signals. Many tests have been devised to measure this interaction. Three common standards are SMPTE[3], DIN[4], and CCIF[5]. The AA 501A with Option 01 and Option 02 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 remove the residual carrier (high frequency) components. The amplitude of the low frequency modulation is displayed as a percentage of the high frequency level.

[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.

[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.

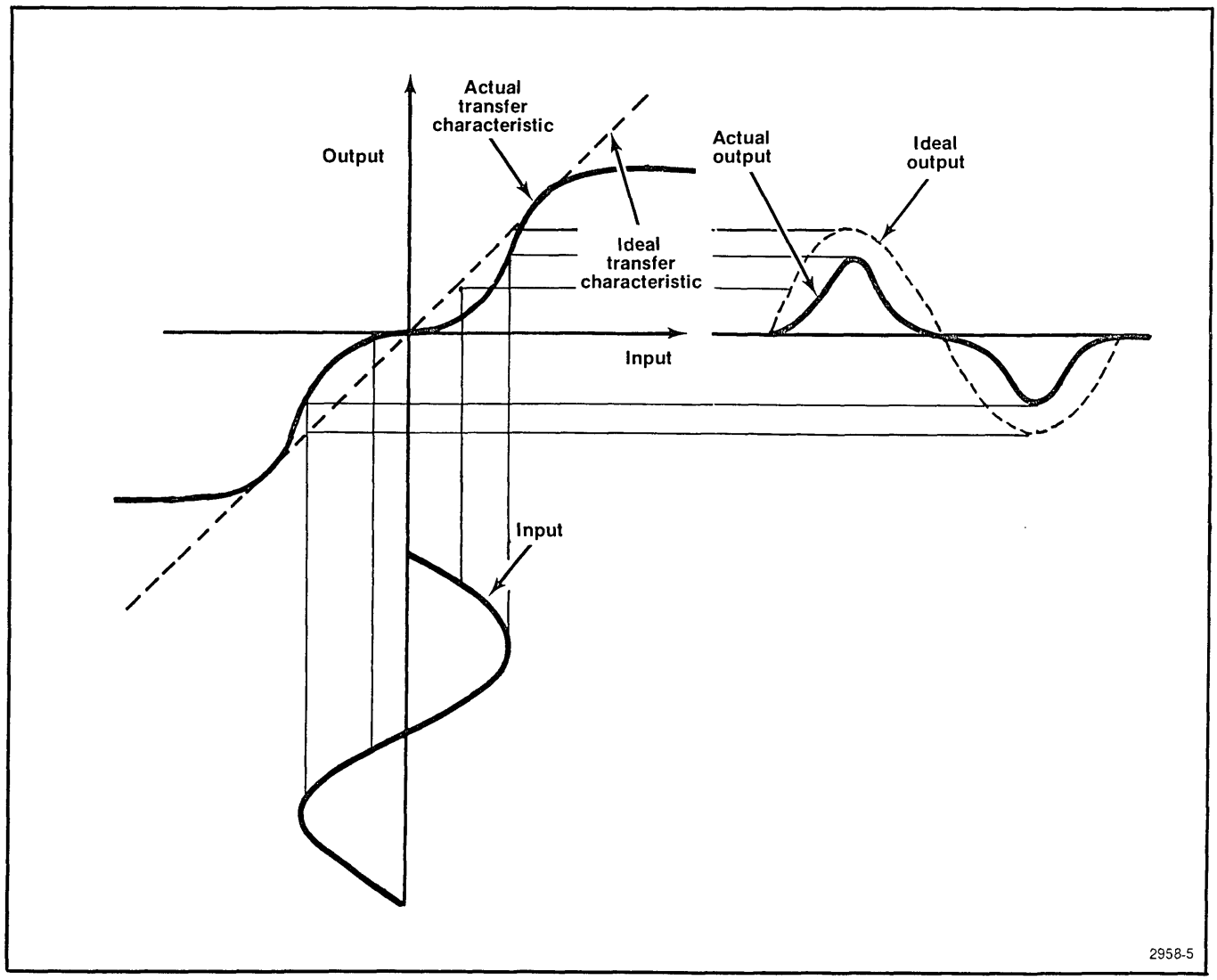


Fig. 2-6. THD test of transfer characteristics.

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 501A 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 most common). The AA 501A 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.

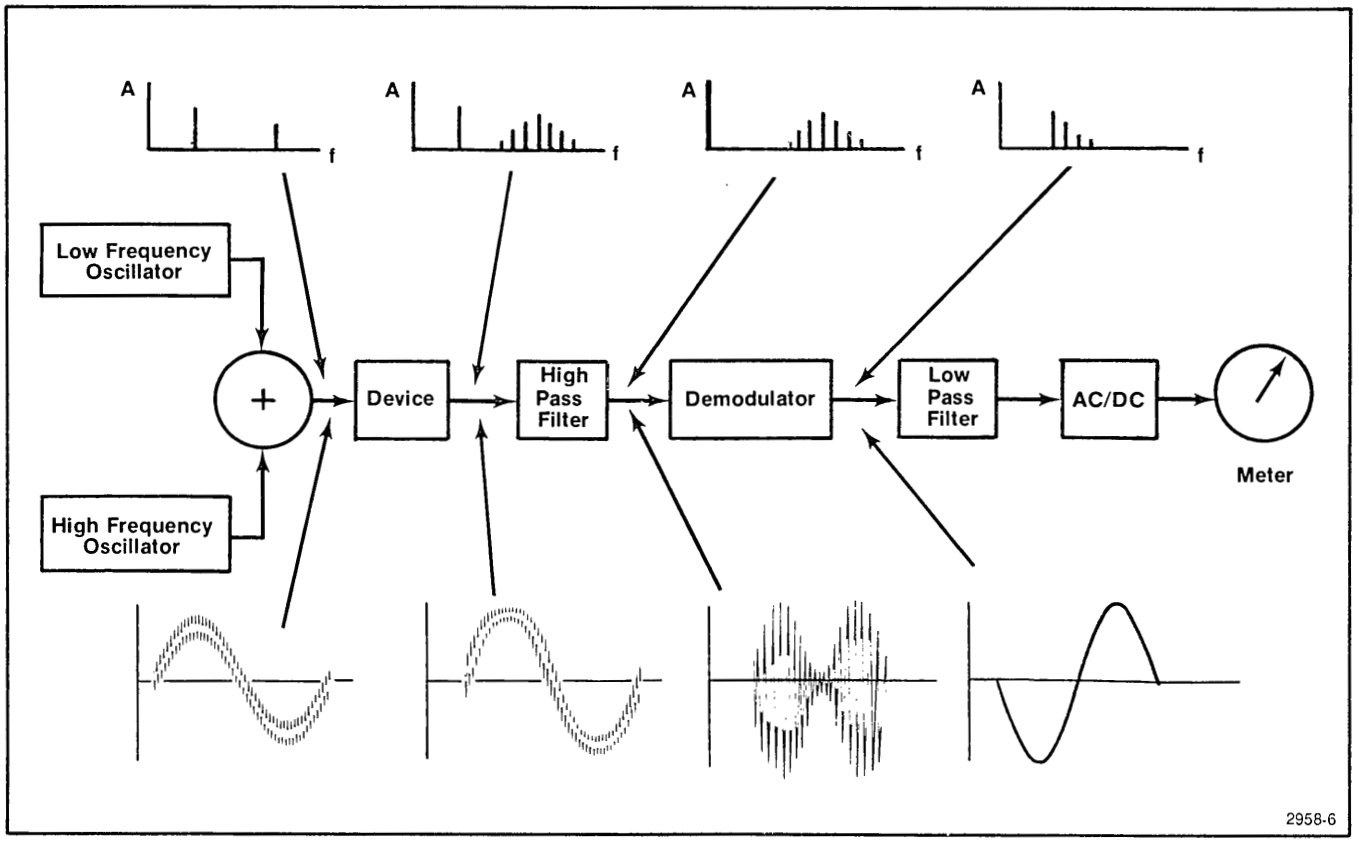


Fig. 2-7. Block diagram of basic IM analyzer.

The user could 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. In many systems and especially those with asymmetric non-linearities, a good measure of this distortion may be obtained by investigating 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 remove the two test tones and extract the difference frequency product. The level of this component is expressed as a percentage of the high frequency signals. The AA 501A 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 and Option 02)

Intermodulation and THD testing are similar, using the AA 501A. After connecting the appropriate signal source to the device under test, set the INPUT 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 501A accepts either a SMPTE, DIN, or a CCIF difference frequency test signal. Selection between the necessary analyzing circuits is accomplished automatically for IMD levels less than 20%, based upon the spectral content of the test tones. (There is a moveable jumper inside the AA 501A to allow defeating the automatic test selection circuitry for special applications requiring IMD measurments in excess of 20%. Refer any jumper changes to qualified service personnel.)

The LO PASS filter may be selected in the IM mode but will have little or no effect. The 400 Hz HI PASS and the 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 may attenuate some of the frequency components being measured and should be avoided.

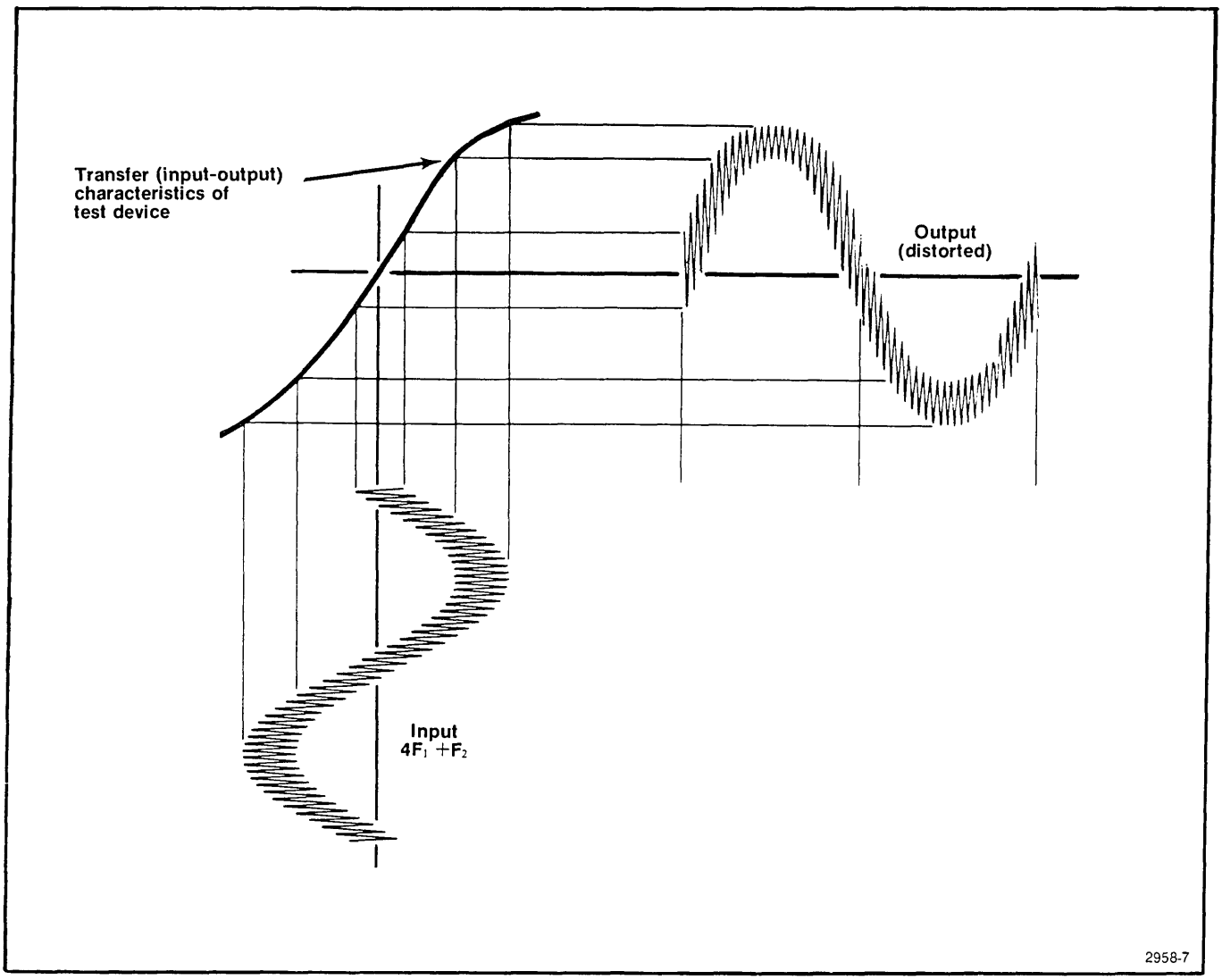


Fig. 2-8. IM test of transfer characteristics in time and frequency domain.

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 both 3-pole (18 dB per octave rolloff) Butterworth alignment. The AUDIO BAND PASS (Option 02 only) filter (Option 02 only) follows CCIR Recommendation 468-2[6] for unweighted response. It is approximately two pole response below the lower 3 dB point of 22.4 Hz and three pole response above the upper 3 dB point of 22.4 kHz. They are placed in the measuring circuitry immediately before the average or rms detectors. These filters are functional in all modes of operation. They also 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. Therefore, 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.

[6]International Radio Consultative Committee.

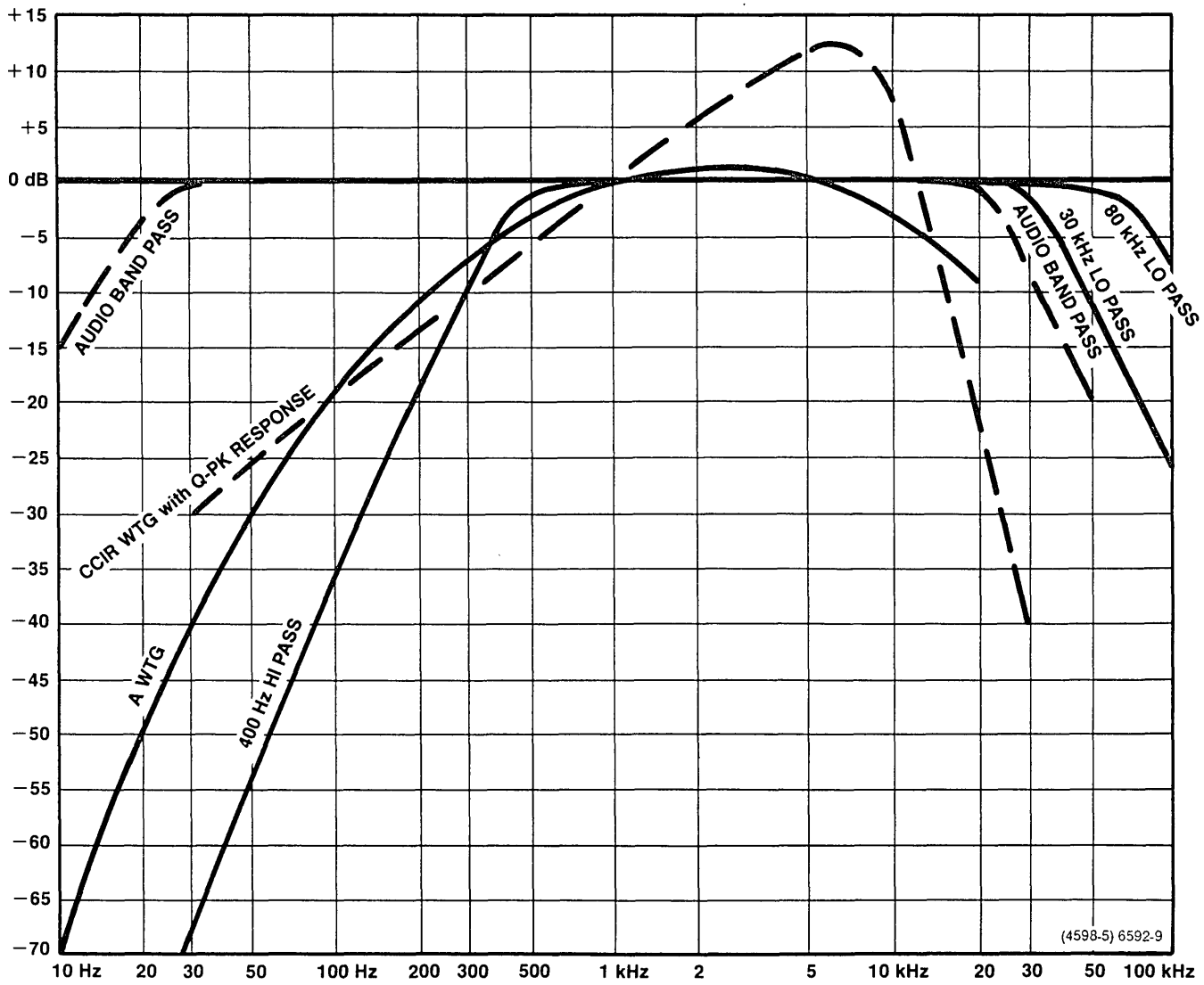


Fig. 2-9. Response curves for AA 501A filters.

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 501A 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 harmonic distortion of signals at about 400 Hz or greater, but should not be used when measuring levels at frequencies less than 1 kHz, nor when measuring intermodulation distortion.

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.

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 AUDIO BANDPASS or WEIGHTING filters are recommended as they correlate better with the perceived noise level.

The AUDIO BAND PASS filter (Option 02 only) provides bandwidth limiting according to CCIR Recommendation 468-2 and DIN 45405. It is also useful for unweighted measurements on certain accoustic equipment. When the AUDIO BAND PASS filter is used, the 80 kHz filter is disabled.

The 'A' weighting filter (standard and Option 01 instruments only) is used when measuring the subjective noise 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[7] standards for class 1 sound level meters.

The CCIR weighting filter (option 02 instruments only) is also used when measuring the subjective noise of audio equipment, however it conforms to CCIR Recommendation 468-2 and DIN 45405 when used with the quasi-peak detector response. This filter may also be used with the rms detector, however the gain calibration is shifted for unity gain at 2.0 kHz instead of 1.0 kHz permitting noise measurements similar to those proposed by Dolby et al[8] on tape recording and playback systems.

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 unity gain bandpass filter as an external filter[9] and adjusting the frequency to the harmonic desired.

Displays

The AA 501A provides two display forms for manual measurements. The digital readout displays the selected function with units. Overrange indication blanks all digits and displays a numeral 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 501A may aid considerably in the interpretation of measurements.

The INPUT MONITOR connector provides a fixed amplitude version (approximately equal to 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 (gain of approximately equal to 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 501A is used as a constant gain differential amplifier the INPUT 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 501A.

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

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

[9]International Radio Consultive Committee.

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

One interesting use of the Function Output and Input Monitor signals is to investigate the non-linearities of the transfer function of a device under test with the THD+N mode. 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. This can be particularly useful in diagnosing sources of non-linearity such as clipping, crossover, etc. If the device under test has large amounts of phase shift at the test frequencies it may be necessary to introduce 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.

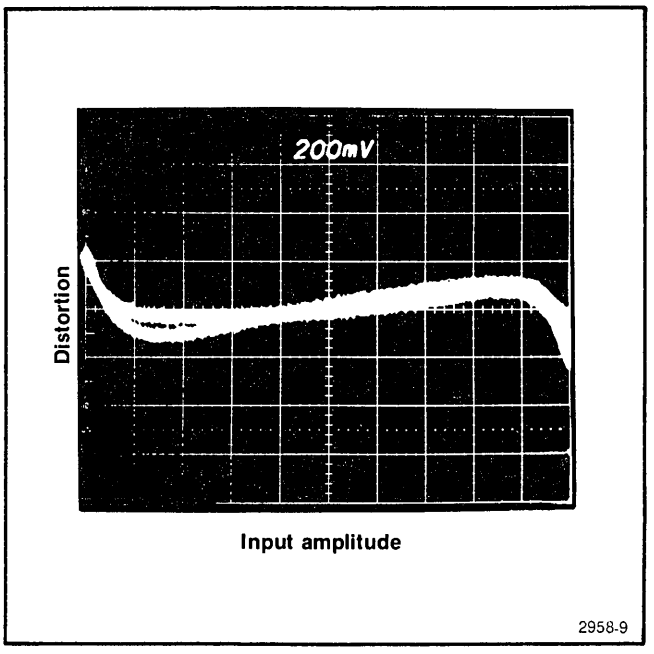


Fig. 2-10. Oscilloscope display of deviation from linearity.

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 501A operation. A detailed circuit description follows.

Input Amplifier ◇1

The input amplifier is designed for low noise and distortion. The input configuration 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 also 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 amplifier remains between 0.75 V and 3.0 V rms. An attenuator, prior to the amplifier, provides additional 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 RANGE switch if not in AUTO RANGE). For example, the 200 V Input Range corresponds to 40 dB of attenuation and amplifier unity gain.

The input signal, from the front panel connections or the rear interface input (selected by front panel switch S6181) enters the input amplifier through P4070/J4070. Each input is ac coupled through C5070 or C4070. The signal then passes to the differential input attenuator hybrid, R2052. These resistors are laser trimmed and ratioed to maintain gain accuracy and common mode rejection. Relays K2052, K2060, K2061, K2070 and K2071 select attenuation from 10 dB steps. Frequency compensation of the attenuator is provided by C2061, C2051, and R2051.

When there is no attenuation (0 dB), DS3050 and DS3060 limit the input current under overload conditions. The current passing through the lamps warms their filaments, increasing their resistance. These lamps will sustain 120 Vac indefinitely and 200 Vac for at least 30 minutes. If the AA 501A is subjected to greater overloads in the 0 dB attenuator position, the lamps act as fuses. 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 VR4071 and VR4070 through four diode connected transistors Q4060, Q4061, Q4070 and Q4071 and four diodes CR4072 through CR4075. When the post attenuator voltage on any scale exceeds about ±10 V, one set of transistors turns on to limit the voltage at diode connected U4050A and B. The effect of the nonlinear capacitance of clamp diodes CR4072, CR4073, CR4074 and CR4075 is eliminated by maintaining a constant voltage across the diodes via a bootstrap arrangement from the outputs of U4050A and B.

The input signal is buffered by low noise amplifiers U4050A and U4050B. On the 0 dB through 40 dB attenuation ranges, these buffers provide unity gain. Relays K2050 and K2051 change the gain to +20 dB or +10 dB, respectively, by adding resistors R4056D or R4056E. Capacitors C4053 and C4062 provide frequency compensation.

The buffer outputs are combined into a single-ended output signal by U4061 (gain=1.5). 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 R4056. These resistors are laser trimmed and ratioed to insure gain accuracy and common mode rejection.

The signal level at the output of the input amplifier is detected by active rectifier U4041, in conjunction with CR4041 and CR4042. This full wave rectified signal is filtered by U4042A with C3045 and routed to the logic circuitry through J1060, pin 1. Recovery from overload is provided by VR3041. Resistor R4040 sets the filter gain so that, with 2 V rms into the AA 501A input on the 2 V scale (3 V at pin 6 of U4061) the output at pin 1 of U4042 is 6 Vdc.

The gain setting driver relays, K2052 through K2071, are driven by the inverting amplifiers within U1060. Control signals from the logic circuitry enter the input board through P1060-J1060, pins 2 through 9, with one line at a time high (about +12 V). This logic high causes a low at the output of the inverting amplifier and closes the relay. When either 0 dB, +10 dB or +20 dB (pins 6, 7 or 8) is activated, K2052 activates directly or by Q1070 and U1050B. In AUTORANGE, the logic circuitry selects the proper input attenuation or gain to maintain 0.75 V to 3.0 V at U4061 pin 6, for inputs greater than approximately 50 mV.

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 approximately 50 mV, and the agc automatically adjusts the signal to a constant 1.61 Vac. This is the reference level for the distortion measuring circuits.

The agc circuitry is composed of attenuator R4053, U5041, U5051, R4055, and amplifier U4051. The control element in the agc is a pair of light-dependent resistors (LDRs), U5041 and U5051. These devices consist of a light emitting diode and a semiconductor resistance cell in one package. As more control current is forced through the LEDs, the cells are illuminated more brightly and their cells resistance decreases. This causes more signal to shunt to ground.

The control circuitry for the agc consists of active rectifier, U4042B with diodes CR4052 and CR4051. The filters are composed of U4062A and U4062B and associated components. This circuitry seeks to keep the voltage at the output, pin 6 of low noise operational amplifier U4051, to approximately 1.61 V. This output voltage is varied to calibrate the THD measurements by adjusting R1051, the THD CAL control.

The output of U4051 is fullwave rectified by U4042B with diodes CR4051, CR4052 and integrated by U4062A and C5061 with the reference current from R5041 and R4042. Amplifier U4062B in conjunction with C5060, C5062, R5063, R5064 and C5063 with R5065 provides additional filtering of the rectified voltage to reduce distortion introduced by the agc action. Transistor Q5071 provides the current drive necessary for the LDRs, while VR5051 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 (U4051) 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 amplifier U4020, and asso-

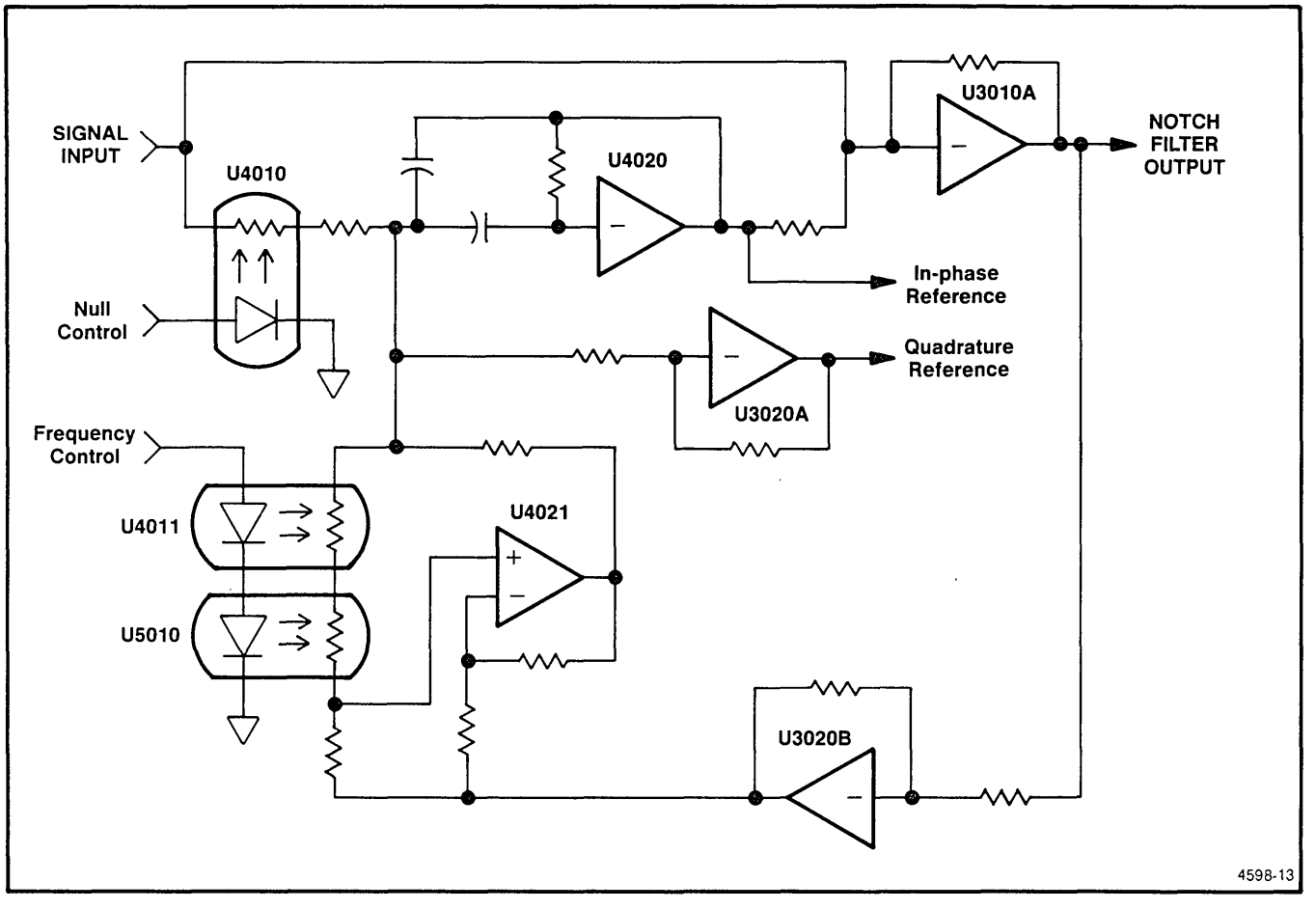


Fig. 3-1. Simplified notch filter.

ciated resistors and capacitors comprises a multiple feedback path inverting band pass filter. Amplifier U3010A is an inverting summer. Filter tuning is accomplished in half decade bands by switching both resistors and capacitors. Capacitors are switched each decade. Relay K4031 is energized for input frequencies below approximately 10 kHz. When below approximately 1 kHz, K4032 is also activated, while below approximately 100 Hz, K5030, K4032, and K4031 are used. K4030 is energized in the upper half of each decade reducing the tuning resistances by a factor of 3.2 thus scaling up the frequency range by a factor of 3.2. Continuous tuning within each half decade is achieved by adjusting the impedance of an electronic resistor (U4021A and B) with LDR opto isolators U4011 and U5010. As the LDR resistance rises, the electronic resistor value decreases, at the junctions of the outputs of R3026 and R5033, raising the filter frequency.

This circuit technique, although unusual, provides a good compromise between residual noise and distortion sources inherent in U4021, and LDR's U4011 and U5010.

U3020B feeds back a portion of the notch output to the electronic resistor keeping the Q of the bandpass filter nearly constant, as it is tuned.

Minor variations in the gain of the band pass filter (which causes incomplete cancellation of the fundamental) are compensated by a third LDR, U4010. Components C4021, R5032 and C5031 provide additional gain compensation. Drive signals for the LDRs come from the control loop circuitry. Synchronization signals, to run the control loops, come from the outputs of U4020 and U3020A.

Frequency Band Discriminator ◇5◇

The signal from the junction of R2026 and R3021 located on schematic 2 is squared by a Schmitt trigger, composed of Q1041 and Q1042. The frequency band is determined by measuring the period of the resulting squarewave. When the input goes high, the outputs of U2050 change state. Assuming the Q outputs are high, the capacitors in the four rc networks (that are connected to the Q outputs of U2050) start to charge. The capacitor voltage on each network is compared via U2051 to a reference voltage developed across R2065, R3060, and R3061. When the input signal again goes high, the outputs of the comparators are latched in U2042. Simultaneously, the outputs of U2050 go low to discharge the capacitors in the rc networks in preparation 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 (U2060) and comparing it to a higher reference voltage at pin 6 of U2051B. The last column in Table 3-1 shows the inputs for U2060. If the input frequency is below the band switch point of the selected decade (about 2.8 kHz for the 1 kHz to 10 kHz band) the output of U2051 is low. Resistors R2054, R3052, R2052, and R2050 provide a slight hysteresis at each decade edge, while R1515 provides hysteresis at half decade points. This hysteresis prevents random band switching when measuring signals close to the transition frequencies.

A bounce eliminator, U2041, prevents random band changes caused by grossly non-periodic signals. Capacitor C1041 sets the internal clock frequency of U2041 to approximately 7 Hz. The input state to U1400 must be stable for four clock cycles or 0.6 seconds for any change in output to occur.

Table 3-1
TRUTH TABLE FOR U2042 OUTPUTS

Fin (Hz)	Q 2042A pin 3	Q U2042C pin 10	Q U2042D pin 15	Q U2042B pin 7	U2060 input pin no.
10-28	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-100k	H	L	L	L	13

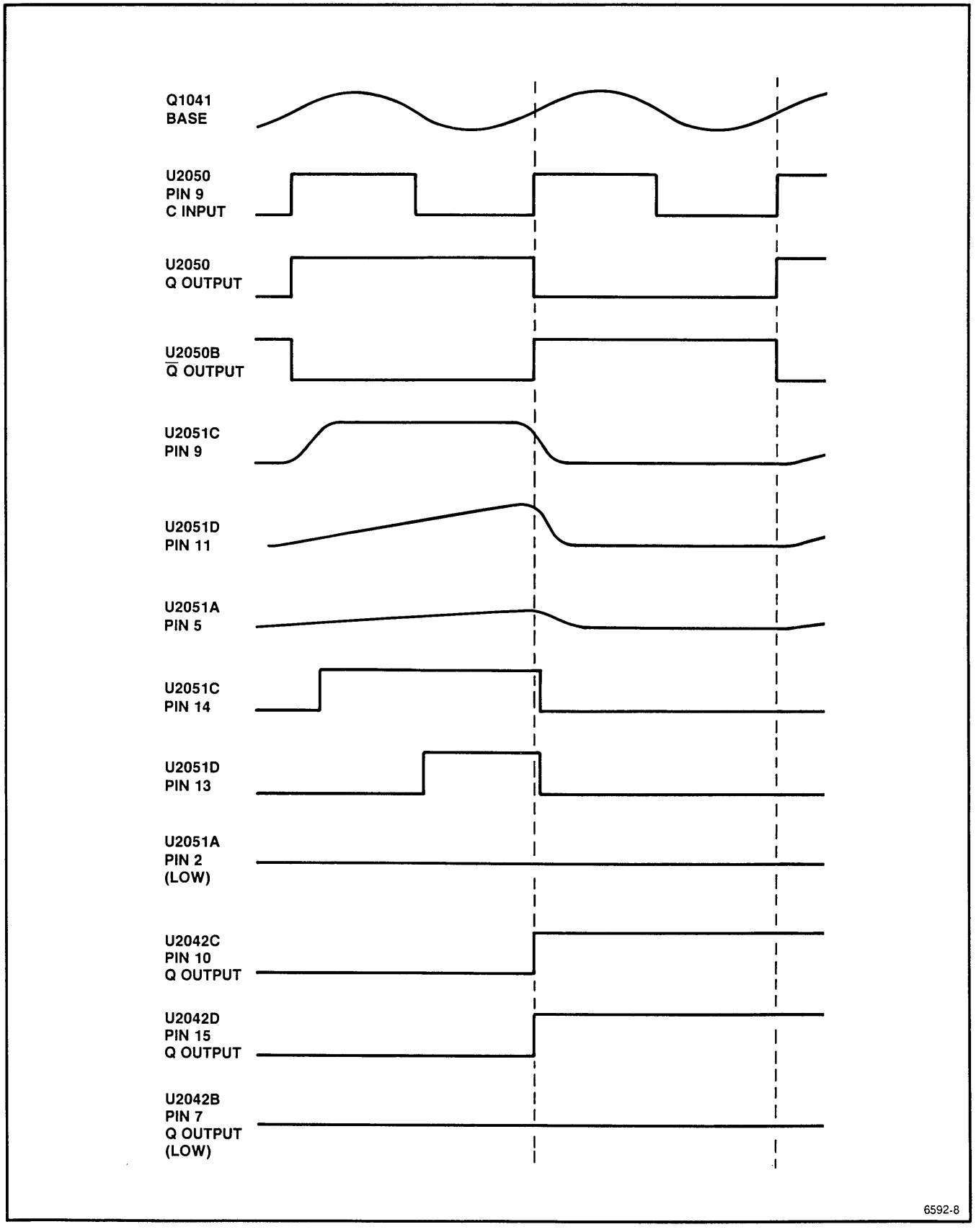


Fig. 3-2. Frequency band discriminator.

Notch Filter Control ◇3◇

The notch filter is controlled by demodulating the in-phase and quadrature phase (shifted 90 degrees) components of the notch filter output referenced to the input fundamental signal. See Fig. 3-1. The in-phase reference inputs to pin 2 of U1020A, and the quadrature phase reference inputs to pin 6 of U1020B. 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 U3010B and U1011B. A total of 50 dB of gain is provided by these amplifiers. Differential input to the demodulators (U1010) is provided by U1011A. The output of this amplifier stage is rectified by CR1010 and CR1011. This signal is amplified by Q2010 and filtered by C2011 to control the resistance of FET Q2011, thus providing automatic gain control. This loop serves to optimize and level the input to the demodulators that generate the tuning and nulling error voltages. The amplifier gain is raised by Q2012 in all but the lowest fundamental frequency decade.

As stated earlier, the in-phase component of the fundamental derived from the output of the bandpass filter U4020 (located on diagram 2) feeds pin 2 of U1020A. This circuitry forms a CMOS compatible logic signal to drive the CMOS multiplexer, U1010. The quadrature component of the fundamental derived from U3020A (diagram 2) similarly feeds pin 6 of U1020B. The switching arrangements of U1010 are shown in Table 3-2. The input to U2020A is switched between the inverted (pins 1 and 13) and the normal (pins 2 and 12) output of the notched filter at rate and phase determined by the in-phase signal at pin 10. The input to U2020B is also switched between the normal and inverted inputs to U1010 at a rate and phase determined by the quadrature signal at pin 11. The outputs of U1010 represent the synchronously demodulated in-phase and quadrature components of the fundamental, present in the notch output signal.

These outputs are integrated by U2020A, for the amplitude control loop and U2020B for the frequency control loop, buffered by Q2021 and Q2024, to drive the respective LDR opto-isolators in the notch filter. The net dc polarity of the signals at pins 15 and 14 determine, after passing through integrators U2020A and U2020B, the direction of frequency change and amplitude change necessary to properly set the notch frequency and null the fundamental. Adjustments R1023 and R1030 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 U1010 is essentially 0 V.

The gain of the frequency control integrator is increased by Q2023 in all but the lowest frequency decade. Components VR2022, VR2023, R2018, C2010, CR2024, and CR2025 help speed the frequency control integrator for large control errors. VR4010 linearizes the open loop gain of the frequency control loop.

Table 3-2
INTERNAL CONNECTIONS IN U1010 DEPENDING ON LOGIC STATES OF PINS 10 AND 11

Logic Level Pins 11, 10	Internal Connections Pins
0 0	12 to 14 & 2 to 15
1 0	13 to 14 & 2 to 15
0 1	12 to 14 & 1 to 15
1 1	13 to 14 & 1 to 15

Distortion Amplifier ◇4◇

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 ranges in level function.

Multiplexer U2040, 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 R2033 and R2032), THD notch filter pins 12 and 15, and IMD pins 2 and 4. Control of U2040 is through the level and IMD switches, as well as the output of U3021A as shown on the schematic. In the IMD mode, Q2042 turns on. This action shorts the THD input to U2040 to prevent possible crosstalk. In both the THD and IMD, Q2041 also turns off, to prevent crosstalk.

The distortion amplifier gain is controlled by multiplexer U2031. The input to U2030B, attenuated by R2036, R2037 or R2041 is supplied from U2031. See Table 3-3. A gain of +46 dB is provided by U2030A and B. The output of U2030A supplies a 4 V rms full scale signal to the filters.

Table 3-3
GAIN AND SWITCHING THROUGH U2031

Logic Level Pins 9 10	Total Gain Through Dist Amp	U2041 Gain	Internal Connections pins
0 0	+6 dB	0 dB	13 to 12 and 3 to 1
0 1	+26 dB	0 dB	13 to 14 and 3 to 5
1 0	+46 dB	0 dB	13 to 15 and 3 to 2
1 1	+66 dB	+20 dB	13 to 11 and 3 to 4

Filters and AC-DC Converters (Standard and Option 01 Instruments Only) ◇6◇

The output of the distortion amplifier enters the main board through J1042 driving the weighting filters and the distortion amplifier ranging level detector. The detector, composed of U4030A and U4030B, 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 U2023A, U2023B, U3021B, U3021A and associated resistors and capacitors. The signal from the distortion amplifier passes through the 330 kHz filter before passing to the remaining filters. Output from the filters is multiplexed by U1021 to the input of buffer, U4020A. Table 3-4 is a truth table for U1021.

Table 3-4
TRUTH TABLE FOR U1021

B	A	ON CHANNELS		
0	0	X0	Y0	WEIGHTING
0	1	X1	Y1	30 kHz LOWPASS (Bandpass Option 02 only)
1	0	X2	Y2	80 kHz LOWPASS
1	1	X3	Y3	330 kHz LOWPASS

The highpass filter (three pole 400 Hz Butterworth) is composed of U4020B, C4012, C4011, C4010, R4012, R4010, and R4011. This filter is driven by U4020A. When the highpass filter is disabled, U3020 connects pins 1, 13, 14, and 15 thus shorting the output of U4020A directly to the input of U4020B. R4013, R4014, and C4013 provide 10 Hz response compensation for low frequency accuracy.

Output from the highpass filter, U4020B, connects to the front panel Function output connector and the Cy channel of U3020. The AUXILIARY INPUT on the front panel connects to the Cx input through protection components R3022, CR4020, and CR4021. U2030B connects to either the AUXILIARY INPUT or the output from U4020B depending upon the state of the EXT control signal.

After filtering, the signal is converted to a dc voltage by both rms and average techniques. Rms conversion is accomplished in U3031 (pin 10 out) using an implicit computing approach. The averaging capacitor is C3032. A low pass filter, U2040A, reduces readout jitter due to low frequency noise or ripple.

The averaging rectifier is U2030A with diodes CR2031 and CR2032. The rectified output is smoothed and filtered by U2040B, C1040, and associated components. The average detector output connects to U2040A via Q3040 in the average response mode, overriding the rms converter.

Filters and AC-DC Converters (Option 02 Instruments Only) ◇6a◇

The output of the distortion amplifier enters the main board through J1042 to drive the filters and the distortion amplifier ranging level detector. This detector, composed of U4030A and U4030B, full wave rectifies and filters the distortion amplifier output. This dc signal goes to the logic board to control the distortion amplifier autoranging.

The filters consist of U2023A, U2023B, U2021B, U2040A, U2040C, and U2040D with associated resistors and capacitors. The signal from the distortion amplifier passes through the 330 kHz filter before passing to the 80 kHz LO PASS and AUDIO BAND PASS filters. The weighting filter input is taken directly from the distortion amplifier output. R2035 provides gain calibration adjustment for the CCIR weighting filter. Output from the filters are multiplexed by U1021 to the input of buffer U4020A. Table 3-4 is a truth table for U1021.

The high pass filter (three pole 400 Hz Butterworth) is composed of U4020B, C4012, C4011, C4010, R4012, R4010, and R4011. This filter is driven by U4020A. When the high pass filter is disabled, U3020 connects pins 1, 13, 14, and 15, shorting the output of U4020B directly to the input of U4020B. Components R4013, R4014, and C4013 provide 10 Hz response compensation for low frequency accuracy.

Output from the high pass filter, U4020B connects to the front panel FUNCTION OUTPUT connector and the Cy channel of U3020. The AUXILIARY INPUT, on the front panel, connects to the Cx input through protecting components R3022, CR4020, and CR4021. U2030B connects to either the AUXILIARY INPUT or the output from U4020B, depending upon the state of the EXT control signal.

After filtering, the signal is converted to a dc voltage by both rms and quasi-peak techniques. Rms conversion is accomplished in U3031 (pin 10 out) using an implicit computing approach. The averaging capacitor is C3032. A low pass filter, U2021A, reduces readout jitter due to low frequency noise or ripple.

The quasi-peak convertor consists of full wave rectifier U2040B, peak detector U4031 and U3030A, and averager U3030B and their related circuitry. The input to the full wave rectifier is normally connected through R2022, except for the special case of simultaneous CCIR weighting filter and quasi-peak response selections. In this case, Q2021 turns on directly connecting the output of the CCIR weighting filter from U2040A to the full wave rectifier. This causes a gain calibration shift of the weighting filter, depending upon the response selection. With RMS response, the 0 dB frequency is nominally 2.0 kHz. However, with quasi-peak response, it shifts to 1.0 kHz.

The output from the full wave rectifier, U2040B, passes to pin 2 of U4031. This circuitry rapidly charges C3053 to the peak value of the input waveform. This peak voltage is referenced to the input through U3030A with R4055, providing gain calibration adjustment. U3030B, C3052, and R3033 low-pass filter the charged peaks on C3053 and pass the signal on to the peak hold circuit, composed of U3030D and U3030C.

The purpose of the peak hold circuit is to allow short peak pulses to be accurately measured and displayed on the digital readout. Capacitor C3038 is charged to positive peaks through CR4033 until U3030D inputs at pins 12 and 13 are nearly equal. C4031 is also charged through CR4034. When the peak disappears, CR4033 reverse biases, and C3038 maintains the peak voltage which is buffered through U3030C and connected to the convertor output through Q3040 and U2021A. The voltage across C4031 decays through R4035 generating approximately 1 second time delay. The voltage across C3038 remains constant until the voltage across C4031 drops to about 7 V below the level on C3038. C3038 then discharges through Q4030, operating as a low leakage zener diode. The quasi-peak detector output connects to U2021A via Q3040, in the quasi-peak response mode, overriding the rms converter.

dB Converter ◈8◈

The dB section is fed by the dc output voltage from the selected 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 U4111, transistor array U5101 and associated circuitry. The input to the converter is a 0-4 V dc signal from the selected detector and a 6 V reference. The output is a dc signal at U4111 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:

$$E = K \times \log \frac{Ic \text{ for U5101A}}{Ic \text{ for U5101B}}$$

K is a constant and Ic is the noted collector current. The converter output is zero when the input voltage is 1.549 V, with a scale factor of −100 mV/dB.

Operational amplifier U4111D provides a constant collector current in U5101B while holding the collector voltage at 0. The collector voltage of U5101A is held at 0 V by the action of U4111C. The collector current in U5101A varies with the input voltage. When the two collector currents are equal (at Vin = 1.549 Volts), U5101A pin 2 is at 0 V and U4111C pin 8 is at 0 V. The offset voltage of the differential pair and U4111A is adjusted by R8101 (0 dB Adjust), which sets the 0 dB output level. Compensation for the offset voltage of U4111C (−40 dB Adjust) is provided by R8091. This provides correct log conformity at low input voltages. Inversion of the dB output is provided by U4111A. Pin 1 of U4111A also provides the dB voltage to the bar graph display.

The three remaining transistors in U5101 serve as heaters to maintain the differential pair (U5101A and B) at a constant junction temperature. The voltage at U5101 pin 3 is proportional to the internal temperature of U5101. This voltage is compared with the reference voltage and any error is amplified by U4111B. The amplified error signal drives Q3111 which supplies current to the heater transistors. The −20 dB Adjust, R2161, sets the internal junction temperature of the differential pair for the correct scale factor.

dB Offset Generator ⑧

The offset generator consists of U4121, U7101 and R7101. This circuitry provides a dc offset voltage that is added to the log converter output at the input of operational amplifier U4121C. This voltage is set by input from the logic section and corrects dB measurements for the overall gain in the signal path.

The reference voltage is divided by R7101 into six offset voltages. Multiplexer U7101 selects one of these six voltages (or ground) and supplies it to U4121D. The gain setting resistor for U4121D, as well as a resistor in series with its output, is included in R7101. The offset output is supplied to U4121C through R8111.

This signal is routed to U2151, a multiplexer, which selects the dB-processed voltage (+10 mV/dB) or the voltage directly from the selected detector. This voltage is supplied to the DVM section. In the distortion modes, R3173 provides a small offset so that the 0 dB reference is changed from 0.775 V (0 dBm) to 1 V corresponding to 100%. In the dB ratio mode, U4121C also adds the stored reference voltage from the dBr section supplied via pin 5 of U2151.

dB Ratio Circuitry ⑧

The dB ratio circuitry allows selection of any input voltage as the 0 dB reference. This is accomplished by adding a dc offset voltage from pin 15 of R7121 to pin 9 of U4121 through multiplexer U2151C. This causes 0 V at pin 8 of U4121C at the desired reference input voltage.

Amplifiers U6121C and D with resistor network R7121 form a digital-to-analog converter which supplies the dc offset to the input of U4121C. This converter is driven by an 11 bit binary counter composed of U6111 and U7111. This counter is controlled by dual flip-flop U7161B which is supplied with a clock signal from the gated oscillator composed of U7151A and B.

