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************************** NOTE ****************************

This is a preliminary manual for the 1450-3. All references to the 1450-2 should be taken as refering to the 1450-3. Specifications appearing in this manual are still company confidential.

1450-3

TELEVISION DEMODULATOR

INSTRUCTION MANUAL

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

Serial Number ____________________

070-3660-00

First Printing — May 1980

WARRANTY

Tektronix warrants that this product is free from defects in materials and workmanship. The warranty period is one (1) year from the date of shipment. Tektronix will, at its option, repair or replace the product if Tektronix determines it is defective within the warranty period and if it is returned, freight prepaid, to a service center designated by Tektronix.

Tektronix is not obligated to furnish service under this warranty:

a. to repair damage resulting from attempts by personnel other than Tektronix representatives to install, repair, or service the product;
b. to repair damage resulting from improper use or from connecting the product to incompatible equipment;
c. if personnel other than Tektronix representatives modify the hardware or software.

There is no implied warranty of fitness for a particular purpose. Tektronix is not liable for consequential damages.

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PREFACE

This manual documents the TEKTRONIX 1450-2 Television Demodulator. The 1450-2 uses a plug-in down converter for channel selection. The appropriate down converter instruction manual should also be consulted for information about using the 1450-2 and down converter as a SYSTEM (1450-2 + Down Converter = SYSTEM).

This preface describes the contents of the manual, with a brief description of each section within the manual.

The Table of Contents is a detailed list of all important pieces of information and their location in the manual.

The manual is split into two parts; Operator's Information and Service Information. All pertinent information regarding the operation of the instrument is located in the Operator's part. This will be of use to both the operator and the service technician. The Service part contains that information necessary to effectively service the instrument. This information should be useful only to qualified service technicians.

The Operator's part includes Sections 1 and 2:

Section 1 (Introduction and Specification) includes a general description of the instrument, a safety summary, and the specifications.

Section 2 (Operating Instructions) includes information on installation, connectors, operator familiarization, and Application Notes relating to the 1450-2.

The Service part contains Sections 3 through 9:

Section 3 (Theory of Operation) begins with a general overview of the instrument, followed by a detailed circuit description.

Section 4 (Calibration) includes a Test Equipment List, Channel Frequency Table, Performance Check Procedure, and an Adjustment Procedure.

Section 5 (Maintenance) covers the standard electrical and mechanical maintenance; plus any special tools, unusual components, and special handling.

Section 6 (Options) documents any options available with the instruments.

Section 7 (Replaceable Electrical Parts list) includes ordering information and part numbers for all replaceable electrical parts.

Section 8 (Diagrams) includes a block diagram, schematics, circuit board illustrations, component basing diagrams, waveforms, parts locating charts, and adjustment location illustrations.

Section 9 (Replaceable Mechanical Parts list) refers to an exploded view drawing of the instrument, and lists ordering information for all replaceable mechanical parts.

Change and correction information after the manual has been printed is located behind a tabbed page at the rear of the manual.

The text and diagrams are in accord with, and based on the following standards of the American National Standards Institute, Inc. (ANSI):

ANSI Y1.1—1972, Abbreviations

ANSI Y32.2—1975, Graphic Symbols

ANSI Y32.14—1973, Graphic Symbols (Logic)

ANSI Y32.16—1975, Reference Designators

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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 THE OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

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OPERATORS SAFETY SUMMARY

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

Terms In This Manual

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

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

Terms 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.

Symbols As Marked on Equipment

⚡ DANGER — High voltage.

⏚ Protective ground (earth) terminal.

⚠ ATTENTION — refer to manual.

Power Source

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

Grounding the Product

This product is grounded through the grounding conductor of the power 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.

For detailed information on power cords and connectors, see Power Plug Options illustration in the Servicing Safety Summary.

Refer cord and connector changes to qualified service personnel.

Use the Proper Fuse

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

Refer fuse replacement to qualified service personnel.

Do Not Operate in Explosive Atmospheres

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

Do Not Remove Covers or Panels

To avoid personal injury, do not remove the product covers or panels. Do not operate the product without the covers and panels properly installed.

SERVICE SAFETY SUMMARY

FOR QUALIFIED SERVICE PERSONNEL ONLY

Refer also to the preceding Operators Safety Summary.

Do Not Service Alone

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

Use Care When Servicing With Power On

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

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

Power Source

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

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.