When the dB ratio button is pushed (grounded), a debounce circuit, composed of U7151C and D, causes pin 3 of U7161A to go high. A short time later, determined by R8131 and C8135, pin 4 of U7161A goes high, terminating the high at pin 1. A positive pulse appears at U7161 pin 1, resetting counters U6111 and U7111 and flip-flop U7161B. 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 U4121C connects to comparator U6121B. When the output of U4121C is 0 V, U6121B pin 7 goes high, causing U7161B 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 U6121A goes positive a short time before U6121B pin 7. This switches the oscillator to a lower frequency through Q8161 and C7135 to prevent the circuits from overshooting the correct value.

6 V Reference ⑧

A 6 V reference voltage to the dB converter, offset generator, dBr section, and dvm is provided by U4121A and VR2143.

DVM/Interface ⑭

The DVM section accepts the dc voltage from the dB converter or directly from the selected 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, U2041, drives the respective segments in LED display. Overrange indication is supplied internally in U2041. Reference voltage adjustment for the correct full scale reading is provided by R2057. Other external components support the internal operation of U2041.

The most significant LED module, DS1022, is controlled by U1051D and Q1047. 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 DS1021, pin 2 of U1051A is low. This assures that pin 11 of U1051D is also low and illuminates the two segments comprising the one (1) in the most significant digit module, DS1022. Pin 19 of U2041 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 is used only in the db mode. Q1025 prevents the minus sign from illuminating in any other mode.

The ten operational amplifiers, U4021A, B, U4031 and U4041 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.

P4011 is used for factory test interfacing only.

Display Board ◇12◇

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 analog signal strength.

Logic Circuitry ◇9◇ ◇10◇ ◇11◇

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.

Diagram 10 shows the logic switching circuitry.

On diagram 11 a presettable up-down counter, U7011, controls the gain of the input stage. In the manual ranges, the preset inputs are enabled by S4171-4. The proper input level range signals are supplied by S4171-1, 2, and 3. In the auto range position, the counter accepts clock inputs from level comparators U5081A and B. These signals pass from U7011 to U3011. They are decoded in U3011, 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 U5081A. The bias voltages on pins 5 and 6 of U5081A and B are such that pin 2 of U5081A goes low when the input signal is higher than the range the input stage is presently in. This low appears at pin 10 of U7011 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 U7021A. A low then exists on pin 3 of U7021A which prevents the underrange LED from being illuminated. Pin 1 of U5081B is low when the input signal is lower than the input attenuator range. Pin 6 of U7021B 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 overrange and underrange LEDs are illuminated through Q2181 and Q2183 respectively. When the bases of these transistors are high, through the outputs of U7021A and U7021B, the lights are illuminated. The increase range and decrease range lights are also controlled by the distortion amplifier gain in the level mode.

U3021 decodes the odd 10 dB steps in the input stage gain and supplies this information to the distortion amplifier control and to U5011 for decimal point and offset formatting purposes.

Distortion amplifier gain is controlled in a manner similar to the input circuitry gain. U5081C, and U5081D are the level comparator and U7071A, U7071B, and U7071D perform the enable gating function.

The gain control input for the distortion amplifier is selected by U7041, 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, S4171, as the gain control input. In the distortion modes, pin 14 is high, 9 is low and 7, 5, and 3 are connected to the output. The distortion range switches now control the gain.

The signals from and to U7021C control the switching of U7041. A dc voltage proportional to the output of the distortion amplifier connects to pin 11 of U5081D. The operation of U5081 and U7071 are identical as described for the input stage up/down counter. These gates control up/down counter, U7061, for the distortion amplifier gain. A three-to-eight decoder driver, U5071, supplies decimal output for the distortion amplifier gain control circuitry.

A binary adder, U5011, 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 U5021, and passes through CR5031, CR5033 and CR5037. These diodes drive U3021B and U4061 to operate the μV, mV, and Volts annunicator LEDs. The control source for the decimal points is selected by U3041, 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 U5021 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 1, 3, 5 and 7. In the dB modes, U3041 is disabled, and Q2063 is turned on by U4071A or U4071B. This illuminates the proper decimal point for all dB displays.

A 4 bit and/or selector (U5061) operating as a multiplexer, selects the control source for the dB offset generator. In the lever mode, the offset is controlled by the sum at the output of U5011. In the distortion modes, U5061 is controlled by the distortion amplifier gain.

Power Supplies ⟨7⟩

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

The +5 V dc supply is derived from the +8 V dc supply in the mainframe. A three terminal voltage regulator, U4040, provides +5 V and includes built-in current limiting. Additional overcurrent protection is provided by F4062. R3047 provides adjustment of the voltage to a nominal value of +5.25 V measured at TP3041.

The +15 V dc supply is regulated from the +26 V dc mainframe supply. The reference voltage, against which the regulator output, divided down by R3043 and R3044 is compared, is supplied by VR3041. Errors between the reference voltage and divided output are amplified by U4041B and Q4050. The mainframe NPN transistor and Q3051 form a Darlington series-pass transistor. Frequency compensation for stability is provided by R4050 and C4050. Current limiting is accomplished by Q3050 which senses the voltage across R3053. When the current delivered by the +15 V supply exceeds about 500 mA, Q3050 turns on. This shunts base drive current from Q3051 lowering the output voltage. Fuse F4060 provides additional protection.

The −15 V is supplied from the −26 V dc in the mainframe. Amplifier U4041A compares the regulated +15 V supply with the −15 V through R4041 and R4042. Voltage differences are amplified by U4041 and Q4051. The mainframe PNP transistor and Q4052 form a Darlington series-pass transistor. Frequency compensation for stability is provided by R4054 and C4051. Current limiting is accomplished by Q4044 which senses the current through R4053. When the current delivered by the −15 V supply exceeds about 500 mA, Q4053 turns on. This shunts base drive current away from Q4052 and lowers the output voltage of the power supply. Fuse F4061 provides additional protection.

IM Analyzer (Option 01 and Option 02 only) 13

The IMD Analyzer is block diagrammed in Fig. 3-3. In the difference frequency distortion mode (CCIF) the analyzer is a 1.1 kHz 9-pole Butterworth low pass filter. Two poles of this filter are provided by U3081B and associated components. The CCIF signal then passes to the level sensor composed of Q7071, CR5083 and C6071. Depending on the position of jumper P1053 and the amplitude of low frequency components at the anode of CR5083, multiplexer U8051 selects the output from the SMPTE/DIN demodulator at pin 2 or the partially filtered CCIF signal at pin 3. If approximately 1 V or more of low frequency signal is present at the anode of CR5083, Q7071 turns on. If the jumper is in the automatic position, the collector of U7071 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 1.0 kHz. Under these conditions Q7071 is off, and pin 3 is connected to pin 14 of U8051.

The output of U8051 feeds buffer U6051B. The signals then pass through the remaining 7 poles of the 1.1 kHz low pass filter, comprised of U6051A, U6041A and U6041B, to the distortion amplifier.

In the SMPTE/DIN mode, the input signal passes through 7 poles of a 2 kHz high pass filter to remove the low frequency tone. This filter is composed of U3081A, U3061B and U3061A. The signal is full-wave rectified by U3041A and applied to the input of a voltage controlled amplifier U3041B. To maintain a constant signal amplitude of 3.6 V dc, U3031A integrates the difference between this signal and a dc reference voltage. The current through the LED in gain control resistor U2041 maintains the gain of U3041B so that the output is at 3.6 Vdc. The rectifier signal contains the demodulated SMPTE/DIN IM distortion product and passes through a 30 Hz two pole high pass filter comprised of C2021, C2011, R3021 and R3023 to the input of U3031B. This amplifier, along with C5021, C5023, C3031, and C3033 forms the first two poles of the 9-pole 1.1 kHz low pass filter. Pin 7 of U3031B connects to multiplexer U8051. From this point, the signal is processed exactly the same as the CCIF signal.

CALIBRATION

PERFORMANCE CHECK

Introduction

This procedure checks the electrical performance requirements as listed in the Specifications section of this manual and may be used in an incoming inspection facility to determine acceptability of performance. If the instrument fails to meet the requirements given in this Performance Check section, the Adjustments Procedure section should be performed. Refer to the Parts Location Grid in the pull-out pages for the following Checks and Procedures. This procedure can be performed at any ambient temperature between 0°C to 50°C. Allow 20 minutes warm-up time (60 minutes after storage in a high humidity environment) before beginning the Performance Check.

Performance Check Interval

The performance check should be performed at the following intervals:

- At incoming inspection
- After 2000 hours of operation or every 12 months, if used infrequently
- After repair or accidental abuse.

Services Available

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

Test Equipment Required

The test equipment, or equivalent (except as noted) listed in Table 4-1 is suggested to perform the Performance Check and the Adjustment Procedure in this manual.

Table 4-1
Suggested Test Equipment

Description	Minimum Requirements	Example
Low distortion Sinewave oscillator(s)	≤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 (Option 01 and Option 02 only)	Tektronix SG 505 oscillator for standard AA 501A or two SG 505 oscillators (one must have Option 01) for AA501A Option 01 and 02 instruments
Function generator	10 Hz to 500 KHz sinewave, triggerable tone burst capability	Tektronix FG 501A or FG 504
AC Voltage Calibrator	100 μV to 180 V; 10 Hz to 100 KHz	[a]Fluke 5200A and 5205A
General Purpose Digital Multimeter	0.5% AC volts at 1 KHz, 0.2% dc volts and ohms	Tektronix DM 501A
General Purpose Counter	10 Hz to 500 KHz, 0.01%	Tektronix DC 509 or DC 504A
Adapter, BNC female to dual Banana adapter		Tektronix Part No. 103-0090-00
BNC T-adapter		Tektronix Part No. 103-0030-00
BNC connectors, 50 Ω coaxal cables 42 inch, 2 ea.		Tektronix Part No. 012-0057-01
6 inch banana-to-banana Patch Cord		Tektronix Part No. 012-0024-00
50 Ω Feedthrough Termination		Tektronix Part No. 011-0049-01
50 Ω 10X Attenuator, 3 ea.		Tektronix Part No. 011-0059-01
1 MΩ/20 pF input Normalizer		Tektronix Part No. 067-0538-00

[a]Model 5101B-03 may be substituted for the 5200A; however its specified accuracy derates to 2.0% at 1 mV (20 Hz to 20 kHz). Amplitude accuracy should be independently verified.

Performance Check Steps

1. Check Input Impedance
2. Check Common Mode Rejection
3. Check Volts Accuracy
4. Check dBm Accuracy and Flatness
5. Check Bandwidth
6. Check Filters Response Accuracy
7. Check Residual Noise
8. Check THD+N Accuracy
9. Check SMPTE/DIN IM Accuracy (Option 01 and Option 02 only)
10. Check CCIF IM Accuracy (Option 01 and Option 02 only)
11. Check Residual THD+N
12. Check Residual SMPTE/DIN IMD (Option 01 and Option 02 only)
13. Check Residual CCIF IMD (Option 01 and Option 02 only)
14. Check Q-PK Response Dynamic Characteristic (Opt. 02 only)
15. Check Input Monitor
16. Check Function Output
17. Check Auxiliary Input

NOTE

The AA 501A has selectable measurement response. Unless specifically noted, all performance specifications and checks are valid using rms response only.

AA 501A Performance Check Summary

Serial Number: _____ **Notes:** _____
Date: _____ _____

STEP #	CHECK	ALLOWABLE LIMITS	ACTUAL VALUE
1.	**Input Impedance**		
	+ Input	98.0 to 102.0 kΩ	
	− Input	98.0 to 102.0 kΩ	
2.	**Common Mode Rejection**		
	50 mV (200 μV range)	≤1.58 V	
	50 mV (2 mV range)	≤158 mV	
	50 mV (20 mV range)	≤15.8 mV	
	100 mV (200 mV range)	≤3.2 mV	
	300 mV (600 mV range)	≤1.0 mV	
	1 V (2 V range)	≤3.2 mV	
	3 V (6 V range)	≤1.0 mV	
	10 V (20 V range)	≤3.2 mV	
	30 V (60 V range)	≤1.0 mV	
	100 V (200 V range)	≤3.2 mV	
3.	**Volts Accuracy**		
	A. 20 Hz to 20 kHz band	20 Hz 1 kHz 20 kHz	
	100 μV (200 μV range)	97.9 to 102.1 μV	
	1.8 mV (2 mV range)	1.763 to 1.837 mV	
	18 mV (20 mV range)	17.63 to 18.37 mV	
	180 mV (200 mV range)	176.3 to 183.7 mV	
	500 mV (600 mV range)	489 to 511 mV	
	1.800 V (2 V range)	1.763 to 1.837 V	
	5.00 V (6 V range)	4.89 to 5.11	
	18.00 V (20 V range)	17.63 to 18.37	
	50.0 V (60 V range)	48.9 to 51.1	
	80.0 V (200 V range)	176.3 to 183.7	
	B. 10 Hz to 100 kHz	10 Hz 100 kHz	
	100 μV (200 μV range)	95.8 to 104.2 μV	
	1.8 mV (2 mV range)	1.727 to 1.873 mV	
	18 mV (20 mV range)	17.27 to 18.73 mV	
	180 mV (200 mV range)	172.7 to 187.3 mV	
	500 mV (600 mV range)	479 to 521 mV	
	1.800 V (2 V range)	1.727 to 1.873 V	
	5.00 V (6 V range)	4.79 to 5.21	
	18.00 V (20 V range)	17.27 to 18.73	
	50.00 V (60 V range)	47.9 to 52.1	
	180.00 V (200 V range)	172.7 to 187.3	

STEP #	CHECK	ALLOWABLE LIMITS	ACTUAL VALUE
4.	**dBm Accuracy and Flatness**		
	A. 0.7746 V, 1 kHz	−0.3 to +0.3 dBm	
	24.50 mV, 1 kHz	−30.3 to −29.7 dBm	
	B. Flatness		
	10 Hz	−0.5 to +0.5 dB	
	20 Hz	−0.3 to +0.3 dB	
	20 kHz	−0.3 to +0.3 dB	
	100 kHz	−0.5 to +0.5 dB	
	C. 100 dB Ratio Accuracy	−100.8 to −99.2 dB	
5.	**Bandwidth**	⩾300 kHz	
6.	**Filters Response Accuracy**		
	A. 400 Hz HI PASS −3 dB	380 to 420 Hz	
	60 Hz rejection	⩽ −40 dB	
	B. 80 KHz LO PASS −3 dB	76 to 84 kHz	
	C. 30 kHz LO PASS −3 dB	28.5 to 31.5 kHz	
	(Std and Option 01 only)		
	D. AUDIO BANDPASS		
	(Option 02 only)		
	Upper −3 dB	21.28 to 23.52 kHz	
	Lower −3 dB	21.28 to 23.52 Hz	
	E. A WTG (std only)		
	100 Hz	−20.1 to −18.1 dB	
	1 kHz	−1.0 to +1.0 dB	
	10 kHz	−6.5 to −0.5 dB	
	F. CCIR WTG (Opt 02 only)		
	100 Hz	−20.8 to −18.8 dB	
	1 kHz	−0.5 to +0.5 dB	
	10 KHz	+7.3 to +8.9 dB	
	20 KHz	−24.2 to −20.2 dB	
	Q-PK 1 kHz cal	−0.2 to +0.2 dB	
	RMS 2 kHz cal	−0.3 to +0.3 dB	
7.	**Residual Noise**		
	400 Hz −80 kHz	⩽3.0 μV	
	A WTG (Std and Option 01 only)	⩽1.5 μV	
	CCIR WTG (Option 02 only	⩽5.0 μV	
	with Q-PK response)		

STEP #	CHECK	ALLOWABLE LIMITS	ACTUAL VALUE
8.	**Total Harmonic Distortion Accuracy**		
	A. 20 Hz fundamental		
	40 Hz	0.900 to 1.100%	
	60 Hz	0.900 to 1.100%	
	80 Hz	0.900 to 1.100%	
	1 kHz	0.900 to 1.100%	
	B. 1 kHz fundamental		
	2 kHz	0.900 to 1.100%	
	3 kHz	0.900 to 1.100%	
	4 kHz	0.900 to 1.100%	
	10 kHz	0.900 to 1.100%	
	C. 20 kHz fundamental		
	40 kHz	0.900 to 1.100%	
	60 kHz	0.900 to 1.100%	
	80 kHz	0.900 to 1.100%	
	100 kHz	0.900 to 1.100%	
	D. 10 Hz fundamental		
	20 Hz	0.800 to 1.200%	
	100 Hz	0.800 to 1.200%	
	E. 100 kHz fundamental		
	200 kHz	0.800 to 1.200%	
	300 kHz	0.800 to 1.200%	
9.	**SMPTE/DIN IM Distortion (Option 01 and Option 02 only)**		
	Accuracy	0.900 to 1.100%	
10.	**CCIF IM Distortion (Option 01 and Option 02 only)**		
	Accuracy	0.900 to 1.100%	
11.	**Residual THD+N** (with SG 505)		**−Input Grounded** **+Input Grounded**
	10 Hz	≤0.0071%	
	20 Hz	≤0.0032%	
	1 kHz	≤0.0032%	
	20 kHz	≤0.0032%	
	50 kHz	≤0.0071%	
	100 kHz	≤0.010%	

STEP #	CHECK	ALLOWABLE LIMITS	ACTUAL VALUE
12.	**Residual SMPTE/DIN IMD** (with SG505)		
	A. 4 to 1 Ratio		
	—Input Grounded	≤0.0025%	
	+Input Grounded	≤0.0025%	
13.	**Residual CCIF IMD**		
	(with SG 505 pair)		
	—Input Grounded	≤0.0018%	
	+Input Grounded	≤0.0018%	
14.	**Q-PK Response (Opt 02 only)**		
	Single cycle 200 Hz tone burst with 10 Hz repetition rate relative response	−2.7 to −1.9 dB	
15.	**Input Monitor**		
	Amplitude	0.90 to 1.10 V	
	Output Impedance	950 to 1050 Ω	
16.	**Function Output**		
	Accuracy	0.97 to 1.03 V	
	Output Impedance	950 to 1050 Ω	
17.	**Auxiliary Input**		
	Accuracy	0.97 to 1.03 V	
	Input Impedance	95 to 105 kΩ	

PROCEDURE

1. Check Input Impedance

AA 501A Control Settings

FUNCTION	Level-Volts
INPUT RANGE	200 mV
FILTERS	None
RESPONSE	RMS

a. Connect the ac voltage calibrator to the input terminals of the AA 501A. Also connect a patch cord from the low or grounded side of the banana plug adapter to the ground terminal of the AA 501A so that it grounds out the −Input. Refer to Fig. 4-1.

b. Set the ac calibrator for an output frequency of 400 Hz and an amplitude of 110 mV. Adjust calibrator amplitude until the AA 501A display reads exactly 110.0 mV.

c. Insert the 1MΩ/20 pF Normalizer in series with the BNC to banana plug adapter and set the ac calibrator range for an output amplitude equal to 10 times the amount as determined in part b.

d. CHECK—That the AA 501A display readout is 98.0 to 102.0 mV, corresponding to an Input impedance of 98.0 to 102.0 kΩ.

e. Reverse the banana plug connections to the AA 501A so that the grounding connection shorts out the +Input.

f. CHECK—That the AA 501A display readout is 98.0 to 102.0 mV corresponding to an input impedance of 98.0 to 102.0 kΩ.

g. Remove the 1 MΩ/20 pF Normalizer.

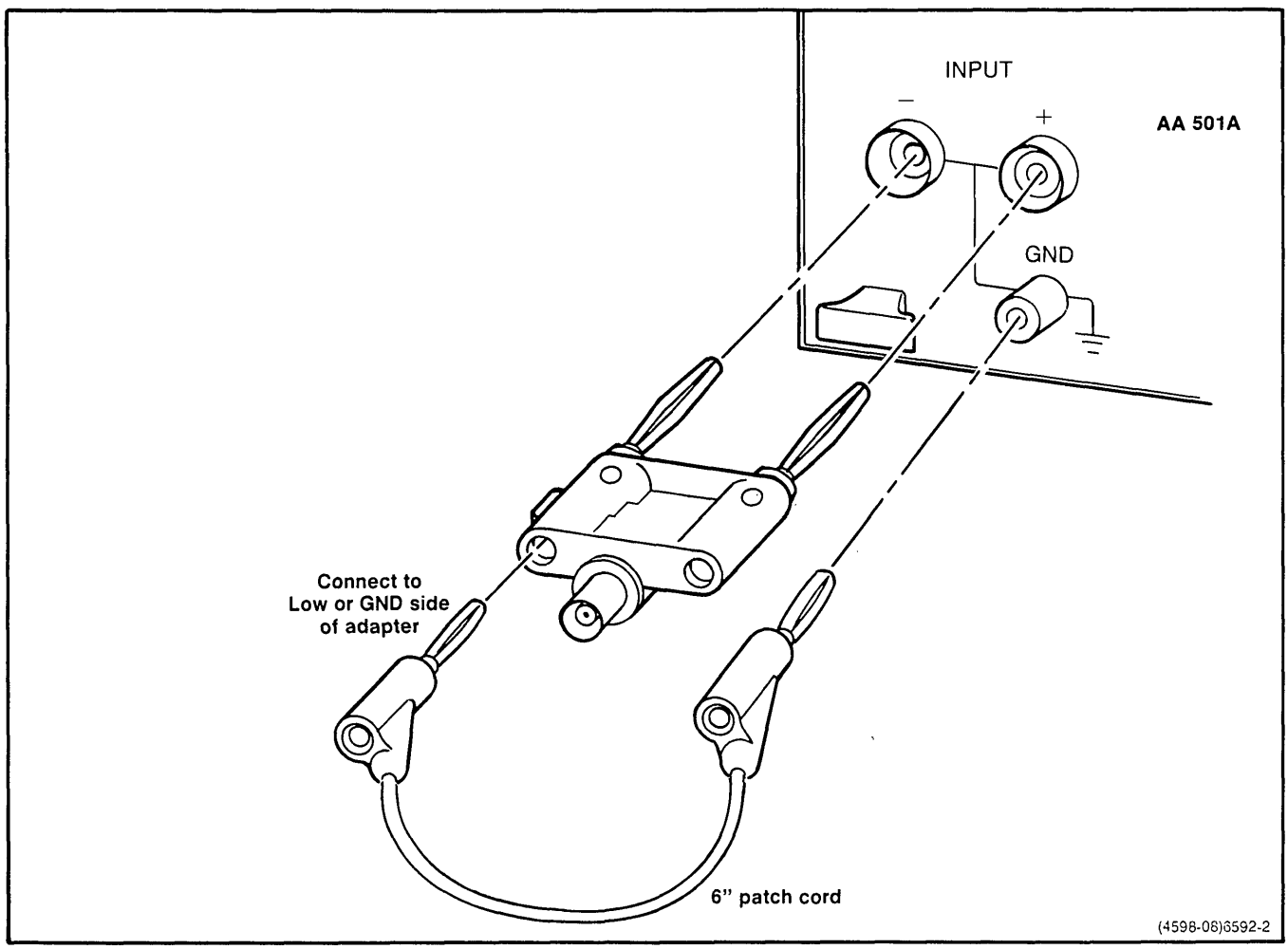


Fig. 4-1. AA 501A grounded unbalanced input connection.

2. Check Common Mode Rejection

a. Connect the ac calibrator to the input terminal of the AA 501A as shown in Fig. 4-2.

b. Connect the digital multimeter to the AA 501A Function Output and adjust it to measure AC volts.

c. Set the ac calibrator for an output frequency of 50 Hz (or 60 Hz) and an amplitude of 50 mV.

d. Set the AA 501A INPUT RANGE switch to 200 μV.

e. CHECK—that the digital multimeter display readout is 1.580 volts or less.

NOTE

The internal gain from the AA 501A INPUT to the FUNCTION OUTPUT is 80 dB (x 10,000) on the 200 μV range. With 50 mV of common mode signal, 50 dB rejection would correspond to an equivalent input signal of 158 μV. This is amplified by 80 dB to 1.58 V. Other input ranges decrease this gain in inverse proportion to their value.

f. CHECK—that when using Table 4-2, the digital multimeter readings are acceptable for the listed input conditions.

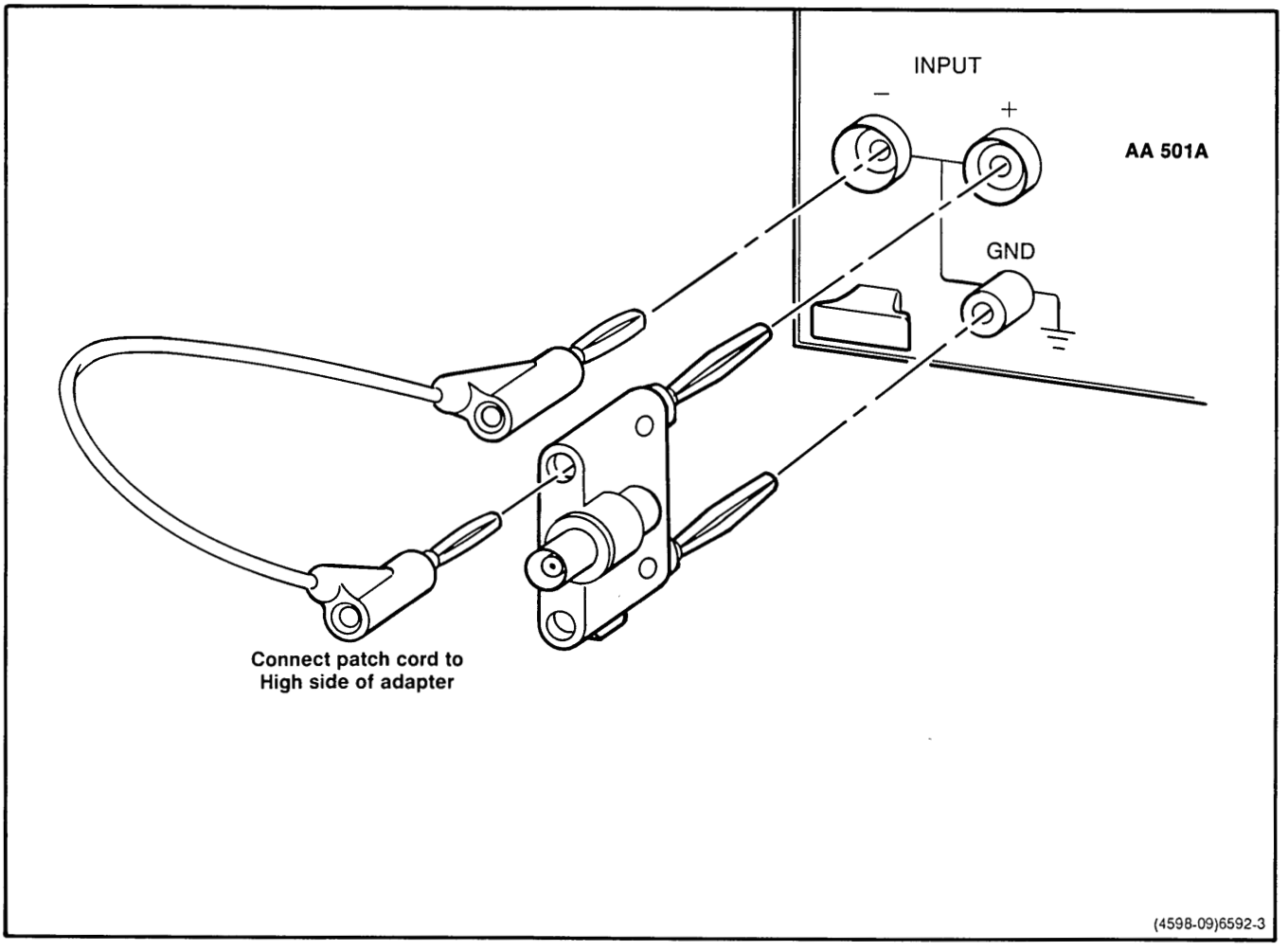


Fig. 4-2. AA 501A common mode input connection.

Table 4-2
Common Mode Rejection CHECK

AA 501A Input Range	Input Common Mode Voltage	Maximum DVM Reading
200 μV	50 mV	1.58 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	1.0 mV
2 V	1 V	3.2 V
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

3. Check Level Function Volts Accuracy

a. Connect an ac calibrator to the AA 501A INPUT. Also connect a patch cord from the low side of the banana plug adapter to the ground terminal referring to Fig. 4-1 (same setup as in step 1).

b. Set the voltage output of the ac calibrator and the AA 501A INPUT RANGE switch as shown in Table 4-2.

c. CHECK—that the displayed voltage readings are within the limits shown in the following table using 10 Hz, 20 Hz, 1 kHz, 20 kHz, and 100 kHz frequencies.

NOTE

The operational range and/or specified accuracy of most commercially available ac calibrators is not adequate to directly check the AA 501A performance at 100 μV. If desired, an accurate 100 μV signal may be obtained by connecting a 1 kΩ 0.1% resistor shunting the AA 501A INPUT and a 100 kΩ, 0.1% resistor in series with the ac calibrator set for 10.20 mV. The resistor divider ratio (including AA 501A input impedance effects) will be 102 to 1 causing the required 100 μV at the input terminals.

d. Maintain test setup for next check.

Table 4-3
Level Function Volts Accuracy

AA 501A Input Range	Calibrator Setting	Reading Limits	
		20 kHz – 20 kHz	10 Hz – 100 kHz
200 μV	100.0 μV	97.9 to 102.1	95.8 to 104.2
2 mV	1.800 mV	1.763 to 1.837	1.727 to 1.873
20 mV	18 mV	17.63 to 18.37	17.27 to 18.73
200 mV	180 mV	176.3 to 183.7	172.7 to 187.3
600 mV	500 mV	489 to 511	479 to 521
2 V	1.800 V	1.763 to 1.837	1.727 to 1.873
6 V	5.00 V	4.89 to 5.11	4.79 to 5.21
20 V	18.00 V	17.63 to 18.37	17.27 to 18.73
60 V	50.0 V	48.9 to 51.1	47.9 to 52.1
200 V	180.0 V	176.3 to 183.7	172.7 to 187.3

4. Check dBm Accuracy and Flatness

a. Connect an ac calibrator to the AA 501A as shown in step 3 (referring to Fig. 4-1).

b. Set the ac calibrator output frequency to 1 kHz with an amplitude of 0.7746 V.

c. Change the AA 501A INPUT RANGE switch to AUTO RANGE and the LEVEL FUNCTION to dBm 600 Ω.

d. CHECK—that the dBm reading is −0.3 to +0.3.

e. Set the ac calibrator for an output frequency of 1 kHz and any valid voltage ⩾100 μV and 1 kHz. Calculate the dBm equivalent of this voltage using the formula:

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

For example 24.50 mV would correspond to −30.0 dBm.

f. Select the dBm 600 Ω display mode.

g. CHECK—that the dBm reading is within ±(0.3 dB +0.5% x Reading) of the calculated result in part 4e.

Using the same example of 24.50 mV corresponding to −30.0 dBm, the tolerance would be ±(0.3 + 0.06) = ±0.3 dB rounded off the the nearest 0.1 dB of displayed resolution.

h. Select dB RATIO display mode and PUSH TO SET 0dB REFerence set button.

i. CHECK—that the dB reading is −0.3 to +0.3 at 20 Hz and 20 kHz, and −0.5 to +0.5 at 10 Hz and 100 kHz frequency settings of the ac calibrator.

j. Set the ac calibrator to 100.0 V and 1 kHz and PUSH TO SET 0 dB REFerence set button.

k. Set the ac calibrator to 1.000 mV.

l. CHECK—that the dB reading is −99.2 to −100.8.

5. Check Bandwidth

a. Connect function generator to AA 501A input using a 50 Ω terminator and BNC-to-dual banana plug adapter. Also connect the digital counter to the AA 501A Input Monitor or the function generator, if desired, and adjust for a stable frequency readout.

b. Set function generator output to 1 kHz and any convenient amplitude, such as 1 V.

c. Select the dB RATIO display mode and PUSH TO SET 0 dB REFerence set button.

d. Increase the frequency of the function generator until the display readout indicates −3.0 dB.

e. CHECK—that the digital counter frequency readout indicates ⩾300 kHz.

6. Check Filters Response Accuracy

a. Connect the sinewave oscillator to the AA 501A INPUT.

b. Set the oscillator frequency to 1 KHz and any convenient amplitude, such as 1 V.

c. Select dB RATIO display mode and PUSH TO SET 0 dB REFerence set button.

d. Press the 400 Hz HI PASS filter button.

e. Decrease the frequency of the sinewave oscillator until the display readout indicates −3.0 dB.

f. CHECK—that the counter readout indicates between 380 Hz and 420 Hz.

g. Decrease the frequency of the generator to 60 Hz.

h. CHECK—that the AA 501A display readout indicates 40 dB or more attenuation.

i. Release the 400 Hz HI PASS filter and select the 80 kHz LO PASS filter.

j. Increase the frequency of the oscillator until the display readout indicates −3.0 dB.

k. CHECK—that the counter reads 76 kHz to 84 kHz.

l. Release the 80 kHz LO PASS filter and select the 30 kHz LO PASS filter (STD and Option 01 only).

m. Decrease oscillator frequency until the display readout indicates −3.0 dB.

n. CHECK—that the counter indicates 28.5 kHz to 31.5 kHz.

o. Release the 30 kHz LO PASS filter and select the AUDIO BAND PASS filter (Option 02 only).

p. Decrease the frequency of the oscillator until the display readout indicates −3.0 dB at the upper cutoff frequency.

q. CHECK—that the counter reads 21.28 kHz to 23.52 kHz.

r. Decrease the frequency of the oscillator until the display readout indicates −3.0 dB at the lower cutoff frequency.

s. CHECK—that the counter display readout is 21.28 Hz to 23.52 Hz.

NOTE

Follow steps 6t through 6z for standard and Option 01 instruments only. Perform steps 6aa and following for Option 02 instruments only. Steps 6t through 6z spot check the response of the A weighting filter. For more information, refer to ANSI S 1.4 1971 (revised 1976) or IEC Recommendation 179 for type 1 sound level meters.

t. Release the previously selected filter and select the A WTG filter.

u. Set frequency of the oscillator to 100 Hz.

v. CHECK—that the AA 501A display readout indicates −20.1 dB to −18.1 dB.

w. Set oscillator frequency to 1 kHz.

x. CHECK—that the AA 501A display readout indicates −1.0 dB to +1.0 dB.

y. Set oscillator frequency to 10 kHz.

z. CHECK—that the AA 501A display readout indicates −6.5 dB to −0.5 dB.

NOTE

The following steps spot check the response of the CCIR WTG filter (Option 02 instruments only). For more information, refer to CCIR Recommendation 468-2 or DIN 45405. The CCIR weighting characteristic exhibits a very sharp rolloff at high frequencies. Exercise care to avoid small errors in setting frequency that can translate to significant amplitude (response) errors.

aa. Release all previously selected filters and select the CCIR WTG filter to check the Option 02 instruments.

bb. Set the oscillator output frequency to 1.0 kHz and the output amplitude to approximately 0.8 V.

cc. Select dB RATIO mode and PUSH TO SET 0 dB REFerence set button.

dd. Increase oscillator output frequency to 6.30 kHz and readjust the output amplitude to obtain an AA 501A display readout of exactly +12.2 dB. (CCIR response accuracy is referenced to +12.2 dB at 6.3 kHz.)

ee. Set the oscillator output frequency to 100 Hz.

ff. CHECK—that the AA 501A display readout indicates −20.8 dB to −18.8 dB.

gg. Set the oscillator output frequency to 1.00 kHz.

hh. CHECK—that the AA 501A display readout indicates −0.5 dB to +0.5 dB.

ii. Set the oscillator output frequency to 10.0 kHz.

jj. CHECK—that the AA 501A display readout indicates +7.3 dB to +8.9 dB.

kk. Set the oscillator output frequency to 20.0 kHz.

ll. CHECK—that the AA 501A display readout indicates −24.2 dB to −20.2 dB.

NOTE

The following steps check the overall gain calibration of the CCIR WTG filter with both quasi-peak and rms detector responses. These gain calibrations are intentionally different with the 0 dB reference frequencies being 1.00 kHz and 2.00 kHz respectively.

mm. Release CCIR WTG filter (flat response) and select Q-PK response.

nn. Set the oscillator output frequency to 1.00 kHz and the amplitude to approximately 0.8 V.

oo. Select dB RATIO mode and PUSH TO SET 0 dB REFerence set button.

pp. Select CCIR WTG filter.

qq. CHECK—that the AA 501A display readout indicates −0.2 dB to +0.2 dB.

rr. Release the CCIR WTG filter (flat response) and select RMS response.

ss. Set the oscillator output frequency to 2.00 kHz.

tt. PUSH TO SET 0 dB REFerence set button.

uu. Select CCIR WTG filter.

vv. CHECK—that the AA 501A display readout indicates −0.3 dB to +0.3 dB.

7. Check Residual Noise

a. Disconnect all cables from the AA 501A. Connect a shorting bar across the + and − Input terminals.

b. Set the AA 501A INPUT RANGE to 200 μV or the Auto Range position. Select VOLTS display, RMS RESPONSE and both 400 Hz HI PASS and 80 kHz LO PASS filters.

c. CHECK—that the display readout indicates ≤3.0 μV.

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

NOTE

For standard and Option 01 instruments perform steps 7e and 7f only. For Option 02 instruments, perform steps 7g and 7h only.

e. Select the A Wgt filter.

f. CHECK—that the display readout indicates ≤1.5 μV.

g. Select CCIR WTG filter and Q-PK response.

h. CHECK—that the display readout indicates ≤5.0 μV.

8. Check Total Harmonic Distortion Accuracy

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

b. Select Input AUTO RANGE, LEVEL FUNCTION (VOLTS display mode), rms response, with no FILTERS.

c. Turn the oscillator output off.

d. Set the function generator output frequency to 7.00 kHz (sinewave) and adjust its output amplitude for an AA 501A display readout of approximately 3.00 mV.

e. Turn on the oscillator output and set its frequency to 400 Hz and amplitude for an AA 501A display readout of 300 mV (or exactly 100 times the value set in part 8d).

NOTE

Do not disturb the oscillator or function generator output amplitudes for the remainder of this step. The resultant composite two tone signal comprises a calibrated 1.00% distortion source.

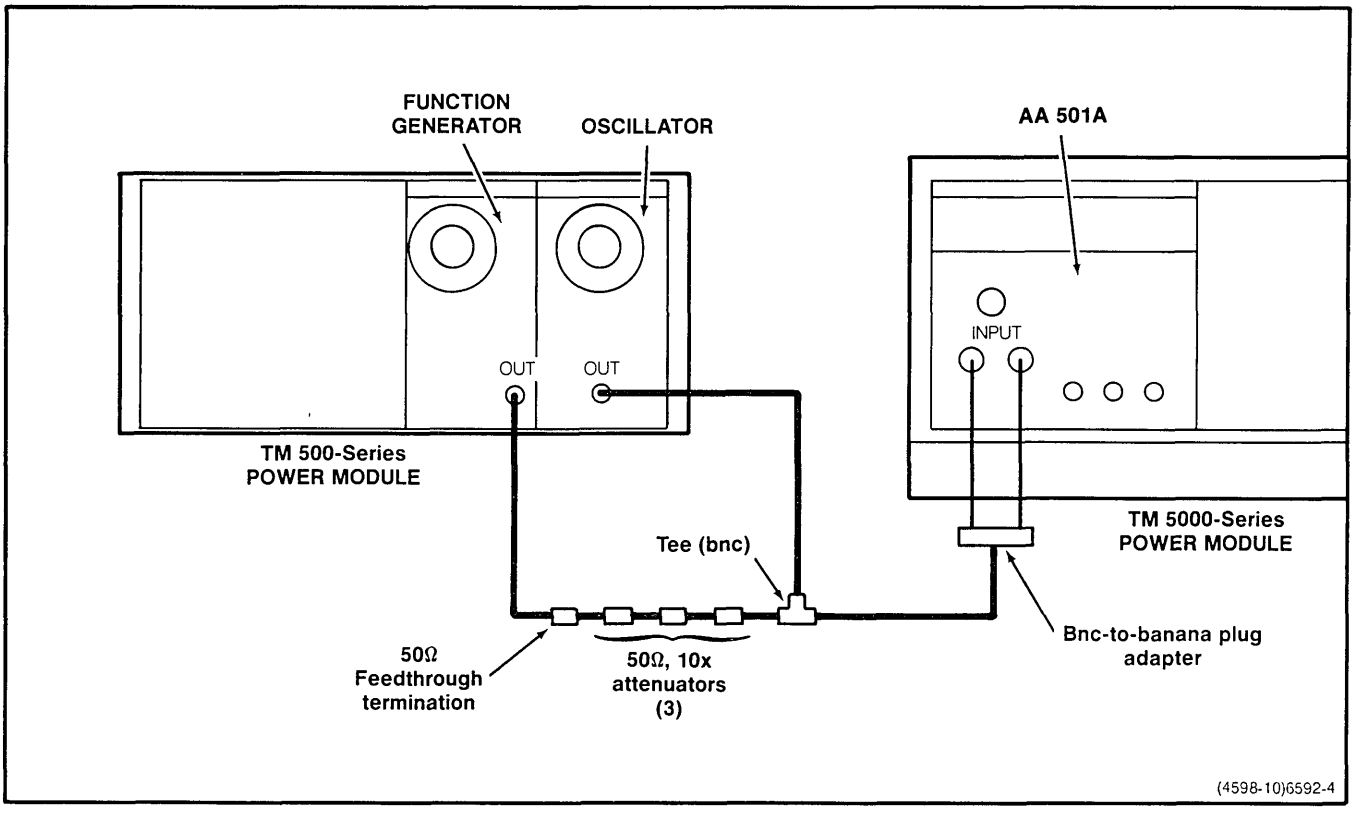


Fig. 4-3. AA 501A check/adjust step.

f. Select THD+N FUNCTION and AUTO RANGE.

g. CHECK—that the displayed distortion readout is within the limits at the various suggested frequency combinations as shown in Table 4-4.

NOTE

When checking measurement accuracy, carefully set the test frequency as close to an exact harmonic ratio with the fundamental frequency. Beat frequency related display jitter can occur if the test frequency is offset by 0.1 Hz to 5 Hz from an exact harmonic. This is caused by the AA 501A automatic tuning operation and nulling control loops and the relatively fast response of the response detectors. A Lissajous waveform, formed by an X-Y display of the Input Monitor and Function Output signals may be helpful in setting the frequencies for exact harmonic ratios.

h. Maintain test setup for next check.

Table 4-4
Total Harmonic Distortion Accuracy CHECK

Fundamental (Oscillator)	Test Frequency (Function Generator)	Reading Limits
20 Hz	40 Hz 60 Hz 80 Hz	
1 kHz	1 kHz 2 kHz 3 kHz 4 kHz 10 kHz	0.900% to 1.100%
20 kHz	40 kHz 60 kHz 80 kHz 100 kHz	
10 Hz	20 Hz 100 Hz	0.800% to 1.200%
100 KHz	200 kHz 300 kHz	

9. Check SMPTE/DIN IM Distortion Accuracy (Option 01 and Option 02 Only)

a. Select Input AUTO RANGE LEVEL FUNCTION, VOLTS display mode, using no FILTERS.

b. Turn the oscillator output off.

c. Set the function generator output frequency to 7.00 kHz and adjust its output amplitude for an AA 501A display readout of 0.800 mV.

d. Turn on the oscillator output, select the 60 Hz IM test signal, and set the output frequency to 7.20 kHz.

e. Select the 400 Hz HI PASS FILTER to reject the 60 Hz component of the IM test signal and adjust the oscillator output amplitude for an AA 501A displayed readout of 80.0 mV.

f. Select the IMD FUNCTION and AUTO RANGE % mode, then release the 400 Hz HI PASS Filter.

g. CHECK—that the AA 501A display readout indicates 0.900% to 1.100%.

h. Leave test equipment setup for next step.

10. Check CCIF IM Distortion Accuracy (Option 01 and Option 02 Only)

a. Select the AA 501A LEVEL (VOLTS and release any FILTERS previously selected (flat response).

b. Turn the oscillator output off. Turn off the oscillator IM test signal.

c. Set the function generator output frequency to 250 Hz and adjust its output amplitude for an AA 501A display readout of 3.00 mV.

NOTE

CCIF distortion is referenced to the level of either component of two equal amplitude test tones. This procedure simplifies test instrumentation requirements by omitting one of the two test tones. Subsequently, the averaging response of the automatic set-level circuitry of the AA 501A will cause readings to be high by a factor of exactly (4π) or 1.273. To compensate for this effect, the 250 Hz test tone amplitude is reduced proportionately from 300 mV to 382 mV.

d. Turn on the oscillator output and set its frequency to 14 kHz and amplitude for an AA 501A display readout of 382 mV.

e. Select IMD FUNCTION.

f. CHECK—that the AA 501A display readout indicates 0.900% to 1.100%.

11. Check Residual THD+N

a. Connect the SG 505 oscillator output to AA 501A Input with the grounded connection to the −Input (refer to Fig. 4-1) and perform the following settings:

SG 505 Control Settings

Vrms	any setting ⩾250 mV,
GND-FLTG	FLTG
ON-OFF	ON

AA 501A Control Settings

INPUT RANGE	AUTO
FUNCTION	THD+N
%	Auto Range

b. CHECK—that the AA 501A displayed readout does not exceed the limits as shown in the following table for the frequencies specified and for the AA 501A filter used.

SG 505 Freq.	AA 501A Filter	AA 501A THD+N Reading Limit
10 Hz	None	0.0071%
20 Hz	80 kHz	0.0032%
1 kHz	80 kHz	0.0032%
20 kHz	80 kHz	0.0032%
50 kHz	None	0.0071%
100 kHz	None	0.010%

c. Reverse the polarity connection to the AA 501A Input so that the grounding connection shorts out the +Input.

d. CHECK—(repeat step 11b).

e. Maintain test setup for next check.

12. Check Residual Intermodulation Distortion in the SMPTE/DIN Mode (Option 01 and 02 only)

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

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. On Option 02 instruments press the RESPONSE pushbutton.

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. Reverse the polarity of the connection to the AA 501A Input.

i. CHECK—that the display reads ⩽0.0025%.

j. Remove these connections for the next step.

13. Check Residual Intermodulation Distortion in the CCIF Difference Tone Test Mode (Option 01 or 02)

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

b. Turn the first SG 505 output off.

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

d. Set the output frequency of the second SG 505 to 14 kHz.

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

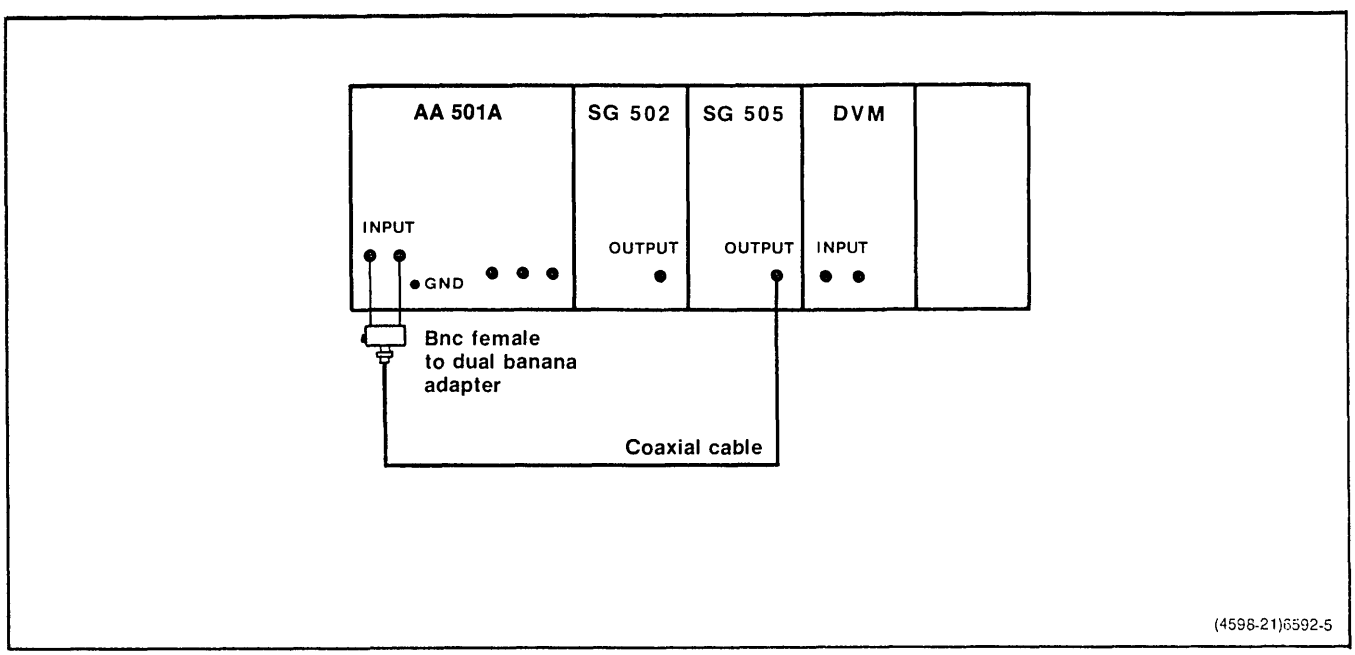


Fig. 4-4. SMPTE residual intermodulation distortion check/adjust.

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

g. Set the output amplitude of the second SG 505 to any voltage above 177 mV. Note the output amplitude as read on the AA 501A display.

h. Turn the first SG 505 output on.

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

j. Press the IMD pushbutton.

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

l. Reverse the polarity of the connection to the AA 501A input.

m. CHECK—that the display reads ≤0.0018%.

n. Remove all connections.

14. Check Q-PK Response Dynamic Characteristic (Option 02 only)

NOTE

The following procedure is optional and spot checks the peak hold dynamic characteristic of the Q-PK detector circuitry. It verifies proper operation and is provided in lieu of the complex and lengthy procedures defined in CCIR Recommendation 468-2 or DIN 45405. This procedure checks the relative response of the Q-PK detector to a single cycle 200 Hz tone burst with a 10 Hz repetition rate. If desired, the SG 5010 Programmable Oscillator may be substituted for the suggested triggerable function generator and SG 505 using ON cycles = 1 and OFF cycles = 19 to obtain the required tone burst.

a. Select the AA 501A 2 V INPUT RANGE, LEVEL FUNCTION (volts mode) and Q-PK Response. Make certain all FILTERS are off.

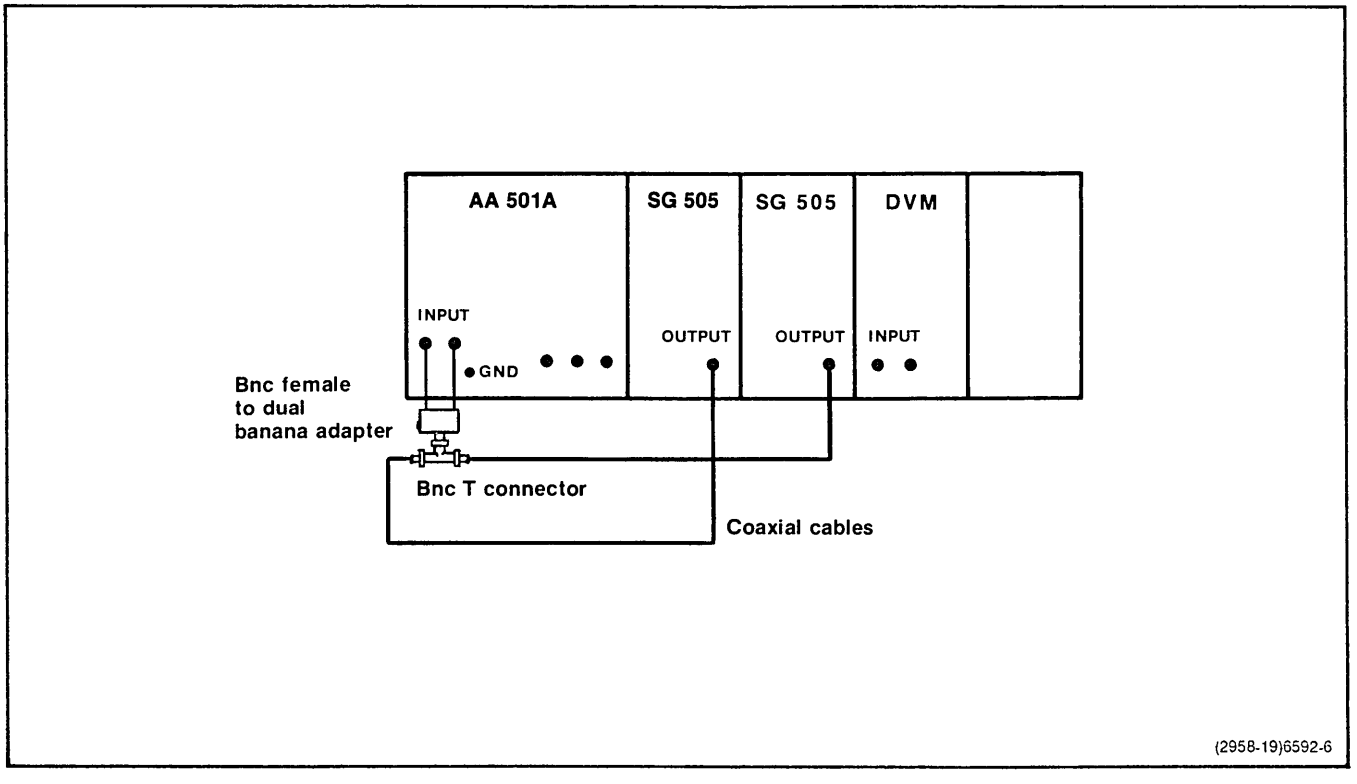


Fig. 4-5. Total harmonic SMPTE and CCIF distortion and CCIF residual IM distortion check/adjust.

b. Connect the output of the triggerable function generator to the input of the AA 501A. Connect the output of the SG 505 oscillator to the trigger input of the function generator.

c. Set the output of the function generator for a 200 Hz sinewave in its free run mode.

d. Adjust the function generator output amplitude for an AA 501A display readout of approximately 1.60 V.

e. Select dB RATIO mode and PUSH TO SET 0 dB REFerence button. Note the display readout indicates 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 function generator to triggered mode and make certain the phase control setting is near 0°. (The output signal should now be a single cycle 200 Hz burst starting at 0° phase with a 10 Hz repetition rate.)

h. CHECK—that the AA 501A display readout is −2.7 dB to −1.9 dB.

15. Check Input Monitor

a. Connect the SG 505 oscillator to the AA 501A INPUT and the digital multimeter to INPUT MONITOR.

b. Set the SG 505 output frequency to 1.00 kHz and approximately 1 V rms.

c. Select the 2 V INPUT RANGE and LEVEL FUNCTION.

d. Set the digital multimeter to measure AC volts.

e. CHECK—that the digital multimeter display readout is 0.90 to 1.10 V rms.

f. Turn the SG 505 oscillator output off.

g. Set the digital multimeter to measure Ω.

h. CHECK—that the digital multimeter display readout is 950 to 1050 Ω.

NOTE

A slight dc offset may be present at the Function Output and will affect an ohm reading. To prevent measurement error, take the average of two readings reversing the digital multimeter connections between readings.

16. Check Function Output

a. Adjust the test setup so that the digital multimeter is connected to the FUNCTION OUTPUT.

b. Set the digital multimeter to measure AC volts.

c. Turn on the SG 505 oscillator output and adjust its amplitude for an AA 501A display readout of 0.998 V to 1.002 V.

d. CHECK—that the digital multimeter display readout is 0.97 to 1.03 V.

e. Turn the SG 505 oscillator output off.

f. Set the digital multimeter to measure Ω.

g. CHECK—that the digital multimeter display readout is 950 to 1050 Ω.

NOTE

A slight dc offset may be present at the FUNCTION OUTPUT and will affect an ohm reading. To prevent measurement error, take the average of two readings reversing the digital multimeter connections between readings.

17. Check Auxiliary Input

a. Connect an ac calibrator to the AA 501A AUXILIARY INPUT. Set the calibrator output frequency to 400 Hz and 1.000 V amplitude.

b. Select 2 V INPUT RANGE, LEVEL FUNCTION (VOLTS mode), and Auxiliary FILTER (Input).

c. CHECK—that the AA 501A display readout is 0.970 to 1.030.

d. Adjust calibrator amplitude until the AA 501A display readout indicates exactly 1.100 V.

e. Insert the 1 MΩ/20 pF Normalizer in series with the Auxiliary Input.

f. CHECK—that the AA 501A display readout is 0.095 to 0.105 V, corresponding to an input impedance of 95 to 105 kΩ.

ADJUSTMENT PROCEDURE

Introduction

This procedure need not be performed unless the instrument fails to meet the performance requirements of the electrical characteristics listed in the Specification section of this manual. To ensure instrument accuracy, perform the adjustment of the instrument every 2000 hours of operation or every 12 months if used infrequently. Adjustment may be required after a repair has been made. If adjustment of internal controls does not bring the instrument performance within the limits listed in the Specification section, troubleshooting is indicated. Adjustments should be made with the instrument operating at an ambient temperature of +20°C to +30°C.

Test Equipment Required

Test equipment used for adjustment of the AA 501A is listed at the beginning of the Performance Check section of this manual.

Preparation

To gain access to the test points and adjustable components, remove the instrument side covers (refer to the Maintenance section for instructions). Some adjustments are accessible through the top and bottom covers. See Fig. 4-6.

Connect the AA 501A to the power module via the extender cable. Connect the test equipment and the power module to a suitable line voltage source.

Turn on the power module and test equipment; allow at least 30 minutes warm-up time for the AA 501A.

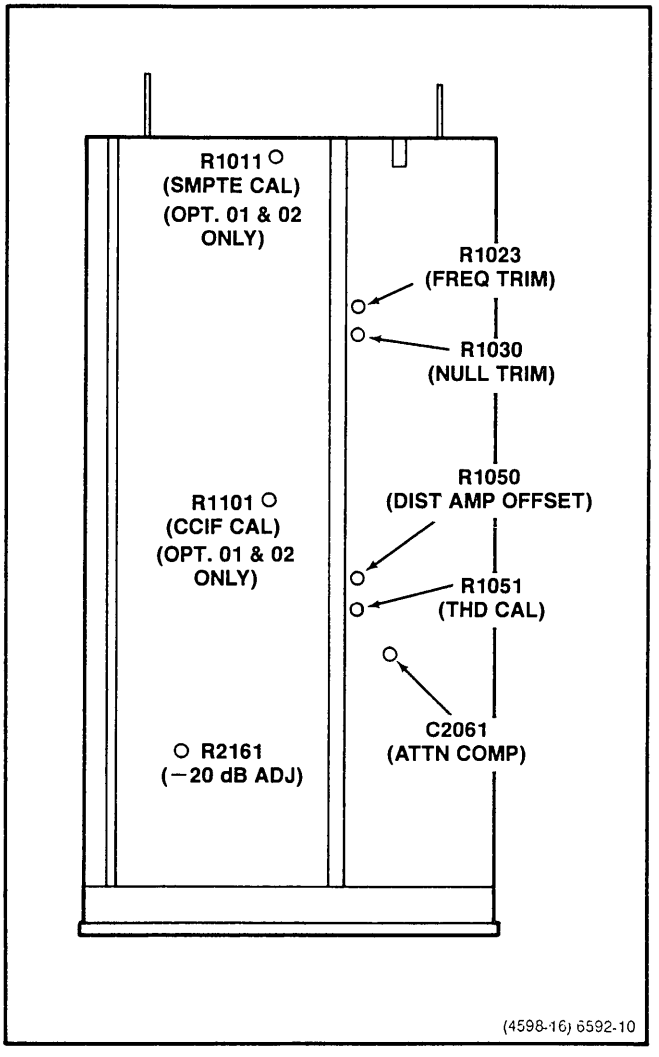


Fig. 4-6. AA 501A top cover adjustment access.

PROCEDURE

1. + 5.25 V (R3047) ADJUST

a. Connect a test cable from the digital voltmeter with the positive lead to the +5.25 V test point (TP 3041) and the negative lead connected to ground (TP 3044).

b. ADJUST—R3047, located on the Main board, for a digital readout of 5.25 V, ±0.1 V.

c. Remove all cable connections.

2. Distortion Amp Offset (R1050) ADJUST

AA 501A Settings

FUNCTION	THD+N
AUTO RANGE	0.2%
FILTERS	80 kHz LO PASS
INPUT RANGE	2 V

a. Short the AA 501A INPUT terminals using the dual banana shorting bar.

b. Connect a test cable from the oscilloscope vertical plug-in to the AA 501A FUNCTION OUTPUT connector.

c. Set the oscilloscope system for 200 mV/div, dc coupling (vertical) and 200 ms/div (horizontal). Adust timebase for auto trigger and position the displayed baseline near center screen.

d. Press the AA 501A AUTO RANGE 2% button and note the jump and recovery of the displayed waveform baseline.

e. ADJUST—R1050, accessable through a hole in the top cover (see Fig. 4-6) and located on the Input/Notch Filter board, while alternately pressing the 0.2% and 2% AUTO RANGE buttons for a jump amplitude of less than 100 mV.

f. Remove all connections.

3. Rms Zero (R1030), Avg Zero (R1035) or Q-PK Zero (R4037) ADJUSTS

a. Press the AA 501A FUNCTION LEVEL and VOLTS buttons. Make certain the INPUT RANGE switch is set to 2 V.

b. Connect a test cable from the calibrator output to the AA 501A INPUT terminals. Set the AC Calibrator for a 15.00 mV, 1 kHz (sinewave) output.

c. Press the AA 501A RESPONSE button (RMS position).

d. ADJUST—R1030, located on the Main board, for a display readout of .014; then slowly adjust R1030 until .015 reading is attained.

e. Press the FUNCTION dBm 600 Ω button, and note the display readout.

f. Release the RESPONSE button.

g. ADJUST—R1035 in standard and Option 01 instruments, or R4037 in Option 02 instruments (located on the Main board), for the same reading as noted in step 3e.

h. Maintain same test setup.

4. Rms Cal (R2064), Avg Cal (R1040) or Q-PK Cal (R4055) ADJUSTS

a. Change the AA 501A FUNCTION to LEVEL and VOLTS, and make certain the INPUT RANGE switch is set to 2 V.

b. Press the RESPONSE button (RMS position).

c. Set the AC Calibrator for a 1.500 V rms output.

d. ADJUST—R2057, located on the DVM/Interface board, for a display readout of 1.500, ±0.001.

e. Release the RESPONSE button.

f. ADJUST—R1040 in standard instruments, or R4055 in Option 02 intruments (located on the Main board), for a display readout of 1.500, ±0.001.

g. Maintain same test setup.

5. Attn Comp (C2061) ADJUST

a. Make certain the FUNCTION LEVEL, VOLTS, and RESPONSE (RMS position) buttons are pressed and all FILTER buttons are out (off).

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

c. Set the AC Calibrator for a 1.00 V, 60 kHz (sinewave) output.

d. Note the display readout.

e. Change the INPUT RANGE switch to 20 V.

f. Change the AC Calibrator to 10.00 V (60 kHz).

g. ADJUST—C2061, accessible through hole in the top cover (see Fig. 4-6) and located on the Input/Notch Filter board, (using an insulated low capacitance screwdriver) for a display readout equal to exactly ten times the reading noted in step 5d.

h. Maintain same test setup.

6. 0 dB (R8101), −20 dB (R2161), and −40 dB (R8091) ADJUSTS

a. Make certain the FUNCTION LEVEL button is pressed.

b. Press the FUNCTION dBm 600 Ω button.

c. Change the INPUT RANGE switch to 2 V.

d. Press the RESPONSE (RMS position) button.

e. Change the AC Calibrator for a 0.7746 V rms, 1 kHz output.

f. ADJUST—R8101, located on the Logic board, for a display readout of exactly 00.0.

g. Reduce the calibrator amplitude to 77.46 mV rms.

h. ADJUST—R2161, accessable through hole in the top cover (see Fig. 4-6) and located on the Logic board, for a display readout of exactly −20.0.

i. Reduce the calibrator amplitude to 7.746 mV rms.

j. ADJUST—R8091, located on the Logic board, for a display readout of −40.0, ±0.2.

k. INTERACTION—Repeat steps 6e through 6j, until the display readouts are correct.

l. Maintain same test setup.

7. Offset Gain (R8111) ADJUST

a. Change the INPUT RANGE switch to 20 mV.

b. Change the calibrator output signal to 7.746 mV rms.

c. ADJUST—R8111, located on the Logic board, for a display readout of exactly −40.0.

d. Maintain same test setup.

8. dBr Zero (R8153) ADJUST

a. Press the AA 501A FUNCTION dB Ratio button and change the Input Range switch to 2 V.

b. Set the calibrator output for 0.7746 V rms at 1 kHz.

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

d. ADJUST—R8153, located on the Logic board, if the display readout is not exactly 00.0. To correct for a − error, adjust (slightly) R8153 clockwise; for a + error correction, adjust counterclockwise.

e. Interaction—Repeat steps 8c and 8d until the display readout indicates 00.0.

f. Remove all connections.

9. Null (R1030), Freq Trim (R1023), and Ldr Balance (R5025) ADJUSTS

NOTE

In these steps, although unnecessary, a dual channel oscilloscope system may be used. Connect the channel 1 to the AA 501A INPUT MONITOR, and the channel 2 to the FUNCTION OUTPUT (triggering on channel 1 signal). Channel 1 indicates the fundamental frequency. R1030 and R1023 are adjusted for minimum fundamental at the FUNCTION OUTPUT, while R5025 adjusts for minimum harmonics.

a. Change the INPUT RANGE switch to 2 V and press the THD+N, 0.2%, and 80 kHz LO PASS buttons.

b. Connect the SG 505 oscillator to the AA 501A INPUT through a BNC to banana plug adapter as shown in Fig. 4-1. Make certain the SG 505 output is floating.

c. Set the SG 505 oscillator output frequency to 400 Hz at approximately 0 dBm (1.55 V rms) amplitude.

d. ADJUST—R1030, accessable through hole in the top rail (see Fig. 4-6) and located on the Input/Notch Filter board, for the lowest display readout.

e. ADJUST—R1023, accessable through the top cover hole (Input/Notch Filter board), for the lowest display readout.

f. INTERACTION—Repeat steps 9d and 9e to obtain the lowest display reading.

g. Change the oscillator frequency to 800 Hz.

h. ADJUST—R5025, accessable through hole in the bottom cover (Input/Notch Filter board), for the lowest display readout.

NOTE

If R5025 has no effect on the display readout, leave the adjustment in the center position. If U4011 or U5010 have been replaced, this adjustment should be performed or rechecked after 24 hours of operation.

i. Disconnect the oscillator.

10. Dist Cal (R4042) ADJUST

a. Change the INPUT RANGE switch to AUTO RANGE.

b. Press the FUNCTION LEVEL, VOLTS, RESPONSE and AUTO RANGE buttons. All other buttons are out (position).

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

d. Turn off the SG 505 oscillator output and make certain it is floating.

e. Adjust the function generator for a sinewave output frequency of 7 kHz and a AA 501A display of approximately 3.00 mV.

f. Turn on the SG 505 oscillator output and set the frequency to 400 Hz. Adjust the output level to 300 mV or exactly 100 times the level set in part 10e (as displayed on the AA 501A) and press the THD+N button.

g. ADJUST—R1051, accessable through the top cover hole (see Fig. 4-6) located on the Input/Notch Filter board, for a display readout of 1.000%.

h. Maintain same test setup.

11. SMPTE Cal (R1011) ADJUST (Option 01 and Option 02 Only)

a. Press the LEVEL button.

b. Turn off the SG 505 oscillator output.

c. Set the function generator output frequency to 7.00 kHz and adjust its output amplitude for an AA 501A display of 0.800 mV.

d. Turn on the SG 505 oscillator output, select the 60 Hz IM test signal mode, and set the output frequency to 7.20 kHz.

e. Press the 400 Hz HI PASS FILTER button to reject the 60 Hz component of the IM test signal and adjust the oscillator output amplitude for a AA 501A display of 80.0 mV.

f. Release the 400 Hz HI PASS Filter and press the IMD button.

g. ADJUST—R1011, accessible through the top cover hole (see Fig. 4-6) located on the IMD board, for a display readout of 1.000%.

h. Maintain the same test setup.

12. CCIF Cal (R1101) ADJUST (Option 01 and Option 02 Only)

a. Press the AA 501A LEVEL button and release any FILTERS previously selected.

b. Turn off the oscillator output. Turn off oscillator IM test signal.

c. Set the function generator output frequency to 250 Hz and adjust its output amplitude for an AA 501A display readout of 3.00 mV.

NOTE

CCIF distortion is referenced to the level of either component of two equal amplitude test tones. This procedure simplifies test instrumentation requirements by omitting one of the two test tones. Subsequently, the averaging response of the automatic set-level circuitry of the AA 501A will cause readings to be high by a factor of exactly (4÷π) or 1.273. To compensate for this effect, high frequency test tone amplitude is increased proportionally from 300 mV to 382 mV.

d. Turn on the SG 505 oscillator output and set its frequency to 14 kHz and amplitude for an AA 501A display readout of 382 mV.

e. Press the IMD button.

f. ADJUST—R1101, accessible through the top cover (see Fig. 4-6) located on the IMD board, for a display readout of 1.000%.

g. Remove all connections.

13. CCIR Cal (Option 02 Instruments Only)

a. Connect SG 505 oscillator to AA 501A INPUT.

b. Select Level Function, Volts, and Q-PK response. Make sure all FILTERS are off.

c. Adjust oscillator output frequency to 1.000 kHz ±1 Hz and amplitude for an AA 501A display readout of approximately 1.000 V.

d. Press the CCIR WTG button.

e. ADJUST—R2035, CCIR Cal located on the main board, for a display readout equal to that observed in step 13c.

f. Disconnect all test equipment.

This completes the Adjustment Procedure.

MAINTENANCE

Introduction

This section of the manual describes on-board jumpers and rear interface information and provides general maintenance and troubleshooting information.

CAUTION

To prevent damage to the AA 501A, turn off the power module before installing or removing the instrument. Do not use excessive force to install or remove.

Preparation For Use

On-board Jumpers

Refer to the Parts Location Grids located in the pull-out pages of this manual.

IMD board: (Option 01 and Option 02 Only)

J1053 CCIF/AUTO/SMPTE—Used to set IMD mode. An internal jumper (J1053) has been provided to defeat the automatic IMD selection feature if desired. To change the jumper position, remove the top cover (see Circuit Board Removal). With the jumper positioned on the back two pins, the instrument is locked in the CCIF IMD mode. With the jumper positioned on the center two pins, the instrument automatically selects either CCIF or SMPTE/DIN modes as determined by the input signals. With the jumper positioned on the front two pins, the unit is locked in the SMPTE/DIN mode.

REAR INTERFACE INFORMATION

FUNCTIONS AVAILABLE AT REAR CONNECTOR

Refer to Fig. 5-1 for the MAIN board assignments.

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 501A as a member of the TM 500 family. Signal inputs, outputs, or other specialized connections may be made to the rear interface connectors as shown in the input output assignments illustration (Fig. 5-1). A description of these connections follows.

+ and − Input Connectors (28B, 28A)

These terminals are connected to the input of the AA 501A 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 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.

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 1kΩ, ±5 %. Changes in input level range or distortion range will cause brief ac transients.

dB Converter Output Ground (20B)

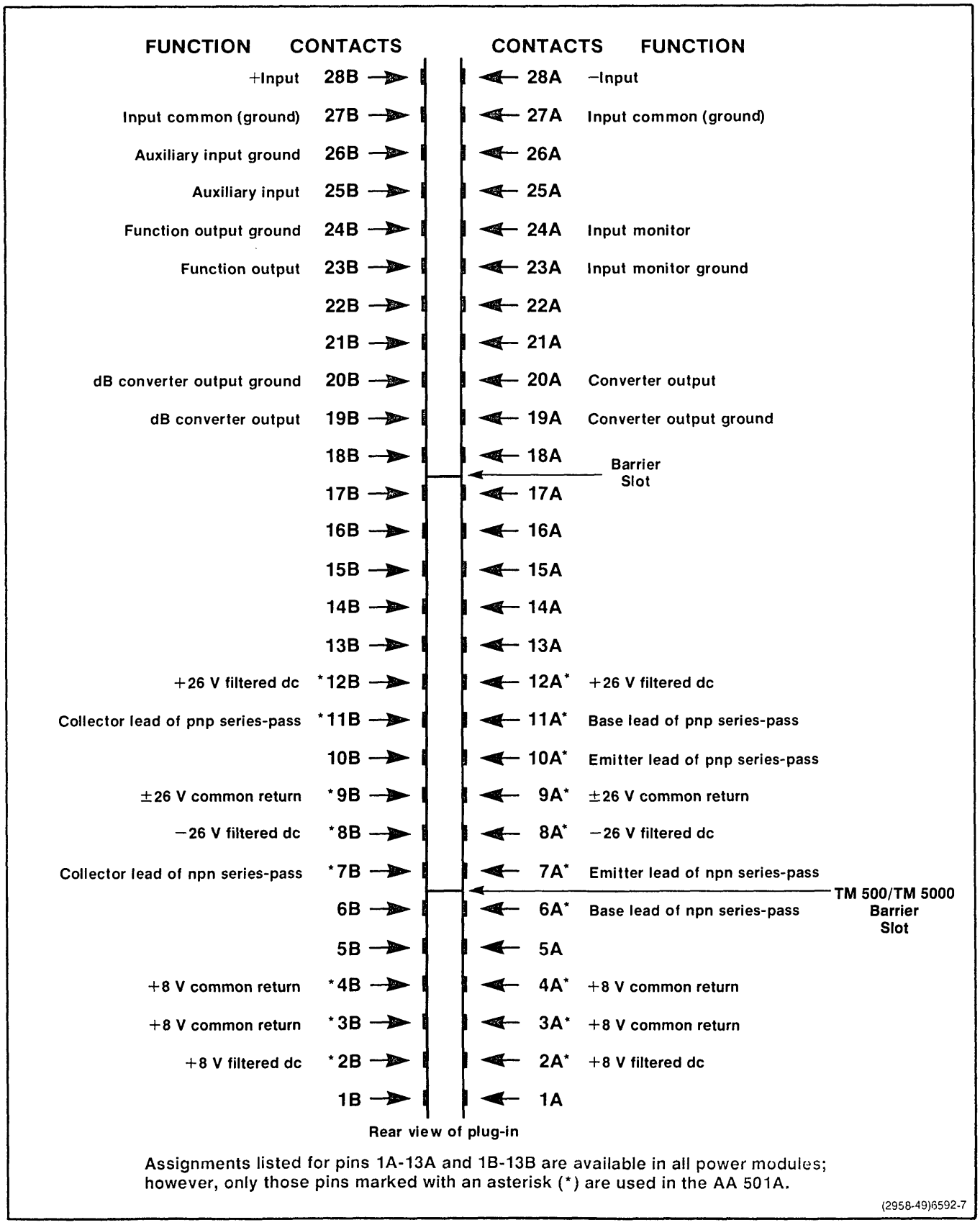
Use this connector as the ground return for the dB converter output.

GENERAL MAINTENANCE INFORMATION

Troubleshooting Aids

Diagrams. Complete circuit diagrams are located in the pullout pages in the Diagrams and Circuit Board Illustrations Section of this manual. The portions of the circuit mounted on the circuit boards is enclosed by a solid line. The circuit number of each component in this instrument is shown on a diagram. See the first page of the Diagrams and Circuit Board Illustrations section for definitions of the symbols and reference designators used on the diagrams.

Circuit Board Illustrations. Circuit board illustrations are provided in conjunction with the circuit diagrams. Each board-mounted component shown on a diagram is also identified on the circuit board illustration by circuit number. A table is provided with each diagram, listing components by assembly and circuit number. The table also lists the component grid locations on both the associated diagram and the circuit board illustration.



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 501A.

(2958-49)6592-7

Fig. 5-1. Main board rear interface connector assignments.

Calibration Fixtures

Several calibration fixtures are available from Tektronix, Inc. that are helpful in troubleshooting the AA 501A.

067-0645-02	Plug-in Extender
067-1156-00	Extender Cable Kit

Contact your nearest Tektronix, Inc. Field Office or representative for ordering information.

Troubleshooting Equipment

Before using any test equipment to make measurements on static-sensitive components or assemblies, be certain that any voltage or current supplied by the test equipment does not exceed the limits of the component to be tested.

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 Ω.)

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.

Circuit Board Removal

Refer to the following procedure and Fig. 5-2 for circuit board removal by qualified service personnel.

1. Top Cover Removal

a. Remove the two side covers (four 1/4 turn fasteners).

b. Remove the top cover screws (2).

c. Remove screws (2) attaching the back cover to top cover.

d. Carefully pull the top cover up to remove.

2. Bottom and Back Covers Removal

a. Remove top cover.

b. Remove shield ground screw (1) on bottom.

c. Remove the latch assembly using the following procedure. Refer to Fig. 5-3.

Use a small screwdriver to push forward slightly on the rear latch just in front of the spring. Press down on the latch knob to raise the latch knob extension at the point where the two latch pieces engage. While holding the latch knob down, push up on the front panel latch piece at the point of engagement to disengage the two pieces. Then, pull the latch knob out.

CAUTION

Do not install the plug-in in the power module while the latch is disassembled. Removal of the plug-in without use of the latch can be extremely difficult.

d. Remove screws (2) attaching the bottom cover to front panel.

CAUTION

The spacers used on the front panel screws are necessary to prevent damage to the front panel. Make sure these spacers are in place when the screws are reinstalled.

e. Carefully pull the covers down and back to remove.

3. Main (A15), Input/Notch (A14), and IMD Option 01 and Option 02 Only (A13) Boards Removal

a. Remove the top, bottom and back covers.

b. Remove the Cable Assembly from J1020 on the Main Board.

c. Position the AA 501A bottom side up, and remove the cables from J7171 on the Logic Board and J4070 on the Input/Notch Board.

d. Remove the screws (2) that secure the Main Board to the Front panel.

e. Slide the boards back to disengage the pushbutton switches from the front panel and fold out the boards as an assembly.

NOTE

This position may be used for troubleshooting most of the AA 501A with an input signal applied to J4070 on the Input/Notch Board. If further disassembly is required, continue this procedure.

f. Remove the screws (3) that secure the IMD Board, disconnect the cable from J8011 on the IMD Board and carefully pull up the board to separate (Option 01 and Option 02 only).

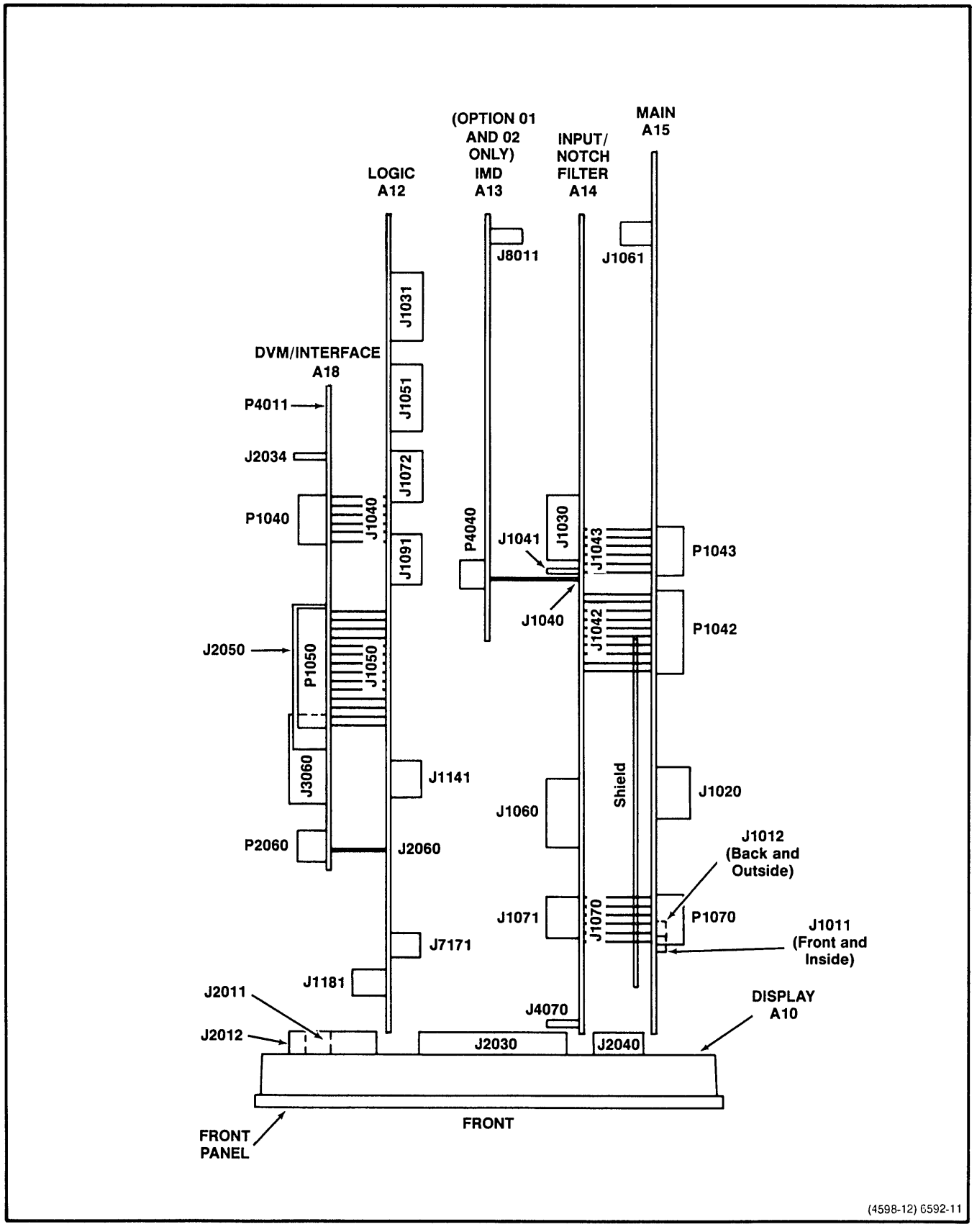


Fig. 5-2. Circuit boards and connectors pictorial (top view).

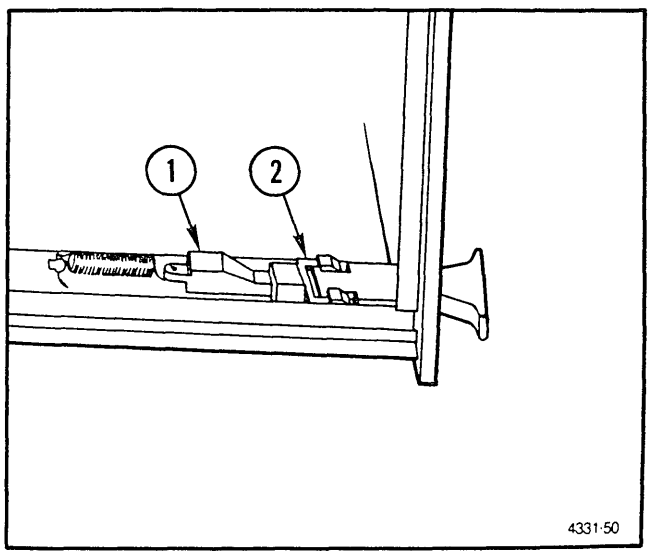


Fig. 5-3. Latch assembly pictorial.

g. Disconnect all cables attaching the board assembly to the rest of the instrument.

h. Remove the screws (2) and posts (2) on the Input/-Notch Board that secure the Input/Notch Board to the Main Board and carefully pull the boards apart.

j. Remove the shield from the Main Board by first removing the spacers (2) from the shield then the screws (3) that secure the shield to the Main Board.

NOTE

On reassembly, the shield should be secured to the Main Board by the screws (3) before the spacers (2) are added.

4. Control Logic (A12) and DVM/Interface (A18) Boards Removal

a. Remove the top, bottom and back covers.

b. Carefully unsolder resistors (2) R530 and R540 from the Input connector solder lugs.

c. Remove the Input Range knob.

d. Disconnect all ribbon cables from the Control Logic and DVM/Interface Boards.

e. Remove the screw (1) that secures the Control Logic Board to the Front Panel.

f. Slide the boards back to disengage the pushbutton switches from the front panel.

g. Remove the screws (3) on the DVM/Interface Board that secure it to the Control Logic Board and carefully pull the boards apart.

5. Display Board (A10) Removal

a. Remove the top, bottom and back covers.

b. Remove the Main (A15), Input/Notch (A14), and IMD (A13) Boards (Option 01 and Option 02 only).

c. Remove the Control Logic (A12) and DVM/Interface (A16) Boards.

d. Disconnect all ribbon cables from the Display Board.

e. Remove the screws (2) that secure the Display Board to the Front Panel.

f. Pull the Display Board away from the Front Panel.

Magnetic Shield

The shield attached to the rear plate of the AA 501A 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. Also, this shield uses a single point ground (center mounting screw) to prevent ground loop currents that would decrease its effectiveness. Note that the top and bottom mounting screws use insulating washers.

Soldering Techniques

WARNING

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

The reliability and accuracy 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

Some of the circuit boards in the AA 501A are of the multilayer type with conductive paths laminated between the top and bottom board layers. All soldering on these boards should be done with extreme care to prevent breaking the connections to these conductive paths. Only experienced maintenance personnel should attempt to repair these boards. Do not allow solder or solder flux to flow under printed curcuit 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 soldering 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.

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 501A can be replaced or repaired as necessary.

Exterior Cleaning

Chassis. Accumulated dust on the instrument chassis 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; then remove the detergent with a cloth dampened in clean water. Do not use abrasive cleaners.

Front Panel. Use only a cotton swab or soft cloth, dampened in isopropyl alcohol or water.

CAUTION

To avoid damage, use only isopropyl alcohol or water. Do not use petroleum based cleansing agents. Before using any other type of cleaner, consult your Tektronix Service Center or representative for information.

Interior Cleaning

Clean circuit boards only when required for operation to specified performance. Dust in the interior of the instrument should be removed occasionally due to its electrical conductivity under high humidity conditions.

The best way to clean the interior is to blow off the accumulated dust with dry, low-velocity air (approximately 5 lb/in^2). Then use a soft brush.

Do not scrape or use an eraser to clean the edge connector contacts. Abrasive cleaning can remove the gold plating.

Isopropyl alcohol can be used to clean major repairs to the circuit board; however, flush the board well with clean, isopropyl alcohol. Make certain that resin or dirt is carefully removed from board areas having high impedance circuitry.

CAUTION

Circuit boards and components must be dry before applying power.

Troubleshooting High Residual Distortion Problems

Refer to Table 5-2 and the following.

Because of the ultra-low distortion and noise levels in the AA 501A, the following precautions and suggestions will save considerable time and minimize erroneous diagnosis.

1. Use only the recommmended SG 5010 or SG 505 (preferred) oscillators as signal sources. An AA 501A residual distortion reading will include the effects of noise and distortion contributions from both oscillator and analyzer. Using other oscillators may give inferior results.
2. Perform servicing only in a "quiet" environment, free from excessive electromagnetic interference. Without its shielding, a disassembled AA 501A is susceptable to stray fields from power transformers, flourescent lights, and particularly raster-scan monitors. Monitors of this type should be turned off, or located at least 5 meters away during troubleshooting.
3. Avoid the use of general purpose bnc connector terminators. Many terminators have voltage coefficients that cause excessive distortion, compared to that of the AA 501A.
4. Connect an oscilloscope system to the FUNCTION OUTPUT, for observation of the residual products actually being measured. Some problems, with high residual readings do not involve distortion but are caused by excessive noise or incomplete fundamental nulling.

Slightly high (or just marginal) residual distortion performance is usually caused by a degradation of a single component in the main signal path.

Semi-conductor devices should be investigated first in the following order of probability: LDRs (light dependent resistors), op-amps (operational amplifiers), and transistors or diodes. Table 5-2 lists some of the more common distortion/noise behavior symptoms along with the most probable defective components.

During disassembly, repair, and reassembly, use good static control measures. Even small static discharges can induce soft failures in the LDRs or op-amps resulting in substantially higher distortion or noise contribution. Also, exercise care when soldering LDRs and op-amps to minimize the chance of heat damage, which can have a similar degrading effect.

Unusually high residual distortion readings (0.1% to 100%) are often the result of band or range selection malfunctions. Check the appropriate relays, as suggested by the symptoms first. Other possible causes may be found in the band discriminator or ranging logic circuitry.

Table 5-2
HIGH DISTORTION/NOISE SYMPTOMS AND PROBABLE CAUSES

	SYMPTOM	CHECK OR REPLACE
1.	High THD near tops of internal frequency bands (e.g., 250-270 Hz; 750-950 Hz)	• Misadjustment of R5025 (LDR Balance to compensate for aging and characteristics mismatch) • U4011, U5010 LDRs
2.	High THD at all frequencies but varies with input level within a given range	• U5051, U5051 LDRs
3.	High 100 kHz THD with either input polarity	• U4051 or U4021 op-amps • (More rarely) U4020 or U4061 op-amps • Also check op-amp compensation elements
4.	High 100 kHz THD with one input polarity only	• Q4060, Q4071 or Q4061, Q4070 diode connected clamps • U4051 or U4021 op-amps
5.	High or elevated 10 kHz THD but, 20 kHz is useable (30 kHz THD may also be relatively high)	• U4021 op-amp
6.	High 30 Hz THD but, 20-25 Hz is useable	• U1011 op-amp (excessive offsets will cause control voltage ripple)
7.	High THD readings at all frequencies but, dominant component is noise	• U4051 op-amp
8.	High THD readings at all frequencies but, dominant component is fundamental	• Misadjustment of R1023 or R1030 • U2020 • (Rarely) C2020 or C2021 is leaky
9.	Unusually high THD readings at lower band edge frequencies (e.g., 100 Hz, 2.8 kHz). Dominant component is fundamental	• U4011, U5010 LDRs • U2024 and related drive components
10.	High CCIF IMD but, SMPTE IMD is usable (will often occur with symptom #2)	• U5041, U5051 LDRs • U4051 op-amp • (Rarely) C2032 or C1010 is open
11.	High SMPTE IMD but, CCIF IMD is usable	• U8051 multiplexer (on IMD board) • U3031A and related control loop components

OPTIONS

There are no options for the AA 501A at this time.

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.

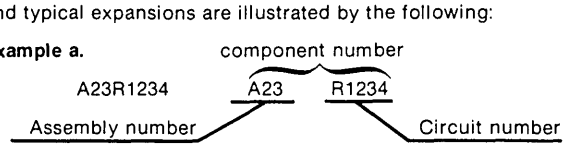
ABBREVIATIONS

Abbreviations conform to American National Standard Y1.1.

COMPONENT NUMBER (column one of the Electrical Parts List)

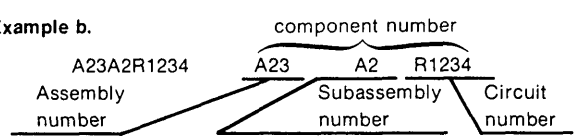
A numbering method has been used to identify assemblies, subassemblies and parts. Examples of this numbering method and typical expansions are illustrated by the following:

Example a.



Read: Resistor 1234 of Assembly 23

Example b.