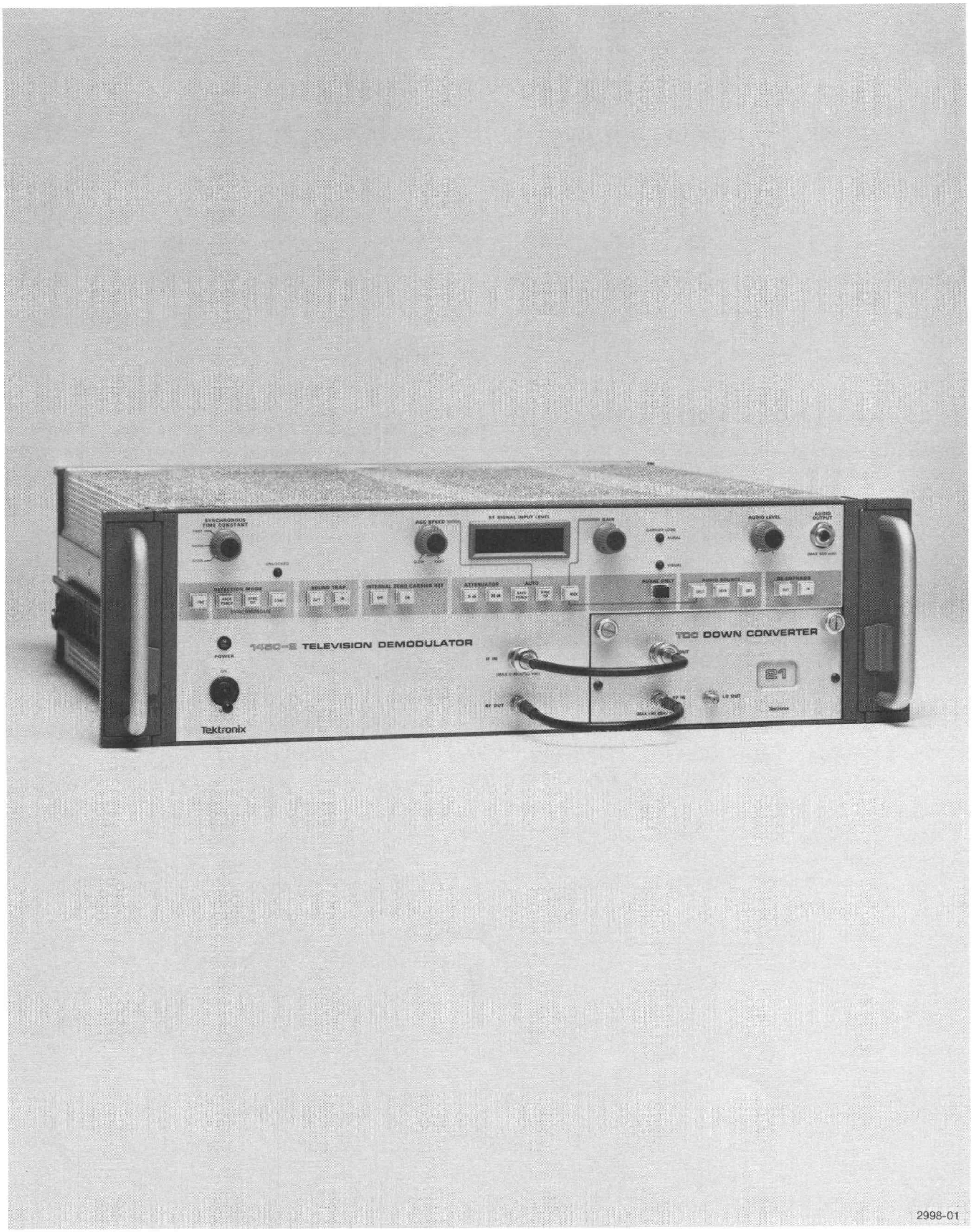

Fig. 1-1. 1450-2 Television Demodulator.

Part I

OPERATOR'S INFORMATION

INTRODUCTION AND SPECIFICATION

Introduction

The 1450-2 is a high quality television demodulator. The RF section is easily interchangeable and can be ordered for any System B or System G channel in the following countries:

Algeria, Austria, Bahrain, Bangladesh, Belgium, Brunei, Cyprus, Denmark, East Germany, Egypt, Ethiopia, Finland, Ghana, Gibraltar, Greece, Guinea, Hong Kong[1], Iceland, India, Indonesia, Iran, Iraq, Israel, Italy[2], Jordan, Kenya, Kuwait, Lebanon, Liberia, Libiya, Malta, Mauritius, Nethrelands, Netherlands, Nigeria, Norway, Oman, Pakistan, Portugal, Qatar, Rhodesia, Saudi Arabia[1], Sierra Leone, Singapore, Spain, Sudan, Sweden, Switzerland, Syria, Tanzania, Tunisia, Turkey, Uganda, United Arab Emirates, West Germany, Yemen Arab Republic, Republic of Yemen, Yugoslavia, Zambia.

The IF section uses Surface Acoustic Wave (SAW) filters for a precise Nyquist slope and exceptional stability. This stability means that very little maintenance or recalibration is required.

Both synchronous and envelope detection is used in the 1450-2. The synchronous-detection mode eliminates quadrature distortion so that the transmitter output can be compared with the video-input signal. The envelope-detection mode is used in conjunction with synchronous detection to assess how a home receiver is affected by certain transmitter distortions. A quadrature output from the synchronous detector is provided for measuring transmitter incidental phase. When used with the video output, a vector display of the **rf** signal can be produced on an XY monitor or a 1480 Waveform Monitor with an external phase graticule.

The 1450-2 has a high dynamic-range, allowing a low-sensitivity input for a signal directly out of a transmitter, and a high sensitivity for a distant signal. A LED readout indicates the input power level in dBm.

Visual and Aural Carrier Loss alarm lights are included on the front panel. These LEDs light with a loss of either carrier. A set of relay contacts are available at the rear-panel REMOTE connector to drive an external alarm circuit. The relay switches when either of the alarm lights activate, and when instrument power is lost.

Both Split Carrier and Intercarrier sound-detection methods are included in the 1450-2. Split Carrier is used to accurately measure the aural transmitter. The Intercarrier mode is used to help determine the effects of picture carrier **fm** noise on the sound signal.

The audio section has three audio outputs and a calibrated-deviation output voltage. These outputs are used for monitoring and measuring parameters of the aural transmitter.

A zero-carrier reference pulse is generated internally, or the 1450-2 can be driven by an external source (i.e., a TEKTRONIX 1460). This pulse establishes a reference for measuring modulation depth.

[1] **System B only.**

[2] **System G only.**

SPECIFICATION

Table 1-1 Electrical Characteristics

CHARACTERISTICS	PERFORMANCE REQUIREMENT	SUPPLEMENTAL INFORMATION
System (1450-3 + TDC) RF Attenuator Range	30 dB in 10 dB steps	Input level range shifts with atten. (-59 dBm to +7 dBm with 10 dB atten.) (-49 dBm to +17 dBm with 20 dB atten.) (-39 dBm to +27 dBm with 30 dB atten.)
Noise Figure VHF	10 dB or less	For input levels less than 13 mV (-25 dBm)
UHF	11dB or less	For input levels less than 13 mV (-25 dBm)
AGC Range	66 dB	
Adjacent Channel Cross-modulation	60 dB or greater down	Adjacent channel signal less than or equal to the desired channel signal
2nd Adjacent Channel Cross-modulation	60 db or greater down	2nd adjacent channel signal less than or equal to the desired channel signal
Amplitude vs. Sideband Frequency Response	See Fig. 1-2	

Table 1-1 Electrical Characteristics (Cont'd)

CHARACTERISTICS	PERFORMANCE REQUIREMENT	SUPPLEMENTAL INFORMATION
System (Cont'd)		
Envelope Delay vs. Baseband Frequency Response	0 +-12 ns	0 to 5 MHz in Narrow Band and 0 to 6.5 MHz in Wide Band. Tolerance applies for delay periodic ripple of 1 Hz/MHz or less. Above 1 Hz/MHz, the tolerance increases in proportion to the number of Hz/MHz.
Amplitude vs. Baseband Frequency Response	See Fig. 1-3	
Variation in System Frequency Response with AGC		
VHF	+-0.1 dB or less	
UHF	+-0.15 dB or less	
Chrominance/Aural Carrier/Visual Carrier Inter-modulation	50 dB or greater down	Standard 3-tone test. P-P Video/P-P 1.57 MHz
Readout Accuracy	+-2 dB	
Readout Resolution	+-0.1 dB	

Table 1-1 Electrical Characteristics (Cont'd)

CHARACTERISTICS	PERFORMANCE REQUIREMENT	SUPPLEMENTAL INFORMATION
Mainframe RF IN Connector		50 Ohm N (rear panel)
RF OUT Connector		50 Ohm SMA (front panel)
IF INput		From 50 Ohm source
Zin and Connector		50 Ohm BNC (front panel)
Return Loss	18 dB or greater (Over IF passband)	
Level Range	-20 dBm to -64 dBm	Signal to Noise Ratio deteriorates as signal decreases
Frequency Visual IF	38.9 MHz +-127 kHz	
Aural IF		6 MHz below the Visual IF
Variation in Mainframe Frequency Response as a function of AGC		+-0.05 dB or less
VIDEO OUTPUT Zo and Connector		75 Ohm BNC (2 rear panel outputs)
Return Loss	34 dB or greater from 0 to 6 MHz	
Video Level		1 V p-p +- 2% (Sync Tip to Peak White at Standard Modulation Percentages).