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 Code
00779	AMP INC	P O BOX 3608	HARRISBURG PA 17105
00853	SANGAMO WESTON INC SANGAMO CAPACITOR DIV	SANGAMO RD P O BOX 128	PICKENS SC 29671
01121	ALLEN-BRADLEY CO	1201 SOUTH 2ND ST	MILWAUKEE WI 53204
01295	TEXAS INSTRUMENTS INC SEMICONDUCTOR GROUP	13500 N CENTRAL EXPRESSWAY P O BOX 225012 M/S 49	DALLAS TX 75265
02111	SPECTROL ELECTRONICS CORP SUB OF CARRIER CORP	17070 E GALE AVE P O BOX 1220	CITY OF INDUSTRY CA 91749
02735	RCA CORP SOLID STATE DIVISION	ROUTE 202	SOMERVILLE NJ 08876
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT	W GENESEE ST	AUBURN NY 13021
04099	CAPCO INC	FORESIGHT INDUSTRIAL PARK P O BOX 2164	GRAND JUNCTION CO 81501
04222	AVX CERAMICS DIV OF AVX CORP	19TH AVE SOUTH P O BOX 867	MYRTLE BEACH SC 29577
04713	MOTOROLA INC SEMICONDUCTOR GROUP	5005 E MCDOWELL RD	PHOENIX AZ 85008
05397	UNION CARBIDE CORP MATERIALS SYSTEMS DIV	11901 MADISON AVE	CLEVELAND OH 44101
05828	GENERAL INSTRUMENT CORP GOVERNMENT SYSTEMS DIV	600 W JOHN ST	HICKSVILLE NY 11802
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV	464 ELLIS ST	MOUNTAIN VIEW CA 94042
07716	TRW INC TRW ELECTRONICS COMPONENTS TRW IRC FIXED RESISTORS/BURLINGTON	2850 MT PLEASANT AVE	BURLINGTON IA 52601
08806	GENERAL ELECTRIC CO MINIATURE LAMP PRODUCTS DEPT	NELA PK	CLEVELAND OH 44112
09922	BURNDY CORP	RICHARDS AVE	NORWALK CT 06852
12954	MICROSEMI CORP	8700 E THOMAS RD P O BOX 1390	SCOTTSDALE AZ 85252
13511	AMPHENOL CADRE DIV BUNKER RAMO CORP		LOS GATOS CA
14433	ITT SEMICONDUCTORS DIV		WEST PALM BEACH FL
14752	ELECTRO CUBE INC	1710 S DEL MAR AVE	SAN GABRIEL CA 91776
15238	ITT SEMICONDUCTORS A DIVISION OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORP	500 BROADWAY P O BOX 168	LAWRENCE MA 01841
15454	AMETEK INC RODAN DIV	2905 BLUE STAR ST	ANAHEIM CA 92806
15636	ELEC-TROL INC	26477 N GOLDEN VALLEY RD	SAUGUS CA 91350
18178	VACTEC INC	10900 PAGE BLVD	ST LOUIS MO 63132
18324	SIGNETICS CORP	811 E ARQUES	SUNNYVALE CA 94086
19396	ILLINOIS TOOL WORKS INC PAKTRON DIVISION	900 FOLLIN LANE S E	VIENNA VA 22180
19701	MEPCO/ELECTRA INC A NORTH AMERICAN PHILIPS CO	P O BOX 760	MINERAL WELLS TX 76067
22229	SOLITRON DEVICES INC SEMICONDUCTOR GROUP SAN DIEGO OPERS	8808 BALBOA AVE	SAN DIEGO CA 92123
22526	DU PONT E I DE NEMOURS AND CO INC DU PONT CONNECTOR SYSTEMS	30 HUNTER LANE	CAMP HILL PA 17011
24355	ANALOG DEVICES INC	RT 1 INDUSTRIAL PK P O BOX 280	NORWOOD MA 02062
24546	CORNING GLASS WORKS	550 HIGH ST	BRADFORD PA 16701
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 DIV	1200 COLUMBIA AVE	RIVERSIDE CA 92507
50434	HEWLETT-PACKARD CO OPTOELECTRONICS DIV	640 PAGE MILL RD	PALO ALTO CA 94304
50558	ELECTRONIC CONCEPTS INC	526 INDUSTRIAL WAY WEST	EATONTOWN NJ 07724
52763	STETTNER ELECTRONICS INC	6135 AIRWAYS BLVD PO BOX 21947	CHATTANOOGA TN 37421
54473	MATSUSHITA ELECTRIC CORP OF AMERICA	ONE PANASONIC WAY	SECAUCUS NJ 07094
55680	NICHICON /AMERICA/ CORP	927 E STATE PKY	SCHAUMBURG IL 60195
56289	SPRAGUE ELECTRIC CO	87 MARSHALL ST	NORTH ADAMS MA 01247

CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip Code
57668	ROHM CORP	16931 MILLIKEN AVE	IRVINE CA 92713
58361	GENERAL INSTRUMENT CORP OPTOELECTRONICS DIV	3400 HILLVIEW AVE	PALO ALTO CA 94304
59660	TUSONIX INC	2155 N FORBES BLVD	TUCSON, ARIZONA 85705
59821	CENTRALAB INC SUB NORTH AMERICAN PHILIPS CORP	7158 MERCHANT AVE	EL PASO TX 79915
71400	BUSSMANN MFG CO MCGRAW EDISION CO	114 OLD STATE RD PO BOX 14460	ST LOUIS MO 63178
80009	TEKTRONIX INC	4900 S W GRIFFITH DR P O BOX 500	BEAVERTON OR 97077
91637	DALE ELECTRONICS INC	P O BOX 609	COLUMBUS NE 68601
95348	GORDOS CORP	250 GLENWOOD AVE	BLOOMFIELD NJ 07003
TK1124	LUMEX INC	540 NORTH COURT	PALATINE IL 60067
TK1483	TEKA PRODUCTS INC	45 SALEM ST	PROVIDENCE RI 02907

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A10	670-7992-00			CIRCUIT BD ASSY:DISPLAY	80009	670-7992-00
A12	670-7994-01			CIRCUIT BD ASSY:LOGIC	80009	670-7994-01
A13	670-8104-00			CIRCUIT BD ASSY:IMD (OPTION 01,OPTION 02 ONLY)	80009	670-8104-00
A14	670-7995-00			CIRCUIT BD ASSY:INPUT & NOTCH	80009	670-7995-00
A15	671-0276-00			CIRCUIT BD ASSY:MAIN (STANDARD AND OPTION 01 ONLY)	80009	671-0276-00
A15	671-0277-00			CIRCUIT BD ASSY:MAIN (OPTION 02 ONLY)	80009	671-0277-00
A18	671-0248-00			CIRCUIT BD ASSY:DVM	80009	671-0248-00
A10	670-7992-00			CIRCUIT BD ASSY:DISPLAY	80009	670-7992-00
A10DS1010	150-1083-00			LAMP,LED RDOUT:RED,10 ELEM BAR GRAPH	50434	HDSP-4820
A10DS1021	150-1053-00			LAMP,LED RDOUT:ORANGE,7 SEG,0.4 DIGIT	58361	MAN4610A/Q3411
A10DS1022	150-1053-00			LAMP,LED RDOUT:ORANGE,7 SEG,0.4 DIGIT	58361	MAN4610A/Q3411
A10DS1023	150-1053-00			LAMP,LED RDOUT:ORANGE,7 SEG,0.4 DIGIT	58361	MAN4610A/Q3411
A10DS1030	150-1053-00			LAMP,LED RDOUT:ORANGE,7 SEG,0.4 DIGIT	58361	MAN4610A/Q3411
A10DS1031	150-1053-00			LAMP,LED RDOUT:ORANGE,7 SEG,0.4 DIGIT	58361	MAN4610A/Q3411
A10DS1041	150-1112-00			LT EMITTING DIO:RED	50434	HLMP-2620
A10DS1042	150-1112-00			LT EMITTING DIO:RED	50434	HLMP-2620
A10DS2010	150-1061-00			LT EMITTING DIO:RED,660NM,50MA MAX	50434	HLMP-1301
A10DS2011	150-1061-00			LT EMITTING DIO:RED,660NM,50MA MAX	50434	HLMP-1301
A10J2011	131-1857-00			TERM SET,PIN:36/0.025 SQ PIN,ON 0.1 CTRS	TK1483	082-3643-SS10
A10J2012	131-1857-00			TERM SET,PIN:36/0.025 SQ PIN,ON 0.1 CTRS	TK1483	082-3643-SS10
A10J2030	131-2238-00			CONN,RCPT,ELEC:CKT BD,2 X 20,MALE	TK1483	082-2043-SD08
A10J2040	131-1857-00			TERM SET,PIN:36/0.025 SQ PIN,ON 0.1 CTRS	TK1483	082-3643-SS10
A10R1010	315-0431-00			RES,FXD,FILM:430 OHM,5%,0.25W	19701	5043CX430R0J
A10R1011	315-0431-00			RES,FXD,FILM:430 OHM,5%,0.25W	19701	5043CX430R0J
A10R1012	315-0431-00			RES,FXD,FILM:430 OHM,5%,0.25W	19701	5043CX430R0J
A10R1013	315-0431-00			RES,FXD,FILM:430 OHM,5%,0.25W	19701	5043CX430R0J
A10R1031	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25W	57668	NTR25J-E330E
A10R1032	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25W	57668	NTR25J-E330E
A10R2010	315-0681-00			RES,FXD,FILM:680 OHM,5%,0.25W	57668	NTR25J-E680E
A10R2021	315-0431-00			RES,FXD,FILM:430 OHM,5%,0.25W	19701	5043CX430R0J
A10R2022	315-0431-00			RES,FXD,FILM:430 OHM,5%,0.25W	19701	5043CX430R0J
A10R2031	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25W	57668	NTR25J-E330E
A12	670-7994-01			CIRCUIT BD ASSY:LOGIC	80009	670-7994-01
A12C2091	290-0748-00			CAP,FXD,ELCTLT:10UF,+50-10%,25V	54473	ECE-B1EV100S
A12C3101	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A12C4103	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A12C4121	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A12C7051	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A12C7133	281-0814-00			CAP,FXD,CER DI:100 PF,10%,100V	04222	MA101A101KAA
A12C7135	281-0772-00			CAP,FXD,CER DI:4700PF,10%,100V	04222	MA201C472KAA
A12C8135	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	04222	MA201C103KAA
A12CR1111	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A12CR2131	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A12CR2133	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A12CR4031	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A12CR4051	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A12CR5031	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A12CR5033	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A12CR5035	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A12CR5037	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A12CR5039	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A12CR5081	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A12CR5131	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A12CR5133	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A12CR6031	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A12CR6033	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A12CR6035	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A12CR6131	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A12J1031	131-1426-00			CONN,RCPT,ELEC:RTANGLE HEADER,1 X 36	22526	65524-136
A12J1040	131-1934-00			TERM SET,PIN:1 X 36,0.1 CTR,0.9 L	TK1483	082-3643-SS04
A12J1050	131-1934-00			TERM SET,PIN:1 X 36,0.1 CTR,0.9 L	TK1483	082-3643-SS04
A12J1051	131-1426-00			CONN,RCPT,ELEC:RTANGLE HEADER,1 X 36	22526	65524-136
A12J1072	131-1426-00			CONN,RCPT,ELEC:RTANGLE HEADER,1 X 36	22526	65524-136
A12J1091	131-1426-00			CONN,RCPT,ELEC:RTANGLE HEADER,1 X 36	22526	65524-136
A12J1141	131-1857-00			TERM SET,PIN:36/0.025 SQ PIN,ON 0.1 CTRS	TK1483	082-3643-SS10
A12J1181	131-1857-00			TERM SET,PIN:36/0.025 SQ PIN,ON 0.1 CTRS	TK1483	082-3643-SS10
A12J2060	131-1934-00			TERM SET,PIN:1 X 36,0.1 CTR,0.9 L	TK1483	082-3643-SS04
A12J7171	131-1857-00			TERM SET,PIN:36/0.025 SQ PIN,ON 0.1 CTRS	TK1483	082-3643-SS10
A12Q2041	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A12Q2043	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A12Q2051	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A12Q2053	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A12Q2055	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A12Q2061	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A12Q2063	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A12Q2071	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A12Q2081	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A12Q2181	151-0302-00			TRANSISTOR:NPN,SI,TO-18	04713	ST899
A12Q2183	151-0302-00			TRANSISTOR:NPN,SI,TO-18	04713	ST899
A12Q3081	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A12Q3111	151-0301-00			TRANSISTOR:PNP,SI,TO-18	04713	ST898
A12Q7091	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A12Q8161	151-1025-00			TRANSISTOR:FET,N-CHAN,SI,TO-92	04713	SPF3036
A12R350	315-0470-00			RES,FXD,FILM:47 OHM,5%,0.25W	57668	NTR25J-E47E0
A12R540	315-0470-00			RES,FXD,FILM:47 OHM,5%,0.25W	57668	NTR25J-E47E0
A12R1121	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
A12R1141	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A12R1143	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A12R1151	321-0323-00			RES,FXD,FILM:22.6K OHM,1%,0.125W,TC=T0	07716	CEAD22601F
A12R1171	321-0960-07			RES,FXD,FILM:513 OHM,0.1%,0.125W,TC=T9	24546	NE55E5130B
A12R1173	321-0397-00			RES,FXD,FILM:133K OHM,1%,0.125W,TC=T0	19701	5043ED133K0F
A12R2021	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A12R2031	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	19701	5043CX22K00J92U
A12R2061	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A12R2071	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	19701	5043CX22K00J92U
A12R2111	321-0753-06			RES,FXD,FILM:9K OHM,0.25%,0.125W,TC=T2	07716	CEAE90000C
A12R2113	321-0318-07			RES,FXD,FILM:20.0K OHM,0.1%,0.125W,TC=T9	19701	5033RE20K00BCM
A12R2133	321-0614-00			RES,FXD,FILM:10.1K OHM,1%,0.125W,TC=T0	19701	5043ED10K10F
A12R2141	321-0208-00			RES,FXD,FILM:1.43K OHM,1%,0.125W,TC=T0	19701	5033ED1K43F
A12R2143	321-0193-01			RES,FXD,FILM:1K OHM,0.5%,0.125W,TC=T0	07716	CEAD10000D
A12R2145	315-0122-00			RES,FXD,FILM:1.2K OHM,5%,0.25W	57668	NTR25J-E01K2
A12R2161	311-1339-00			RES,VAR,NONWW:TRMR,5K OHM,0.75W	02111	43P502T672
A12R2171	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A12R2173	315-0362-00			RES,FXD,FILM:3.6K OHM,5%,0.25W	19701	5043CX3K600J
A12R2175	315-0362-00			RES,FXD,FILM:3.6K OHM,5%,0.25W	19701	5043CX3K600J
A12R3051	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A12R3053	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	19701	5043CX22K00J92U
A12R3055	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	19701	5043CX22K00J92U
A12R3057	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	19701	5043CX22K00J92U
A12R3061	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	19701	5043CX22K00J92U
A12R3063	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	19701	5043CX22K00J92U
A12R3065	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A12R3071	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	19701	5043CX22K00J92U
A12R3073	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	19701	5043CX22K00J92U
A12R3081	321-0205-00			RES,FXD,FILM:1.33K OHM,1%,0.125W,TC=T0	19701	5033ED1K330F
A12R3083	321-0222-00			RES,FXD,FILM:2.00K OHM,1%,0.125W,TC=T0	19701	5033ED2K00F
A12R3085	321-0324-00			RES,FXD,FILM:23.2K OHM,1%,0.125W,TC=T0	07716	CEAD23201F
A12R3091	321-0336-00			RES,FXD,FILM:30.9K OHM,1%,0.125W,TC=T0	19701	5043ED30K90F
A12R3101	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A12R3102	321-0638-00			RES,FXD,FILM:7.96K OHM,1%,0.125W,TC=T0	24546	NA55D7961F
A12R3103	315-0360-00			RES,FXD,FILM:36 OHM,5%,0.25W	19701	5043CX36R00J
A12R3104	315-0475-00			RES,FXD,FILM:4.7M OHM,5%,0.25W	01121	CB4755
A12R3105	321-0023-01			RES,FXD,FILM:16.9 OHM,0.5%,0.125W	91637	CMF55116G16R90D
A12R3141	321-0193-01			RES,FXD,FILM:1K OHM,0.5%,0.125W,TC=T0	07716	CEAD10000D
A12R3143	321-0816-03			RES,FXD,FILM:5K OHM,0.25%,0.125W,TC=T2	19701	5033RC5K000C
A12R3151	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A12R3171	321-0294-00			RES,FXD,FILM:11.3K OHM,1%,0.125W,TC=T0	19701	5043ED11K30F
A12R3173	321-0995-00			RES,FXD,FILM:549K OHM,1%,0.125W,TC=T0	24546	NA55D5493F
A12R3181	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A12R3183	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A12R3185	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A12R3187	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A12R4051	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A12R4053	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A12R4055	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A12R4081	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
A12R4083	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A12R4085	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A12R4087	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A12R4089	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A12R4091	315-0363-00			RES,FXD,FILM:36K OHM,5%,0.25W	57668	NTR25J-E36K0
A12R4101	321-0609-07			RES,FXD,FILM:480 OHM,0.1%,0.125W,TC=T9	19701	5033RE480R0B
A12R4103	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
A12R4121	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A12R4131	321-0318-07			RES,FXD,FILM:20.0K OHM,0.1%,0.125W,TC=T9	19701	5033RE20K00BCM
A12R4133	321-0312-00			RES,FXD,FILM:17.4K OHM,1%,0.125W,TC=T0	19701	5033ED17K40F
A12R4135	321-0318-07			RES,FXD,FILM:20.0K OHM,0.1%,0.125W,TC=T9	19701	5033RE20K00BCM
A12R4151	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A12R5111	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
A12R5133	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	19701	5043CX22K00J92U
A12R6101	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
A12R6103	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
A12R6105	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A12R6130	321-0316-00			RES,FXD,FILM:19.1K OHM,1%,0.125W,TC=T0	07716	CEAD19101F
A12R6131	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A12R7041	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A12R7042	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A12R7043	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A12R7044	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A12R7046	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A12R7051	315-0474-00			RES,FXD,FILM:470K OHM,5%,0.25W	19701	5043CX470K0J92U
A12R7052	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A12R7053	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A12R7055	315-0474-00			RES,FXD,FILM:470K OHM,5%,0.25W	19701	5043CX470K0J92U
A12R7081	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
A12R7083	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A12R7085	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A12R7087	321-0153-00			RES,FXD,FILM:383 OHM,1%,0.125W,TC=T0	07716	CEAD383R0F
A12R7101	307-0685-00			RES NTWK,FXD,FI:OFFSET	80009	307-0685-00
A12R7121	307-0686-00			RES NTWK,FXD,FI:DBR	80009	307-0686-00

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A12R7122	315-0153-00			RES,FXD,FILM:15K OHM,5%,0.25W	19701	5043CX15K00J
A12R7123	315-0241-00			RES,FXD,FILM:240 OHM,5%,0.25W	19701	5043CX240R0J
A12R7131	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A12R7133	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A12R7137	315-0224-00			RES,FXD,FILM:220K OHM,5%,0.25W	57668	NTR25J-E220K
A12R8021	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A12R8023	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A12R8025	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A12R8027	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A12R8031	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A12R8081	321-0777-00			RES,FXD,FILM:5.14K OHM,1%,0.125W,TC=T0	24546	NA55D5141F
A12R8083	321-0222-00			RES,FXD,FILM:2.00K OHM,1%,0.125W,TC=T0	19701	5033ED2K00F
A12R8085	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A12R8091	311-1232-00			RES,VAR,NONWW:TRMR,50K OHM,0.5W	32997	3386F-T04-503
A12R8101	311-1232-00			RES,VAR,NONWW:TRMR,50K OHM,0.5W	32997	3386F-T04-503
A12R8111	311-1466-00			RES,VAR,NONWW:TRMR,2K OHM,0.5W	32997	3386F-T04-202
A12R8131	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A12R8133	315-0131-00			RES,FXD,FILM:130 OHM,5%,0.25W	19701	5043CX130R0J
A12R8135	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A12R8151	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A12R8153	311-1232-00			RES,VAR,NONWW:TRMR,50K OHM,0.5W	32997	3386F-T04-503
A12S3141	260-2160-00			SWITCH,PUSH:4 BUTTON,2 POLE,DMM	80009	260-2160-00
A12S4171	263-1187-00			SW CAM ACTR AS:LEVEL RANGE	80009	263-1187-00
A12S6181	260-1996-00			SWITCH,PUSH:1 BUTTON,4 POLE,INPUT	59821	2KAB0010001169
A12TP3131	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
A12TP8161	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
A12U2151	156-0515-00			MICROCKT,DGTL:CMOS,TRIPLE 3-CHAN MUX	02735	CD4053BF
A12U3011	156-0756-01			MICROCKT,DGTL:BCD DECIMAL DECODER,SCRN	02735	CD4028BFX
A12U3021	156-0575-03			MICROCKT,DGTL:3 INPUT NOR GATE,SELECTED	02735	CD4025BFX
A12U3041	156-0505-00			MICROCKT,DGTL:CMOS,4-BIT AND-OR SEL	04713	MC14519BCL
A12U4061	156-0577-02			MICROCKT,DGTL:QUAD 2-INP AND GATE,SEL	27014	DM74C08NA+
A12U4071	156-0350-05			MICROCKT,DGTL:QUAD 2 INPUT NAND GATE	02735	CD4011BFX
A12U4111	156-1200-00			MICROCKT,LINEAR:OPERATIONAL AMP,QUAD BI-FET	01295	TL074CN
A12U4121	156-1200-00			MICROCKT,LINEAR:OPERATIONAL AMP,QUAD BI-FET	01295	TL074CN
A12U5011	156-0502-02			MICROCKT,DGTL:4 BIT ADDER,SELECTED	02735	CD4008BFX
A12U5021	156-0756-01			MICROCKT,DGTL:BCD DECIMAL DECODER,SCRN	02735	CD4028BFX
A12U5051	156-0349-06			MICROCKT,DGTL:QUAD 2 INP NOR GATE	02735	CD4001BFX
A12U5061	156-0505-00			MICROCKT,DGTL:CMOS,4-BIT AND-OR SEL	04713	MC14519BCL
A12U5071	156-0756-01			MICROCKT,DGTL:BCD DECIMAL DECODER,SCRN	02735	CD4028BFX
A12U5081	156-0411-00			MICROCKT,LINEAR:SGL SPLY COMPARATOR	04713	LM339N
A12U5101	156-0048-00			MICROCKT,LINEAR:5 XSTR ARRAY	02735	CA3046
A12U6111	156-0579-02			MICROCKT,DGTL:DUAL 4 BIT BIN COUNTER,SCRN	02735	CD4520BFX
A12U6121	156-1200-00			MICROCKT,LINEAR:OPERATIONAL AMP,QUAD BI-FET	01295	TL074CN
A12U7011	156-0582-03			MICROCKT,DGTL:BINARY UP/DOWN CNTR,SCRN	02735	CD4516 BFX
A12U7021	156-0349-06			MICROCKT,DGTL:QUAD 2 INP NOR GATE	02735	CD4001BFX
A12U7041	156-0505-00			MICROCKT,DGTL:CMOS,4-BIT AND-OR SEL	04713	MC14519BCL
A12U7061	156-0582-03			MICROCKT,DGTL:BINARY UP/DOWN CNTR,SCRN	02735	CD4516 BFX
A12U7071	156-0349-06			MICROCKT,DGTL:QUAD 2 INP NOR GATE	02735	CD4001BFX
A12U7101	156-0513-00			MICROCKT,DGTL:CMOS,8-CHANNEL MUX	04713	MC14051BCL
A12U7111	156-0579-02			MICROCKT,DGTL:DUAL 4 BIT BIN COUNTER,SCRN	02735	CD4520BFX
A12U7151	156-0961-00			MICROCKT,DGTL:CMOS,QUAD 2-INP NAND ST	02735	CD4093BF
A12U7161	156-0366-02			MICROCKT,DGTL:DUAL D FLIP-FLOP,SCREENED	02735	CD4013BFX
A12VR1091	152-0278-00			SEMICOND DVC,DI:ZEN,SI,3V,5%,0.4W,DO-7	04713	SZG35009K20
A12VR2143	152-0486-00			SEMICOND DVC,DI:ZEN,SI,6.2V,2%,0.25W	04713	SZG20008
A12W800	198-4302-00			WIRE SET,ELEC:	80009	198-4302-00
A13	670-8104-00			CIRCUIT BD ASSY:IMD (OPTION 01,OPTION 02 ONLY)	80009	670-8104-00
A13C2011	285-1056-00			CAP,FXD,PLASTIC:1UF,2%,50V	14752	650B1A105G

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A13C2021	285-1056-00			CAP,FXD,PLASTIC:1UF,2%,50V	14752	650B1A105G
A13C2051	285-0643-00			CAP,FXD,PLASTIC:0.0047UF,5%,100V	56289	192P47252R468
A13C2061	285-0889-00			CAP,FXD,PLASTIC:0.0027UF,5%,100V	19396	DU490/74-28221
A13C2063	285-0643-00			CAP,FXD,PLASTIC:0.0047UF,5%,100V	56289	192P47252R468
A13C2071	285-0643-00			CAP,FXD,PLASTIC:0.0047UF,5%,100V	56289	192P47252R468
A13C2073	285-0643-00			CAP,FXD,PLASTIC:0.0047UF,5%,100V	56289	192P47252R468
A13C2081	285-1100-00			CAP,FXD,PLASTIC:0.022UF,5%,200V	19396	223J02PT485
A13C2091	285-0643-00			CAP,FXD,PLASTIC:0.0047UF,5%,100V	56289	192P47252R468
A13C3011	290-0804-00			CAP,FXD,ELCTLT:10UF,+50-10%,25V	55680	ULB1E100TAAANA
A13C3071	281-0763-00			CAP,FXD,CER DI:47PF,10%,100V	04222	MA101A470KAA
A13C4081	281-0763-00			CAP,FXD,CER DI:47PF,10%,100V	04222	MA101A470KAA
A13C5011	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A13C5013	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A13C5021	285-0598-00			CAP,FXD,PLASTIC:0.01UF,5%,100V	19396	DU490B103J
A13C5023	285-0598-00			CAP,FXD,PLASTIC:0.01UF,5%,100V	19396	DU490B103J
A13C5031	283-0067-00			CAP,FXD,CER DI:0.001UF,10%,200V	59660	835-515-YSE0102K
A13C5045	285-1066-00			CAP,FXD,PLASTIC:0.05UF,1%,200V	14752	230B1C503F
A13C5051	285-1130-00			CAP,FXD,PLASTIC:0.22UF,1%,100V	50558	MH12D224F
A13C5053	285-0643-00			CAP,FXD,PLASTIC:0.0047UF,5%,100V	56289	192P47252R468
A13C5061	285-0643-00			CAP,FXD,PLASTIC:0.0047UF,5%,100V	56289	192P47252R468
A13C5071	285-0643-00			CAP,FXD,PLASTIC:0.0047UF,5%,100V	56289	192P47252R468
A13C6011	290-0524-00			CAP,FXD,ELCTLT:4.7UF,20%,10V	05397	T368A475M010AZ
A13C6071	290-0804-00			CAP,FXD,ELCTLT:10UF,+50-10%,25V	55680	ULB1E100TAAANA
A13C7021	285-1056-00			CAP,FXD,PLASTIC:1UF,2%,50V	14752	650B1A105G
A13C7023	285-1100-00			CAP,FXD,PLASTIC:0.022UF,5%,200V	19396	223J02PT485
A13C7031	285-1130-00			CAP,FXD,PLASTIC:0.22UF,1%,100V	50558	MH12D224F
A13C7061	285-1050-00			CAP,FXD,PLASTIC:0.1UF,1%,200V	14752	230B1C104F
A13C8021	285-1050-00			CAP,FXD,PLASTIC:0.1UF,1%,200V	14752	230B1C104F
A13C8033	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A13C8041	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A13C8081	290-0950-00			CAP,FXD,ELCTLT:100UF,+50-10%,50V	55680	ULB1H101TJAANA
A13CR2033	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A13CR3051	152-0322-00			SEMICOND DVC,DI:SCHOTTKY BARR,SI,15V,DO-35	50434	5082-2672
A13CR5083	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A13J1053	131-1857-00			TERM SET,PIN:36/0.025 SQ PIN,ON 0.1 CTRS	TK1483	082-3643-SS10
A13J8011	131-1426-00			CONN,RCPT,ELEC:RTANGLE HEADER,1 X 36	22526	65524-136
A13P1053	131-0993-00			BUS,CONDUCTOR:SHUNT ASSEMBLY,BLACK	22526	65474-005
A13P4040	136-0558-00			SKT,PL-IN ELEK:CKT BOARD,6 CONTACT	80009	136-0558-00
A13Q4011	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A13Q7071	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A13R1011	311-1240-00			RES,VAR,NONWW:TRMR,25K OHM,10%,0.5W	32997	3386X-T07-253
A13R1041	315-0820-00			RES,FXD,FILM:82 OHM,5%,0.25W	57668	NTR25J-E82E0
A13R1101	311-1237-00			RES,VAR,NONWW:1K OHM,10%,0.50W	32997	3386X-DY6-102
A13R2021	321-0314-01			RES,FXD,FILM:18.2K OHM,0.5%,0.125W,TC=T0	19701	5033RD18K20D
A13R2031	321-0379-00			RES,FXD,FILM:86.6K OHM,1%,0.125W,TC=T0	07716	CEAD86601F
A13R2033	301-0754-00			RES,FXD,FILM:750K OHM,5%,0.5W	19701	5053CX750K0J
A13R2035	301-0361-00			RES,FXD,FILM:360 OHM,5%,0.5W	19701	5053CX360R0J
A13R2041	315-0433-00			RES,FXD,FILM:43K OHM,5%,0.25W	19701	5043CX43K00J
A13R2051	321-0331-00			RES,FXD,FILM:27.4K OHM,1%,0.125W,TC=T0	19701	5043ED27K40F
A13R2053	321-0291-00			RES,FXD,FILM:10.5K OHM,1%,0.125W,TC=T0	19701	5033ED10K50F
A13R2061	321-0329-00			RES,FXD,FILM:26.1K OHM,1%,0.125W,TC=T0	19701	5043ED26K10F
A13R2081	321-0341-00			RES,FXD,FILM:34.8K OHM,1%,0.125W,TC=T0	19701	5043ED34K80F
A13R2091	321-0292-00			RES,FXD,FILM:10.7K OHM,1%,0.125W,TC=T0	07716	CEAD10701F
A13R2101	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A13R3021	321-0241-00			RES,FXD,FILM:3.16K OHM,1%,0.125W,TC=T0	07716	CEAD31600F
A13R3023	321-0293-00			RES,FXD,FILM:11.0K OHM,1%,0.125W,TC=T0	07716	CEAD11001F
A13R3031	321-0673-00			RES,FXD,FILM:17.0K OHM,0.5%,0.125W,TC=T2	19701	5033RC17K00D

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A13R3033	321-0724-03			RES,FXD,FILM:13.6K OHM,0.125%,0.125W,TC=T2	24546	NC55C1362C
A13R3051	321-0193-00			RES,FXD,FILM:1K OHM,1%,0.125W,TC=T0	19701	5033ED1K00F
A13R3061	321-0373-00			RES,FXD,FILM:75.0K OHM,1%,0.125W,TC=T0	19701	5033ED75K00F
A13R3063	321-0249-00			RES,FXD,FILM:3.83K OHM,1%,0.125W,TC=T0	19701	5033ED3K83F
A13R3081	321-0295-00			RES,FXD,FILM:11.5K OHM,1%,0.125W,TC=T0	07716	CEAD11501F
A13R3091	321-0317-00			RES,FXD,FILM:19.6K OHM,1%,0.125W,TC=T0	07716	CEAD19601F
A13R3093	321-0282-00			RES,FXD,FILM:8.45K OHM,1%,0.125W,TC=T0	07716	CFAD84500F
A13R5013	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A13R5031	321-0926-07			RES,FXD,FILM:4K OHM,0.1%,0.125W,TC=T9	19701	5033RE4K00B
A13R5041	321-0929-07			RES,FXD,FILM:2.5K OHM,0.1%,0.125W,TC=T9	19701	5033RE2K500B
A13R5043	321-0222-07			RES,FXD,FILM:2.0K OHM,0.1%,0.125W,TC=T9	19701	5033RE2K000B
A13R5045	321-0929-07			RES,FXD,FILM:2.5K OHM,0.1%,0.125W,TC=T9	19701	5033RE2K500B
A13R5061	315-0152-00			RES,FXD,FILM:1.5K OHM,5%,0.25W	57668	NTR25J-E01K5
A13R5071	301-0242-00			RES,FXD,FILM:2.4K OHM,5%,0.5W	19701	5053CX2K400J
A13R5073	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	19701	5043CX22K00J92U
A13R5081	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	57668	NTR25J-E03K3
A13R5083	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A13R5821	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A13R6031	321-0169-00			RES,FXD,FILM:562 OHM,1%,0.125W,TC=T0	07716	CEAD562R0F
A13R6033	321-0215-00			RES,FXD,FILM:1.69K OHM,1%,0.125W,TC=T0	07716	CEAD16900F
A13R6041	321-0192-00			RES,FXD,FILM:976 OHM,1%,0.125W,TC=T0	19701	5033ED976R0F
A13R6043	321-0219-00			RES,FXD,FILM:1.87K OHM,1%,0.125W,TC=T0	07716	CEAD18700F
A13R6061	321-0213-00			RES,FXD,FILM:1.62K OHM,1%,0.125W,TC=T0	07716	CEAD16200F
A13R6063	321-0171-00			RES,FXD,FILM:590 OHM,1%,0.125W,TC=T0	19701	5033ED590R0F
A13R7011	321-0216-00			RES,FXD,FILM:1.74K OHM,1%,0.125W,TC=T0	07716	CEAD17400F
A13R7013	321-0237-00			RES,FXD,FILM:2.87K OHM,1%,0.125W,TC=T0	07716	CEAD 28700F
A13R7015	321-0237-00			RES,FXD,FILM:2.87K OHM,1%,0.125W,TC=T0	07716	CEAD 28700F
A13R8031	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A13R8051	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	57668	NTR25J-E47K0
A13R8061	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A13U2041	307-0700-00			CPLR,OPTOELECTR:140 OHM @ 13MA	18178	21L478
A13U3031	156-1191-00			MICROCKT,LINEAR:DUAL BI-FET OPNL AMPL	01295	TL072CP
A13U3041	156-1272-00			MICROCKT,LINEAR:DUAL OPERATIONAL AMPLIFIER	18324	NE5532 FE-B
A13U3061	156-1272-00			MICROCKT,LINEAR:DUAL OPERATIONAL AMPLIFIER	18324	NE5532 FE-B
A13U3081	156-1446-00			MICROCKT,LINEAR:OPNL AMPL,DUAL	18324	NE5533N
A13U6041	156-1272-00			MICROCKT,LINEAR:DUAL OPERATIONAL AMPLIFIER	18324	NE5532 FE-B
A13U6051	156-1272-00			MICROCKT,LINEAR:DUAL OPERATIONAL AMPLIFIER	18324	NE5532 FE-B
A13U8051	156-0515-00			MICROCKT,DGTL:CMOS,TRIPLE 3-CHAN MUX	02735	CD4053BF
A13VR8031	152-0127-00			SEMICOND DVC,DI:ZEN,SI,7.5V,5%,0.4W,DO-7	14433	Z5347 (1N958B)
A13VR8033	152-0127-00			SEMICOND DVC,DI:ZEN,SI,7.5V,5%,0.4W,DO-7	14433	Z5347 (1N958B)
A14	670-7995-00			CIRCUIT BD ASSY:INPUT & NOTCH	80009	670-7995-00
A14C1010	290-0529-00			CAP,FXD,ELCTLT:47UF,20%,20V	05397	T362C476M020AS
A14C1013	281-0820-00			CAP,FXD,CER DI:680 PF,10%,50V	04222	MA105C651KAA
A14C1020	290-0573-00			CAP,FXD,ELCTLT:2.7UF,20%,50V	05397	T368B275M050AS
A14C1021	290-0573-00			CAP,FXD,ELCTLT:2.7UF,20%,50V	05397	T368B275M050AS
A14C1030	290-0720-00			CAP,FXD,ELCTLT:68UF,20%,15V	56289	196D686X0015PE3
A14C1031	283-0779-00			CAP,FXD,MICA DI:27 PF,2%,500V	00853	D155E270G0
A14C1033	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C2010	290-0974-00			CAP,FXD,ELCTLT:10UF,20%,50VDC	55680	ULB1H100MAA
A14C2011	290-0534-00			CAP,FXD,ELCTLT:1UF,20%,35V	05397	T368A105M035AZ
A14C2012	290-0512-00			CAP,FXD,ELCTLT:22UF,20%,15V	05397	T368B226M015AS
A14C2014	281-0819-00			CAP,FXD,CER DI:33 PF,5%,50V	04222	GC105A330J
A14C2020	290-0536-00			CAP,FXD,ELCTLT:10UF,20%,25V TANTALUM	05397	T368B106M025AS
A14C2021	290-0718-00			CAP,FXD,ELCTLT:22UF,20%,35V	56289	196D226X0035PE4
A14C2022	290-0718-00			CAP,FXD,ELCTLT:22UF,20%,35V	56289	196D226X0035PE4
A14C2031	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C2032	290-0529-00			CAP,FXD,ELCTLT:47UF,20%,20V	05397	T362C476M020AS
A14C2040	281-0759-00			CAP,FXD,CER DI:22PF,10%,100V	04222	MA101A220KAA

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A14C2041	281-0763-00			CAP,FXD,CER DI:47PF,10%,100V	04222	MA101A470KAA
A14C2050	283-0728-00			CAP,FXD,MICA DI:120PF,1%,500V	00853	D155F121F0
A14C2051	283-0642-00			CAP,FXD,MICA DI:33PF,+/-0.5PF,300V	00853	D105E330G0
A14C2060	283-0672-00			CAP,FXD,MICA DI:200PF,1%,500V	00853	D155F2010F0
A14C2061	281-0096-00			CAP,VAR,AIR DI:5.5-18PF,350V	52763	302324237
A14C3014	281-0772-00			CAP,FXD,CER DI:4700PF,10%,100V	04222	MA201C472KAA
A14C3021	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C3023	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C3031	285-1142-00			CAP,FXD,PLASTIC:0.01UF,1%,200VDC	19396	103F02PP460
A14C3032	285-1056-00			CAP,FXD,PLASTIC:1UF,2%,50V	14752	650B1A105G
A14C3033	285-1221-00			CAP,FXD,MTLZD:0.1UF,2%,100V	14752	650D1B104G
A14C3040	290-0974-00			CAP,FXD,ELCTLT:10UF,20%,50VDC	55680	ULB1H100MAA
A14C3041	285-1142-00			CAP,FXD,PLASTIC:0.01UF,1%,200VDC	19396	103F02PP460
A14C3042	285-1056-00			CAP,FXD,PLASTIC:1UF,2%,50V	14752	650B1A105G
A14C3044	285-1221-00			CAP,FXD,MTLZD:0.1UF,2%,100V	14752	650D1B104G
A14C3045	290-0525-00			CAP,FXD,ELCTLT:4.7UF,20%,50V	05397	T368B475M050AS
A14C3050	283-0728-00			CAP,FXD,MICA DI:120PF,1%,500V	00853	D155F121F0
A14C3051	290-0920-00			CAP,FXD,ELCTLT:33UF,+50-10%,35V	55680	ULB1V330TAAANA
A14C3060	283-0672-00			CAP,FXD,MICA DI:200PF,1%,500V	00853	D155F2010F0
A14C4010	290-0573-00			CAP,FXD,ELCTLT:2.7UF,20%,50V	05397	T368B275M050AS
A14C4020	290-0808-00			CAP,FXD,ELCTLT:2.7UF,10%,20V	05397	T322B275K020AS
A14C4021	283-0168-00			CAP,FXD,CER DI:12PF,5%,100V	05397	C315C120J1G5CA
A14C4022	281-0763-00			CAP,FXD,CER DI:47PF,10%,100V	04222	MA101A470KAA
A14C4023	281-0819-00			CAP,FXD,CER DI:33 PF,5%,50V	04222	GC105A330J
A14C4024	283-0631-00			CAP,FXD,MICA DI:95PF,1%,500V	00853	D155F950F0
A14C4031	283-0594-00			CAP,FXD,MICA DI:0.001UF,1%,100V	00853	D151F102F0
A14C4032	283-0594-00			CAP,FXD,MICA DI:0.001UF,1%,100V	00853	D151F102F0
A14C4041	281-0823-00			CAP,FXD,CER DI:470PF,10%,50V	04222	MA105A471KAA
A14C4051	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C4052	281-0759-00			CAP,FXD,CER DI:22PF,10%,100V	04222	MA101A220KAA
A14C4053	281-0819-00			CAP,FXD,CER DI:33 PF,5%,50V	04222	GC105A330J
A14C4054	283-0680-00			CAP,FXD,MICA DI:330PF,1%,500V	00853	D155F331F0
A14C4055	283-0638-00			CAP,FXD,MICA DI:130PF,1%,100V	00853	D155F131F0
A14C4061	281-0759-00			CAP,FXD,CER DI:22PF,10%,100V	04222	MA101A220KAA
A14C4062	281-0819-00			CAP,FXD,CER DI:33 PF,5%,50V	04222	GC105A330J
A14C4063	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C4064	281-0823-00			CAP,FXD,CER DI:470PF,10%,50V	04222	MA105A471KAA
A14C4065	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A14C4070	285-1219-00			CAP,FXD,MTLZD:1UF,5%,400V	04099	TEK-103
A14C5020	290-0808-00			CAP,FXD,ELCTLT:2.7UF,10%,20V	05397	T322B275K020AS
A14C5021	281-0812-00			CAP,FXD,CER DI:1000PF,10%,100V	04222	MA101C102KAA
A14C5024	281-0823-00			CAP,FXD,CER DI:470PF,10%,50V	04222	MA105A471KAA
A14C5025	283-0186-00			CAP,FXD,CER DI:27PF,5%,50V	04222	SR155A 270JAA
A14C5031	281-0823-00			CAP,FXD,CER DI:470PF,10%,50V	04222	MA105A471KAA
A14C5041	290-0512-00			CAP,FXD,ELCTLT:22UF,20%,15V	05397	T368B226M015AS
A14C5060	290-0525-00			CAP,FXD,ELCTLT:4.7UF,20%,50V	05397	T368B475M050AS
A14C5061	290-0573-00			CAP,FXD,ELCTLT:2.7UF,20%,50V	05397	T368B275M050AS
A14C5062	290-0534-00			CAP,FXD,ELCTLT:1UF,20%,35V	05397	T368A105M035AZ
A14C5063	290-0512-00			CAP,FXD,ELCTLT:22UF,20%,15V	05397	T368B226M015AS
A14C5069	283-0220-00			CAP,FXD,CER DI:0.01UF,20%,50V	04222	3429 050C 103M
A14C5070	285-1219-00			CAP,FXD,MTLZD:1UF,5%,400V	04099	TEK-103
A14CR1010	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR1011	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR1060	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR1061	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR1070	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR2020	152-0246-00			SEMICOND DVC,DI:SW,SI,40V,200MA,DO-7	14433	WG1537TK
A14CR2021	152-0246-00			SEMICOND DVC,DI:SW,SI,40V,200MA,DO-7	14433	WG1537TK

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A14CR2024	152-0322-00			SEMICOND DVC,DI:SCHOTTKY BARR,SI,15V,DO-35	50434	5082-2672
A14CR2025	152-0322-00			SEMICOND DVC,DI:SCHOTTKY BARR,SI,15V,DO-35	50434	5082-2672
A14CR2041	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR4041	152-0322-00			SEMICOND DVC,DI:SCHOTTKY BARR,SI,15V,DO-35	50434	5082-2672
A14CR4042	152-0322-00			SEMICOND DVC,DI:SCHOTTKY BARR,SI,15V,DO-35	50434	5082-2672
A14CR4051	152-0322-00			SEMICOND DVC,DI:SCHOTTKY BARR,SI,15V,DO-35	50434	5082-2672
A14CR4052	152-0322-00			SEMICOND DVC,DI:SCHOTTKY BARR,SI,15V,DO-35	50434	5082-2672
A14CR4072	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A14CR4073	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A14CR4074	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A14CR4075	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A14CR5025	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14CR5061	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A14DS3050	150-0131-00			LAMP,INCAND:120V,0.025A,#120PS,WIRE LD	TK1124	IFL-LX120PS
A14DS3060	150-0131-00			LAMP,INCAND:120V,0.025A,#120PS,WIRE LD	TK1124	IFL-LX120PS
A14J1030	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14J1041	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14J1042	131-2132-01			CONN,RCPT,ELEC:HEADER,1X36,0.1CTR	TK1483	082-3640-SS05
A14J1043	131-2132-01			CONN,RCPT,ELEC:HEADER,1X36,0.1CTR	TK1483	082-3640-SS05
A14J1060	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14J1070	131-2132-01			CONN,RCPT,ELEC:HEADER,1X36,0.1CTR	TK1483	082-3640-SS05
A14J1071	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL	22526	48283-036
A14J4040	131-2132-01			CONN,RCPT,ELEC:HEADER,1X36,0.1CTR	TK1483	082-3640-SS05
A14J4070	131-0589-00			TERMINAL,PIN:0.46 L X 0.025 SQ PH BRZ	22526	48283-029
A14K2050	148-0122-00			RELAY,REED:FORM A,5A,200V,COIL 5V,575 OHM	95348	F81-1050-4
A14K2051	148-0122-00			RELAY,REED:FORM A,5A,200V,COIL 5V,575 OHM	95348	F81-1050-4
A14K2052	148-0134-00			RELAY,REED:2 FORM A,0,25A,200VDC,COIL 5VDC 250 OHM	15636	R8077-1
A14K2060	148-0134-00			RELAY,REED:2 FORM A,0,25A,200VDC,COIL 5VDC 250 OHM	15636	R8077-1
A14K2061	148-0134-00			RELAY,REED:2 FORM A,0,25A,200VDC,COIL 5VDC 250 OHM	15636	R8077-1
A14K2070	148-0134-00			RELAY,REED:2 FORM A,0,25A,200VDC,COIL 5VDC 250 OHM	15636	R8077-1
A14K2071	148-0134-00			RELAY,REED:2 FORM A,0,25A,200VDC,COIL 5VDC 250 OHM	15636	R8077-1
A14K4030	148-0079-00			RELAY,REED:2 FORM A,110MA,28VDC,COIL 5VDC	15636	RA30382051-99
A14K4031	148-0079-00			RELAY,REED:2 FORM A,110MA,28VDC,COIL 5VDC	15636	RA30382051-99
A14K4032	148-0079-00			RELAY,REED:2 FORM A,110MA,28VDC,COIL 5VDC	15636	RA30382051-99
A14K5030	148-0079-00			RELAY,REED:2 FORM A,110MA,28VDC,COIL 5VDC	15636	RA30382051-99
A14Q1031	151-0220-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0220-00
A14Q1070	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A14Q2010	151-0220-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0220-00
A14Q2011	151-1021-00			TRANSISTOR:FET,N-CHAN,SI,TO-18	80009	151-1021-00
A14Q2012	151-1025-00			TRANSISTOR:FET,N-CHAN,SI,TO-92	04713	SPF3036
A14Q2021	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A14Q2023	151-1025-00			TRANSISTOR:FET,N-CHAN,SI,TO-92	04713	SPF3036
A14Q2024	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A14Q2041	151-1059-00			TRANSISTOR:FET,N-CHAN,TO-106	04713	ORDER BY DESCR
A14Q2042	151-1059-00			TRANSISTOR:FET,N-CHAN,TO-106	04713	ORDER BY DESCR
A14Q4060	151-0198-00			TRANSISTOR:SELECTED	04713	SPS8802-1
A14Q4061	151-0198-00			TRANSISTOR:SELECTED	04713	SPS8802-1
A14Q4070	151-0198-00			TRANSISTOR:SELECTED	04713	SPS8802-1
A14Q4071	151-0198-00			TRANSISTOR:SELECTED	04713	SPS8802-1
A14Q5071	151-0342-00			TRANSISTOR:PNP,SI,TO-92	07263	S035928
A14R1010	315-0204-00			RES,FXD,FILM:200K OHM,5%,0.25W	19701	5043CX200K0J
A14R1011	315-0274-00			RES,FXD,FILM:270K OHM,5%,0.25W	57668	NTR25J-E270K
A14R1012	315-0243-00			RES,FXD,FILM:24K OHM,5%,0.25W	57668	NTR25J-E24K0