Table 1-1 Electrical Characteristics (Cont'd)

CHARACTERISTICS	PERFORMANCE REQUIREMENT	SUPPLEMENTAL INFORMATION
Mainframe (Cont'd) VIDEO OUTPUT (Continued) DC Level Blanking Level	0 V +- 50 mV	In Back Porch AGC.
Sync Tip	Blanking Level - 300 mV +- 6 mV	In Sync Tip AGC.
Peak White	Blanking Level + 700 mV +-14 mV	In BACK PORCH (AGC)
Levels Relative to Zero Carrier Blanking Level	Zero Carrier - ~~925~~ 950 mV +- ~~18.5~~ 19.0 mV	In Back Porch AGC.
Sync Tip	Zero Carrier - 1.250 V +- 25 mV	In Sync Tip AGC.
Linear Distortions Synchronous Detection Overshoot	1% or less	0.5 % Typical
Line Time Wideband	0.5% or less	
Narrowband	1% or less	
Kpb	0.5% k or less	
K2t	0.5% k or less	
Field Time	0.5% or less	
Chrominance to Luminance Delay	+- 20 nS or less	

Table 1-1 Electrical Characteristics (Cont'd)

CHARACTERISTICS	PERFORMANCE REQUIREMENT	SUPPLEMENTAL INFORMATION
Mainframe (Cont'd) Non-Linear Distortions Line Time Non-Linearity	1% or less	
Differential Gain Synchronous	1% or less	
Envelope	4% or less	
Differential Phase	1 degree or less	
Aural Signal Rejection	46 dB or greater	6 MHz/p-p Blanking-to-reference white picture signal. Also see Fig. 2-2 for sound trap responses.
Video Signal to Noise Ratio Low Frequency	60 dB or greater	P-P Video/P-P Mains Ripple
Mid Frequency Coherent	50 dB or greater	P-P Video/P-P Noise
White Noise	60 dB or greater with at least -25 dBm of input signal.	P-P Video/RMS White Noise (10 kHz to 5.5 MHz) (Decreases with input signal. See Fig. 2-3)
QUADRATURE OUTput Zo and Connector		75 Ohm BNC (rear panel)
Return Loss	34 dB or greater from 0 to 6 MHz	

Table 1-1 ELectrical Characteristics (Cont'd)

CHARACTERISTICS	PERFORMANCE REQUIREMENT	SUPPLEMENTAL INFORMATION
Mainframe (Cont'd) QUADRATURE OUTput (Continued) Quadrature Phase with Respect to Video Out	90 +-2 Degrees	
Synchronous Detection LO Phase Angle With Respect to Visual IF Carrier	+-3 Degrees	
Low Frequency Phase Noise	0.25 degrees rms or less	With SYNCHRONOUS TIME CONSTANT switch set to SLOW.
Synchronous Detector Phase Response		See Fig. 1-5
Zero Carrier Reference Gate Carrier Cutoff	50 dB or greater	Zero Carrier +-~~4~~ 3.5 mV
Width	30 us +-10%	
Delay		20 us +-10% from leading edge of sync
Timing		Factory set to line 16 of both fields. Internally selectable from lines 10 through 25 of both fields.

Table 1-1 Electrical Characteristics (Cont'd)

CHARACTERISTICS	PERFORMANCE REQUIREMENT	SUPPLEMENTAL INFORMATION
Mainframe (Cont'd) Zero Carrier Reference Gate (Continued) Ext ZERO CARRIER REFERENCE DRIVE INPUT		
Zin and Connector		Approximately 5 kOhm BNC (rear panel)
Level Required		Approximately +1 V. Accepts input from TEKTRONIX 1460 set for positive output.
Audio Characteristics Frequency Response	+-0.4 dB	30 Hz to 15 kHz
De-emphasis	50 us +-0.5 dB to 20 dB	See Fig. 1-6 for Curve
Harmonic Distortion	0.2% or less	30 Hz to 15 kHz at full output with +-50 kHz deviation
Audio Signal to Noise Ratio		With +-50 kHz deviation and 1 kHz modulation.
Intercarrier	55 dB or greater.	With 2T Pulse & Bar video modulation
Split Carrier	~~75~~ 70 dB or greater.	
EXT AURAL INTERCARRIER IN	75 dB or greater.	
AURAL ONLY	75 dB or greater.	

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Table 1-1 Electrical Characteristics (Cont'd)

CHARACTERISTICS	PERFORMANCE REQUIREMENT	SUPPLEMENTAL INFORMATION
Mainframe (Cont'd) Audio Characteristics (Cont'd) DEVIATION OUTput Zo and Conn.		600 ohm BNC (rear panel)
Level	50 mV/kHz +- 1%	20 kHz/Volt +- 1%
AURAL INTER-CARRIER IN Zin and Connector		50 Ohm BNC (rear panel
Return Loss	20 dB or greater at 6 MHz.	
Level	-30 dBm +-5 dB	Nominal 0 dBm Output
Frequency	5.996 MHz +-10 kHz	
ORAL INTER-CARRIER OUT Zout and connector		50 Ohm BNC (rear panel)
Return Loss	20 dB or greater	
Level		Nominal -6 dBm up to 0 dBm. (Depends on Aural/Visual ratio.)

Table 1-1 Electrical Characteristics (Cont'd)

CHARACTERISTICS	PERFORMANCE REQUIREMENT	SUPPLEMENTAL INFORMATION
Mainframe (Cont'd) Audio Outputs 600 OHM BAL-ANCED LINE Level	Factory set to +10 dBm with +- 50 kHz deviation.	Internally adjustable from at least -10 dBm to +15 dBm.
Connector		XLR male (rear panel)
8 OHM SPEAKER Output Level	Up to at least 5 Watts RMS.	Front Panel adjust
Connector		Barrier Block (rear panel
Headphone OUTPUT Level	Up to at least 50 mW.	Accepts mono or stereo style phones.
Connector		Phone Jack (front panel)
REMOTE Connector		9 pin Cinch (rear panel)
Alarm Output		SPDT relay contacts rated at 28V, 3A maximum Pins 8 and 9 close for alarm or loss of power. Pins 7 and 8 open for alarm or loss of power.
External Syn-chronous/ Envelope Sw.		Ground pin 6 for Envelope detection (front-panel switches in desired Synchronous mode)

Table 1-1 Electrical Characteristics (Cont'd)

CHARACTERISTICS	PERFORMANCE REQUIREMENT	SUPPLEMENTAL INFORMATION
Mainframe (Cont'd) Electromagnetic Susceptability	Up to 10 V/Meter	
Damage Level at RF Input	1 Watt maximum	At any attenuator setting
Power Supply Characteristics Mains Power	100 Watts maximum	90 Watts nominal
Voltage Range 115 V Low	90 V to 110 V	100 V nominal
115 V High	108 V to 132 V	120 V nominal
230 V Low	198 V to 242 V	220 V nominal
230 V High	216 V to 250 V	240 V nominal
Fuse Data 115 V		1.25 A Slo-Blo
230 V		0.6 A Medium-Blow
Frequency	48 to 62 Hz	
Crest Factor		At least 1.3 (P-P RMS)
Internal Supply Accuracy +5 V	+-1%	1.5 Amps
+15 V	+-1%	1.5 Amps
-15 V	+-0.5%	1.5 Amps

Table 1-1 Electrical Characteristics (Cont'd)

CHARACTERISTICS	PERFORMANCE REQUIREMENT	SUPPLEMENTAL INFORMATION
Mainframe (Cont'd)		
Power Supply		
Characteristics (Cont'd)		
Internal Supply (Cont'd)		
Ripple	1 mV or less	All supplies
Line Regulation	5 mV or less	All supplies
Safety		
Insulation Stress		
Primary Circuit	Withstands 1500V RMS	50 to 60 Hz for 10 secs
Grounding Circuit	0.1 Ohm maximum	

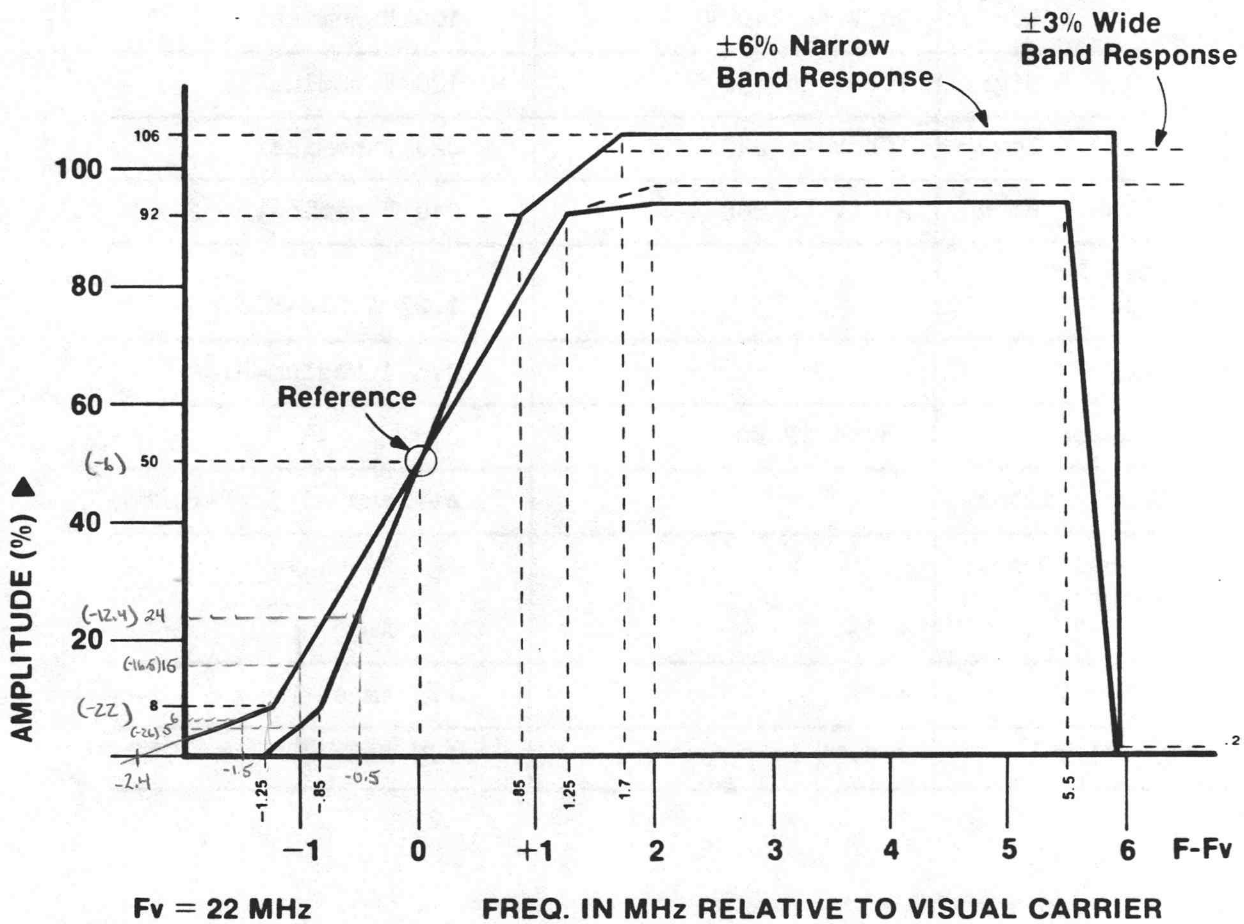

Fig. 1-2. Amplitude vs. Sideband Frequency Response.