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A14R1013	315-0683-00			RES,FXD,FILM:68K OHM,5%,0.25W	57668	NTR25J-E68K0
A14R1020	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A14R1021	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A14R1022	315-0333-00			RES,FXD,FILM:33K OHM,5%,0.25W	57668	NTR25J-E33K0
A14R1023	311-1240-00			RES,VAR,NONWW:TRMR,25K OHM,10%,0.5W	32997	3386X-T07-253
A14R1024	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	57668	NTR25J-E47K0
A14R1025	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A14R1026	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	57668	NTR25J-E47K0
A14R1027	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A14R1030	311-1240-00			RES,VAR,NONWW:TRMR,25K OHM,10%,0.5W	32997	3386X-T07-253
A14R1031	321-0754-07			RES,FXD,FILM:900 OHM,0.1%,0.125W,TC=T9	19701	5033RE900R0B
A14R1032	321-0991-03			RES,FXD,FILM:18K OHM,0.25%,0.125W,TC=T2	24546	NC55C1802C
A14R1033	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A14R1034	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A14R1035	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A14R1036	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A14R1040	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A14R1041	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A14R1042	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A14R1043	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A14R1044	315-0162-00			RES,FXD,FILM:1.6K OHM,5%,0.25W	19701	5043CX1K600J
A14R1050	311-1240-00			RES,VAR,NONWW:TRMR,25K OHM,10%,0.5W	32997	3386X-T07-253
A14R1051	311-1240-00			RES,VAR,NONWW:TRMR,25K OHM,10%,0.5W	32997	3386X-T07-253
A14R1052	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	19701	5043CX22K00J92U
A14R1053	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A14R1062	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A14R1070	315-0243-00			RES,FXD,FILM:24K OHM,5%,0.25W	57668	NTR25J-E24K0
A14R1071	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
A14R1072	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	57668	NTR25J-E03K3
A14R1073	315-0163-00			RES,FXD,FILM:16K OHM,5%,0.25W	57668	NTR25J-E 16K
A14R1074	315-0163-00			RES,FXD,FILM:16K OHM,5%,0.25W	57668	NTR25J-E 16K
A14R1075	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
A14R1076	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A14R1077	315-0123-00			RES,FXD,FILM:12K OHM,5%,0.25W	57668	NTR25J-E12K0
A14R2010	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A14R2011	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A14R2013	315-0393-00			RES,FXD,FILM:39K OHM,5%,0.25W	57668	NTR25J-E39K0
A14R2014	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	57668	NTR25J-E03K3
A14R2015	315-0243-00			RES,FXD,FILM:24K OHM,5%,0.25W	57668	NTR25J-E24K0
A14R2016	315-0226-00			RES,FXD,FILM:22M OHM,5%,0.25W	80009	315-0226-00
A14R2017	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	57668	NTR25J-E03K3
A14R2018	315-0182-00			RES,FXD,FILM:1.8K OHM,5%,0.25W	57668	NTR25J-E1K8
A14R2020	315-0242-00			RES,FXD,FILM:2.4K OHM,5%,0.25W	57668	NTR25J-E02K4
A14R2022	315-0182-00			RES,FXD,FILM:1.8K OHM,5%,0.25W	57668	NTR25J-E1K8
A14R2023	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	57668	NTR25J-E03K3
A14R2024	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A14R2025	315-0561-00			RES,FXD,FILM:560 OHM,5%,0.25W	19701	5043CX560R0J
A14R2026	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A14R2030	321-0774-03			RES,FXD,FILM:4.5K OHM,0.25%,0.125W,TC=T2	19701	5033RC4K500C
A14R2031	321-0612-03			RES,FXD,FILM:500 OHM,0.25%,0.125W,TC=T2	19701	5033RC500R0C
A14R2032	321-1600-07			RES,FXD,FILM:1.851K OHM,0.1%,0.125W,TC=T0	24546	NE55E18150B
A14R2033	321-0926-07			RES,FXD,FILM:4K OHM,0.1%,0.125W,TC=T9	19701	5033RE4K00B
A14R2034	315-0105-00			RES,FXD,FILM:1M OHM,5%,0.25W	19701	5043CX1M000J
A14R2035	315-0361-00			RES,FXD,FILM:360 OHM,5%,0.25W	19701	5043CX360R0J
A14R2036	321-0771-03			RES,FXD,FILM:50 OHM,0.25%,0.125W,TC=T2	57668	RB14 DYE 50E
A14R2037	321-0749-06			RES,FXD,FILM:450 OHM,0.2K%,0.125W,TC=T9	19701	5033RE450R0C
A14R2041	321-0774-03			RES,FXD,FILM:4.5K OHM,0.25%,0.125W,TC=T2	19701	5033RC4K500C
A14R2042	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A14R2051	321-0409-00			RES,FXD,FILM:178K OHM,1%,0.125W,TC=T0	57668	CRB25 FXE 178K
A14R2052	307-0684-00			RES NTWK,FXD,FI:INPUT ATTENUATOR	80009	307-0684-00
A14R3010	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A14R3011	315-0303-00			RES,FXD,FILM:30K OHM,5%,0.25W	19701	5043CX30K00J
A14R3012	315-0272-00			RES,FXD,FILM:2.7K OHM,5%,0.25W	57668	NTR25J-E02K7
A14R3013	315-0105-00			RES,FXD,FILM:1M OHM,5%,0.25W	19701	5043CX1M000J
A14R3014	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
A14R3015	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A14R3017	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A14R3020	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
A14R3021	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A14R3022	321-0202-00			RES,FXD,FILM:1.24K OHM,1%,0.125W,TC=T0	24546	NA55D1241F
A14R3023	315-0301-00			RES,FXD,FILM:300 OHM,5%,0.25W	57668	NTR25J-E300E
A14R3024	301-0431-00			RES,FXD,FILM:430 OHM,5%,0.5W	19701	5053CX430R0J
A14R3025	315-0433-00			RES,FXD,FILM:43K OHM,5%,0.25W	19701	5043CX43K00J
A14R3026	315-0153-00			RES,FXD,FILM:15K OHM,5%,0.25W	19701	5043CX15K00J
A14R3030	315-0361-00			RES,FXD,FILM:360 OHM,5%,0.25W	19701	5043CX360R0J
A14R3041	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25W	57668	NTR25J-E330E
A14R3042	315-0182-00			RES,FXD,FILM:1.8K OHM,5%,0.25W	57668	NTR25J-E1K8
A14R3043	321-0238-00			RES,FXD,FILM:2.94K OHM,1%,0.125W,TC=T0	07716	CEAD29400F
A14R3044	315-0105-00			RES,FXD,FILM:1M OHM,5%,0.25W	19701	5043CX1M000J
A14R4010	315-0751-00			RES,FXD,FILM:750 OHM,5%,0.25W	57668	NTR25J-E750E
A14R4011	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
A14R4012	315-0391-00			RES,FXD,FILM:390 OHM,5%,0.25W	57668	NTR25J-E390E
A14R4015	321-0222-07			RES,FXD,FILM:2.0K OHM,0.1%,0.125W,TC=T9	19701	5033RE2K000B
A14R4020	321-0259-03			RES,FXD,FILM:4.87K OHM,0.25%,0.125W,TC=T2	07716	CEAC48700C
A14R4021	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
A14R4022	321-0299-00			RES,FXD,FILM:12.7K OHM,1%,0.125W,TC=T0	19701	5033ED12K70F
A14R4023	321-1617-06			RES,FXD,FILM:5.85K OHM,0.25%,0.125W,TC=T9	07716	CEAE58500C
A14R4024	321-0229-00			RES,FXD,FILM:2.37K OHM,1%,0.125W,TC=T0	19701	5043ED2K37F
A14R4025	321-0174-00			RES,FXD,FILM:634 OHM,1%,0.125W,TC=T0	07716	CEAD634R0F
A14R4026	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A14R4027	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A14R4031	321-0336-00			RES,FXD,FILM:30.9K OHM,1%,0.125W,TC=T0	19701	5043ED30K90F
A14R4032	321-0368-00			RES,FXD,FILM:66.5K OHM,1%,0.125W,TC=T0	07716	CEAD66501F
A14R4040	321-0322-00			RES,FXD,FILM:22.1K OHM,0.1%,0.125W,TC=T0	19701	5033ED22K10F
A14R4041	321-0260-00			RES,FXD,FILM:4.99K OHM,1%,0.125W,TC=T0	19701	5033ED4K990F
A14R4042	315-0225-00			RES,FXD,FILM:2.2M OHM,5%,0.25W	01121	CB2255
A14R4050	321-0289-00			RES,FXD,FILM:10.0K OHM,1%,0.125W,TC=T0	19701	5033ED10K0F
A14R4051	321-0289-00			RES,FXD,FILM:10.0K OHM,1%,0.125W,TC=T0	19701	5033ED10K0F
A14R4052	321-0289-00			RES,FXD,FILM:10.0K OHM,1%,0.125W,TC=T0	19701	5033ED10K0F
A14R4053	321-0249-07			RES,FXD,FILM:3.83K OHM,0.1%,0.125W,TC=T9	19701	5033RE3K830B
A14R4054	321-0286-00			RES,FXD,FILM:9.31K OHM,1%,0.125W,TC=T0	19701	5043ED9K310F
A14R4055	321-0183-00			RES,FXD,FILM:787 OHM,1%,0.125W,TC=T0	07716	CEAD787R0F
A14R4056	307-0683-00			RES NTWK,FXD,FI:GAIN SET	80009	307-0683-00
A14R4061	315-0270-00			RES,FXD,FILM:27 OHM,5%,0.25W	19701	5043CX27R00J
A14R4062	315-0164-00			RES,FXD,FILM:160K OHM,5%,0.25W	57668	NTR25J-E160K
A14R4071	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A14R4072	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A14R4073	315-0470-00			RES,FXD,FILM:47 OHM,5%,0.25W	57668	NTR25J-E47E0
A14R4074	315-0470-00			RES,FXD,FILM:47 OHM,5%,0.25W	57668	NTR25J-E47E0
A14R5011	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A14R5012	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	57668	NTR25J-E03K9
A14R5020	321-0119-00			RES,FXD,FILM:169 OHM,1%,0.125W,TC=T0	07716	CEAD169R0F
A14R5021	315-0270-00			RES,FXD,FILM:27 OHM,5%,0.25W	19701	5043CX27R00J
A14R5022	315-0270-00			RES,FXD,FILM:27 OHM,5%,0.25W	19701	5043CX27R00J
A14R5024	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	57668	NTR25J-E02K2
A14R5025	311-1238-00			RES,VAR,NONWW:TRMR,5K OHM,0.5W	32997	3386X-DY6-502

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A14R5031	315-0431-00			RES,FXD,FILM:430 OHM,5%,0.25W	19701	5043CX430R0J
A14R5032	315-0221-00			RES,FXD,FILM:220 OHM,5%,0.25W	57668	NTR25J-E220E
A14R5033	321-0136-00			RES,FXD,FILM:255 OHM,1%,0.125W,TC=T0	07716	CEAD255R0F
A14R5034	321-0197-00			RES,FXD,FILM:1.10K OHM,1%,0.125W,TC=T0	07716	CEAD11000F
A14R5035	321-0099-00			RES,FXD,FILM:105 OHM,1%,0.125W,TC=T0	07716	CEAD105R0F
A14R5041	321-0416-00			RES,FXD,FILM:210K OHM,1%,0.125W,TC=T0	07716	CEAD21002F
A14R5042	321-0239-00			RES,FXD,FILM:3.01K OHM,1%,0.125W,TC=T0	19701	5043ED3K010F
A14R5043	321-0318-00			RES,FXD,FILM:20.0K OHM,1%,0.125W,TC=T0	19701	5033ED20K00F
A14R5044	321-0289-00			RES,FXD,FILM:10.0K OHM,1%,0.125W,TC=T0	19701	5033ED10K0F
A14R5045	321-0239-00			RES,FXD,FILM:3.01K OHM,1%,0.125W,TC=T0	19701	5043ED3K010F
A14R5046	315-0270-00			RES,FXD,FILM:27 OHM,5%,0.25W	19701	5043CX27R00J
A14R5051	315-0151-00			RES,FXD,FILM:150 OHM,5%,0.25W	57668	NTR25J-E150E
A14R5052	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
A14R5061	315-0151-00			RES,FXD,FILM:150 OHM,5%,0.25W	57668	NTR25J-E150E
A14R5062	315-0132-00			RES,FXD,FILM:1.3K OHM,5%,0.25W	57668	NTR25J-E01K3
A14R5063	315-0273-00			RES,FXD,FILM:27K OHM,5%,0.25W	57668	NTR25J-E27K0
A14R5064	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	19701	5043CX22K00J92U
A14R5065	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	57668	NTR25J-E 2K
A14R5066	315-0134-00			RES,FXD,FILM:130K OHM,5%,0.25W	57668	NTR25J-E130K
A14RT5010	307-0124-00			RES,THERMAL:5K OHM,10%,NTC	15454	1DC502K-220-EC
A14S2070	260-1998-00			SWITCH,PUSH:4 BTN,2/4 POLE,FUNCTION SEL	59821	2KBM0400001303
A14TP1030	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
A14U1010	156-0515-00			MICROCKT,DGTL:CMOS,TRIPLE 3-CHAN MUX	02735	CD4053BF
A14U1011	156-1191-00			MICROCKT,LINEAR:DUAL BI-FET OPNL AMPL	01295	TL072CP
A14U1020	156-1191-00			MICROCKT,LINEAR:DUAL BI-FET OPNL AMPL	01295	TL072CP
A14U1050	156-1245-00			MICROCKT,LINEAR:7 XSTR,NPN,SI,HV/HIGH CUR	01295	ULN2003AN-P3
A14U1060	156-1810-00			MICROCKT,LINEAR:CMOS,BIPOL,PRPHL DRV	04713	MC1416P
A14U1070	156-1225-01			MICROCKT,LINEAR:DUAL COMPARATOR,SCREENED	01295	LM393P3
A14U1072	156-1191-00			MICROCKT,LINEAR:DUAL BI-FET OPNL AMPL	01295	TL072CP
A14U2020	156-1191-00			MICROCKT,LINEAR:DUAL BI-FET OPNL AMPL	01295	TL072CP
A14U2030	156-1446-00			MICROCKT,LINEAR:OPNL AMPL,DUAL	18324	NE5533N
A14U2031	156-0514-00			MICROCKT,DGTL:CMOS,DIFF 4-CHANNEL MUX	02735	CD4052BF-98
A14U2040	156-0513-00			MICROCKT,DGTL:CMOS,8-CHANNEL MUX	04713	MC14051BCL
A14U2041	156-1338-00			MICROCKT,LINEAR:OPERATIONAL AMPLIFIER	01295	NE5534P
A14U3010	156-1272-00			MICROCKT,LINEAR:DUAL OPERATIONAL AMPLIFIER	18324	NE5532 FE-B
A14U3020	156-1272-00			MICROCKT,LINEAR:DUAL OPERATIONAL AMPLIFIER	18324	NE5532 FE-B
A14U4010	307-0700-00			CPLR,OPTOELECTR:140 OHM @ 13MA	18178	21L478
A14U4011	307-0700-00			CPLR,OPTOELECTR:140 OHM @ 13MA	18178	21L478
A14U4020	156-1338-00			MICROCKT,LINEAR:OPERATIONAL AMPLIFIER	01295	NE5534P
A14U4021	156-1446-01			MICROCKT,LINEAR:OPERATIONAL AMPL,SCREENED	18324	NE5533AN
A14U4041	156-0742-00			MICROCKT,LINEAR:OPNL AMPL	01295	LM318P
A14U4042	156-1191-00			MICROCKT,LINEAR:DUAL BI-FET OPNL AMPL	01295	TL072CP
A14U4050	156-1446-01			MICROCKT,LINEAR:OPERATIONAL AMPL,SCREENED	18324	NE5533AN
A14U4051	156-1338-01			MICROCKT,LINEAR:OPNL AMPL,SELECTED	18324	NE5534AN
A14U4061	156-1338-01			MICROCKT,LINEAR:OPNL AMPL,SELECTED	18324	NE5534AN
A14U4062	156-0158-00			MICROCKT,LINEAR:DUAL OPNL AMPL	04713	MC1458P1/MC1458U
A14U5010	307-0700-00			CPLR,OPTOELECTR:140 OHM @ 13MA	18178	21L478
A14U5041	307-0700-00			CPLR,OPTOELECTR:140 OHM @ 13MA	18178	21L478
A14U5051	307-0700-00			CPLR,OPTOELECTR:140 OHM @ 13MA	18178	21L478
A14VR2022	152-0688-00			SEMICOND DVC,DI:ZEN,SI,2.4V,5%,0.4W,DO-35	04713	SZG30618RL
A14VR2023	152-0688-00			SEMICOND DVC,DI:ZEN,SI,2.4V,5%,0.4W,DO-35	04713	SZG30618RL
A14VR2031	152-0127-00			SEMICOND DVC,DI:ZEN,SI,7.5V,5%,0.4W,DO-7	14433	Z5347 (1N958B)
A14VR3030	152-0127-00			SEMICOND DVC,DI:ZEN,SI,7.5V,5%,0.4W,DO-7	14433	Z5347 (1N958B)
A14VR3041	152-0647-00			SEMICOND DVC,DI:ZENER,SI,6.8V,5%,400MW,DO-7	04713	SZG35014K3RL
A14VR4010	152-0395-00			SEMICOND DVC,DI:ZEN,SI,4.3V,5%,0.4W	04713	SZG35009K18
A14VR4070	152-0149-00			SEMICOND DVC,DI:ZEN,SI,10V,5%,0.4W,DO-7	15238	Z5406
A14VR4071	152-0149-00			SEMICOND DVC,DI:ZEN,SI,10V,5%,0.4W,DO-7	15238	Z5406
A14VR5051	152-0395-00			SEMICOND DVC,DI:ZEN,SI,4.3V,5%,0.4W	04713	SZG35009K18

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A14XQ4060	136-0252-07			SOCKET,PIN CONN:W/O DIMPLE (QTY 3)	22526	75060-012
A14XQ4061	136-0252-07			SOCKET,PIN CONN:W/O DIMPLE (QTY 3)	22526	75060-012
A14XQ4070	136-0252-07			SOCKET,PIN CONN:W/O DIMPLE (QTY 3)	22526	75060-012
A14XQ4071	136-0252-07			SOCKET,PIN CONN:W/O DIMPLE (QTY 3)	22526	75060-012
A15	671-0276-00			CIRCUIT BD ASSY:MAIN (STANDARD AND OPTION 01 ONLY)	80009	671-0276-00
A15	671-0277-00			CIRCUIT BD ASSY:MAIN (OPTION 02 ONLY)	80009	671-0277-00
A15C1010	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A15C1020	290-0974-00			CAP,FXD,ELCTLT:10UF,20%,50VDC	55680	ULB1H100MAA
A15C1021	283-0635-00			CAP,FXD,MICA DI:51PF,1%,100V (STANDARD ONLY)	00853	D151E510F0
A15C1021	283-0636-00			CAP,FXD,MICA DI:36PF,1.4%,100V (OPTION 02 ONLY)	00853	D155E360G0
A15C1022	283-0730-00			CAP,FXD,MICA DI:274PF,1%,500V	00853	D155F2740F0
A15C1023	290-0846-00			CAP,FXD,ELCTLT:47UF,+75-10%,35V (OPTION 02 ONLY)	54473	ECE-A35V47LU
A15C1030	281-0797-00			CAP,FXD,CER DI:15PF,10%,100V (STANDARD ONLY)	04222	MA106A150KAA
A15C1040	290-0517-00			CAP,FXD,ELCTLT:6.8UF,20%,35V (STANDARD ONLY)	05397	T368B685M035AZ
A15C1041	283-0111-00			CAP,FXD,CER DI:0.1UF,20%,50V (STANDARD ONLY)	05397	C330C104M5U1CA
A15C1041	283-0775-00			CAP,FXD,MICA DI:1764 PF,1%,500V (OPTION 02 ONLY)	00853	D195F17640F0
A15C1042	290-0974-00			CAP,FXD,ELCTLT:10UF,20%,50VDC (OPTION 02 ONLY)	55680	ULB1H100MAA
A15C1050	285-1050-00			CAP,FXD,PLASTIC:0.1UF,1%,200V	14752	230B1C104F
A15C1060	283-0594-00			CAP,FXD,MICA DI:0.001UF,1%,100V	00853	D151F102F0
A15C2030	290-0974-00			CAP,FXD,ELCTLT:10UF,20%,50VDC	55680	ULB1H100MAA
A15C2031	290-0517-00			CAP,FXD,ELCTLT:6.8UF,20%,35V (STANDARD ONLY)	05397	T368B685M035AZ
A15C2031	281-0797-00			CAP,FXD,CER DI:15PF,10%,100V (OPTION 02 ONLY)	04222	MA106A150KAA
A15C2032	290-0517-00			CAP,FXD,ELCTLT:6.8UF,20%,35V (STANDARD ONLY)	05397	T368B685M035AZ
A15C2032	283-0696-00			CAP,FXD,MICA DI:2300PF,1%,500V (OPTION 02 ONLY)	00853	D195F232F0
A15C2033	283-0193-00			CAP,FXD,CER DI:510PF,2%,100V (OPTION 02 ONLY)	04222	SR201A511GAA
A15C2040	283-0696-00			CAP,FXD,MICA DI:2300PF,1%,500V (OPTION 02 ONLY)	00853	D195F232F0
A15C2041	283-0696-00			CAP,FXD,MICA DI:2300PF,1%,500V (OPTION 02 ONLY)	00853	D195F232F0
A15C2042	283-0696-00			CAP,FXD,MICA DI:2300PF,1%,500V (OPTION 02 ONLY)	00853	D195F232F0
A15C2050	285-1049-00			CAP,FXD,PLASTIC:0.01UF,1%,200V	14752	230B1C103F
A15C2051	283-0594-00			CAP,FXD,MICA DI:0.001UF,1%,100V	00853	D151F102F0
A15C2061	290-0974-00			CAP,FXD,ELCTLT:10UF,20%,50VDC	55680	ULB1H100MAA
A15C3010	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A15C3021	283-0639-00			CAP,FXD,MICA DI:56PF,1%,100V (STANDARD ONLY)	00853	D155E560F0
A15C3021	283-0635-00			CAP,FXD,MICA DI:51PF,1%,100V (OPTION 02 ONLY)	00853	D151E510F0
A15C3022	283-0620-00			CAP,FXD,MICA DI:470PF,1%,300V	00853	D155F471F0
A15C3031	290-0808-00			CAP,FXD,ELCTLT:2.7UF,10%,20V	05397	T322B275K020AS
A15C3032	290-0808-00			CAP,FXD,ELCTLT:2.7UF,10%,20V	05397	T322B275K020AS

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A15C3033	283-0629-00			CAP,FXD,MICA DI:62PF,1%,500V (STANDARD ONLY)	00853	D105E620F0
A15C3034	283-0620-00			CAP,FXD,MICA DI:470PF,1%,300V	00853	D155F471F0
A15C3035	283-0623-00			CAP,FXD,MICA DI:1200PF,1%,100V	00853	D195F122F0
A15C3036	290-0974-00			CAP,FXD,ELCTLT:10UF,20%,50VDC	55680	ULB1H100MAA
A15C3037	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A15C3038	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V (STANDARD ONLY)	04222	MA205E104MAA
A15C3038	290-0891-00			CAP,FXD,ELCTLT:1UF,+75 -10%,50V (OPTION 02 ONLY)	55680	ULA1H010TEA
A15C3040	290-0534-00			CAP,FXD,ELCTLT:1UF,20%,35V	05397	T368A105M035AZ
A15C3041	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A15C3042	290-0974-00			CAP,FXD,ELCTLT:10UF,20%,50VDC	55680	ULB1H100MAA
A15C3043	290-0782-00			CAP,FXD,ELCTLT:4.7UF,+75-10%,35VDC	55680	ULB1V4R7TAAANA
A15C3046	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A15C3047	281-0813-00			CAP,FXD,CER DI:0.047UF,20%,50V	05397	C412C473M5V2CA
A15C3048	290-0846-00			CAP,FXD,ELCTLT:47UF,+75-10%,35V	54473	ECE-A35V47LU
A15C3049	283-0696-00			CAP,FXD,MICA DI:2300PF,1%,500V (OPTION 02 ONLY)	00853	D195F232F0
A15C3050	283-0696-00			CAP,FXD,MICA DI:2300PF,1%,500V (OPTION 02 ONLY)	00853	D195F232F0
A15C3051	283-0696-00			CAP,FXD,MICA DI:2300PF,1%,500V (OPTION 02 ONLY)	00853	D195F232F0
A15C3052	290-0244-00			CAP,FXD,ELCTLT:0.47UF,5%,35V (OPTION 02 ONLY)	56289	173D474X5035U
A15C3053	290-0246-00			CAP,FXD,ELCTLT:3.3UF,10%,15V	12954	D3R3EA15K1
A15C3054	290-0974-00			CAP,FXD,ELCTLT:10UF,20%,50VDC (OPTION 02 ONLY)	55680	ULB1H100MAA
A15C3060	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A15C4010	285-0702-00			CAP,FXD,PLASTIC:0.033UF,5%,100V	19396	DU591/74-16903
A15C4011	285-0702-00			CAP,FXD,PLASTIC:0.033UF,5%,100V	19396	DU591/74-16903
A15C4012	285-0702-00			CAP,FXD,PLASTIC:0.033UF,5%,100V	19396	DU591/74-16903
A15C4013	285-1056-00			CAP,FXD,PLASTIC:1UF,2%,50V	14752	650B1A105G
A15C4014	290-0974-00			CAP,FXD,ELCTLT:10UF,20%,50VDC	55680	ULB1H100MAA
A15C4020	290-0974-00			CAP,FXD,ELCTLT:10UF,20%,50VDC	55680	ULB1H100MAA
A15C4021	290-0974-00			CAP,FXD,ELCTLT:10UF,20%,50VDC	55680	ULB1H100MAA
A15C4022	283-0639-00			CAP,FXD,MICA DI:56PF,1%,100V (OPTION 02 ONLY)	00853	D155E560F0
A15C4022	283-0623-00			CAP,FXD,MICA DI:1200PF,1%,100V	00853	D195F122F0
A15C4023	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A15C4024	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A15C4025	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V (OPTION 02 ONLY)	04222	MA205E104MAA
A15C4030	285-0598-00			CAP,FXD,PLASTIC:0.01UF,5%,100V (STANDARD ONLY)	19396	DU490B103J
A15C4030	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V (OPTION 02 ONLY)	04222	MA205E104MAA
A15C4031	285-0683-00			CAP,FXD,PLASTIC:0.022UF,5%,100V (STANDARD ONLY)	19396	223J01PT485
A15C4031	290-0782-00			CAP,FXD,ELCTLT:4.7UF,+75-10%,35VDC (OPTION 02 ONLY)	55680	ULB1V4R7TAAANA
A15C4032	285-0683-00			CAP,FXD,PLASTIC:0.022UF,5%,100V (STANDARD ONLY)	19396	223J01PT485
A15C4032	281-0541-00			CAP,FXD,CER DI:6.8PF,10%,500V (OPTION 02 ONLY)	52763	2RDPLZ007 6P80DC
A15C4033	285-0650-00			CAP,FXD,PLASTIC:0.027UF,5%,100V (STANDARD ONLY)	56289	192P27352M447
A15C4033	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V (OPTION 02 ONLY)	04222	MA205E104MAA
A15C4034	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V (STANDARD ONLY)	04222	MA205E104MAA

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A15C4034	281-0786-00			CAP,FXD,CER DI:150PF,10%,100V (OPTION 02 ONLY)	04222	MA101A151KAA
A15C4041	281-0813-00			CAP,FXD,CER DI:0.047UF,20%,50V	05397	C412C473M5V2CA
A15C4042	290-0846-00			CAP,FXD,ELCTLT:47UF,+75-10%,35V	54473	ECE-A35V47LU
A15C4044	290-0267-00			CAP,FXD,ELCTLT:1UF,20%,35V	05397	T320A105M035AS
A15C4045	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A15C4050	281-0813-00			CAP,FXD,CER DI:0.047UF,20%,50V	05397	C412C473M5V2CA
A15C4051	281-0813-00			CAP,FXD,CER DI:0.047UF,20%,50V	05397	C412C473M5V2CA
A15C4060	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A15CR1040	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35 (OPTION 02 ONLY)	03508	DA2527 (1N4152)
A15CR1041	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35 (OPTION 02 ONLY)	03508	DA2527 (1N4152)
A15CR2021	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A15CR2031	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35 (STANDARD ONLY)	03508	DA2527 (1N4152)
A15CR2032	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35 (STANDARD ONLY)	03508	DA2527 (1N4152)
A15CR2050	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A15CR2052	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A15CR2053	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A15CR3040	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A15CR3041	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A15CR3042	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A15CR3043	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A15CR3044	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A15CR3045	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A15CR3046	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35 (STANDARD ONLY)	03508	DA2527 (1N4152)
A15CR3050	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A15CR3061	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A15CR4020	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A15CR4021	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A15CR4022	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A15CR4031	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A15CR4032	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A15CR4033	152-0246-00			SEMICOND DVC,DI:SW,SI,40V,200MA,DO-7 (OPTION 02 ONLY)	14433	WG1537TK
A15CR4034	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35 (OPTION 02 ONLY)	03508	DA2527 (1N4152)
A15CR4035	152-0322-00			SEMICOND DVC,DI:SCHOTTKY BARR,SI,15V,DO-35 (OPTION 02 ONLY)	50434	5082-2672
A15CR4036	152-0322-00			SEMICOND DVC,DI:SCHOTTKY BARR,SI,15V,DO-35 (OPTION 02 ONLY)	50434	5082-2672
A15CR4050	152-0141-02			SEMICOND DVC,DI:SW,SI,30V,150MA,30V,DO-35	03508	DA2527 (1N4152)
A15CR4061	152-0066-00			SEMICOND DVC,DI:RECT,SI,400V,1A,DO-41	05828	GP10G-020
A15DS3060	150-0077-01			LAMP,INCAND:14V,0.08A,#2282D,WIRE LEADS	08806	2162D
A15DS3061	150-0077-01			LAMP,INCAND:14V,0.08A,#2282D,WIRE LEADS	08806	2162D
A15F4060	159-0022-00			FUSE,CARTRIDGE:3AG,1A,250V,MEDIUM BLOW	71400	AGC-CW-1
A15F4061	159-0022-00			FUSE,CARTRIDGE:3AG,1A,250V,MEDIUM BLOW	71400	AGC-CW-1
A15F4062	159-0016-00			FUSE,CARTRIDGE:3AG,1.5,250V,FAST BLOW	71400	AGC-CW-1 1/2
A15J1011	131-1425-00			CONN,RCPT,ELEC:RTANG HEADER,1 X 36,0.1 SP (STANDARD ONLY)	22526	65521-136
A15J1011	131-1426-00			CONN,RCPT,ELEC:RTANGLE HEADER,1 X 36 (OPTION 02 ONLY)	22526	65524-136
A15J1012	131-1426-00			CONN,RCPT,ELEC:RTANGLE HEADER,1 X 36	22526	65524-136
A15J1020	131-1426-00			CONN,RCPT,ELEC:RTANGLE HEADER,1 X 36 (STANDARD ONLY)	22526	65524-136
A15J1020	131-1425-00			CONN,RCPT,ELEC:RTANG HEADER,1 X 36,0.1 SP (OPTION 02 ONLY)	22526	65521-136

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A15J1061	131-1426-00			CONN,RCPT,ELEC:RTANGLE HEADER,1 X 36	22526	65524-136
A15P1042	136-0499-10			CONN,RCPT,ELEC:CKT BD,1 X 10,0.1 SPACING,TIN	00779	4-380949-0
A15P1043	136-0499-06			CONN,RCPT,ELEC:CIRCUIT BD,6 CONTACTS	00779	3-380949-6
A15P1070	136-0499-06			CONN,RCPT,ELEC:CIRCUIT BD,6 CONTACTS	00779	3-380949-6
A15Q1041	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A15Q1042	151-0254-00			TRANSISTOR:DARLINGTON,NPN,SI	03508	X38L3118
A15Q2020	151-0190-00			TRANSISTOR:NPN,SI,TO-92 (OPTION 02 ONLY)	80009	151-0190-00
A15Q2021	151-1110-00			TRANSISTOR:FE,N-CHANNEL,SI,TO-92 (OPTION 02 ONLY)	22229	2N5434
A15Q3040	151-1025-00			TRANSISTOR:FET,N-CHAN,SI,TO-92 (STANDARD ONLY)	04713	SPF3036
A15Q3040	151-1110-00			TRANSISTOR:FE,N-CHANNEL,SI,TO-92 (OPTION 02 ONLY)	22229	2N5434
A15Q3040	151-1025-00			TRANSISTOR:FET,N-CHAN,SI,TO-92	04713	SPF3036
A15Q3050	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A15Q3051	151-0302-00			TRANSISTOR:NPN,SI,TO-18	04713	ST899
A15Q4030	151-0192-00			TRANSISTOR:SELECTED (OPTION 02 ONLY)	04713	SPS8801
A15Q4050	151-0190-00			TRANSISTOR:NPN,SI,TO-92	80009	151-0190-00
A15Q4051	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A15Q4052	151-0301-00			TRANSISTOR:PNP,SI,TO-18	04713	ST898
A15Q4053	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A15R1020	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
A15R1021	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
A15R1022	315-0272-00			RES,FXD,FILM:2.7K OHM,5%,0.25W	57668	NTR25J-E02K7
A15R1023	321-0268-00			RES,FXD,FILM:6.04K OHM,1%,0.125W,TC=T0	19701	5043ED6K040F
A15R1024	321-0268-00			RES,FXD,FILM:6.04K OHM,1%,0.125W,TC=T0	19701	5043ED6K040F
A15R1030	311-1232-00			RES,VAR,NONWW:TRMR,50K OHM,0.5W (STANDARD ONLY)	32997	3386F-T04-503
A15R1030	311-1231-00			RES,VAR,NONWW:TRMR,25K OHM,0.5W (OPTION 02 ONLY)	32997	3386F-T04-253
A15R1031	315-0510-00			RES,FXD,FILM:51 OHM,5%,0.25W	19701	5043CX51R00J
A15R1032	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	57668	NTR25J-E47K0
A15R1033	321-0222-07			RES,FXD,FILM:2.0K OHM,0.1%,0.125W,TC=T9	19701	5033RE2K000B
A15R1034	321-0222-07			RES,FXD,FILM:2.0K OHM,0.1%,0.125W,TC=T9	19701	5033RE2K000B
A15R1035	311-1232-00			RES,VAR,NONWW:TRMR,50K OHM,0.5W (STANDARD ONLY)	32997	3386F-T04-503
A15R1035	321-0297-00			RES,FXD,FILM:12.1K OHM,1%,0.125W,TC=T0 (OPTION 02 ONLY)	07716	CEAD12101F
A15R1036	321-0289-07			RES,FXD,FILM:10.0K OHM,0.1%,0.125W,TC=T9 (STANDARD ONLY)	19701	5033RE10K00B
A15R1036	321-0344-00			RES,FXD,FILM:37.4K OHM,1%,0.125W,TC=T0 (OPTION 02 ONLY)	19701	5033ED 37K40F
A15R1037	321-0259-00			RES,FXD,FILM:4.87K OHM,1%,0.125W,TC=T0 (OPTION 02 ONLY)	07716	CEAD48700F
A15R1040	311-1225-00			RES,VAR,NONWW:TRMR,1K OHM,0.5W (STANDARD ONLY)	32997	3386F-T04-102
A15R1040	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W (OPTION 02 ONLY)	57668	NTR25JE01K0
A15R1041	315-0153-00			RES,FXD,FILM:15K OHM,5%,0.25W	19701	5043CX15K00J
A15R1042	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A15R1043	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A15R1044	315-0432-00			RES,FXD,FILM:4.3K OHM,5%,0.25W	57668	NTR25J-E04K3
A15R1045	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
A15R1046	321-0277-00			RES,FXD,FILM:7.50K OHM,1%,0.125W,TC=T0 (OPTION 02 ONLY)	24546	NA55D7501F
A15R1047	321-0289-07			RES,FXD,FILM:10.0K OHM,0.1%,0.125W,TC=T9 (OPTION 02 ONLY)	19701	5033RE10K00B

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A15R1048	321-0289-07			RES,FXD,FILM:10.0K OHM,0.1%,0.125W,TC=T9 (OPTION 02 ONLY)	19701	5033RE10K00B
A15R2010	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
A15R2011	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
A15R2012	315-0274-00			RES,FXD,FILM:270K OHM,5%,0.25W (OPTION 02 ONLY)	57668	NTR25J-E270K
A15R2012	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
A15R2013	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
A15R2020	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A15R2021	321-0289-00			RES,FXD,FILM:10.0K OHM,1%,0.125W,TC=T0 (STANDARD ONLY)	19701	5033ED10K0F
A15R2022	321-0673-07			RES,FXD,FILM:17K OHM,0.1%,0.125W,TC=T9 (OPTION 02 ONLY)	07716	CEAE17001B
A15R2023	321-0318-00			RES,FXD,FILM:20.0K OHM,1%,0.125W,TC=T0 (STANDARD ONLY)	19701	5033ED20K00F
A15R2023	315-0153-00			RES,FXD,FILM:15K OHM,5%,0.25W (OPTION 02 ONLY)	19701	5043CX15K00J
A15R2024	321-0240-00			RES,FXD,FILM:3.09K OHM,1%,0.125W,TC=T0	07716	CEAD30900F
A15R2025	315-0271-00			RES,FXD,FILM:270 OHM,5%,0.25W	57668	NTR25J-E270E
A15R2026	315-0153-00			RES,FXD,FILM:15K OHM,5%,0.25W (OPTION 02 ONLY)	19701	5043CX15K00J
A15R2027	315-0243-00			RES,FXD,FILM:24K OHM,5%,0.25W (OPTION 02 ONLY)	57668	NTR25J-E24K0
A15R2028	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W (OPTION 02 ONLY)	57668	NTR25JE01K0
A15R2031	321-0289-00			RES,FXD,FILM:10.0K OHM,1%,0.125W,TC=T0 (STANDARD ONLY)	19701	5033ED10K0F
A15R2031	321-0293-00			RES,FXD,FILM:11.0K OHM,1%,0.125W,TC=T0 (OPTION 02 ONLY)	07716	CEAD11001F
A15R2032	321-0289-07			RES,FXD,FILM:10.0K OHM,0.1%,0.125W,TC=T9 (STANDARD ONLY)	19701	5033RE10K00B
A15R2032	321-0291-00			RES,FXD,FILM:10.5K OHM,1%,0.125W,TC=T0 (OPTION 02 ONLY)	19701	5033ED10K50F
A15R2033	321-0260-00			RES,FXD,FILM:4.99K OHM,1%,0.125W,TC=T0 (STANDARD ONLY)	19701	5033ED4K990F
A15R2033	321-0260-00			RES,FXD,FILM:4.99K OHM,1%,0.125W,TC=T0 (OPTION 02 ONLY)	19701	5033ED4K990F
A15R2034	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A15R2035	311-1231-00			RES,VAR,NONWW:TRMR,25K OHM,0.5W (OPTION 02 ONLY)	32997	3386F-T04-253
A15R2040	321-0291-00			RES,FXD,FILM:10.5K OHM,1%,0.125W,TC=T0 (STANDARD ONLY)	19701	5033ED10K50F
A15R2040	321-0238-00			RES,FXD,FILM:2.94K OHM,1%,0.125W,TC=T0 (OPTION 02 ONLY)	07716	CEAD29400F
A15R2041	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W (STANDARD ONLY)	57668	NTR25J-E47K0
A15R2041	321-0291-00			RES,FXD,FILM:10.5K OHM,1%,0.125W,TC=T0 (OPTION 02 ONLY)	19701	5033ED10K50F
A15R2042	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W (STANDARD ONLY)	57668	NTR25J-E 100E
A15R2042	321-0222-07			RES,FXD,FILM:2.0K OHM,0.1%,0.125W,TC=T9 (OPTION 02 ONLY)	19701	5033RE2K000B
A15R2043	315-0684-00			RES,FXD,FILM:680K OHM,5%,0.25W	01121	CB6845
A15R2044	315-0153-00			RES,FXD,FILM:15K OHM,5%,0.25W	19701	5043CX15K00J
A15R2045	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
A15R2046	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
A15R2047	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
A15R2048	321-0222-07			RES,FXD,FILM:2.0K OHM,0.1%,0.125W,TC=T9 (OPTION 02 ONLY)	19701	5033RE2K000B
A15R2049	321-0222-07			RES,FXD,FILM:2.0K OHM,0.1%,0.125W,TC=T9 (OPTION 02 ONLY)	19701	5033RE2K000B

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A15R2050	315-0245-00			RES,FXD,FILM:2.4M OHM,5%,0.25W	01121	CB2455
A15R2051	321-0312-00			RES,FXD,FILM:17.4K OHM,1%,0.125W,TC=T0	19701	5033ED17K40F
A15R2052	315-0106-00			RES,FXD,FILM:10M OHM,5%,0.25W	01121	CB1065
A15R2053	321-0414-00			RES,FXD,FILM:200K OHM,1%,0.125W,TC=T0	07716	CEAD20002F
A15R2054	315-0106-00			RES,FXD,FILM:10M OHM,5%,0.25W	01121	CB1065
A15R2060	315-0226-00			RES,FXD,FILM:22M OHM,5%,0.25W	80009	315-0226-00
A15R2061	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A15R2062	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A15R2063	321-0256-00			RES,FXD,FILM:4.53K OHM,1%,0.125W,TC=T9	19701	5033ED4K530F
A15R2064	315-0132-00			RES,FXD,FILM:1.3K OHM,5%,0.25W	57668	NTR25J-E01K3
A15R2065	321-0131-00			RES,FXD,FILM:226 OHM,1%,0.125W,TC=T0	19701	5043ED226R0F
A15R3020	315-0123-00			RES,FXD,FILM:12K OHM,5%,0.25W	57668	NTR25J-E12K0
A15R3021	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A15R3022	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A15R3023	321-0310-00			RES,FXD,FILM:16.5K OHM,1%,0.125W,TC=T0	19701	5033ED16K50F
A15R3024	321-0310-00			RES,FXD,FILM:16.5K OHM,1%,0.125W,TC=T0	19701	5033ED16K50F
A15R3025	321-0310-00			RES,FXD,FILM:16.5K OHM,1%,0.125W,TC=T0	19701	5033ED16K50F
A15R3026	315-0271-00			RES,FXD,FILM:270 OHM,5%,0.25W	57668	NTR25J-E270E
A15R3027	321-0265-00			RES,FXD,FILM:5.62K OHM,1%,0.125W,TC=T0	19701	5043ED5K620F
A15R3028	321-0265-00			RES,FXD,FILM:5.62K OHM,1%,0.125W,TC=T0	19701	5043ED5K620F
A15R3029	321-0265-00			RES,FXD,FILM:5.62K OHM,1%,0.125W,TC=T0	19701	5043ED5K620F
A15R3030	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A15R3031	321-0260-00			RES,FXD,FILM:4.99K OHM,1%,0.125W,TC=T0	19701	5033ED4K990F
A15R3032	321-0326-00			RES,FXD,FILM:24.3K OHM,1%,0.125W,TC=T0	19701	5043ED24K30F
A15R3033	321-0423-00			RES,FXD,FILM:249K OHM,1%,0.125W,TC=T0 (OPTION 02 ONLY)	19701	5043ED249K0F
A15R3034	321-0293-00			RES,FXD,FILM:11.0K OHM,1%,0.125W,TC=T0 (OPTION 02 ONLY)	07716	CEAD11001F
A15R3035	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W (OPTION 02 ONLY)	57668	NTR25J-E 100E
A15R3036	321-0291-00			RES,FXD,FILM:10.5K OHM,1%,0.125W,TC=T0 (STANDARD ONLY)	19701	5033ED10K50F
A15R3036	321-0291-00			RES,FXD,FILM:10.5K OHM,1%,0.125W,TC=T0 (OPTION 02 ONLY)	19701	5033ED10K50F
A15R3040	315-0123-00			RES,FXD,FILM:12K OHM,5%,0.25W	57668	NTR25J-E12K0
A15R3041	315-0243-00			RES,FXD,FILM:24K OHM,5%,0.25W	57668	NTR25J-E24K0
A15R3042	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A15R3043	321-0283-00			RES,FXD,FILM:8.66K OHM,1%,0.125W,TC=T0	19701	5043ED8K660F
A15R3044	321-0268-00			RES,FXD,FILM:6.04K OHM,1%,0.125W,TC=T0	19701	5043ED6K040F
A15R3045	315-0122-00			RES,FXD,FILM:1.2K OHM,5%,0.25W	57668	NTR25J-E01K2
A15R3046	321-0222-07			RES,FXD,FILM:2.0K OHM,0.1%,0.125W,TC=T9 (OPTION 02 ONLY)	19701	5033RE2K000B
A15R3047	311-1423-00			RES,VAR,NONWW:TRMR,20 OHM,0.5W	32997	3386F-T04-200
A15R3048	321-0382-00			RES,FXD,FILM:93.1K OHM,1%,0.125W,TC=T0 (OPTION 02 ONLY)	07716	CEAD93101F
A15R3049	321-0156-00			RES,FXD,FILM:412 OHM,1%,0.125W,TC=T0 (OPTION 02 ONLY)	07716	CEAD412R0F
A15R3050	321-0414-00			RES,FXD,FILM:200K OHM,1%,0.125W,TC=T0	07716	CEAD20002F
A15R3051	321-0416-00			RES,FXD,FILM:210K OHM,1%,0.125W,TC=T0	07716	CEAD21002F
A15R3052	315-0106-00			RES,FXD,FILM:10M OHM,5%,0.25W	01121	CB1065
A15R3053	307-0093-00			RES,FXD,CMPSN:1.2 OHM,5%,0.5W	01121	EB12G5
A15R3054	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A15R3055	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A15R3056	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
A15R3057	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A15R3058	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A15R3060	321-0174-00			RES,FXD,FILM:634 OHM,1%,0.125W,TC=T0	07716	CEAD634R0F
A15R3061	321-0661-00			RES,FXD,FILM:600 OHM,1%,0.125W,TC=T0	19701	5033RD600R0F
A15R4010	321-0244-00			RES,FXD,FILM:3.40K OHM,1%,0.125W,TC=T0	19701	5043ED3K400F

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A15R4011	321-0363-00			RES,FXD,FILM:59.0K OHM,1%,0.125W,TC=T0	07716	CEAD59001F
A15R4012	321-0283-00			RES,FXD,FILM:8.66K OHM,1%,0.125W,TC=T0	19701	5043ED8K660F
A15R4013	321-0326-00			RES,FXD,FILM:24.3K OHM,1%,0.125W,TC=T0 (STANDARD ONLY)	19701	5043ED24K30F
A15R4013	321-0326-00			RES,FXD,FILM:24.3K OHM,1%,0.125W,TC=T0 (OPTION 02 ONLY)	19701	5043ED24K30F
A15R4014	321-0385-00			RES,FXD,FILM:100K OHM,1%,0.125W,TC=T0 (STANDARD ONLY)	19701	5033ED100K0F
A15R4014	321-0385-00			RES,FXD,FILM:100K OHM,1%,0.125W,TC=T0 (OPTION 02 ONLY)	19701	5033ED100K0F
A15R4020	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A15R4021	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	57668	NTR25J-E100K
A15R4024	321-0432-00			RES,FXD,FILM:309K OHM,1%,0.125W,TC=T0 (STANDARD ONLY)	07716	CEAD30902F
A15R4025	321-0197-00			RES,FXD,FILM:1.10K OHM,1%,0.125W,TC=T0 (STANDARD ONLY)	07716	CEAD11000F
A15R4026	321-0289-00			RES,FXD,FILM:10.0K OHM,1%,0.125W,TC=T0 (STANDARD ONLY)	19701	5033ED10K0F
A15R4027	321-0374-00			RES,FXD,FILM:76.8K OHM,1%,0.125W,TC=T0 (STANDARD ONLY)	07716	CEAD76801F
A15R4031	321-0289-00			RES,FXD,FILM:10.0K OHM,1%,0.125W,TC=T0	19701	5033ED10K0F
A15R4032	321-0289-00			RES,FXD,FILM:10.0K OHM,1%,0.125W,TC=T0	19701	5033ED10K0F
A15R4033	321-0289-00			RES,FXD,FILM:10.0K OHM,1%,0.125W,TC=T0	19701	5033ED10K0F
A15R4034	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25W (OPTION 02 ONLY)	57668	NTR25J-E03K0
A15R4035	315-0474-00			RES,FXD,FILM:470K OHM,5%,0.25W (OPTION 02 ONLY)	19701	5043CX470K0J92U
A15R4037	311-1231-00			RES,VAR,NONWW:TRMR,25K OHM,0.5W (OPTION 02 ONLY)	32997	3386F-T04-253
A15R4038	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W (OPTION 02 ONLY)	57668	NTR25J-E47K0
A15R4040	315-0225-00			RES,FXD,FILM:2.2M OHM,5%,0.25W (OPTION 02 ONLY)	01121	CB2255
A15R4041	321-0289-07			RES,FXD,FILM:10.0K OHM,0.1%,0.125W,TC=T9	19701	5033RE10K00B
A15R4042	321-0289-07			RES,FXD,FILM:10.0K OHM,0.1%,0.125W,TC=T9	19701	5033RE10K00B
A15R4043	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A15R4044	307-0093-00			RES,FXD,CMPSN:1.2 OHM,5%,0.5W	01121	EB12G5
A15R4045	321-0306-00			RES,FXD,FILM:15.0K OHM,1%,0.125W,TC=T0 (OPTION 02 ONLY)	19701	5033ED15J00F
A15R4046	315-0221-00			RES,FXD,FILM:220 OHM,5%,0.25W	57668	NTR25J-E220E
A15R4047	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A15R4048	321-0400-00			RES,FXD,FILM:143K OHM,1%,0.125W,TC=T0 (OPTION 02 ONLY)	19701	5043ED143K0F
A15R4049	321-1310-03			RES,FXD,FILM:16.7K OHM,0.25%,0.125W,TC=T2 (OPTION 02 ONLY)	19701	5033RC16K72C
A15R4050	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A15R4051	315-0201-00			RES,FXD,FILM:200 OHM,5%,0.25W	57668	NTR25J-E200E
A15R4052	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A15R4053	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	57668	NTR25J-E04K7
A15R4054	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	57668	NTR25J-E 100E
A15R4055	311-1231-00			RES,VAR,NONWW:TRMR,25K OHM,0.5W (OPTION 02 ONLY)	32997	3386F-T04-253
A15S1010	260-2000-00			SWITCH,PUSH:5 BTN,2/4 POLE,FLTR SEL	59821	2KBB0500001305
A15S1011	260-2159-00			SWITCH,PUSH:5 BUTTON,2 POLE,DISTN RNG	80009	260-2159-00
A15TP3041	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
A15TP3042	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
A15TP3043	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
A15TP3044	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
A15U1020	156-1225-01			MICROCKT,LINEAR:DUAL COMPARATOR,SCREENED	01295	LM393P3
A15U1021	156-0514-01			MICROCKT,DGTL:DIFF 4-CHANNEL MUX,SEL	80009	156-0514-01