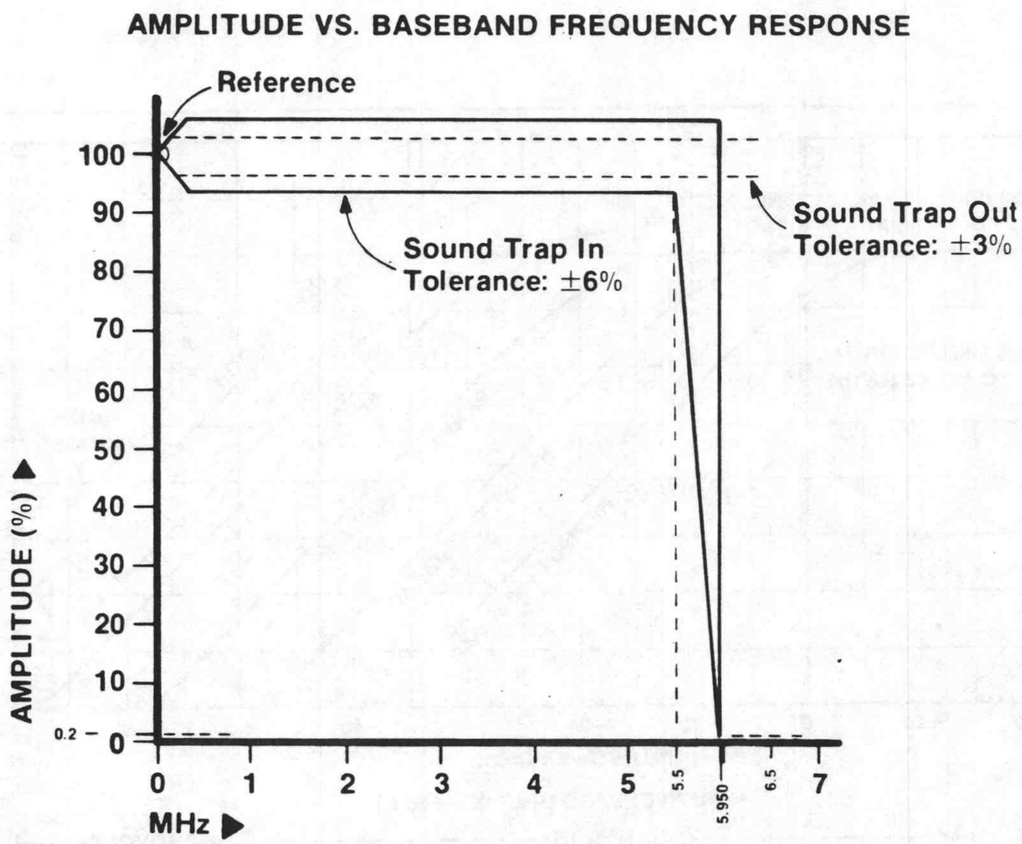

Fig. 1-3. Amplitude vs. Baseband Frequency Response.

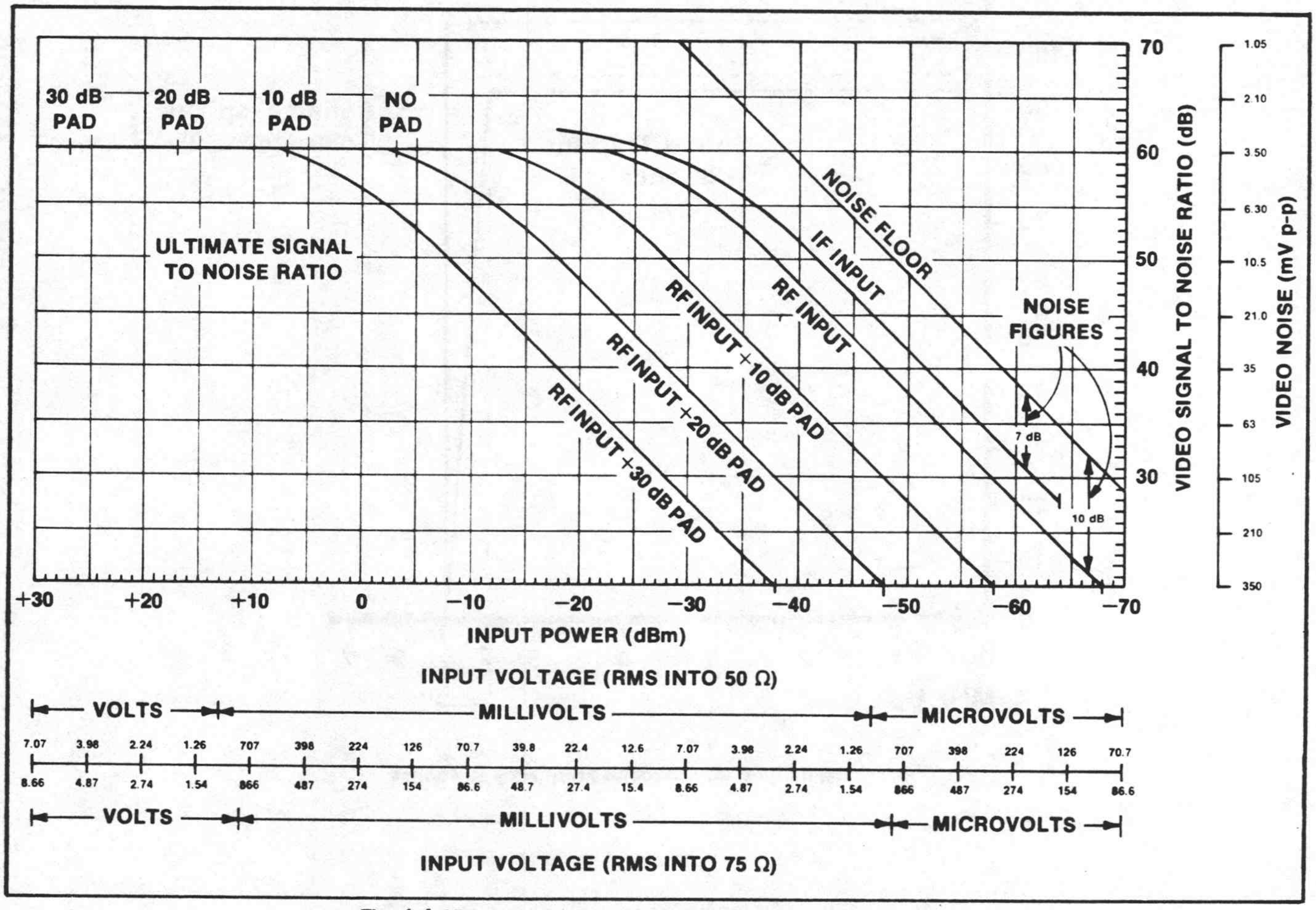

Fig. 1-4. Video Signal to Noise Ratio vs. Input Signal Level.

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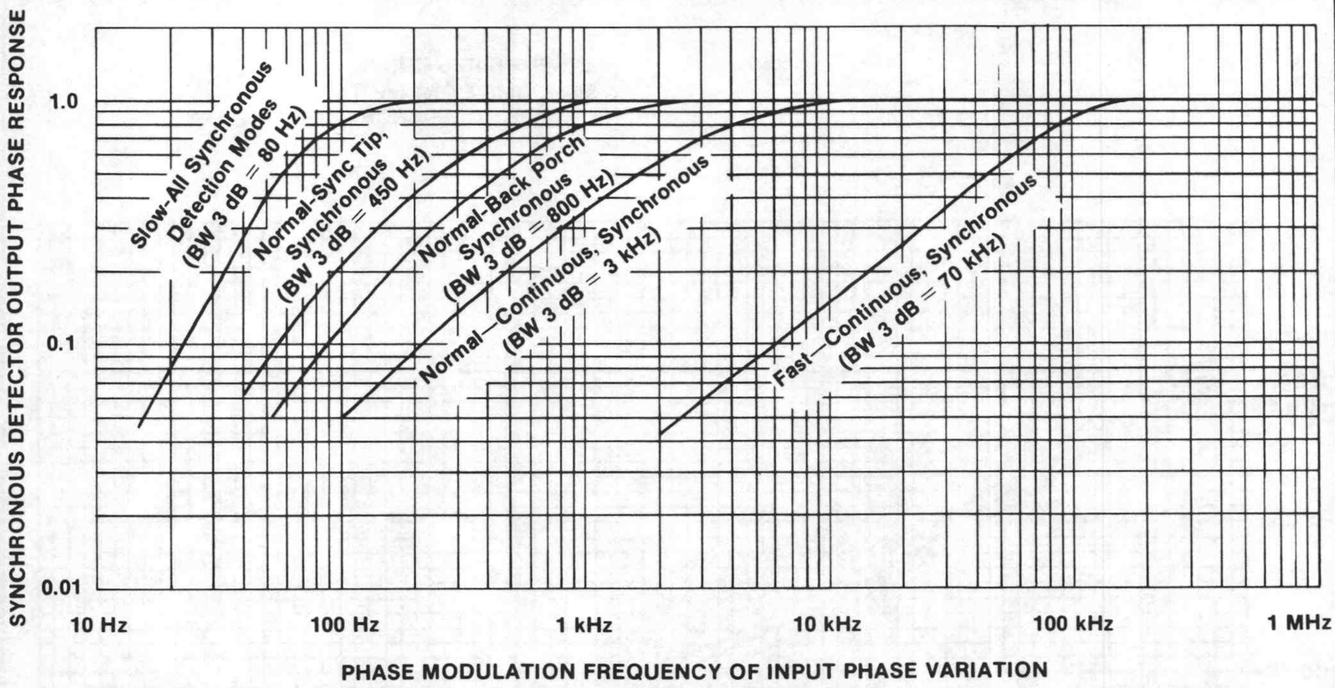

EXAMPLE: A transmitter with 10° of input phase variation modulated at 60 Hz will produce an output signal with 6° (60% response) phase variation when synchronous detection and the SLOW TIME CONSTANT settings are used (in any synchronous mode).

In the NORMAL SYNC TIP SYNCHRONOUS detection mode, the phase variation will reduce to only 1° (10% response).

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Fig. 1-5. Synchronous Detector Phase Response.

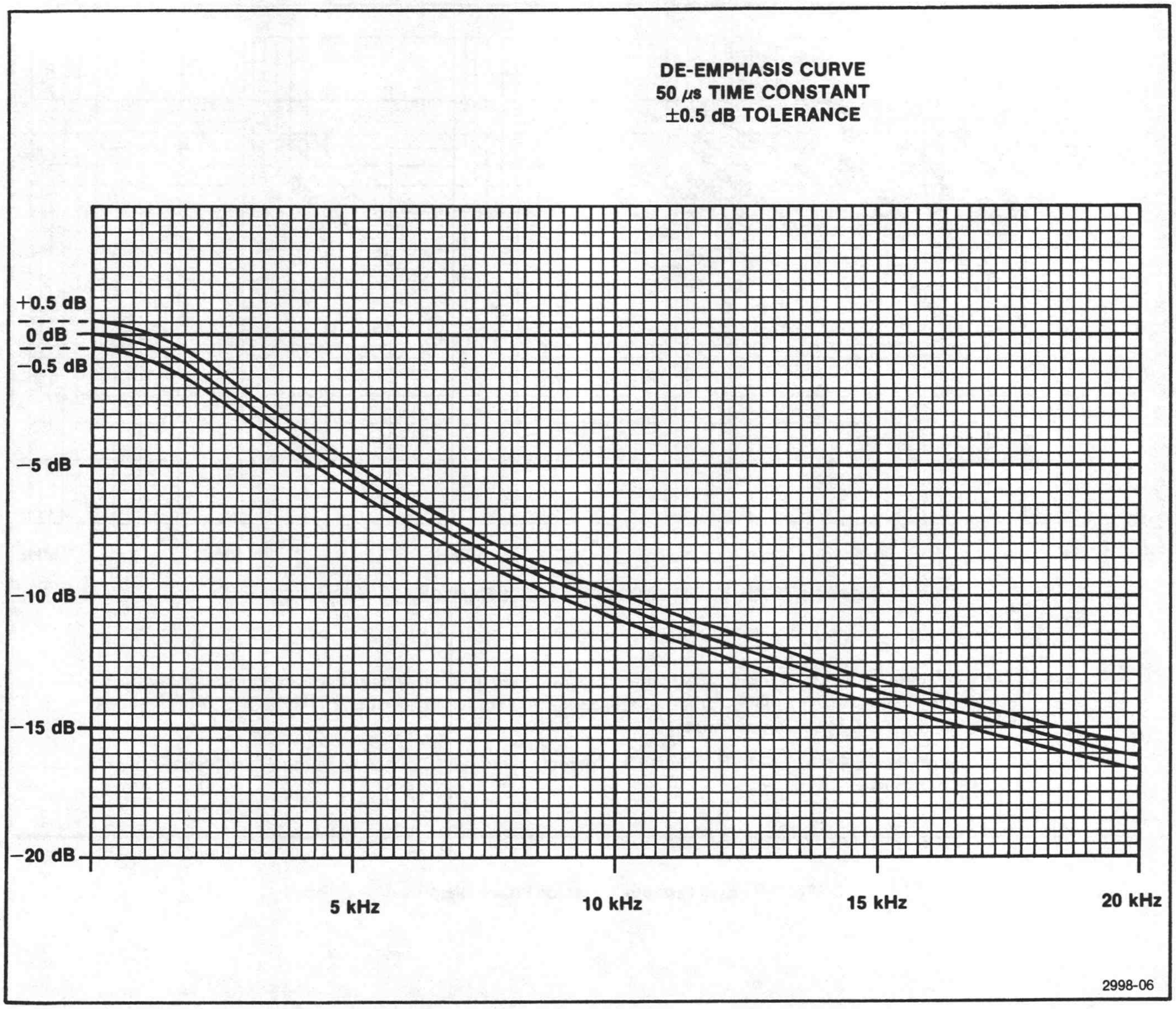

Fig. 1-6. Audio De-Emphasis Frequency Response.