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A15U2020	156-0495-02			MICROCKT,LINEAR:QUAD OPNL AMPL,SELECTED	01295	LM324J4
A15U2021	156-1191-00			MICROCKT,LINEAR:DUAL BI-FET OPNL AMPL (OPTION 02 ONLY)	01295	TL072CP
A15U2023	156-1191-00			MICROCKT,LINEAR:DUAL BI-FET OPNL AMPL	01295	TL072CP
A15U2030	156-1272-00			MICROCKT,LINEAR:DUAL OPERATIONAL AMPLIFIER	18324	NE5532 FE-B
A15U2040	156-1191-00			MICROCKT,LINEAR:DUAL BI-FET OPNL AMPL (STANDARD ONLY)	01295	TL072CP
A15U2040	156-1200-00			MICROCKT,LINEAR:OPERATIONAL AMP,QUAD BI-FET (OPTION 02 ONLY)	01295	TL074CN
A15U2041	156-0763-02			MICROCKT,DGTL:HEX CONT BOUNCE ELIMINATOR	04713	MC14490BC
A15U2042	156-0931-00			MICROCKT,DGTL:CMOS,QUAD D FF	04713	MC14175BCL
A15U2050	156-0931-00			MICROCKT,DGTL:CMOS,QUAD D FF	04713	MC14175BCL
A15U2051	156-0411-00			MICROCKT,LINEAR:SGL SPLY COMPARATOR	04713	LM339N
A15U2060	156-0513-00			MICROCKT,DGTL:CMOS,8-CHANNEL MUX	04713	MC14051BCL
A15U3010	156-0994-02			MICROCKT,DGTL:8 INPUT DATA SEL/MUX,SCRN	01295	SN74LS151NP3
A15U3020	156-0515-02			MICROCKT,DGTL:TRIPLE 3-CHAN MUX,SEL	80009	156-0515-02
A15U3021	156-1191-00			MICROCKT,LINEAR:DUAL BI-FET OPNL AMPL (STANDARD ONLY)	01295	TL072CP
A15U3030	156-1200-00			MICROCKT,LINEAR:OPERATIONAL AMP,QUAD BI-FET (OPTION 02 ONLY)	01295	TL074CN
A15U3031	156-1457-00			MICROCKT,LINEAR:TRUE RMS CONVERTER	24355	AD41127
A15U4020	156-1191-00			MICROCKT,LINEAR:DUAL BI-FET OPNL AMPL	01295	TL072CP
A15U4030	156-1191-00			MICROCKT,LINEAR:DUAL BI-FET OPNL AMPL	01295	TL072CP
A15U4040	156-0277-00			MICROCKT,LINEAR:VOLTAGE REGULATOR	04713	LM340T-5.0
A15U4041	156-0158-00			MICROCKT,LINEAR:DUAL OPNL AMPL	04713	MC1458P1/MC1458U
A15VR1020	152-0127-00			SEMICOND DVC,DI:ZEN,SI,7.5V,5%,0.4W,DO-7	14433	Z5347 (1N958B)
A15VR2020	152-0127-00			SEMICOND DVC,DI:ZEN,SI,7.5V,5%,0.4W,DO-7	14433	Z5347 (1N958B)
A15VR3031	152-0647-00			SEMICOND DVC,DI:ZENER,SI,6.8V,5%,400MW,DO-7	04713	SZG35014K3RL
A15VR3041	152-0486-00			SEMICOND DVC,DI:ZEN,SI,6.2V,2%,0.25W	04713	SZG20008
A15VR3051	152-0590-00			SEMICOND DVC,DI:ZEN,SI,18V,5%,0.4W,DO-7	04713	SZG35014K2
A15VR4060	152-0590-00			SEMICOND DVC,DI:ZEN,SI,18V,5%,0.4W,DO-7	04713	SZG35014K2
A15W1060	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L	24546	OMA 07
A15XU1010	136-0729-00			SKT,PL-IN ELEK:MICROCKT,16 CONTACT	09922	DILB16P-108T
A18	671-0248-00			CIRCUIT BD ASSY:DVM	80009	671-0248-00
A18C1015	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A18C2031	281-0813-00			CAP,FXD,CER DI:0.047UF,20%,50V	05397	C412C473M5V2CA
A18C2038	281-0775-00			CAP,FXD,CER DI:0.1UF,20%,50V	04222	MA205E104MAA
A18C2042	281-0809-00			CAP,FXD,CER DI:200 PF,5%,100V	04222	MA101A201JAA
A18C3029	285-1098-00			CAP,FXD,PLASTIC:0.22UF,10%,80V	56289	192P2249R8
A18J2034	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 6)	22526	48283-036
A18J2050	131-2238-00			CONN,RCPT,ELEC:CKT BD,2 X 20,MALE	TK1483	082-2043-SD08
A18J3060	131-0608-00			TERMINAL,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY OF 10)	22526	48283-036
A18Q1025	151-0188-00			TRANSISTOR:PNP,SI,TO-92	80009	151-0188-00
A18Q1047	151-0302-00			TRANSISTOR:NPN,SI,TO-18	04713	ST899
A18R1026	315-0153-00			RES,FXD,FILM:15K OHM,5%,0.25W	19701	5043CX15K00J
A18R1027	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	19701	5043CX10K00J
A18R1031	315-0821-00			RES,FXD,FILM:820 OHM,5%,0.25W	19701	5043CX820R0J
A18R1033	315-0821-00			RES,FXD,FILM:820 OHM,5%,0.25W	19701	5043CX820R0J
A18R1037	315-0821-00			RES,FXD,FILM:820 OHM,5%,0.25W	19701	5043CX820R0J
A18R1038	315-0821-00			RES,FXD,FILM:820 OHM,5%,0.25W	19701	5043CX820R0J
A18R1051	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
A18R2028	315-0274-00			RES,FXD,FILM:270K OHM,5%,0.25W	57668	NTR25J-E270K
A18R2032	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	19701	5043CX510R0J
A18R2037	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	57668	NTR25JE01K0
A18R2041	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A18R2042	315-0135-00			RES,FXD,FILM:1.3M OHM,5%,0.25W	19701	5043CX1M300J
A18R2051	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25W	57668	NTR25J-E05K1

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A18R2053	321-0269-00			RES,FXD,FILM:6.19K OHM,1%,0.125W,TC=T0	07716	CEAD61900F
A18R2055	321-0199-00			RES,FXD,FILM:1.15K OHM,1%,0.125W,TC=T0	07716	CEAD11500F
A18R2057	311-2082-00			RES,VAR,NONWW:TRMR,200 OHM,10%,0.5W	32997	3386X-T04-201
A18R3019	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A18R3020	315-0125-00			RES,FXD,FILM:1.2M OHM,5%,0.25W	19701	5043CX1M200J
A18R3021	315-0335-00			RES,FXD,FILM:3.3M OHM,5%,0.25W	01121	CB3355
A18R3022	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	57668	NTR25J-E03K3
A18R3031	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	57668	NTR25J-E03K3
A18R3032	315-0335-00			RES,FXD,FILM:3.3M OHM,5%,0.25W	01121	CB3355
A18R3035	315-0305-00			RES,FXD,FILM:3M OHM,5%,0.25W	01121	CB3055
A18R3037	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	57668	NTR25J-E03K3
A18R3041	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A18R3043	315-0335-00			RES,FXD,FILM:3.3M OHM,5%,0.25W	01121	CB3355
A18R3045	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	57668	NTR25J-E03K3
A18R3047	315-0335-00			RES,FXD,FILM:3.3M OHM,5%,0.25W	01121	CB3355
A18R3048	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A18R3050	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A18R3051	315-0914-00			RES,FXD,FILM:910K OHM,5%,0.25W	19701	5043CX910K00J
A18R3052	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	57668	NTR25J-E03K3
A18R3053	315-0335-00			RES,FXD,FILM:3.3M OHM,5%,0.25W	01121	CB3355
A18R4023	315-0335-00			RES,FXD,FILM:3.3M OHM,5%,0.25W	01121	CB3355
A18R4024	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	57668	NTR25J-E03K3
A18R4025	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	57668	NTR25J-E 20K
A18R4026	315-0474-00			RES,FXD,FILM:470K OHM,5%,0.25W	19701	5043CX470K0J92U
A18R4027	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A18R4028	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A18R4029	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A18R4030	315-0624-00			RES,FXD,FILM:620K OHM,5%,0.25W	19701	5043CX620K0J
A18R4035	315-0335-00			RES,FXD,FILM:3.3M OHM,5%,0.25W	01121	CB3355
A18R4036	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	57668	NTR25J-E03K3
A18R4037	315-0824-00			RES,FXD,FILM:820K OHM,5%,0.25W	19701	5043CX820K0J
A18R4038	315-0335-00			RES,FXD,FILM:3.3M OHM,5%,0.25W	01121	CB3355
A18R4039	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	57668	NTR25J-E03K3
A18R4041	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A18R4045	315-0335-00			RES,FXD,FILM:3.3M OHM,5%,0.25W	01121	CB3355
A18R4046	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A18R4048	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	57668	NTR25J-E03K3
A18R4049	315-0225-00			RES,FXD,FILM:2.2M OHM,5%,0.25W	01121	CB2255
A18R4050	315-0335-00			RES,FXD,FILM:3.3M OHM,5%,0.25W	01121	CB3355
A18R4051	316-0156-00			RES,FXD,CMPSN:15M OHM,10%,0.25W	01121	CB1561
A18R4052	315-0513-00			RES,FXD,FILM:51K OHM,5%,0.25W	57668	NTR25J-E51K0
A18R4053	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	57668	NTR25J-E03K3
A18U1051	156-0030-03			MICROCKT,DGTL:QUAD 2 INPUT NAND GATE,SCRN	18324	N7400(NB OR FB)
A18U2041	156-1435-00			MICROCKT,LINEAR:A/D CONV,3.5 DIGIT,SGL CHIP ,NON-MUX LED DSPL DRIVE	32293	ICL7107CPL
A18U4021	156-0495-00			MICROCKT,LINEAR:OPNL AMPL	01295	LM324N
A18U4031	156-0495-00			MICROCKT,LINEAR:OPNL AMPL	01295	LM324N
A18U4041	156-0495-00			MICROCKT,LINEAR:OPNL AMPL	01295	LM324N
A18XU2041	136-0757-00			SKT,PL-IN ELEK:MICROCIRCUIT,40 DIP	09922	DILB40P-108
C500	283-0077-00			CAP,FXD,CER DI:330PF,5%,500V	59660	831-500B331J
C530	283-0076-00			CAP,FXD,CER DI:27PF,10%,500V	59660	831-500S2L270K
C540	283-0076-00			CAP,FXD,CER DI:27PF,10%,500V	59660	831-500S2L270K
J500	131-1315-01			CONN,RCPT,ELEC:BNC,FEMALE	80009	131-1315-01
J510	131-0955-00			CONN,RCPT,ELEC:BNC,FEMALE	13511	31-279
J520	131-0955-00			CONN,RCPT,ELEC:BNC,FEMALE	13511	31-279
W500	175-3261-00			CA ASSY,SP,ELEC:8,26 AWG,8.0 L,RIBBON	80009	175-3261-00

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
				(FROM A12J1031 TO A14J1060)		
W510	175-3262-00			CA ASSY,SP,ELEC:6,26 AWG,10.0 L,RIBBON	80009	175-3262-00
				(FROM A10J2040 TO A12J1091)		
W520	175-3262-00			CA ASSY,SP,ELEC:6,26 AWG,10.0 L,RIBBON	80009	175-3262-00
				(FROM A12J1072 TO A15J1011)		
W530	175-3264-00			CA ASSY,SP,ELEC:3,26 AWG,3.0 L,RIBBON	80009	175-3264-00
				(FROM A10J2011 TO A12J1181)		
W540	175-3374-01			CABLE ASSY,RF:50 OHM COAX,6.0 L,9-5	80009	175-3374-01
				(FROM A13J8011 TO A14J1041)		
W550	175-7212-00	B010100	B010589	CA ASSY,SP,ELEC:5,26 AWG,4.0 L,RIBBON	80009	175-7212-00
W550	175-7212-01	B010590		CA ASSY,SP,ELEC:5,26 AWG,4.0 L,RIBBON	80009	175-7212-01
				(FROM A12J1141 TO A14J1071)		
W560	175-3636-01			CA ASSY,SP,ELEC:2,26 AWG,14.0 L,8-N	80009	175-3636-01
				(FROM A12J7171 TO A15J1061)		
W570	175-5136-00			CA ASSY,SP,ELEC:10,26 AWG,5.0 L,RIBBON	80009	175-5136-00
				(FROM A10J2012 TO A16J3060)		
W580	175-5137-00			CA ASSY,SP,ELEC:34,28 AWG,8.5 L,RIBBON	22526	ORDER BY DESCR
				(FROM A10J2030 TO A16J2050)		
W585	175-6025-00			CA ASSY,SP,ELEC:6,26 AWG,13.0 L,RIBBON	80009	175-6025-00
				(FROM A15J1012 TO A16J2034)		
W590	198-4299-01			WIRE SET,ELEC:	80009	198-4299-01
				(FROM A15J1020 TO J500,J510 & J520)		
W600	175-3261-00			CA ASSY,SP,ELEC:8,26 AWG,8.0 L,RIBBON	80009	175-3261-00
				(FROM A12J1051 TO A14J1030)		

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:

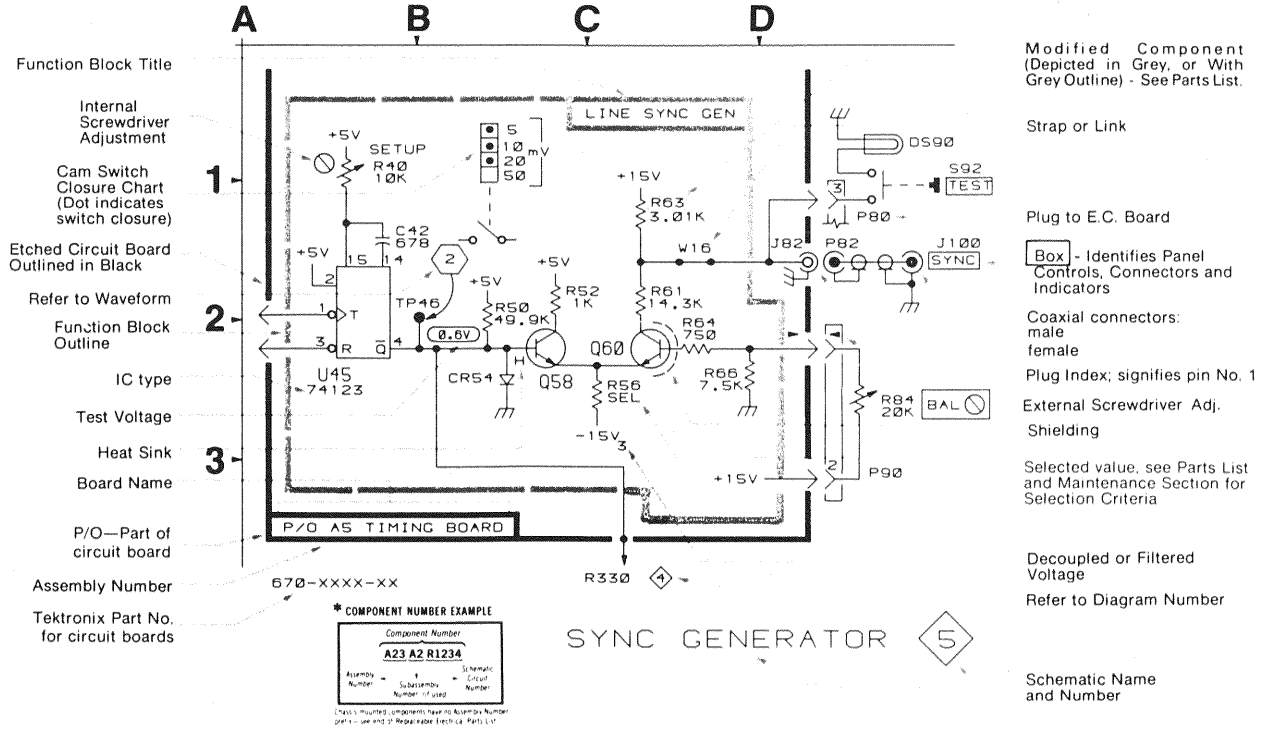
Capacitors = Values one or greater are in picofarads (pF). Values less than one are in microfarads (μF).
Resistors = Ohms (Ω).

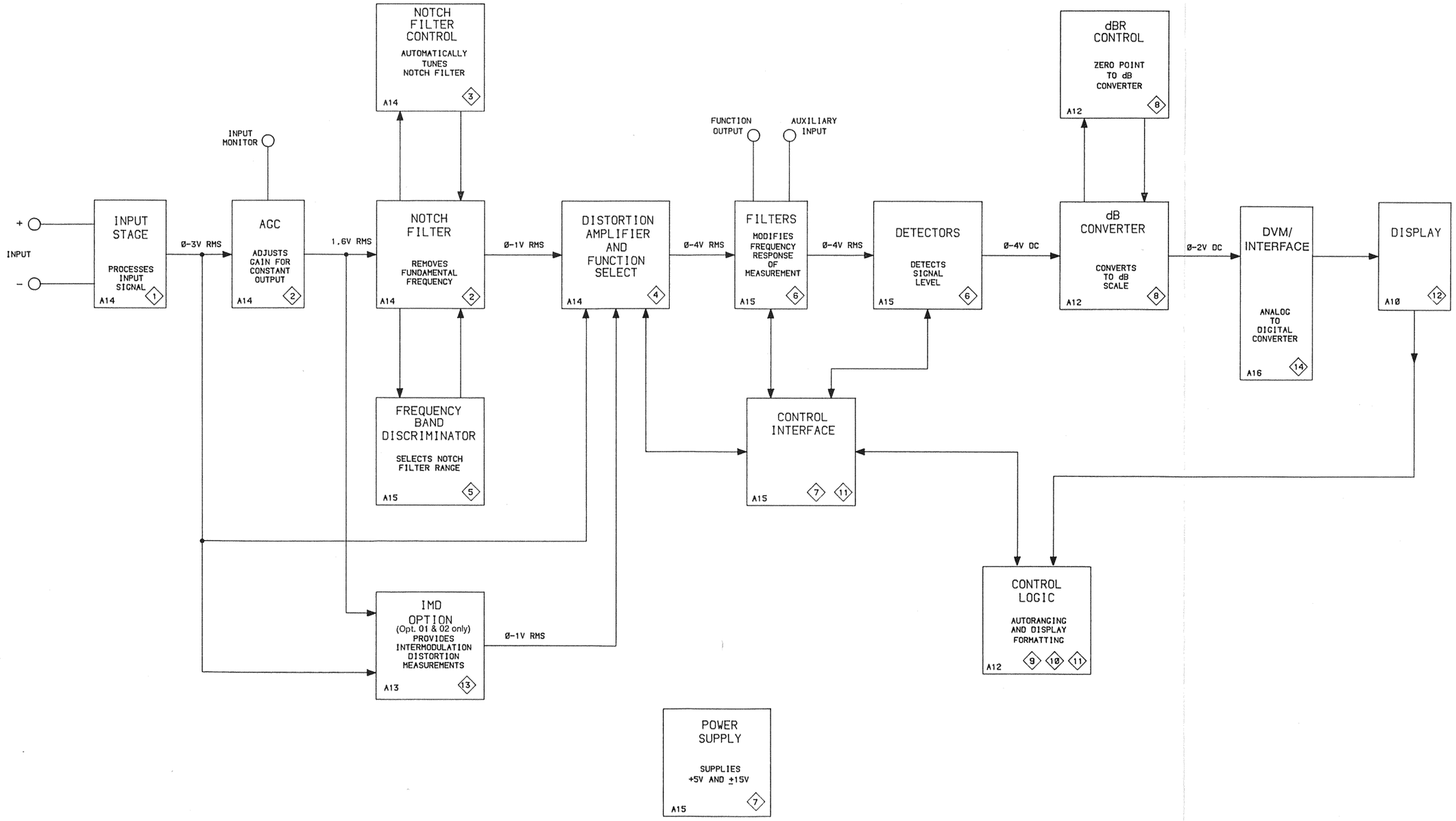
The information and special symbols below may appear in this manual.

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.

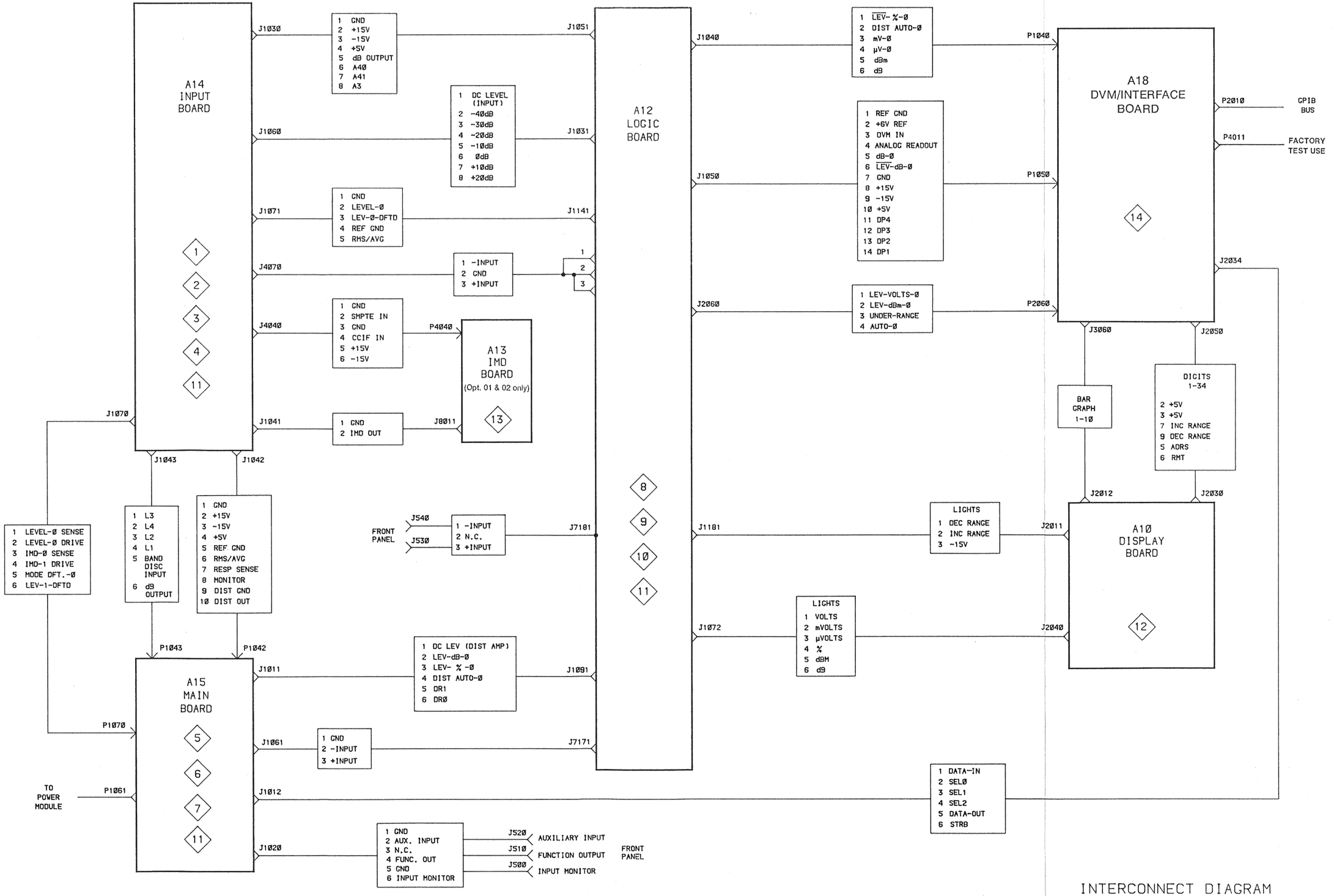




AA 501A

4598-71

BLOCK DIAGRAM



AA 501A

4598-72

INTERCONNECT DIAGRAM

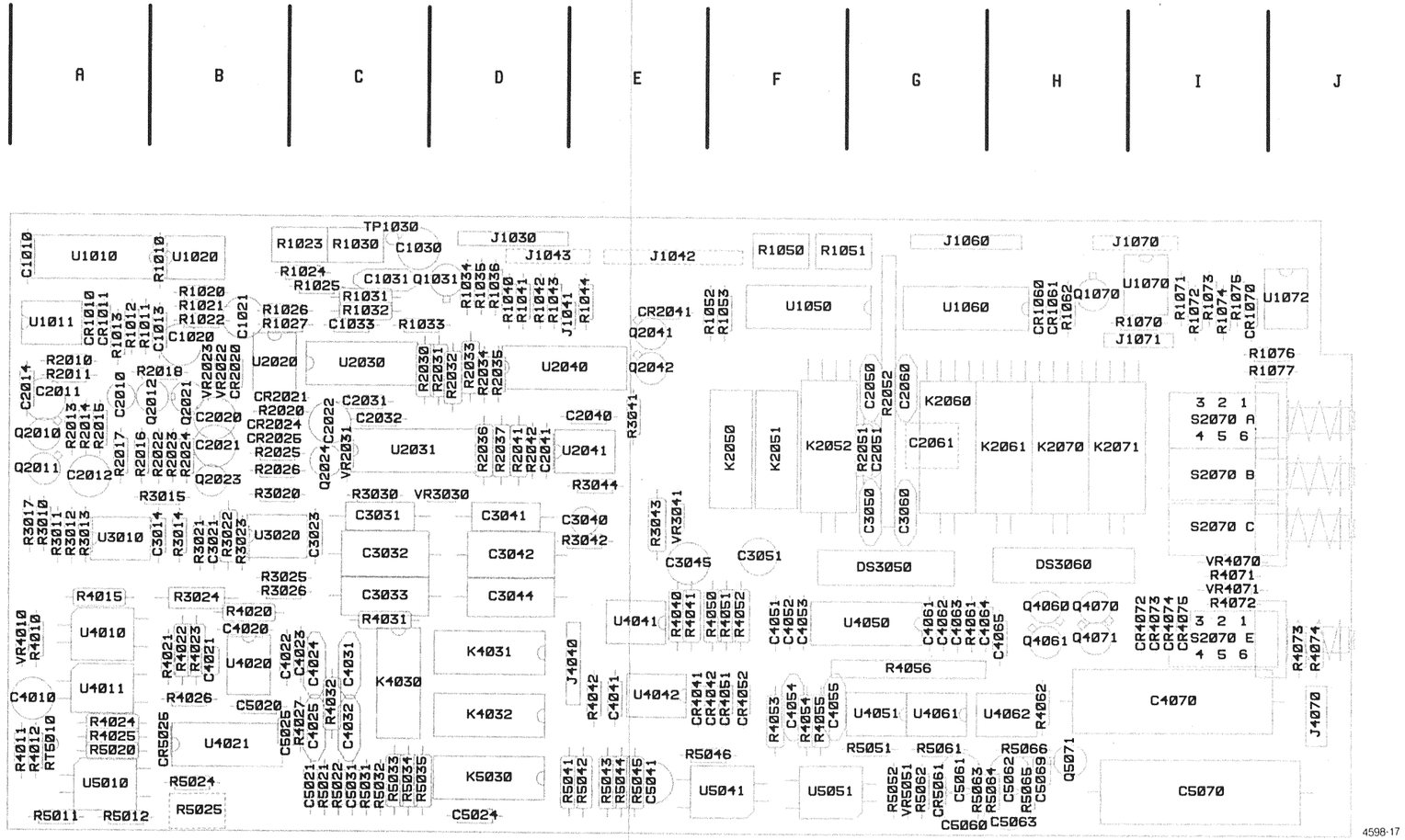
Table 9-1
COMPONENT REFERENCE CHART

P/O A14 ASSY — INPUT AMPLIFIER ◇1

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C2050	C4	G2
C2051	C2	G2
C2060	C4	G2
C2061	C3	G2
C3045	M3	E3
C3050	C1	G3
C3051	L1	F3
C3060	C1	G3
C4051	L6	F4
C4052	J1	F4
C4053	I2	F4
C4061	K2	G4
C4062	I4	G4
C4063	J7	G4
C4064	K2	H4
C4065	L7	H4
C4070	C4	I4
C5070	C1	I5
CR1060	D8	H1
CR1061	D7	H1
CR4041	M3	E4
CR4042	L3	F4
CR4072	G1	I4
CR4073	G1	I4
CR4074	G4	I4
CR4075	G4	I4
DS3050	D1	G3
DS3060	D4	H3
J1042	N4	E1
J1060	B5	G1
J1060	N2	G1
J4070	B1	J4
K2050	I7	F2
K2051	H7	F2
K2052	F6	F2
K2060	E6	G2
K2061	E6	H2
K2070	E6	H2
K2071	D5	H2
P1060	B5	G1
P1060	N2	G1
P4070	B1	J4
Q1070	D7	H4
Q4060	G3	H3
Q4061	G3	H4
Q4070	G3	H3
Q4071	G3	H4
R1062	D7	H1
R2051	C2	G2
R2052A	D1	G2
R2052B	D1	G2
R2052C	D2	G2
R2052D	D2	G2
R2052E	D2	G2
R2052F	D3	G2
R2052G	D3	G2
R2052H	D3	G2
R2052I	D4	G2
R2052J	D4	G2
R4040	M3	E3
R4041	M3	E4
R4050	L2	E3
R4051	L3	F4
R4052	K3	F4
R4056A	K2	E4
R4056B	J4	E4
R4056C	I4	E4
R4056D	I2	E4
R4056E	H2	E4
R4056F	I2	E4
R4056H	J1	E4
R4056J	J1	E4
R4061	K1	G4
R4071	H3	I3
R4072	F3	I3
R4073	C1	J4
R4074	C4	J4
R5061	K1	G4
U1050B	E8	F1
U1060	C5	G1
U4041	L3	E3
U4042A	M2	E4
U4050A	I5	F3
U4050B	I1	F3
U4061	K1	G4
VR3041	M4	E3
VR4070	H3	I3
VR4071	F3	I3
W500	B5	CHASSIS
W500	O2	CHASSIS
W800	B1	CHASSIS

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

PARTS LOCATION GRID

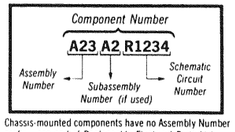


A14 ASSY

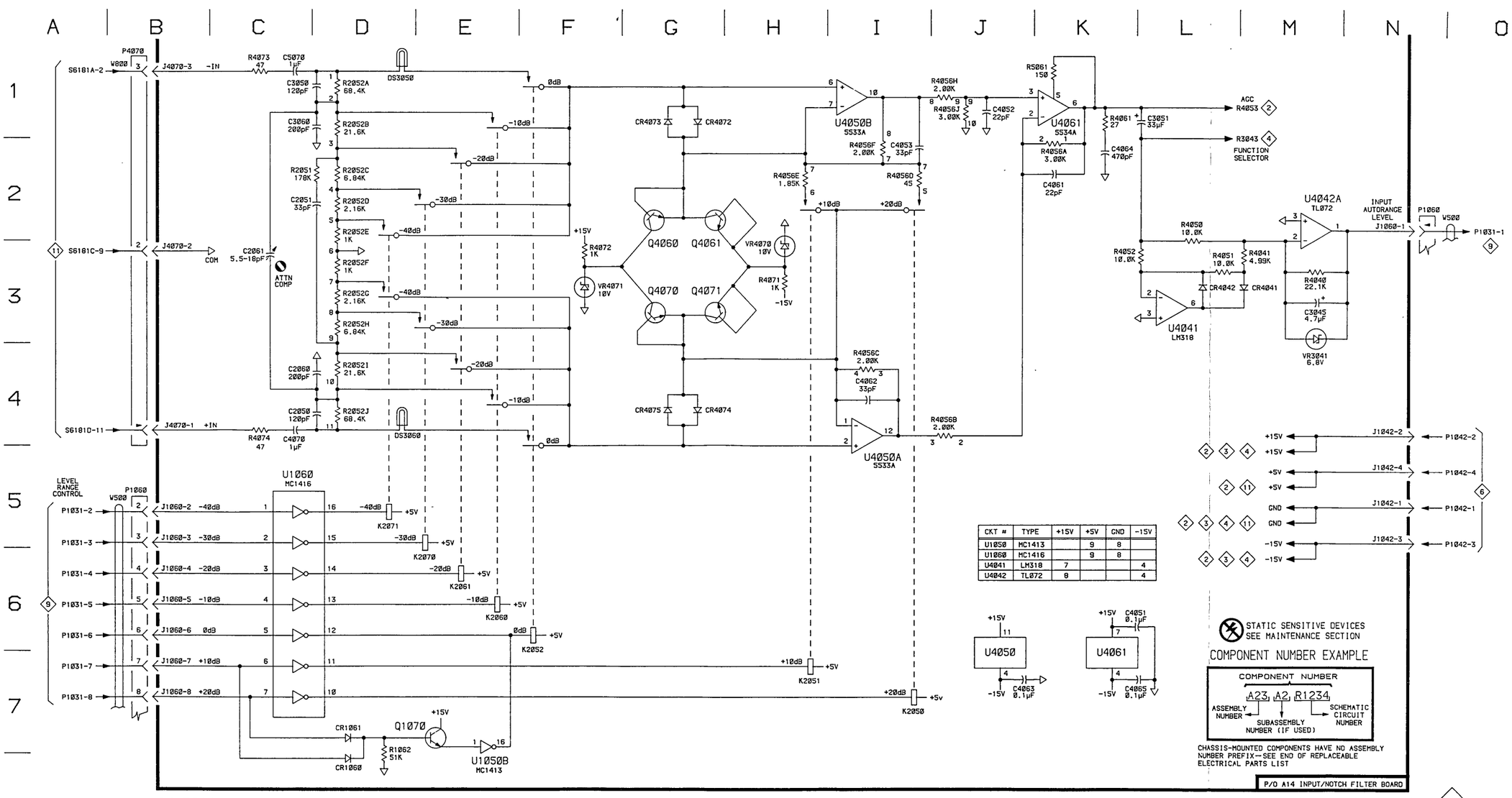
Fig. 9-1. Input/Notch filter board (A14).

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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



CKT #	TYPE	+15V	+5V	GND	-15V
U1050	MC1413		9	8	
U1060	MC1416		9	8	
U4041	LM318	7			4
U4042	TL072	8			4

Table 9-2
COMPONENT REFERENCE CHART

P/O A14 ASSY — AGC & NOTCH FILTER ◇2◇

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C3021	K10	B3	R4022	D4	B4
C3031	F3	C3	R4023	D5	B4
C3032	F3	C3	R4024	H8	A4
C3033	F3	C3	R4025	H8	A4
C3041	E3	D3	R4026	G7	B4
C3042	E4	D3	R4027	H5	C4
C3044	E4	D3	R4031	G4	C3
C4020	K10	B4	R4032	G4	C4
C4021	E5	B4	R4042	G10	E4
C4022	H5	C4	R4053	C8	F4
C4023	G5	C4	R4054	D7	F4
C4024	E4	C4	R4055	C8	F4
C4025	F2	C4	R4062	F9	H4
C4031	E5	C4	R5011	H7	A5
C4032	F3	C4	R5012	H7	A5
C4041	D8	E4	R5020	G8	A4
C4054	C7	F4	R5021	F7	C5
C4055	D7	F4	R5022	I5	C5
C5020	K9	B4	R5024	I7	B5
C5021	F7	C5	R5025	J7	B5
C5024	I5	D5	R5031	H5	C5
C5025	G7	C4	R5032	E7	C5
C5031	F7	C5	R5033	F6	C5
C5041	E8	E5	R5034	F8	C5
C5060	E10	G5	R5035	F7	D5
C5061	F10	G5	R5041	G10	E5
C5062	E10	H5	R5042	F9	E5
C5063	C10	H5	R5043	E8	E5
C5069	C9	H5	R5044	E9	E5
			R5045	F9	E5
CR4051	F9	F4	R5046	D8	E4
CR4052	F9	F4	R5051	D7	G4
CR5061	F9	G5	R5052	B9	G5
			R5062	C9	G5
J1042	B7	E1	R5063	F10	G5
J1043	B1	D1	R5064	E10	H5
J1043	L6	D1	R5065	D10	H5
J4040	B5	E4	R5066	F10	H4
K4030	G1	C4	RT5010	H8	A4
K4031	E2	D4			
K4032	E2	D4	U1050A	C1	F1
K5030	F1	D5	U3010A	J4	A3
			U3020A	K6	B3
Q5071	C10	H4	U3020B	K8	B3
			U4010	B5	A4
R1044	C7	E1	U4011	I7	A4
R1051	H10	F1	U4020	H4	B4
R2026	J6	B2	U4021A	G7	B4
R3020	L8	B3	U4021B	G8	B4
R3021	I6	B3	U4042B	E9	E4
R3022	I5	B3	U4051	D8	G4
R3023	K8	B3	U4062A	F10	H4
R3025	J7	B3	U4062B	D10	H4
R3026	I6	B3	U5010	I7	A5
R4012	H8	A5	U5041	C8	F5
R4015	I6	A3	U5051	C8	F5
R4020	I5	B3			
R4021	C5	B4	VR5051	B10	G5

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

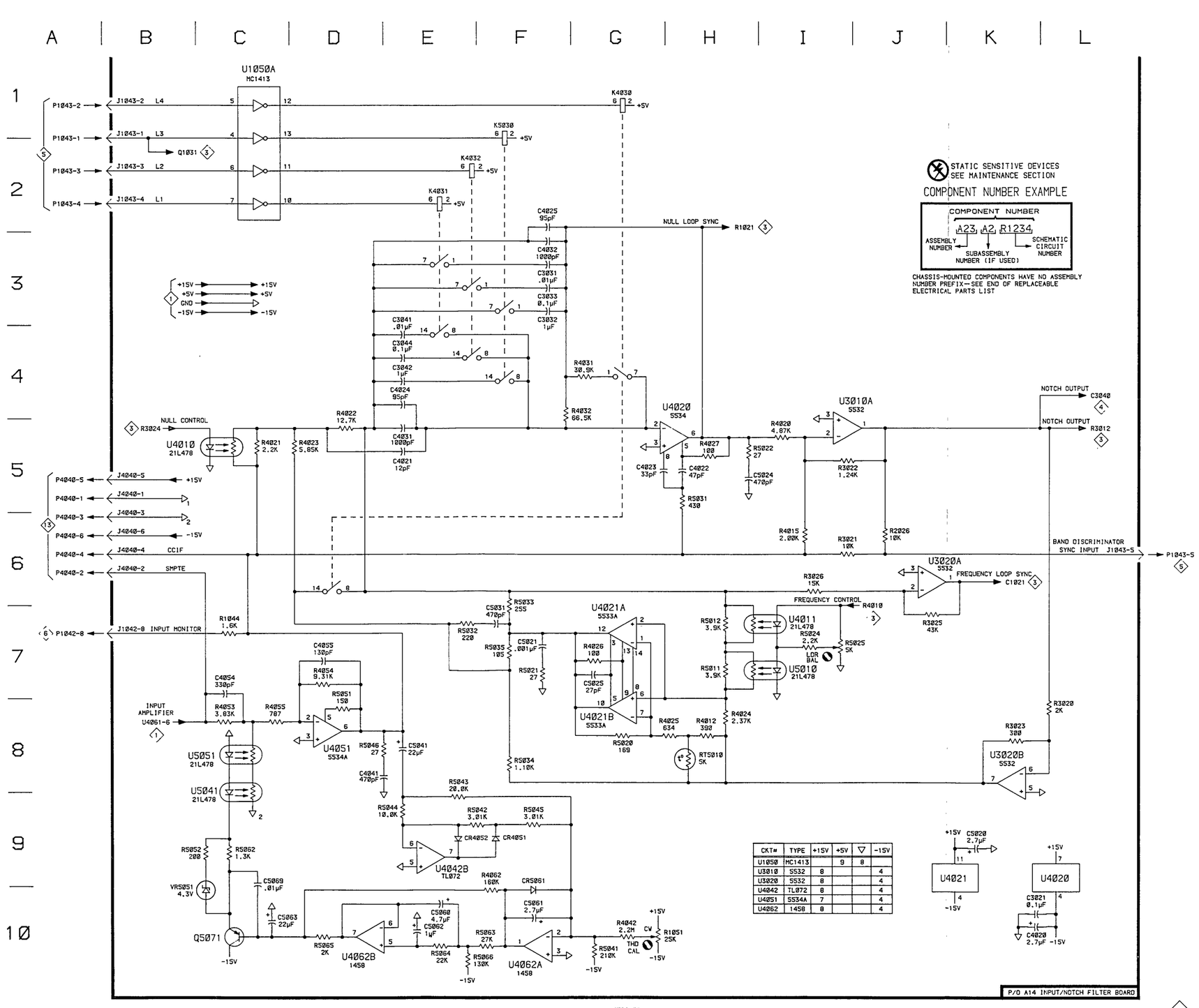
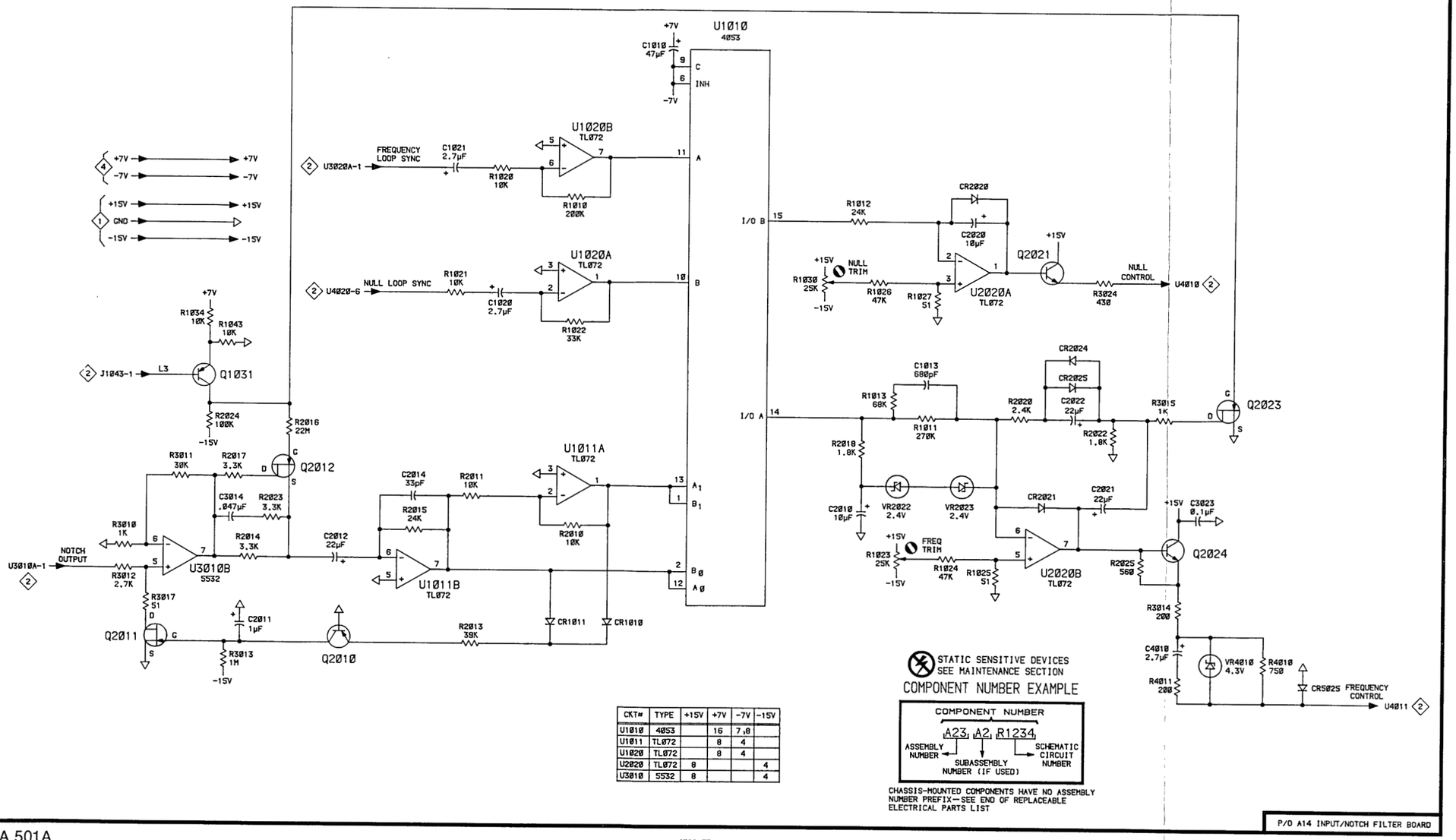

A B C D E F G H I J K L
1 2 3 4 5 6 7 8 9 10
U1050A
MC1413
P1043-2
J1043-2 L4
P1043-1
J1043-1 L3
Q1031
P1043-3
J1043-3 L2
P1043-4
J1043-4 L1
K4030
K5030
K4032
K4031
+5V
C4025
95pF
NULL LOOP SYNC
R1021
C4032
1000pF
C3031
.01µF
C3033
0.1µF
C3032
1µF
C3041
.01µF
C3044
0.1µF
C3042
1µF
C4024
95pF
+15V
+5V
GND
-15V
R4031
30.9K
R4032
66.5K
U4020
5534
R4020
4.87K
U3010A
5532
NOTCH OUTPUT
C3040
NOTCH OUTPUT
R3012
NULL CONTROL
R3024
U4010
21L478
R4021
2.2K
R4023
5.85K
R4022
12.7K
C4031
1000pF
C4021
12pF
R4027
100
R5022
27
C4023
33pF
C4022
47pF
C5024
470pF
R5031
430
R4015
2.00K
R3021
10K
R2026
10K
P4040-5
J4040-5
+15V
P4040-1
J4040-1
P4040-3
J4040-3
P4040-6
J4040-6
-15V
P4040-4
J4040-4
CCIF
P4040-2
J4040-2
SMPTE
BAND DISCRIMINATOR
SYNC INPUT J1043-5
P1043-5
U3020A
5532
FREQUENCY LOOP SYNC
C1021
R3026
15K
FREQUENCY CONTROL
R4010
R3025
43K
P1042-8
J1042-8 INPUT MONITOR
R1044
1.6K
R5033
255
C5031
470pF
R5032
220
C5021
.001µF
R5035
105
R5021
27
U4021A
5533A
R4026
100
C5025
27pF
10
U4021B
5533A
R5020
169
R4025
634
R4012
390
R4024
2.37K
RTS010
5K
R5012
3.9K
U4011
21L478
R5024
2.2K
LDR BAL
R5025
5K
R5011
3.9K
U5010
21L478
R3020
2K
R3023
300
U3020B
5532
C4055
130pF
R4054
9.31K
R5051
150
C4054
330pF
INPUT
AMPLIFIER
U4061-6
R4053
3.83K
R4055
787
U4051
5534A
R5046
27
C5041
22µF
C4041
470pF
U5051
21L478
U5041
21L478
R5043
20.0K
R5044
10.0K
R5042
3.01K
R5045
3.01K
CR4052
CR4051
U4042B
TL072
R5052
200
R5062
1.3K
VR5051
4.3V
C5069
.01µF
C5063
22µF
Q5071
-15V
R4062
160K
CR5061
C5061
2.7µF
C5060
4.7µF
C5062
1µF
R5065
2K
U4062B
1458
R5064
22K
R5063
27K
R5066
130K
U4062A
1458
R4042
2.2M
CV
R1051
25K
THD CAL
R5041
210K
-15V
CKT# TYPE +15V +5V ▽ -15V
U1050 MC1413 9 8
U3010 5532 8 4
U3020 5532 8 4
U4042 TL072 8 4
U4051 5534A 7 4
U4062 1458 8 4
+15V C5020 2.7µF
U4021
-15V
+15V
U4020
C3021 0.1µF
C4020 2.7µF -15V
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 A14 INPUT/NOTCH FILTER BOARD

Table 9-3
COMPONENT REFERENCE CHART

P/O A14 ASSY — NOTCH FILTER CONTROL ◇3

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1010	G1	A1	R1026	I3	B1
C1013	I4	B1	R1027	I3	B1
C1020	E3	B1	R1030	H3	C1
C1021	E2	B2	R1034	C4	D1
C2010	H5	A2	R1043	C4	D1
C2011	C6	A2	R2010	F5	A2
C2012	D6	A2	R2011	E5	A2
C2014	E5	A2	R2013	E6	A2
C2020	J3	B2	R2014	C6	A2
C2021	K5	B2	R2015	E5	A2
C2022	K4	C2	R2016	D5	A2
C3014	C5	B3	R2017	C5	A2
C3023	L5	C3	R2018	I5	A2
C4010	K6	A4	R2020	J4	B2
			R2022	K5	B2
CR1010	G6	A1	R2023	C5	B2
CR1011	F6	A1	R2024	C4	B2
CR2020	J2	B2	R2025	K6	B2
CR2021	J5	B2	R3010	B5	A3
CR2024	K4	B2	R3011	C5	A3
CR2025	K4	B2	R3012	B6	A3
CR5025	M7	B4	R3013	C7	A3
			R3014	K6	B3
Q1031	C4	D1	R3015	K4	A3
Q2010	D7	A2	R3017	C6	A3
Q2011	B6	A2	R3024	K3	B3
Q2012	D5	A2	R4010	L7	A4
Q2021	J3	B2	R4011	K7	A5
Q2023	L4	B2			
Q2024	L6	C2	U1010	G1	A1
			U1011A	F5	A1
R1010	F3	B1	U1011B	E6	A1
R1011	I5	B1	U1020A	F3	B1
R1012	I3	A1	U1020B	F2	B1
R1013	I4	A2	U2020A	J3	B2
R1020	E2	B1	U2020B	J6	B2
R1021	E3	B1	U3010B	C6	A3
R1022	F4	B1			
R1023	I6	B1	VR2022	I5	B2
R1024	I6	B1	VR2023	J5	B2
R1025	J6	C1	VR4010	L7	A4

P/O A14 ASSY also shown on ◇1 ◇2 ◇5 ◇10



CKT#	TYPE	+15V	+7V	-7V	-15V
U1010	4053		16	7,8	
U1011	TL072		8	4	
U1020	TL072		8	4	
U2020	TL072	8			4
U3010	5532	8			4

STATIC SENSITIVE DEVICES
SEE MAINTENANCE SECTION

COMPONENT NUMBER EXAMPLE

CHASSIS-MOUNTED COMPONENTS HAVE NO ASSEMBLY NUMBER PREFIX—SEE END OF REPLACEABLE ELECTRICAL PARTS LIST

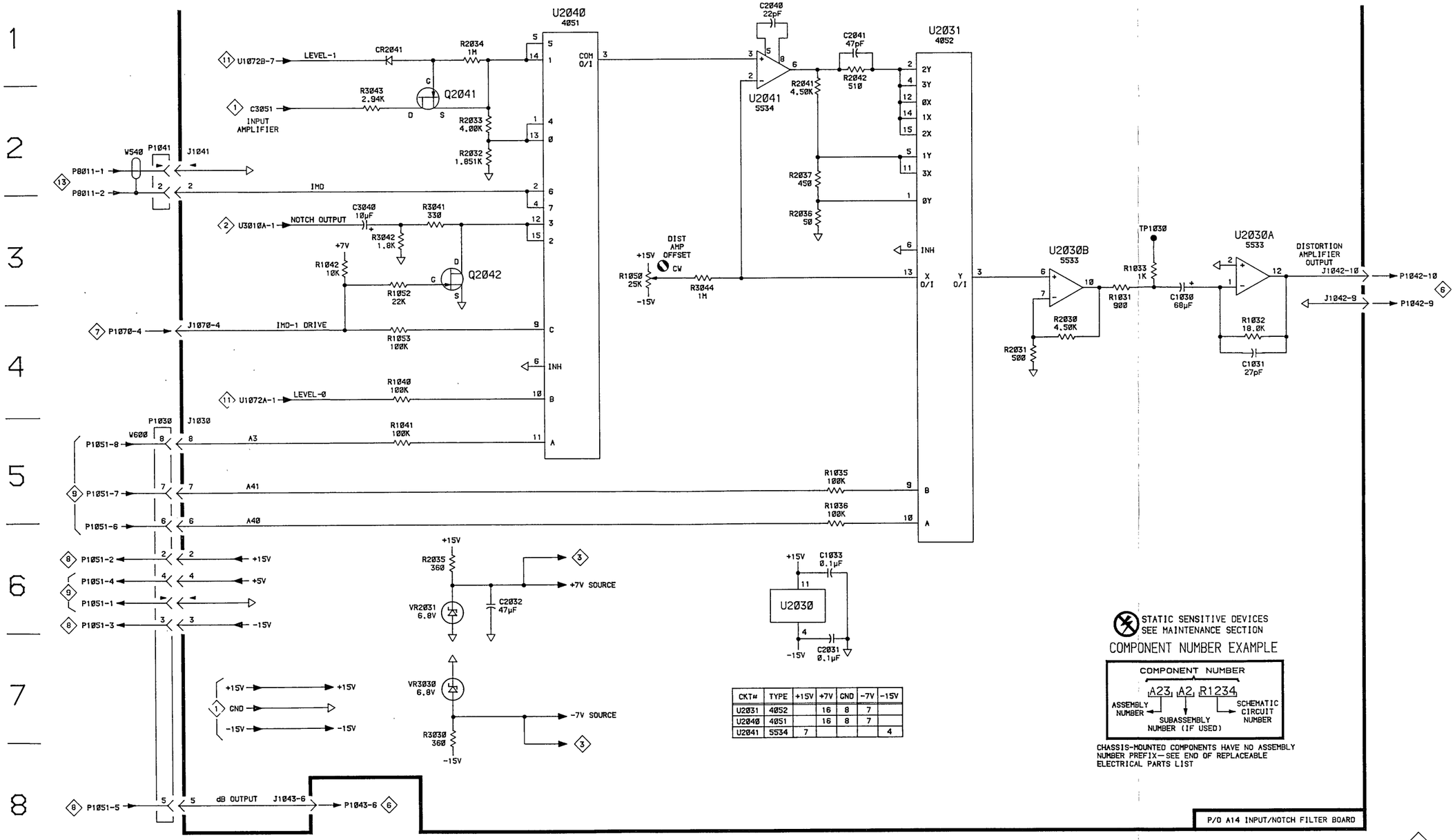
P/O A14 INPUT/NOTCH FILTER BOARD

Table 9-4
COMPONENT REFERENCE CHART

P/O A14 ASSY — FUNCTION SELECTION & DISTORTION AMPLIFIER ◇4◇

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1030	K3	C1	R1052	D3	F1
C1031	L4	C1	R1053	D4	F1
C1033	H6	C1	R2030	J4	D2
C2031	H7	C2	R2031	J4	D2
C2032	E6	C2	R2032	E2	D2
C2040	G1	D2	R2033	E2	D2
C2041	H1	D2	R2034	E1	D2
C3040	D3	D3	R2035	D6	D2
			R2036	H3	D2
CR2041	D1	E1	R2037	H2	D2
			R2041	H2	D2
J1030	B5	D1	R2042	H1	D2
J1041	B2	E1	R3030	D7	C3
J1042	M3	E1	R3041	D3	E2
J1043	C8	D1	R3042	D3	D3
J1070	B4	I1	R3043	D2	E3
			R3044	G3	E2
P1030	B5	D1			
P1041	B2	E1	TP1030	K3	C1
Q2041	E2	E1	U2030A	L3	C2
Q2042	E3	E2	U2030B	J3	C2
			U2031	I1	C2
R1031	K3	C1	U2040	F1	D2
R1032	L4	C1	U2041	G2	D2
R1033	K3	C1			
R1035	H5	D1	VR2031	D6	C2
R1036	H5	D1	VR3030	D7	D2
R1040	D4	D1			
R1041	D5	D1	W540	B2	CHASSIS
R1042	C3	D1	W600	B5	CHASSIS
R1050	F3	F1			

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



CKT#	TYPE	+15V	+7V	GND	-7V	-15V
U2031	4052		16	8	7	
U2040	4051		16	8	7	
U2041	5534	7				4

STATIC SENSITIVE DEVICES
SEE MAINTENANCE SECTION

COMPONENT NUMBER EXAMPLE

CHASSIS-MOUNTED COMPONENTS HAVE NO ASSEMBLY NUMBER PREFIX—SEE END OF REPLACEABLE ELECTRICAL PARTS LIST

P/O A14 INPUT/NOTCH FILTER BOARD

AA 501A

4598-58

FUNCTION SELECTOR & DISTORTION AMPLIFIER 4 DJD

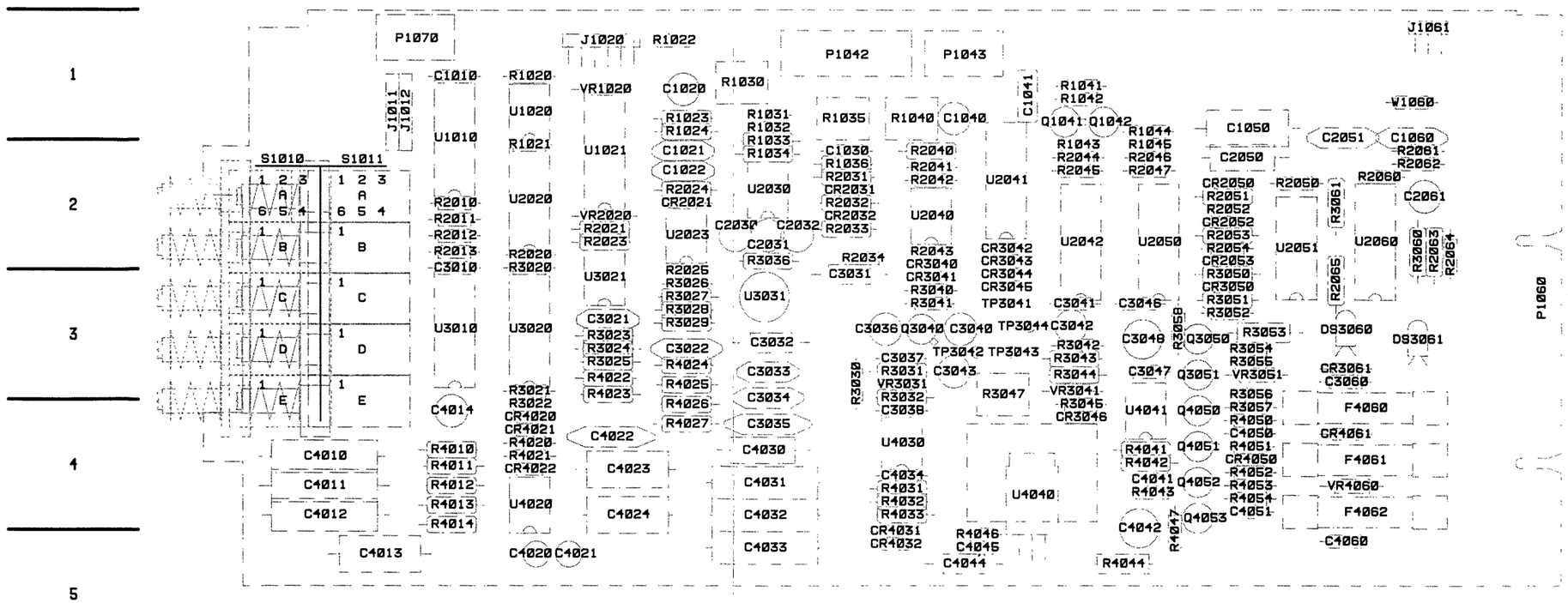
Table 9-5
COMPONENT REFERENCE CHART

P/O A15 ASSY — FREQUENCY BAND DISCRIMINATOR ◇5◇

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1041	K6	G1	R2045	J3	G2
C1050	F7	H1	R2046	J7	H2
C1060	F3	J2	R2047	J1	H2
C2050	F5	H2	R2050	F1	I2
C2051	F1	I2	R2051	F1	H2
C2061	C1	J2	R2052	I7	H2
C3041	C4	G3	R2053	F7	H2
C3046	D4	H3	R2054	I5	H2
			R2060	H1	I2
CR2050	F1	H2	R2065	I2	I3
CR2052	F7	H2	R3050	F5	H3
CR2053	F5	H2	R3051	F3	H3
CR3042	K2	F2	R3052	I4	H3
CR3043	K3	F2	R3060	I2	J3
CR3044	K5	F3	R3061	I7	I2
CR3045	K7	F3			
CR3050	F3	H3	U2041	L1	G2
			U2042A	J1	G2
P1043	B2	F1	U2042B	J6	G2
P1043	M2	F1	U2042C	J3	G2
			U2042D	J5	G2
Q1041	C2	G1	U2050A	E5	H2
Q1042	C2	G1	U2050B	E7	H2
			U2050C	E1	H2
R1041	C2	G1	U2050D	E3	H2
R1042	B2	G1	U2051A	I7	I2
R1043	D2	G2	U2051B	I2	I2
R1044	D2	H1	U2051C	I3	I2
R1045	J5	H2	U2051D	I5	I2
R2044	C1	G2	U2060	H1	I2

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

PARTS LOCATION GRID

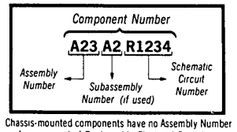


A15 ASSY

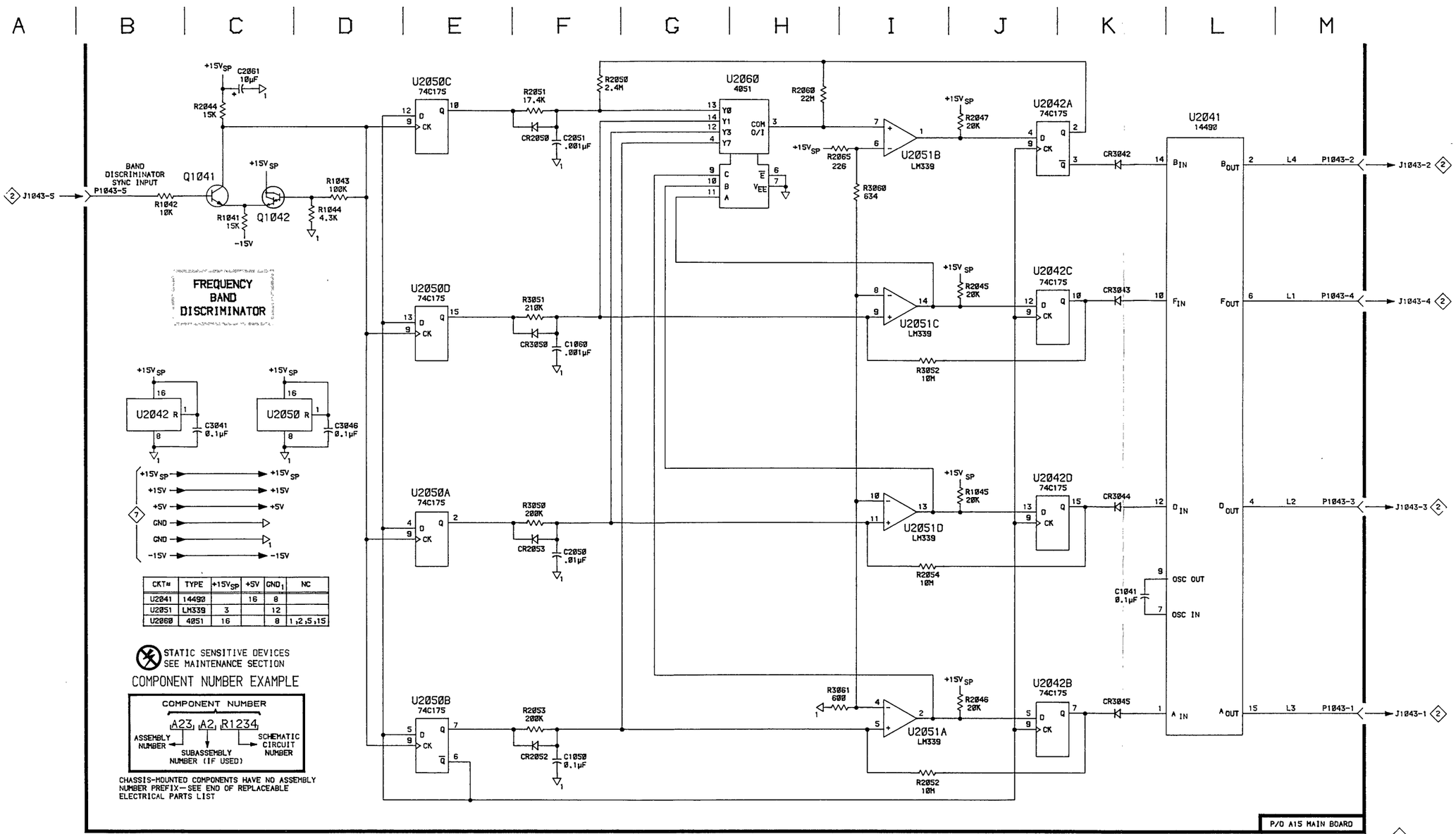
Fig. 9-2. Main board (A15).

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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



CKT#	TYPE	+15V$_{SP}$	+5V	GND$_1$	NC
U2041	14490		16	8	
U2051	LM339	3		12	
U2060	4051	16		8	1,2,5,15

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 9-6
COMPONENT REFERENCE CHART

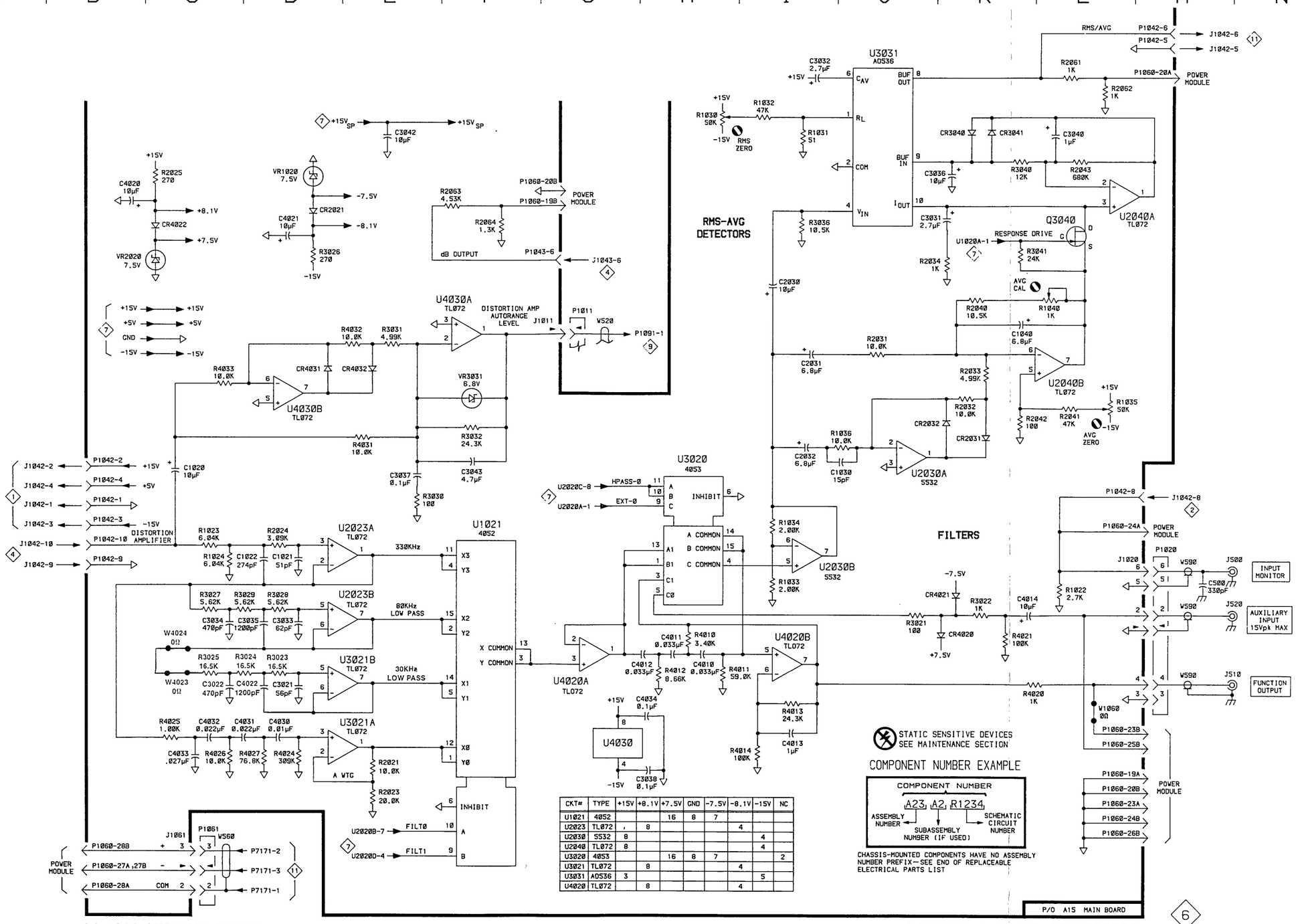
P/O A15 ASSY — FILTERS & AC/DC CONVERTERS ◇6◇

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C500	M6	CHASSIS
C1020	C5	D1
C1021	D6	D2
C1022	D6	D2
C1030	J5	E2
C1040	K4	F1
C2030	I3	D2
C2031	I4	E2
C2032	I5	E2
C3021	D7	C3
C3022	C7	D3
C3031	J3	E3
C3032	I1	E3
C3033	D7	E3
C3034	C7	E4
C3035	D7	E4
C3036	J2	E3
C3037	E5	F3
C3038	H8	F4
C3040	L2	F3
C3042	E2	G3
C3043	F5	F3
C4010	H7	A4
C4011	H7	A1
C4012	H7	A4
C4013	I8	B5
C4014	K7	B4
C4020	B2	C5
C4021	D3	C5
C4022	D7	C4
C4023	C7	D4
C4024	C7	D4
C4030	D8	E4
C4031	D8	E4
C4032	C8	E4
C4033	C8	E5
C4034	H8	F4
CR2021	D3	D2
CR2031	K5	E2
CR2032	J5	E2
CR3040	K2	F2
CR3041	K2	F3
CR4020	K7	C4
CR4021	K6	C4
CR4022	C3	C4
CR4031	D4	F5
CR4032	E4	F5
J500	N6	CHASSIS
J510	N7	CHASSIS
J520	N7	CHASSIS

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
J1011	G4	B1
J1020	L6	D1
J1061	C9	J1
P1011	G4	B1
P1020	M6	D1
P1042	B5	E1
P1042	L5	E1
P1042	M1	E1
P1043	G3	F1
P1060	F2	K3
P1060	B9	K3
P1060	M1	K3
P1060	M6	K3
P1060	M8	K3
P1061	C9	J1
Q3040	L3	F3
R1022	L6	D1
R1023	C6	D1
R1024	C6	D1
R1030	H2	D1
R1031	I2	E1
R1032	I1	E1
R1033	I6	E2
R1034	I6	E2
R1035	L5	E1
R1036	J5	E2
R1040	L4	F1
R2021	E8	D2
R2023	E8	C2
R2024	D6	D2
R2025	C2	D3
R2031	J4	E2
R2032	K5	E2
R2033	K4	E2
R2034	J3	E2
R2040	K4	F2
R2041	L5	F2
R2042	L5	F2
R2043	L2	F2
R2061	L1	J2
R2062	L1	J2
R2063	F2	J3
R2064	F3	J3
R3021	J7	C3
R3022	K7	C4
R3023	D7	C3
R3024	D7	C3
R3025	C7	C3
R3026	D3	D3

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
R3027	C6	D3
R3028	D6	D3
R3029	D6	D3
R3030	E5	F4
R3031	E4	F3
R3032	F5	F3
R3036	I3	E2
R3040	K2	F3
R3041	L3	F3
R4010	H7	B4
R4011	I7	B4
R4012	H7	B4
R4013	I8	B4
R4014	I8	B4
R4020	L7	C4
R4021	K7	C4
R4022	C7	C3
R4023	B7	C3
R4024	D8	D3
R4025	C8	D3
R4026	C8	D4
R4027	D8	D4
R4031	E5	F4
R4032	E4	F4
R4033	C4	F4
U1021	F6	D2
U2023A	E6	D2
U2023B	E6	D2
U2030A	J5	E2
U2030B	J6	E2
U2040A	M3	F2
U2040B	L4	F2
U3020	H5	C3
U3021A	E8	C3
U3021B	E7	C3
U3031	J1	E3
U4020A	G7	C4
U4020B	I7	C4
U4030A	F3	F4
U4030B	D5	F4
VR1020	D2	D1
VR2020	B3	C2
VR3031	F4	F3
W520	G4	CHASSIS
W560	C9	CHASSIS
W590	M6	CHASSIS
W590	M7	CHASSIS
W1060	L8	J1

P/O A15 ASSY also shown on ◇3◇ ◇10◇ ◇13◇



CKT#	TYPE	+15V	+8.1V	+7.5V	GND	-7.5V	-8.1V	-15V	NC
U1021	4052			16	8	7			
U2023	TL072	,	8				4		
U2030	5532	8						4	
U2040	TL072	8						4	
U3020	4053			16	8	7			2
U3021	TL072		8				4		
U3031	AD536	3						5	
U4020	TL072		8				4		

AA 501A

PARTS LOCATION GRID

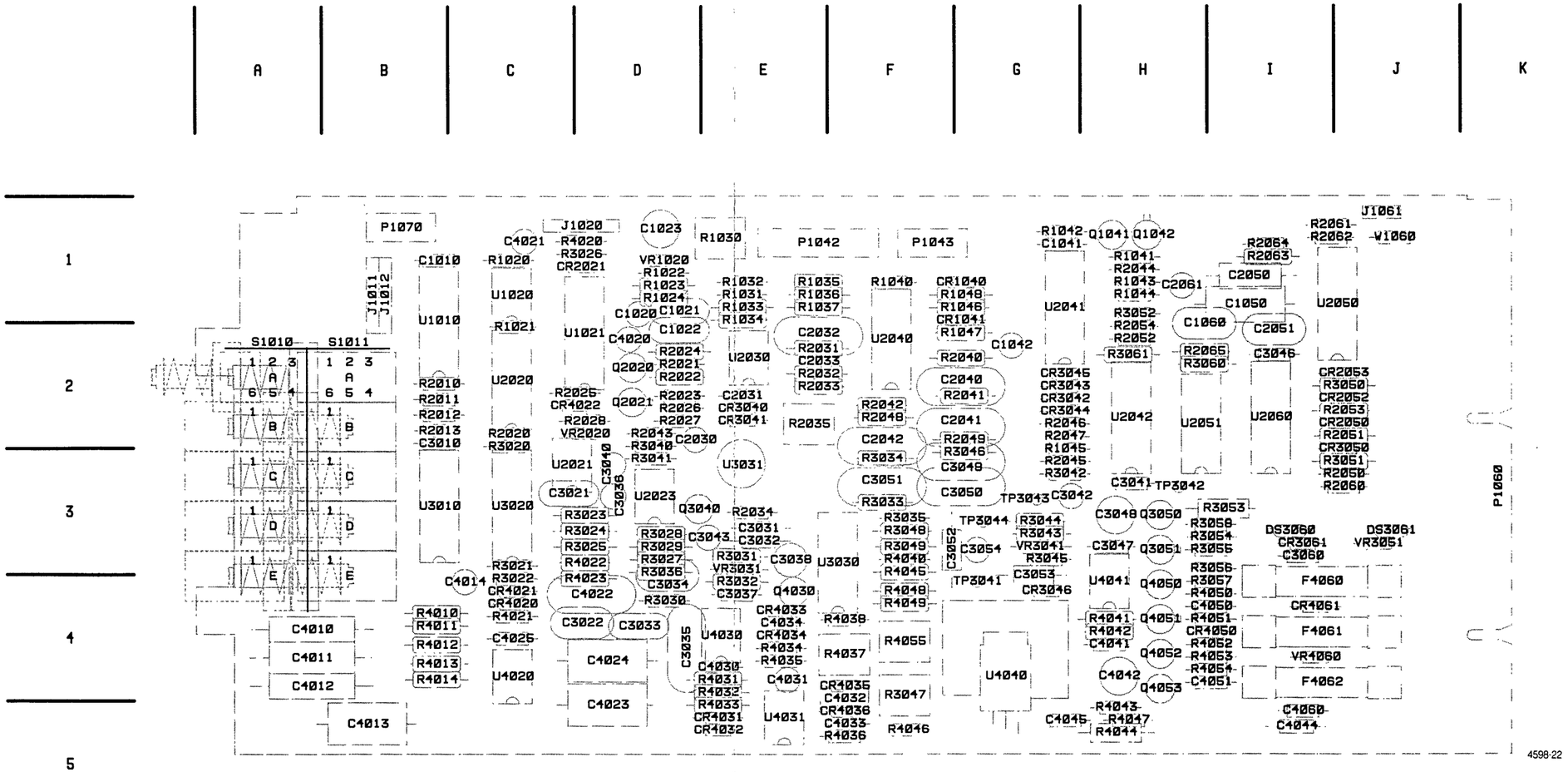
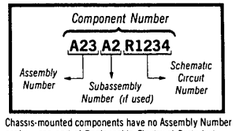


Fig. 9-3. Main board, Option 2 (A15).

A15 ASSY

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 9-7
COMPONENT REFERENCE CHART

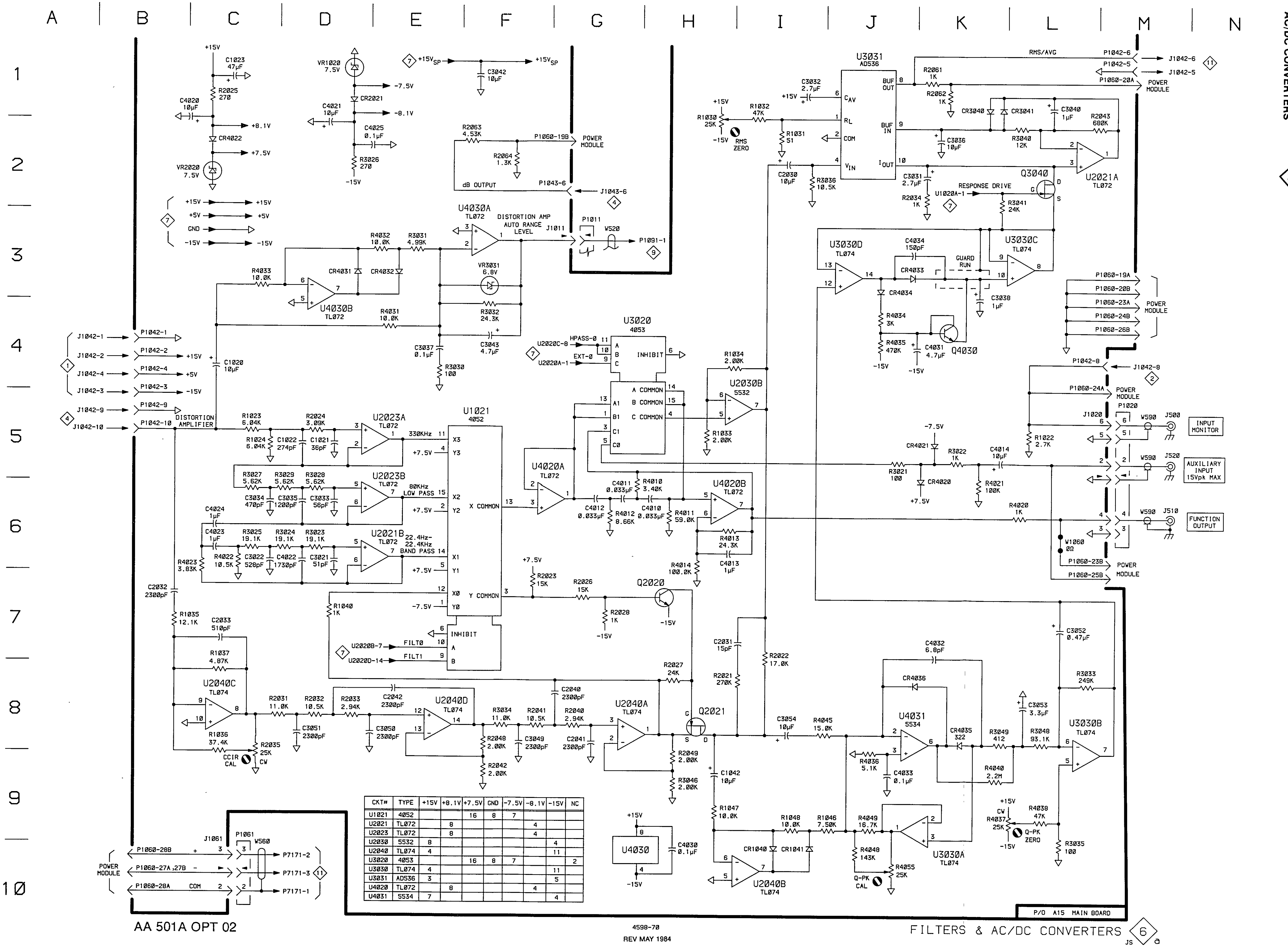
P/O A15 ASSY — FILTERS & AC/DC CONVERTERS ◇6a◇

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1020	C4	D1
C1021	D5	D1
C1022	D5	D2
C1023	C1	D1
C1042	H9	G2
C2030	I2	D2
C2031	H7	E2
C2032	B7	E2
C2033	C7	E2
C2040	G8	F2
C2041	G8	F2
C2042	E8	F2
C3021	D6	C3
C3022	C6	C4
C3031	J2	E3
C3032	I1	E3
C3033	D6	D4
C3034	C6	D4
C3035	D6	D4
C3036	K2	D3
C3037	E4	E4
C3038	K3	E3
C3040	L1	D3
C3042	F1	G3
C3043	F4	D3
C3049	F8	F3
C3050	E8	F3
C3051	D8	F3
C3052	L7	G3
C3053	L8	G4
C3054	I8	G3
C4010	H6	B4
C4011	G6	B4
C4012	G6	B4
C4013	H6	B5
C4014	K5	B4
C4020	C1	D2
C4021	D1	C1
C4022	D6	C4
C4023	C6	D5
C4024	C6	D4
C4025	E2	C4
C4030	H10	D4
C4031	K4	E4
C4032	K7	E5
C4033	J9	E5
C4034	J3	E4
CR1040	I10	F1
CR1041	I10	F2
CR2021	E1	C1
CR3040	K1	E2
CR3041	L1	E2
CR4020	K5	C4
CR4021	K5	C4
CR4022	C2	C2
CR4031	D3	D5
CR4032	E3	D5
CR4033	J3	E4
CR4034	J3	E4
CR4035	K8	E4
CR4036	K8	E5
J500	M5	CHASSIS
J510	M6	CHASSIS
J520	M5	CHASSIS
J1011	G3	B1

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
J1020	L5	D1
J1061	C9	J1
P1011	G3	B1
P1020	M5	D1
P1042	B4	E1
P1042	L4	E1
P1042	M1	E1
P1043	G2	F1
P1060	B10	K2
P1060	F2	K2
P1060	L4	K2
P1060	L6	K2
P1060	M1	K2
P1060	M3	K2
P1061	C9	J1
Q2020	H7	D2
Q2021	H8	D2
Q3040	L2	E3
Q4030	K4	E3
R1022	L5	D1
R1023	C5	D1
R1024	C5	D1
R1030	H1	E1
R1031	I2	E1
R1032	I1	E1
R1033	H5	E1
R1034	I4	E2
R1035	C7	E1
R1036	C8	E1
R1037	C7	E1
R1040	D7	F1
R1046	J9	F1
R1047	H9	F2
R1048	I9	F1
R2021	H8	D2
R2022	I7	D2
R2023	F7	D2
R2024	D5	D2
R2025	C1	C2
R2026	G7	D2
R2027	H8	D2
R2028	G7	C2
R2031	D8	E2
R2032	D8	E2
R2033	D8	E2
R2034	J2	E3
R2035	C8	E2
R2040	G8	F2
R2041	F8	F2
R2042	F9	F2
R2043	M1	D2
R2048	F8	F2
R2049	H8	F2
R2061	K1	I1
R2062	K1	I1
R2063	F2	I1
R2064	F2	I1
R3021	J5	C3
R3022	K5	C4
R3023	D6	C3
R3024	D6	C3
R3025	C6	D3
R3026	D2	C1
R3027	C5	D3
R3028	D5	D3

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
R3029	D5	D3
R3030	E4	D4
R3031	E3	E3
R3032	F4	E4
R3033	L8	F3
R3034	F8	F3
R3035	L9	F3
R3036	J2	D4
R3040	L2	D3
R3041	L2	D3
R3046	H9	F3
R3048	L8	F3
R3049	K8	F3
R4010	H5	B4
R4011	H6	B4
R4012	G6	B4
R4013	H6	B4
R4014	H6	B4
R4020	L6	C1
R4021	K5	C4
R4022	C6	D3
R4023	C6	C4
R4031	E4	D4
R4032	E3	E4
R4033	C3	D5
R4034	J4	E4
R4035	J4	E4
R4036	J9	E5
R4037	K9	E4
R4038	L9	F4
R4040	K9	F3
R4045	J8	F4
R4048	J10	F4
R4049	J9	F3
R4055	J10	F4
U1021	F5	C2
U2021A	M2	C3
U2021B	E6	C3
U2023A	E5	D3
U2023B	E5	D3
U2030B	I4	E2
U2040A	G8	F2
U2040B	I10	F2
U2040C	C8	F2
U2040D	E8	F2
U3020	G4	C3
U3030A	K10	E3
U3030B	L8	E3
U3030C	L3	E3
U3030D	J3	E3
U3031	J1	E3
U4020A	F5	C4
U4020B	H6	C4
U4030A	F2	E4
U4030B	D4	E4
U4031	J8	E5
VR1020	D1	D1
VR2020	B2	D2
VR3031	F3	E3
W520	G3	CHASSIS
W560	C9	CHASSIS
W590	M5	CHASSIS
W590	M6	CHASSIS
W1060	L6	J1

P/O A15 ASSY also shown on ◇3◇ ◇10◇ ◇13◇



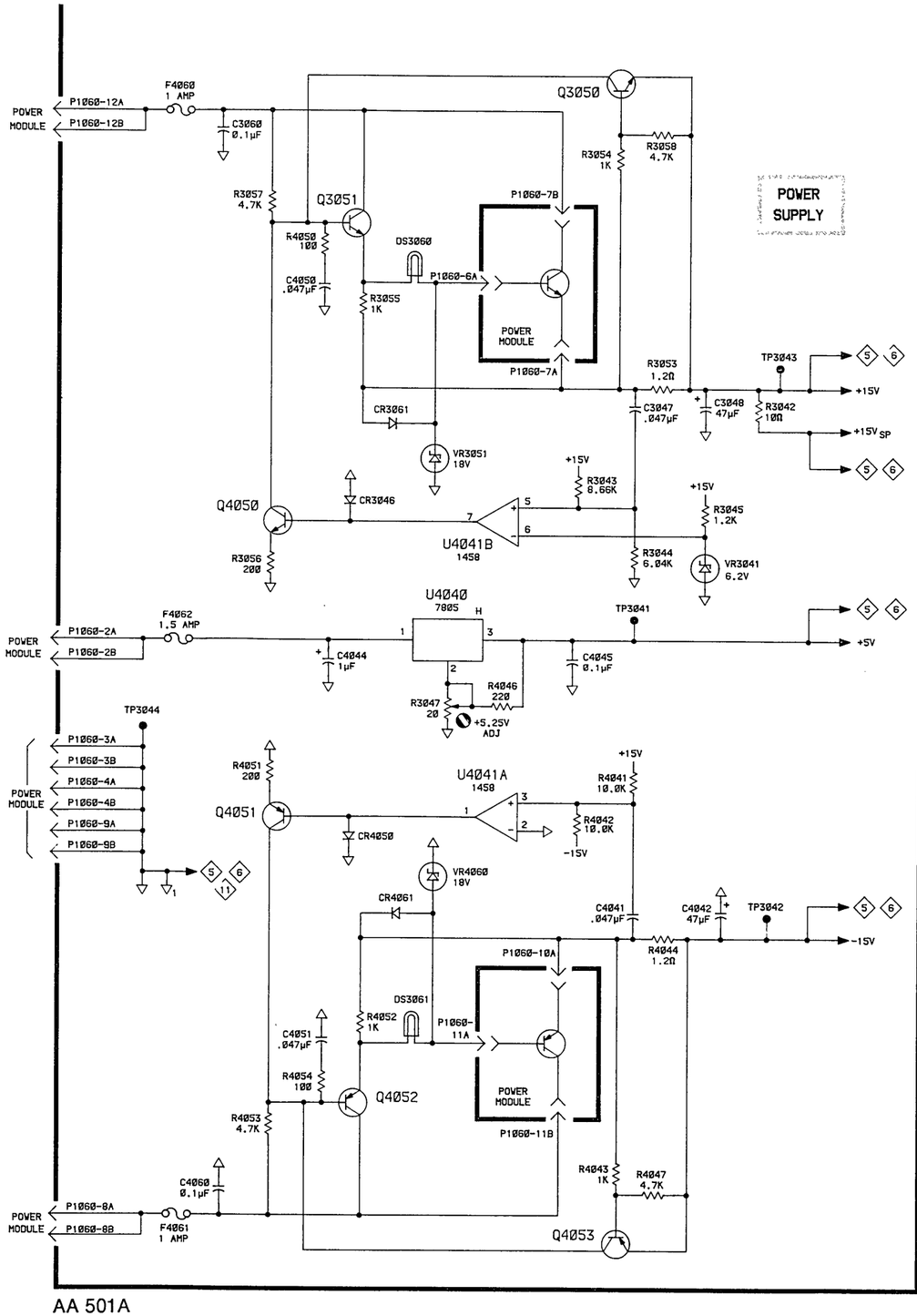
CKT#	TYPE	+15V	+8.1V	+7.5V	GND	-7.5V	-8.1V	-15V	NC
U1021	4052			16	8	7			
U2021	TL072		8				4		
U2023	TL072		8				4		
U2030	5532	8						4	
U2040	TL074	4						11	
U3020	4053			16	8	7			2
U3030	TL074	4						11	
U3031	AD536	3						5	
U4020	TL072		8				4		
U4031	5534	7						4	

Table 9-8
COMPONENT REFERENCE CHART

P/O A15 ASSY — POWER SUPPLY & INTERFACE ◇7

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C1010	K9	B1
C3010	K8	B2
C3047	F3	H3
C3048	F3	H3
C3060	C1	I3
C4041	E7	H4
C4042	F7	H5
C4044	C5	F5
C4045	E5	F5
C4050	C3	H4
C4051	C8	H4
C4060	B9	I5
CR3046	D4	G4
CR3060	D3	I3
CR4050	C7	H4
CR4061	D7	I4
DS3060	D2	I3
DS3061	D8	J3
F4060	B1	I4
F4061	B9	I4
F4062	B5	I4
J1012	I6	B1
P1012	H6	B1
P1042	N6	E1
P1060	B1	K3
P1060	B5	K3
P1060	B6	K3
P1060	B9	K3
P1060	D3	K3
P1060	D8	K3
P1060	E2	K3
P1060	E3	K3
P1060	E7	K3
P1060	E9	K3
P1070	N7	B1
Q3050	E1	H3
Q3051	C2	H3
Q4050	C4	H4
Q4051	C6	H4
Q4052	D8	H4
Q4053	E9	H4
R1020	L7	C1
R1021	L8	C2
R2010	K5	B2
R2011	K4	B2
R2012	K4	B2
R2013	K6	B2
R2020	L8	C2
R3020	L4	C3
R3042	F3	G3
R3043	E4	G3
R3044	F4	G3
R3045	F4	G4
R3047	D6	G3
R3053	F3	H3
R3054	E2	H3
R3055	D3	H3
R3056	C5	H3
R3057	C2	H4
R3058	F2	H3
R4041	E6	H4
R4042	E6	H4
R4043	E9	H4
R4044	F7	G5
R4046	D5	F5
R4047	F9	H5
R4050	C2	H4
R4051	C6	H4
R4052	D8	H4
R4053	C9	H4
R4054	C8	H4
S1011A	J5	B2
S1011B	J4	B2
S1011C	J4	B2
S1011C	J5	B2
S1011D	I4	B2
S1011E	J6	B2
TP3041	E5	G3
TP3042	F7	F3
TP3043	F3	G3
TP3044	B6	G3
U1010	J8	B2
U1020A	M7	C1
U1020B	M8	C1
U2020A	M6	C2
U2020B	M4	C2
U2020C	M5	C2
U2020D	M4	C2
U3010	J6	B3
U4040	D5	G4
U4041A	D6	H4
U4041B	D4	H4
VR3041	F5	G3
VR3051	D4	H3
VR4060	D7	I4
W585	H6	CHASSIS

P/O A15 ASSY also shown on ◇3 ◇6 ◇10



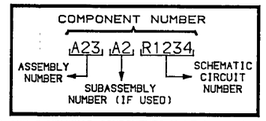
AA 501A

CKT#	TYPE	+15V	+7.5V	+5V	GND	-15V	NC
U1010	74LS259			16	8		
U1020	LM393	8				4	
U2020	LM324		4		11		
U3010	74LS151			16	8		6,12
U4041	1458	8				4	

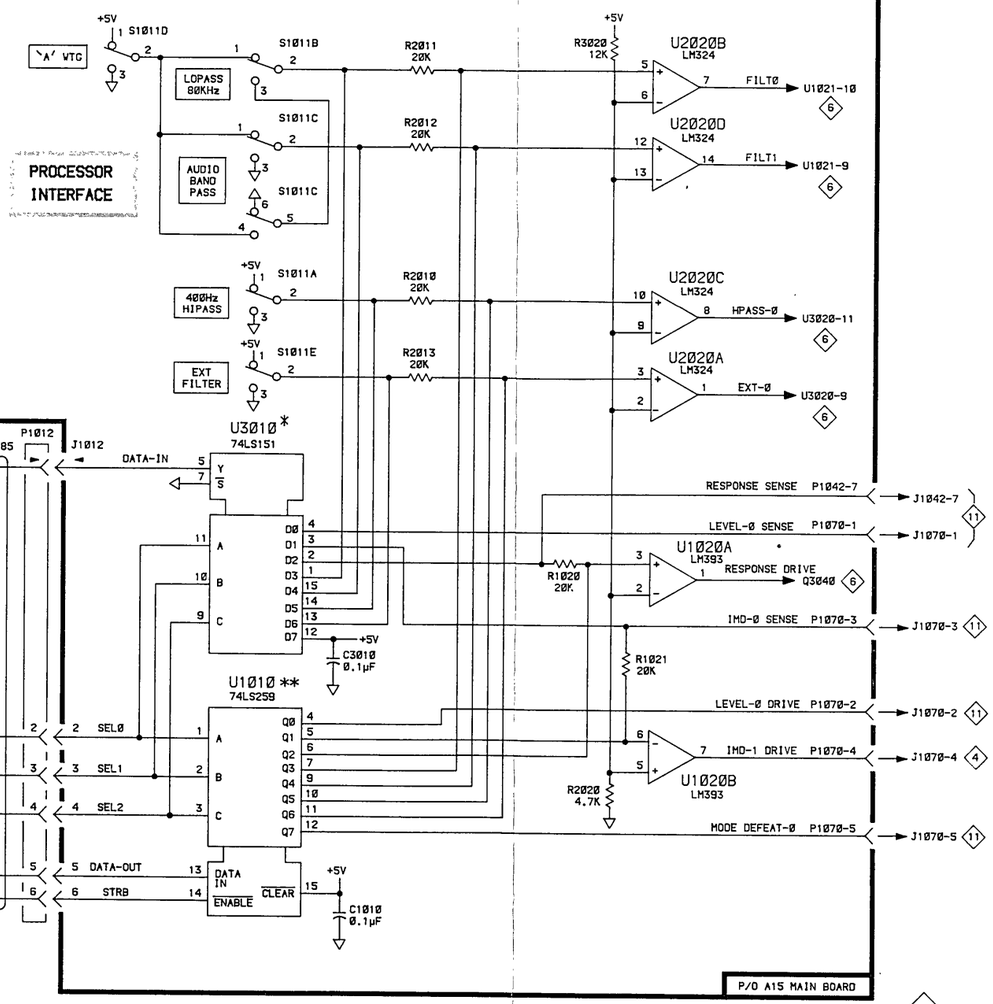
NOTES:
*U3010-12 AA 5001 OPT2 IS GROUNDED.
**U1010 IS INSTALLED FOR FACTORY TEST ONLY

STATIC SENSITIVE DEVICES SEE MAINTENANCE SECTION

COMPONENT NUMBER EXAMPLE



CHASSIS-MOUNTED COMPONENTS HAVE NO ASSEMBLY NUMBER PREFIX--SEE END OF REPLACEABLE ELECTRICAL PARTS LIST

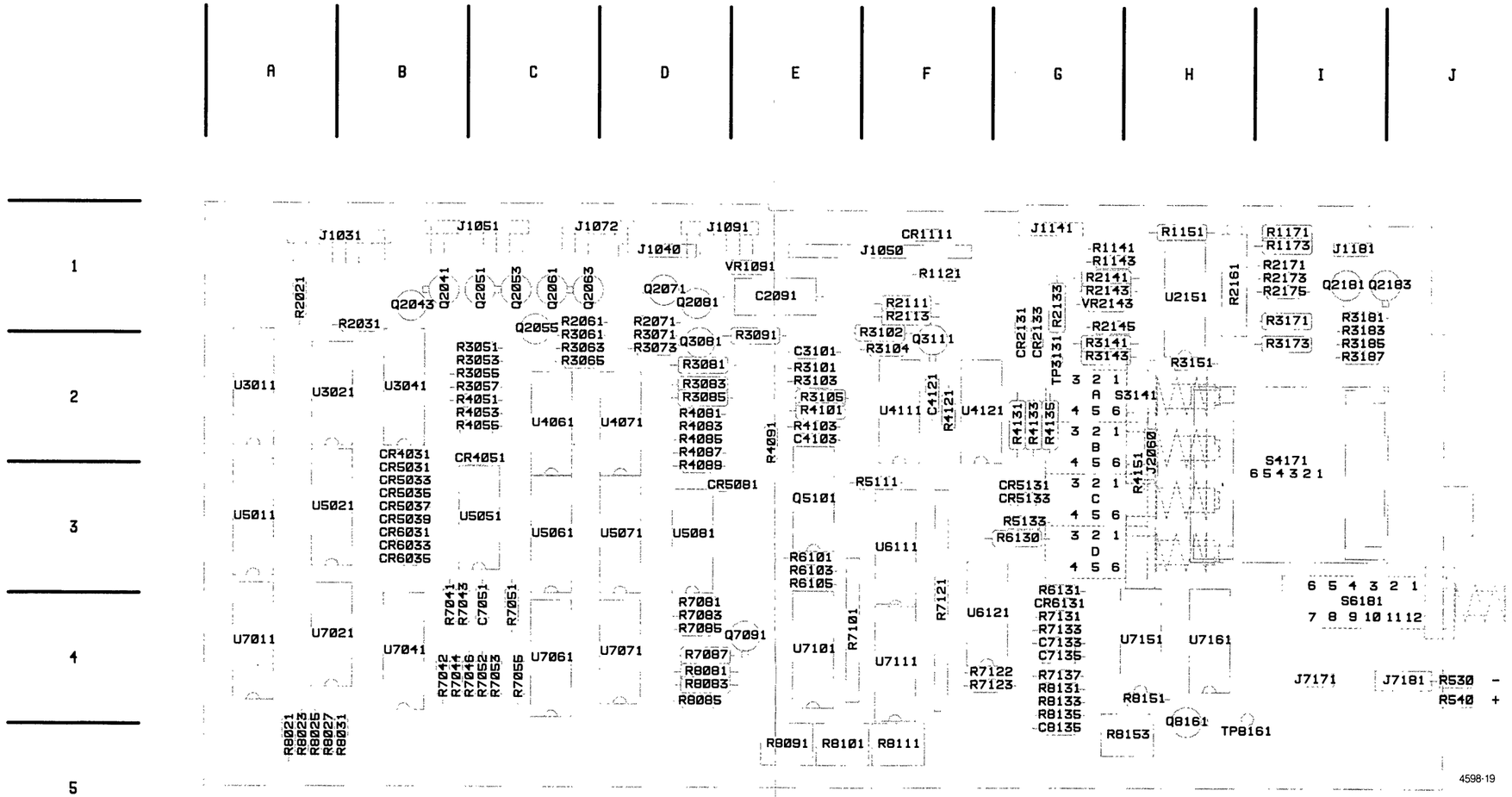


4598-61

POWER SUPPLY & INTERFACE 7

DJO

PARTS LOCATION GRID

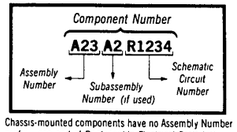


A12 ASSY

Fig. 9-4. Logic board (A12).