Table 1-2

ENVIRONMENTAL CHARACTERISTICS

Characteristics	Information
Temperature	
Operating	0°C to 50°C.
Storage	−40°C to +65°C.
Altitude	
Operating	To 15,000 feet (4,572 m).
Storage	To 50,000 feet (15,240 m).

Table 1-3

PHYSICAL CHARACTERISTICS

Characteristics	Information
DIMENSIONS	See Fig. 1-8.
Length	48.58 cm (19 1/8").
Width	48.26 cm (19").
Height	13.34 cm (5 1/4").
Weight	16.33 kg (36 lbs.).

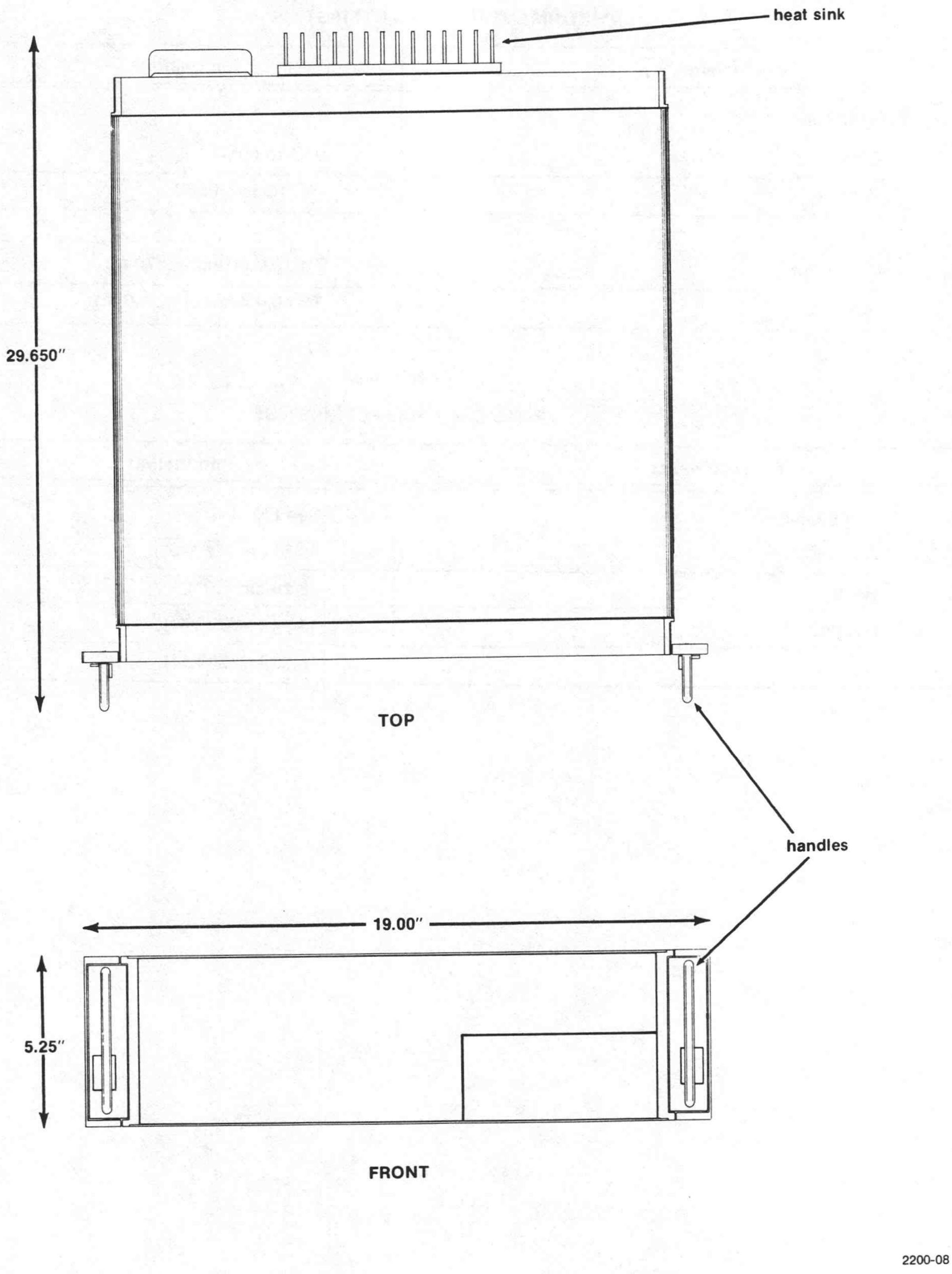

Fig. 1-8. Dimensional Drawing.

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1450-2 Standard Accessories List

Quantity	Item	Tektronix Part No.
1	Power Cable; 8 ft. long	161-0066-00
1	Rackmount Slide Guide (Pair)	351-0301-03
1	Instruction Manual	070-2298-00
1	N-to-BNC Adapter	103-0045-00
1	Extender ECB	670-5034-00
1	Remote Connector Assembly:	
	Male Connector	131-1007-00
	Hood	200-1170-00
	Screw (2 each)	213-0260-00
1	50 Ω Coaxial Cable with BNC Connectors	012-0751-00
1	50 Ω Double-Shielded Coaxial Cable with SMA Connectors	012-0752-00
2	BNC-to-Square-Pin Adapter Cables	175-2140-00
1	BNC-to-Peltola Adapter Cable	067-0709-00
1	TORX Screwdriver	003-0816-00
1	1.25 A Medium-Blow Fuse for 120 V Range	159-0043-00
1	External Phase Graticule	331-0393-15

OPERATING INSTRUCTIONS

This section includes information on the functions of the controls, connectors, and indicators; how to use the demodulator; and installation procedures.

CONTROLS AND CONNECTORS

Front Panel (See Fig. 2-1)

(1) **POWER**—Turns instrument power on and off. Power on is indicated by a green LED (light emitting diode).

DETECTION MODE—These self-canceling push button switches determine the type of detection used.

(2) **ENV**—Selects the Envelope detection mode. This mode is used in conjunction with the Synchronous detector to measure transmitter distortions caused by incidental phase. Envelope detection is not recommended for normal use because it introduces quadrature distortion into the signal.

SYNCHRONOUS—Selects the Synchronous detection modes.

(3) **BACK PORCH**—The normal detection mode. Reference phase samples are taken during the Back Porch period where the reference signal is normally subject to the least phase distortion.

(4) **SYNC TIP**—Reference phase samples are taken during the Sync Tip time. The Sync Tip detector may be used in conjunction with the Back Porch detector to check for effects caused by carrier phase-shift of the sync pulse.

(5) **CONT**—The phase-lock correction is continuously applied in this mode.