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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

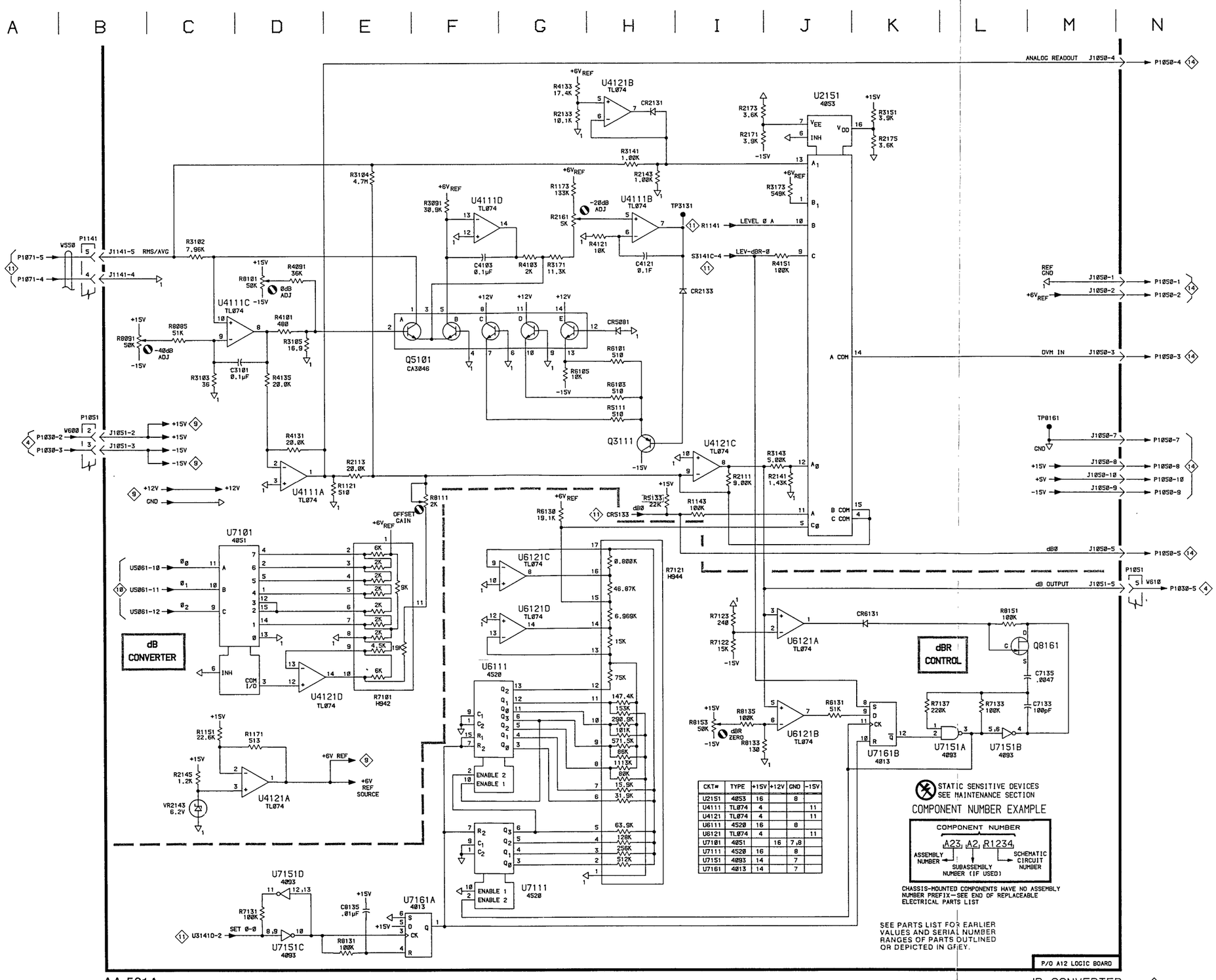
Table 9-9
COMPONENT REFERENCE CHART

P/O A12 ASSY — db CONVERTER ◇8

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C3101	D4	E2	R4151	J3	H3
C4103	F3	E2	R5111	H5	E3
C4121	H3	F2	R5133*	H6	G3
C7133	M8	G4	R6101	H4	E3
C7135	M8	G4	R6103	H5	E3
C8135	E10	G5	R6105	G4	E3
			R6130	G6	G3
CR2131	H1	G2	R6131	J8	G3
CR2133	I3	G2	R7101	E8	E4
CR5081	H4	D3	R7121	I7	F4
CR6131	K7	G4	R7122	I7	F4
			R7123	I7	F4
J1050	M1	E1	R7131	D11	G4
J1051	B5	C1	R7133	L8	G4
J1051	M7	C1	R7137	L8	G4
J1141	B3	G1	R8085	C4	D4
			R8091	B4	E5
P1051	B5	C1	R8101	D3	E5
P1051	N7	C1	R8111	F6	F5
P1141	B3	G1	R8131	E11	G4
			R8133	I9	G4
Q3111	H5	F2	R8135	I8	G4
Q5101	F4	E3	R8151	L7	H4
Q8161	M7	H4	R8153	I8	G5
R1121	E6	F1	TP3131	I2	G2
R1143	I6	G1	TP8161	M5	H4
R1151	C8	H1			
R1171	D8	I1	U2151	J1	H1
R1173	G2	I1	U4111A	D6	F2
R2111	I6	F1	U4111B	H2	F2
R2113	E5	F1	U4111C	C4	F2
R2133	G1	G1	U4111D	F2	F2
R2141	J6	G1	U4121A	D9	G2
R2143	H2	G1	U4121B	H1	G2
R2145	C9	G1	U4121C	I5	G2
R2161	G3	H1	U4121D	E8	G2
R2171	I2	I1	U6111	F8	F3
R2173	I1	I1	U6121A	J7	F4
R2175	K2	I1	U6121B	J8	F4
R3091	F2	E2	U6121C	G6	F4
R3102	C3	E2	U6121D	G7	F4
R3103	C4	E2	U7101	D6	E4
R3104	E2	F2	U7111	G10	F4
R3105	D4	E2	U7151A	L9	H4
R3141	H2	G2	U7151B	L9	H4
R3143	J5	G2	U7151C	D11	H4
R3151	K1	H2	U7151D	D10	H4
R3171	G3	I1	U7161A	F10	H4
R3173	J2	I2	U7161B	K9	H4
R4091	D3	E2			
R4101	D4	E2	VR2143	C9	G1
R4103	G3	E2			
R4121	H3	F2	W550	B3	CHASSIS
R4131	D5	G2	W600	B5	CHASSIS
R4133	G1	G2	W610	N7	CHASSIS
R4135	D4	G2			

P/O A12 ASSY also shown on ◇10 ◇11 ◇12

*See Parts List for serial number ranges.



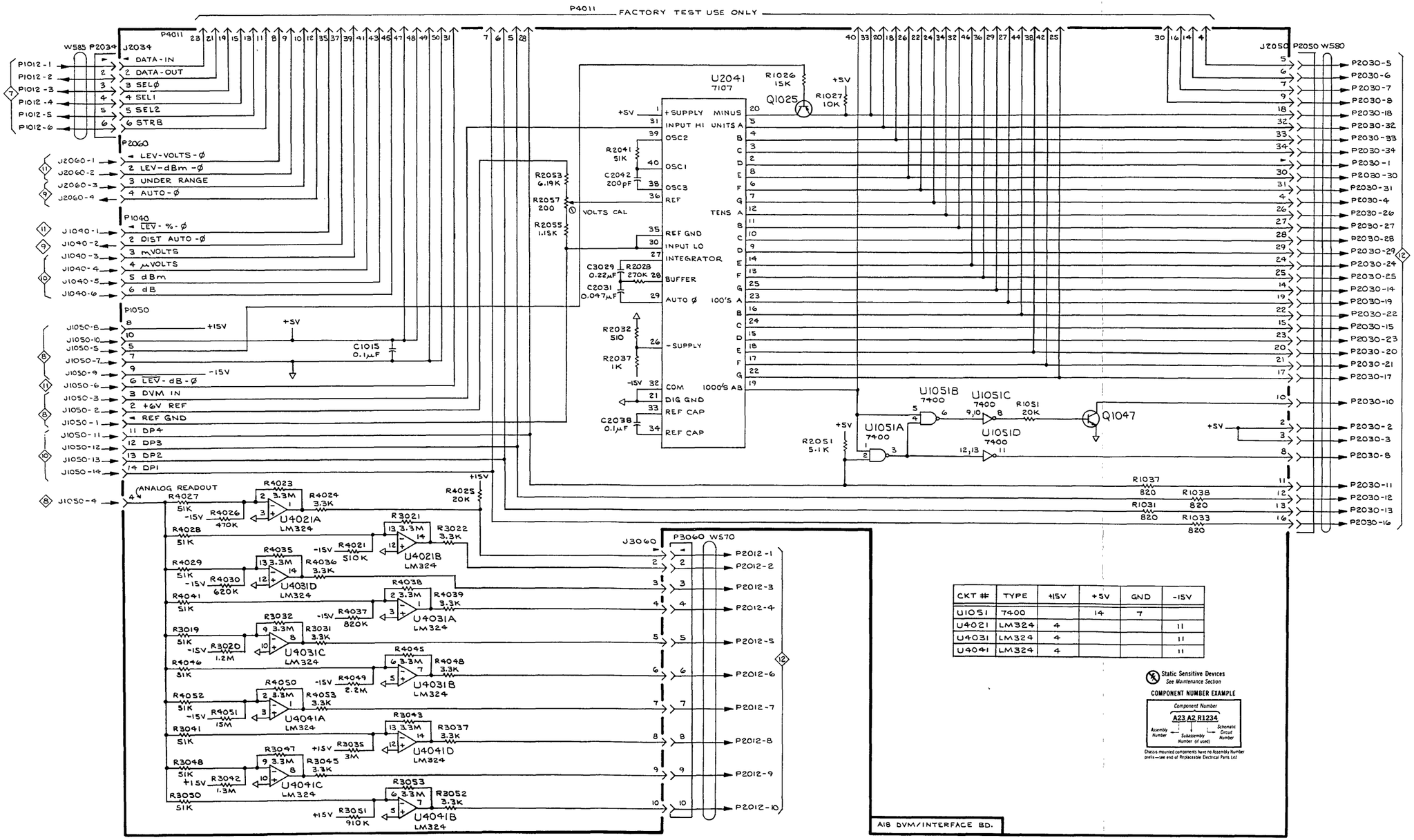
CKT#	TYPE	+15V	+12V	GND	-15V
U2151	4053	16		8	
U4111	TL074	4			11
U4121	TL074	4			11
U6111	4520	16		8	
U6121	TL074	4			11
U7101	4051		16	7,8	
U7111	4520	16		8	
U7151	4093	14		7	
U7161	4013	14		7	

Table 9-10
COMPONENT REFERENCE CHART

P/O A12 ASSY — AUTORANGE CONTROL LOGIC ◇9

CIRCUIT NUMBER	SCHEMATIC LOCATION	BOARD LOCATION
C2091	H1	E1
C7051	D6	C4
J1031	B4	B1
J1031	M2	B1
J1031	M3	B1
J1051	B5	C1
J1051	M2	C1
J1051	M6	C1
J1091	B9	D1
J1181	M5	I1
J2060	B7	H3
J2060	M5	H3
P1031	B4	B1
P1031	M2	B1
P1031	M3	B1
P1051	B5	C1
P1051	M2	C1
P1051	M6	C1
P1091	B9	D1
P1181	M5	I1
Q2181	L6	I1
Q2183	L5	J1
Q7091	D5	E4
R3081	G7	D2
R3083	G9	D2
R3085	G8	D2
R3181	G5	I1
R3183	G6	I1
R3185	K5	I2
R3187	K5	I2
R4083	H7	D2
R4085	H8	D2
R7042	H3	B4
R7043	E7	C4
R7044	F6	B4
R7046	E8	C4
R7051	D6	C4
R7052	E6	C4
R7053	E7	C4
R7055	D6	C4
R7083	D5	D4
R7085	D5	D4
R7087	C4	D4
R8021	H2	A5
R8023	H3	A5
R8025	H3	A5
R8027	D5	A5
R8031	D5	B5
R8081	C4	D4
R8083	C5	D4
S4171	D2	I2
U3011	J2	A2
U3021A	K2	A2
U3021C	H7	A2
U4061B	D6	C2
U5071	L7	D3
U5081A	C4	D3
U5081B	C5	D3
U5081C	H8	D3
U5081D	H8	D3
U7011	H2	A4
U7021A	G4	A4
U7021B	G5	A4
U7021C	E8	A4
U7021D	G4	A4
U7041	G7	B4
U7061	J6	C4
U7071A	I7	D4
U7071B	I8	D4
U7071C	D6	D4
U7071D	J7	D4
VR1091	H1	D1
W500	B4	CHASSIS
W500	N2	CHASSIS
W500	N3	CHASSIS
W520	B9	CHASSIS
W530	N5	CHASSIS
W600	B6	CHASSIS
W600	N2	CHASSIS
W600	N6	CHASSIS

P/O A12 ASSY also shown on ◇7 ◇10 ◇12



CKT #	TYPE	+15V	+5V	GND	-15V
U1051	7400		14	7	
U4021	LM324	4			11
U4031	LM324	4			11
U4041	LM324	4			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

AA 501A

DVM/INTERFACE BOARD 14

Table 9-17
LOGIC AND CONTROL STATES
TROUBLESHOOTING CHART
LEVEL VOLTS FUNCTION

			SELECTED INPUT RANGE									
			200 V	60 V	20 V	6 V	2 V	600 mV	200 mV	20 mV	2 mV	200 µV
INPUT AMP GAIN CONTROL	U7011 OUTPUTS ◇9◇	Q1	0	1	0	1	0	1	0	0	0	0
		Q2	0	0	1	1	0	0	1	1	1	1
		Q3	0	0	0	0	1	1	1	1	1	1
	INPUT AMPLIFIER GAIN (corresponding to U3011 outputs) ◇9◇		−40 dB	−30 dB	−20 dB	−10 dB	0 dB	+10 dB	+20 dB	+20 dB	+20 dB	+20 dB
DISTORTION AMP GAIN CONTROL	U3021A OUTPUT ◇9◇	A3	1	0	1	0	1	0	1	1	1	1
	U2040 ATTENUATION ◇4◇		0	−10 dB	0	−10 dB	0	−10 dB	0	0	0	0
	U7041 OUTPUTS ◇9◇	Z1	0	0	0	0	0	0	0	1	0	1
		Z2	0	0	0	0	0	0	0	0	1	1
	U7061 OUTPUTS ◇9◇	Q1	0	0	0	0	0	0	0	1	0	1
		Q2	0	0	0	0	0	0	0	0	1	1
	DISTORTION AMP GAIN (corresponding to U5071 outputs) ◇9◇		+6 dB	+6 dB	+6 dB	+6 dB	+6 dB	+6 dB	+6 dB	+26 dB	+46 dB	+66 dB
INDICATOR CONTROL	U5011 OUTPUTS ◇10◇	S0	1	1	1	1	1	1	0	0	0	0
		S1	0	0	1	1	0	0	0	1	0	1
		S2	0	0	0	0	1	1	0	0	1	1
		S3	0	0	0	0	0	0	1	1	1	1
	U5021 SELECTED OUTPUT (Hi)		1	1	3	3	5	0	0	2	4	6
	U3041 INPUTS ◇10◇	X0	1	1	0	0	0	0	0	0	0	1
		X1	0	0	1	1	0	0	0	1	0	0
		X2	0	0	0	0	1	0	0	0	1	0
	U3041 SELECTED OUTPUT (Hi)		Z0	Z0	Z1	Z1	Z2	NONE	Z0	Z1	Z2	Z1
	DISPLAY UNIT LEDS		V	V	V	V	V	mV	mV	mV	mV	µV
dB OFFSET CONTROL	U5061 OUTPUTS ◇10◇	Z0	0	0	1	1	0	0	0	1	0	1
		Z1	0	0	0	0	1	1	0	0	1	1
		Z2	0	0	0	0	0	0	1	1	1	1
	dB OFFSET VOLTS ◇8◇		−4 V	−4 V	−2 V	−2 V	0	0	+2 V	+4 V	+6 V	+8 V

Table 9-18
LOGIC AND CONTROL STATES
TROUBLESHOOTING CHART
THD + N FUNCTION

			SELECTED DISTORTION RANGE			
			200% (AUTO ONLY)	20%	2%	0.2%
DIST. AMP GAIN CONTROL	U7061 OUTPUTS ◇9◇	Q1	0	1	0	1
		Q2	0	0	1	1
	U7041 OUTPUTS ◇9◇	Z1	0	1	0	1
		Z2	0	0	1	1
	DISTORTION AMP GAIN (corresponding to U5071 outputs) ◇9◇		+6 dB	+26 dB	+46 dB	+66 dB
dB OFFSET CONTROL	U5061 INPUTS ◇10◇	Y0	0	1	0	1
		Y1	0	1	1	0
		Y2	1	0	0	0
	U5061 OUTPUTS ◇10◇	Z0	0	1	0	1
		Z1	0	0	1	1
		Z2	1	1	1	1
	dB OFFSET VOLTS ◇8◇		+2 V	+4 V	+6 V	+8 V
	U3041 SELECTED OUTPUT (Hi)		Z0	Z1	Z2	Z3

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.

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.

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

END ATTACHING PARTS

Detail Part of Assembly and/or Component
Attaching parts for Detail Part

END ATTACHING PARTS

Parts of Detail Part
Attaching parts for Parts of Detail Part

END ATTACHING PARTS

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.

Attaching parts must be purchased separately, unless otherwise specified.

ABBREVIATIONS

Abbreviations conform to American National Standards Institute YI.I

CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip Code
00779	AMP INC	P O BOX 3608	HARRISBURG PA 17105
00853	SANGAMO WESTON INC SANGAMO CAPACITOR DIV	SANGAMO RD P O BOX 128	PICKENS SC 29671
01121	ALLEN-BRADLEY CO	1201 SOUTH 2ND ST	MILWAUKEE WI 53204
01295	TEXAS INSTRUMENTS INC SEMICONDUCTOR GROUP	13500 N CENTRAL EXPRESSWAY P O BOX 225012 M/S 49	DALLAS TX 75265
01536	TEXTRON INC CAMCAR DIV SEMS PRODUCTS UNIT	1818 CHRISTINA ST	ROCKFORD IL 61108
02111	SPECTROL ELECTRONICS CORP SUB OF CARRIER CORP	17070 E GALE AVE P O BOX 1220	CITY OF INDUSTRY CA 91749
02735	RCA CORP SOLID STATE DIVISION	ROUTE 202	SOMERVILLE NJ 08876
03508	GENERAL ELECTRIC CO SEMI-CONDUCTOR PRODUCTS DEPT	W GENESEE ST	AUBURN NY 13021
04099	CAPCO INC	FORESIGHT INDUSTRIAL PARK P O BOX 2164	GRAND JUNCTION CO 81501
04222	AVX CERAMICS DIV OF AVX CORP	19TH AVE SOUTH P O BOX 867	MYRTLE BEACH SC 29577
04713	MOTOROLA INC SEMICONDUCTOR GROUP	5005 E MCDOWELL RD	PHOENIX AZ 85008
05397	UNION CARBIDE CORP MATERIALS SYSTEMS DIV	11901 MADISON AVE	CLEVELAND OH 44101
05828	GENERAL INSTRUMENT CORP GOVERNMENT SYSTEMS DIV	600 W JOHN ST	HICKSVILLE NY 11802
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIV	464 ELLIS ST	MOUNTAIN VIEW CA 94042
07716	TRW INC TRW ELECTRONICS COMPONENTS TRW IRC FIXED RESISTORS/BURLINGTON	2850 MT PLEASANT AVE	BURLINGTON IA 52601
08806	GENERAL ELECTRIC CO MINIATURE LAMP PRODUCTS DEPT	NELA PK	CLEVELAND OH 44112
09922	BURNDY CORP	RICHARDS AVE	NORWALK CT 06852
12327	FREEWAY CORP	9301 ALLEN DR	CLEVELAND OH 44125
12954	MICROSEMI CORP	8700 E THOMAS RD P O BOX 1390	SCOTTSDALE AZ 85252
13103	THERMALLOY CO INC	2021 W VALLEY VIEW LANE P O BOX 34829	DALLAS TX 75234
13511	AMPHENOL CADRE DIV BUNKER RAMO CORP		LOS GATOS CA
14433	ITT SEMICONDUCTORS DIV		WEST PALM BEACH FL
14752	ELECTRO CUBE INC	1710 S DEL MAR AVE	SAN GABRIEL CA 91776
15238	ITT SEMICONDUCTORS A DIVISION OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORP	500 BROADWAY P O BOX 168	LAWRENCE MA 01841
15454	AMETEK INC RODAN DIV	2905 BLUE STAR ST	ANAHEIM CA 92806
15636	ELEC-TROL INC	26477 N GOLDEN VALLEY RD	SAUGUS CA 91350
18178	VACTEC INC	10900 PAGE BLVD	ST LOUIS MO 63132
18324	SIGNETICS CORP	811 E ARQUES	SUNNYVALE CA 94086
19396	ILLINOIS TOOL WORKS INC PAKTRON DIVISION	900 FOLLIN LANE S E	VIENNA VA 22180
19701	MEPCO/ELECTRA INC A NORTH AMERICAN PHILIPS CO	P O BOX 760	MINERAL WELLS TX 76067
22229	SOLITRON DEVICES INC SEMICONDUCTOR GROUP SAN DIEGO OPERS	8808 BALBOA AVE	SAN DIEGO CA 92123
22526	DU PONT E I DE NEMOURS AND CO INC DU PONT CONNECTOR SYSTEMS	30 HUNTER LANE	CAMP HILL PA 17011
23740	AMUNEAL MFG CORP	4737 DARRAH	PHILADELPHIA PA 19124
24355	ANALOG DEVICES INC	RT 1 INDUSTRIAL PK P O BOX 280	NORWOOD MA 02062
24546	CORNING GLASS WORKS	550 HIGH ST	BRADFORD PA 16701
27014	NATIONAL SEMICONDUCTOR CORP	2900 SEMICONDUCTOR DR	SANTA CLARA CA 95051
32997	BOURNS INC TRIMPOT DIV	1200 COLUMBIA AVE	RIVERSIDE CA 92507
50434	HEWLETT-PACKARD CO OPTOELECTRONICS DIV	640 PAGE MILL RD	PALO ALTO CA 94304

CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip Code
50558	ELECTRONIC CONCEPTS INC	526 INDUSTRIAL WAY WEST	EATONTOWN NJ 07724
52763	STETTNER ELECTRONICS INC	6135 AIRWAYS BLVD PO BOX 21947	CHATTANOOGA TN 37421
54473	MATSUSHITA ELECTRIC CORP OF AMERICA	ONE PANASONIC WAY	SECAUCUS NJ 07094
55680	NICHICON /AMERICA/ CORP	927 E STATE PKY	SCHAUMBURG IL 60195
56289	SPRAGUE ELECTRIC CO	87 MARSHALL ST	NORTH ADAMS MA 01247
57668	ROHM CORP	16931 MILLIKEN AVE	IRVINE CA 92713
58361	GENERAL INSTRUMENT CORP OPTOELECTRONICS DIV	3400 HILLVIEW AVE	PALO ALTO CA 94304
59660	TUSONIX INC	2155 N FORBES BLVD	TUCSON, ARIZONA 85705
59821	CENTRALAB INC SUB NORTH AMERICAN PHILIPS CORP	7158 MERCHANT AVE	EL PASO TX 79915
71400	BUSSMANN MFG CO MCGRAW EDISION CO	114 OLD STATE RD PO BOX 14460	ST LOUIS MO 63178
73743	FISCHER SPECIAL MFG CO	446 MORGAN ST	CINCINNATI OH 45206
78189	ILLINOIS TOOL WORKS INC SHAKEPROOF DIVISION	ST CHARLES ROAD	ELGIN IL 60120
79136	WALDES KOHINOOR INC	47-16 AUSTEL PLACE	LONG ISLAND CITY NY 11101
80009	TEKTRONIX INC	4900 S W GRIFFITH DR P O BOX 500	BEAVERTON OR 97077
83486	ELCO INDUSTRIES INC	1101 SAMUELSON RD	ROCKFORD IL 61101
86928	SEASTROM MFG CO INC	701 SONORA AVE	GLENDALE CA 91201
91637	DALE ELECTRONICS INC	P O BOX 609	COLUMBUS NE 68601
93907	TEXTRON INC CAMCAR DIV	600 18TH AVE	ROCKFORD IL 61101
95348	GORDOS CORP	250 GLENWOOD AVE	BLOOMFIELD NJ 07003
98159	RUBBER TECK, INC.	19115 HAMILTON AVE., P O BOX 389	GARDENA, CA 90247
TK0303	FAB TEK INC	17 SUGAR HOLLOW RD	DANBURY CT 06810
TK0435	LEWIS SCREW CO	4114 S PEORIA	CHICAGO IL 60609
TK0507	O HARA METAL PRODUCTS CO	542 BRANNAN ST	SAN FRANCISCO CA 94107
TK1124	LUMEX INC	540 NORTH COURT	PALATINE IL 60067
TK1483	TEKA PRODUCTS INC	45 SALEM ST	PROVIDENCE RI 02907
TK1569	GERHART TOOL AND DIE	1116 W ISABEL ST	BURBANK CA 91506

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
1-1	337-2807-01			2	SHIELD,ELEC:SIDE,PLUG IN UNIT W/INSUL	80009	337-2807-01
-2	214-3364-00			4	FASTENER,LATCH:ACETAL,SIL GRAY	80009	214-3364-00
-3	105-0932-00			4	LATCH,PANEL:SIDE	80009	105-0932-00
-4	334-6996-00			1	OVERLAY,FR PNL:MKD AA501A DISTORTION ANALY	80009	334-6996-00
-5	378-0159-00			1	LENS,LED DSPL:RED	80009	378-0159-00
-6	366-1190-02			1	KNOB:GY,0.252 ID X 0.706 OD X 0.6 H	80009	366-1190-02
-7	344-0195-01			1	CLIP,ELECTRICAL:GROUNDING,PH BRZ ALBALOY PL	80009	344-0195-01
-8	358-0029-00			1	BSHG,MACH THD:0.375-32 X 0.5 HEX,BRS NP ATTACHING PARTS	80009	358-0029-00
-9	210-0590-00			1	NUT,PLAIN,HEX:0.375-32 X 0.438 BRS CD PL	73743	28269-402
-10	210-0978-00			1	WASHER,FLAT:0.375 ID X 0.5 OD X 0.024,STL END ATTACHING PARTS	12327	ORDER BY DESCR
-11	136-0731-00			2	JACK,TIP:BLACK ATTACHING PARTS	80009	136-0731-00
-12	210-0465-00			4	NUT,PLAIN,HEX:0.25-32 X 0.375,BRS CD PL	73743	3095-402
-13	210-0223-00			2	TERMINAL,LUG:0.26 ID,LOCKING,BRZ TIN PL	86928	5441-37
-14	342-0137-00			2	INSULATOR,WSHR:0.266 ID X 0.5 OD X 0.05	80009	342-0137-00
-15	210-0978-00			2	WASHER,FLAT:0.375 ID X 0.5 OD X 0.024,STL END ATTACHING PARTS	12327	ORDER BY DESCR
-16	366-1851-01			1	KNOB,LATCH:IVORY GY,0.625 X 0.25 X 1.09	80009	366-1851-01
-17	105-0865-00			1	BAR,LATCH RLSE:	80009	105-0865-00
-18	105-0866-00			1	LATCH,RETAINING:SAFETY	80009	105-0866-00
-19	214-3143-00			1	SPRING,HLEXT:0.125 OD X 0.545 L,XLOOP	80009	214-3143-00
-20	200-0103-00			1	NUT,PLAIN,KNURL:0.25-28 X 0.375"OD BRASS	80009	200-0103-00
-21	355-0507-00			1	STUD,SHOULDERED:BINDING POST,BRS NP ATTACHING PARTS	80009	355-0507-00
-22	210-0455-00			1	NUT,PLAIN,HEX:0.25-28 X 0.375,BRS NP	73743	3089-402
-23	210-0223-00			1	TERMINAL,LUG:0.26 ID,LOCKING,BRZ TIN PL END ATTACHING PARTS	86928	5441-37
-24	----- -----			2	CONN,RCPT,ELEC:BNC,FEMALE (SEE J500,J520 REPL)		
-25	210-0255-00			1	TERMINAL,LUG:0.391 ID,LOCKING,BRS CD PL	12327	ORDER BY DESCR
-26	----- -----			1	CONN,RCPT,ELEC:BNC,FEMALE (SEE J510 REPL)		
-27	333-3567-00			1	PANEL,FRONT: (STANDARD AND OPTION 02 ONLY)	80009	333-3567-00
	333-3568-00			1	PANEL,FRONT: (OPTION 01 ONLY) ATTACHING PARTS	80009	333-3568-00
-28	213-0875-00			2	SCR,ASSEM WSHR:6-32 X 0.5,TAPTITE,PNH,STL	83486	ORDER BY DESCR
-29	210-1365-00			2	WASHER,FLAT:0.141 ID X 0.266 OD X 0.5,AL END ATTACHING PARTS	80009	210-1365-00
-30	407-3084-00			1	BRACKET,ANGLE:CKT BD,ALUMINUM ATTACHING PARTS	80009	407-3084-00
-31	211-0534-00			1	SCR,ASSEM WSHR:6-32 X 0.312,PNH,STL,CD PL	01536	ORDER BY DESCR
-32	210-0586-00			2	NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL END ATTACHING PARTS	78189	211-041800-00
-33	407-3085-00			1	BRACKET,ANGLE:CKT BD,ALUMINUM ATTACHING PARTS	80009	407-3085-00
-34	211-0661-00			2	SCR,ASSEM WSHR:4-40 X 0.25,PNH,STL,POZ	01536	821-01655-024
-35	210-0586-00			1	NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL END ATTACHING PARTS	78189	211-041800-00
-36	----- -----			1	CKT BD ASSY:DISPLAY(SEE A10 REPL) ATTACHING PARTS		
-37	211-0661-00			2	SCR,ASSEM WSHR:4-40 X 0.25,PNH,STL,POZ END ATTACHING PARTS	01536	821-01655-024
					.CKT BD ASSY INCLUDES:		
-38	378-0890-00			1	.LENS,LIGHT:CLEAR,PLASTIC ATTACHING PARTS	80009	378-0890-00
-39	211-0051-00			2	.SCREW,MACHINE:4-40 X 0.188 L,FLH,100 DEG END ATTACHING PARTS	83486	ORDER BY DESCR
-40	220-0706-00			2	.NUT,SLEEVE:4-40 X 0.188 HEX,BRS CU-SN-ZN ATTACHING PARTS	80009	220-0706-00
-41	211-0007-00			2	.SCREW,MACHINE:4-40 X 0.188,PNH,STL	TK0435	ORDER BY DESCR
-42	210-0054-00			2	.WASHER,LOCK:#4 SPLIT,0.025 THK STL END ATTACHING PARTS	78189	ORDER BY DESCR
-43	214-1061-00			2	CONTACT,ELEC:GROUNDING,CU BE	80009	214-1061-00
-44	426-1997-00			1	FR SECT,PLUG-IN:TOP	80009	426-1997-00

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
1-					ATTACHING PARTS		
-45	211-0541-00			2	SCREW,MACHINE:6-32 X 0.25,FLH,100 DEG,STL	TK0435	ORDER BY DESCR
					END ATTACHING PARTS		
-46	----- -----			1	CKT BD ASSY:DVM/INTERFACE(SEE A18 REPL)		
					ATTACHING PARTS		
-47	211-0661-00			5	SCR,ASSEM WSHR:4-40 X 0.25,PNH,STL,POZ	01536	821-01655-024
					END ATTACHING PARTS		
-48	129-0420-00			5	SPACER,POST:0.575 L,4-40,AL,0.188 OD	80009	129-0420-00
-49	----- -----			1	CKT BD ASSY:LOGIC(SEE A12 REPL)		
					ATTACHING PARTS		
-50	211-0661-00			5	SCR,ASSEM WSHR:4-40 X 0.25,PNH,STL,POZ	01536	821-01655-024
-51	211-0292-00			4	SCR,ASSEM WSHR:4-40 X 0.29,PNH,BRS NI PL	78189	51-040445-01
					END ATTACHING PARTS		
					.CKT BD ASSY INCLUDES;		
-52	----- -----			1	.SWITCH,PUSH:(SEE A12S3141 REPL)		
-53	361-0385-00			4	.SPACER,PB SW:0.164 L,GREEN POLYCARBONATE	80009	361-0385-00
-54	361-0382-00			4	.SPACER,PB SW:0.275 L,BROWN POLYCARBONATE	80009	361-0382-00
-55	----- -----			1	.SWITCH,PUSH:(SEE A12S6181 REPL)		
-56	361-0385-00			4	.SPACER,PB SW:0.164 L,GREEN POLYCARBONATE	80009	361-0385-00
-57	361-0382-00			4	.SPACER,PB SW:0.275 L,BROWN POLYCARBONATE	80009	361-0382-00
-58	131-0604-00			6	.CONTACT,ELEC:CKT BD SW,SPR,CU BE	80009	131-0604-00
-59	131-0963-00			1	.CONTACT,ELEC:GROUNDING,PH BRZ,W/BRACKET	TK0507	ORDER BY DESCR
					.SWITCH,CAM:(SEE A12S4171 REPL)		
-60	200-2488-00			1	..COVER,CAM SW:ALUMINUM	80009	200-2488-00
					ATTACHING PARTS		
-61	211-0292-00			4	..SCR,ASSEM WSHR:4-40 X 0.29,PNH,BRS NI PL	78189	51-040445-01
					END ATTACHING PARTS		
-62	354-0390-00			1	..RING,RETAINING:BASIC EXT,U/O 0.375 DIA SFT	79136	5100-37-ZD
-63	131-0963-00			1	..CONTACT,ELEC:GROUNDING,PH BRZ,W/BRACKET	TK0507	ORDER BY DESCR
-64	210-0406-00			2	..NUT,PLAIN,HEX:4-40 X 0.188,BRS CD PL	73743	12161-50
-65	401-0178-01			1	..BEARING,CAM SW:CENTER REAR,0.378 ID,PLSTC	80009	401-0178-01
-66	214-1139-02			2	..SPRING,FLAT:0.885 X 0.156 CU BE GRN CLR	80009	214-1139-02
-67	214-1752-00			2	..ROLLER,DETENT:0.125 OD X 0.16,SST	80009	214-1752-00
-68	384-0878-00			1	..SHAFT,CAM SW:1.854 L	80009	384-0878-00
-69	105-0850-00			1	..ACTUATOR,CAM SW:LEVEL RANGE	80009	105-0850-00
-70	210-0406-00			2	..NUT,PLAIN,HEX:4-40 X 0.188,BRS CD PL	73743	12161-50
-71	401-0180-00			1	..BEARING,CAM SW:FRONT & REAR,0.80 & 0.83 DIA	80009	401-0180-00
-72	366-1559-01			1	PUSH BUTTON:GRAY,0.18 SQ X 0.43	80009	366-1559-01
-73	366-1512-00			4	PUSH BUTTON:SIL GY,0.18 SQ X 0.83	80009	366-1512-00
-74	384-1341-00			4	EXTENSION SHAFT:2.183 L X 0.13 OD,NYLON	80009	384-1341-00
-75	----- -----			1	CKT BD ASSY:IMD(SEE A13 REPL)		
					ATTACHING PARTS		
-76	211-0661-00			3	SCR,ASSEM WSHR:4-40 X 0.25,PNH,STL,POZ	01536	821-01655-024
					END ATTACHING PARTS		
-77	----- -----			1	CKT BD ASSY:INPUT NOTCH(SEE A14 REPL)		
					ATTACHING PARTS		
-78	211-0661-00			2	SCR,ASSEM WSHR:4-40 X 0.25,PNH,STL,POZ	01536	821-01655-024
-79	210-0586-00			1	NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	78189	211-041800-00
					END ATTACHING PARTS		
					.CKT BD ASSY INCLUDES;		
-80	----- -----			1	.SWITCH,PUSH:(SEE A14S2070 REPL)		
-81	361-0385-00			4	.SPACER,PB SW:0.164 L,GREEN POLYCARBONATE	80009	361-0385-00
-82	361-0383-00			4	.SPACER,PB SW:0.33 L,CHARCOAL,POLYCARBONATE	80009	361-0383-00
-83	346-0032-00			4	.STRAP,RETAINING:0.075 DIA X 4.0 L	98159	2829-75-4
-84	337-2139-00			3	.SHIELD,ELEC:INPUT CPLG SW	80009	337-2139-00
-85	366-1512-00			2	PUSH BUTTON:SIL GY,0.18 SQ X 0.83	80009	366-1512-00
-86	366-1512-01			2	PUSH BUTTON:CHARCOAL GRAY,0.18 SQ X 0.83H	80009	366-1512-01
-87	129-0457-00			3	SPACER,POST:1.07 L,4-40 TAP/STUD,BRS	80009	129-0457-00
-88	129-0765-00			2	SPACER,POST:0.545 L,4-40 BOTH ENDS,AL,0.188	80009	129-0765-00
-89	385-0107-00			2	SPACER,POST:0.75 L W/4-40 THD THRU,NYL	80009	385-0107-00
-90	337-3140-00			1	SHIELD,ELEC:MAIN BD	80009	337-3140-00
-91	----- -----			1	CKT BD ASSY:MAIN(SEE A15 REPL)		
					ATTACHING PARTS		
-92	211-0121-00			5	SCR,ASSEM WSHR:4-40 X 0.438,PNH,BRS	TK0435	ORDER BY DESCR
					END ATTACHING PARTS		
					.CKT BD ASSY INCLUDES;		
-93	----- -----			1	.SWITCH,PUSH:(SEE A15S1010 REPL)		
-94	361-0573-00			4	.SPACER,SLEEVE:0.234 L,WHITE POLYCARBONATE	80009	361-0573-00

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
1-95	----- -----			1	.SWITCH,PUSH:(SEE A15S1011 REPL)		
-96	361-0385-00			4	.SPACER,PB SW:0.164 L,GREEN POLYCARBONATE	80009	361-0385-00
-97	214-2518-00			1	.HEAT SINK,XSTR:TO-220 OR TO-202	TK0303	332-612
-98	344-0154-03			6	.CLIP,ELEC:FUSE,CKT BD MT,CU BE CU-SN-ZN PL	TK1569	ORDER BY DESCR
-99	366-1559-00			5	PUSH BUTTON:SIL GY,0.18 SQ X 0.43	80009	366-1559-00
-100	384-1136-00			5	EXTENSION SHAFT:0.95 INCH LONG	80009	384-1136-00
-101	366-1559-02			5	PUSH BUTTON:CHARCOAL,0.18 SQ X 0.43	80009	366-1559-02
-102	351-0672-00			4	GUIDE,CKT BOARD:PLASTIC	80009	351-0672-00
-103	351-0604-00			4	GUIDE,CKT BOARD:PLASTIC	80009	351-0604-00
-104	426-1999-01			1	FR SECT,PLUG-IN:BOTTOM W/LATCH	80009	426-1999-01
					ATTACHING PARTS		
-105	211-0101-00			1	SCREW,MACHINE:4-40 X 0.25,FLH,100 DEG,STL	TK0435	ORDER BY DESCR
					END ATTACHING PARTS		
-106	337-2917-00			1	SHIELD,ELEC:TRANSFORMER	23740	ORDER BY DESCR
					ATTACHING PARTS		
-107	211-0008-00			3	SCREW,MACHINE:4-40 X 0.25,PNH,STL	93907	ORDER BY DESCR
-108	210-1178-00			2	WASHER,SHLDR:	13103	7721-7PPS
-109	210-0586-00			3	NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	78189	211-041800-00
					END ATTACHING PARTS		
-110	342-0573-00			1	INSULATOR,SHLD:PLASTIC	80009	342-0573-00
-111	386-4392-02			1	PANEL,REAR:	80009	386-4392-02
					ATTACHING PARTS		
-112	213-0868-00			2	SCREW,TPG,TF:6-32 X 0.375 L,FILH,STL	93907	ORDER BY DESCR
-113	386-3657-01			2	SUPPORT,PLUG-IN:	93907	ORDER BY DESCR
					END ATTACHING PARTS		
					STANDARD ACCESSORIES		
	070-6592-00			1	MANUAL,TECH:AA501A	80009	070-6592-00

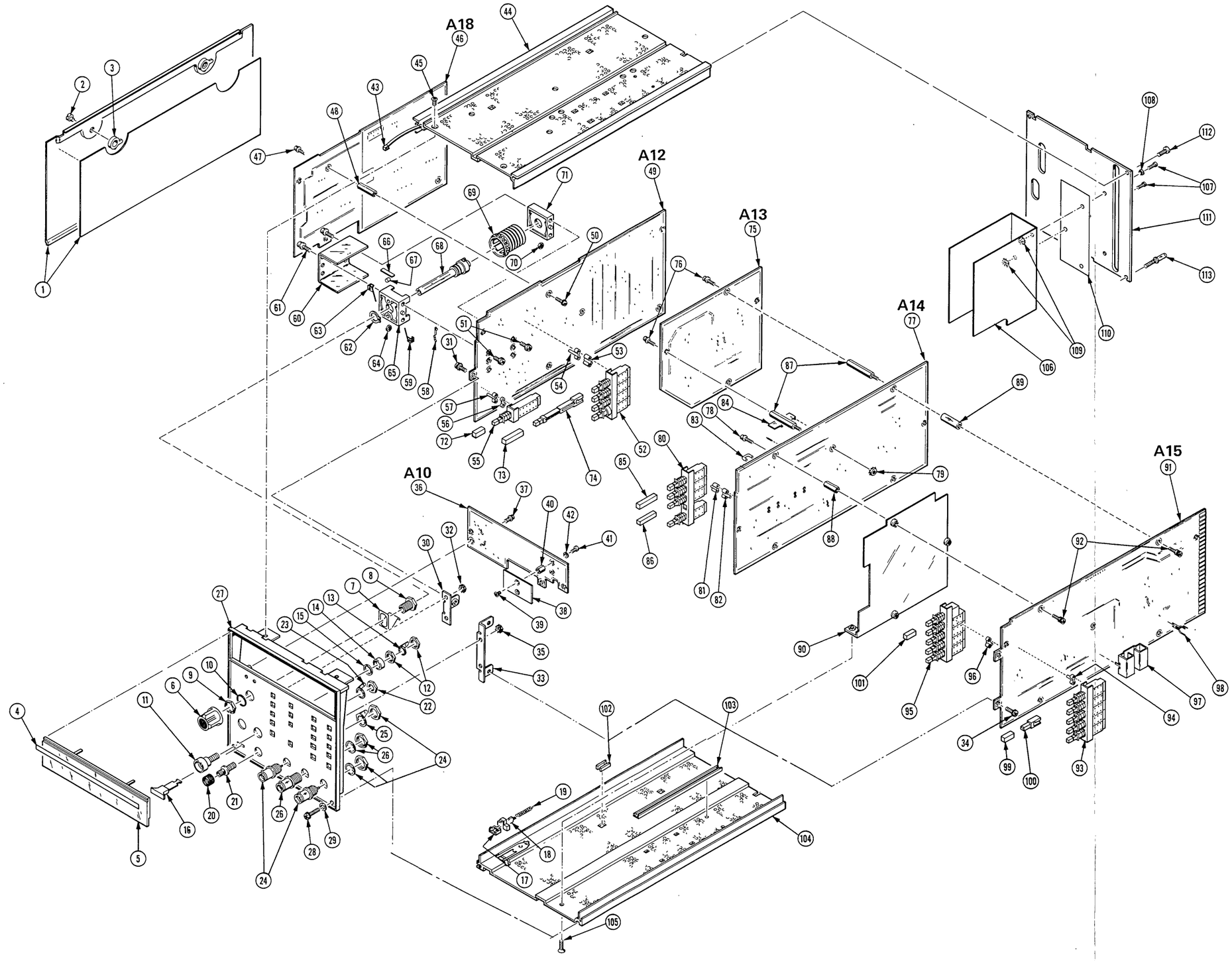


FIG. 1 EXPLODED VIEW

AA501A