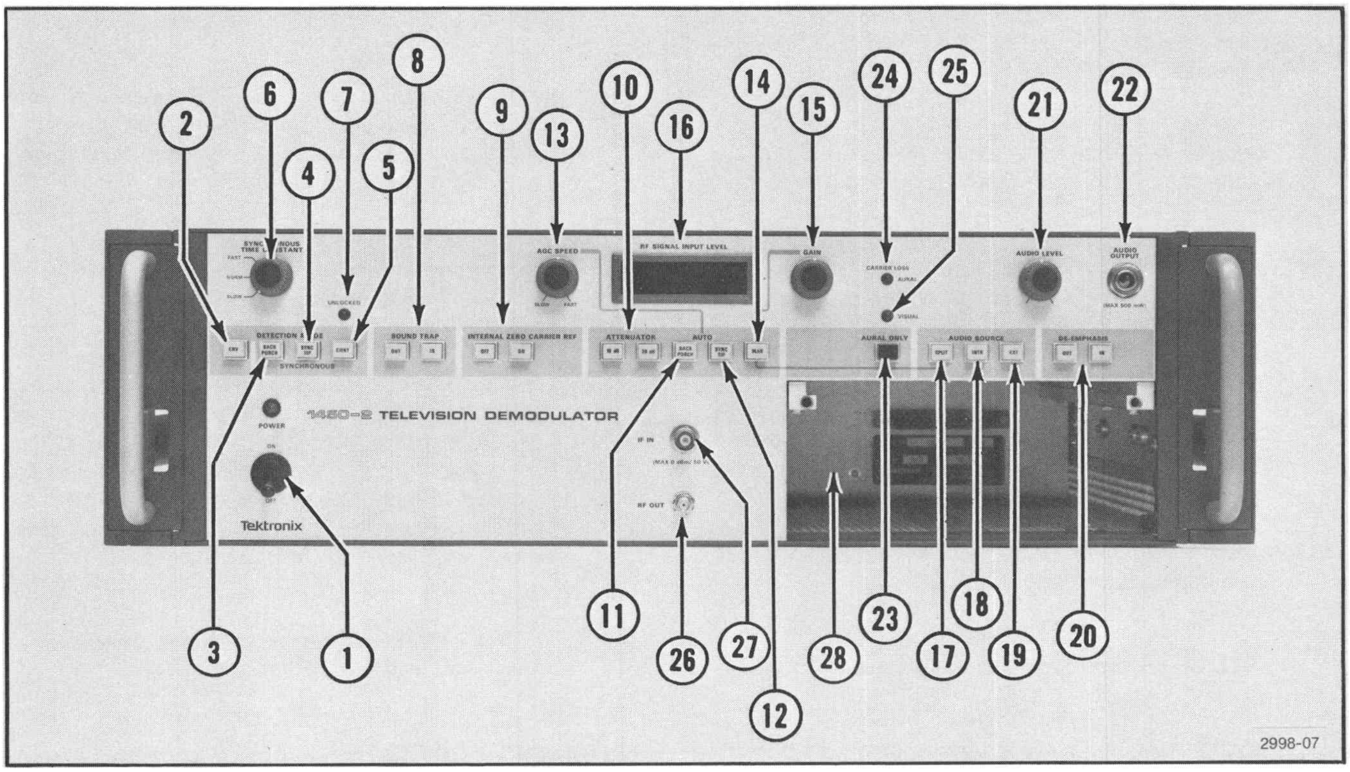


Fig. 2-1. Front Panel Controls, Connectors, and Indicators.

(6) **SYNCHRONOUS TIME CONSTANT**—This switch sets the phase-lock loop bandwidth. A slow time-constant allows transmitter phase-jitter to pass through the demodulator for measurement. A fast time-constant will cause the demodulator to track the jitter, eliminating it as a source of interference for other measurements.

(7) **UNLOCKED Light**—A red LED indicates that phase lock (required for synchronous detection) has not been achieved. The demodulator is automatically switched to the Envelope detection mode when this light is on.

(8) **SOUND TRAP**—Selects the bandwidth of the **if** (intermediate frequency) system. With the sound trap OUT, the wide band filter is selected. When the sound trap is IN, the narrow band filter is selected.

(9) **INTERNAL ZERO CARRIER REF**—When the ON button is pushed, a Zero Carrier Reference signal is generated and inserted on the signal during a selected line.

(10) **ATTENUATOR**—These buttons select attenuation of the input signal in 10 dB steps. 0 dB is selected with both buttons out, and 30 dB is selected with both buttons pushed in. The readout still indicates the correct input power with the attenuators in or out.

AUTO—Selects either Back Porch or Sync Tip reference Automatic Gain Control (**agc**).

(11) **BACK PORCH**—Video output is automatic gain controlled (to 1 V p-p composite video) referenced to the back porch at 0 V.

(12) **SYNC TIP**—Video output is automatic gain controlled (to 1 V p-p composite video) referenced to the sync tip at −286 mV.

(13) **AGC SPEED**—A potentiometer that determines the speed of the **agc**.

SLOW—Shows hum and low-frequency noise.

FAST—Masks low-frequency noise and hum to display a more stable signal.

(14) **MAN**—This mode disables the **agc** and allows manual control of the output amplitude. It can be used to monitor amplitude shifts on a waveform monitor.

(15) **GAIN**—This control is a three-turn potentiometer that controls the gain of the video output signal in the manual mode.

(16) **READOUT**—The LED readout is calibrated to indicate the input power level in dBm (0 dBm equals 1 mW). When the input power level is out of the **agc** range, one of the two LEDs on the right side of the readout will light. The upper LED indicates the signal is too high, and the lower LED indicates that the signal is too small. When using the Manual Gain control, the correct output voltage will be obtained and the correct input power indicated when both of the LEDs on the right side are out. The readout also indicates correctly whether the attenuators are in or out.

AUDIO SOURCE—The buttons select the type of audio desired.

(17) **SPLIT**—Selects Split Carrier. Source is the difference between the aural carrier and an oscillator at the visual carrier frequency.

(18) **INTR**—Selects Intercarrier. Source is the difference between the aural carrier and the visual carrier. PM noise on the visual carrier will be added to the audio in this mode.

(19) **EXT**—Selects the signal fed to the External AURAL INTERCARRIER IN connector.

(20) **DE-EMPHASIS**—Selects whether de-emphasis is applied to the audio signal or not. The normal setting for monitoring is with DE-EMPHASIS IN. De-emphasis is applied according to the 50 μs standard. When DE—EMPHASIS is OUT, the sound signal passes through a flat amplifier. This is used for checking the aural transmitter.

(21) **AUDIO LEVEL**—Controls the level of the low-impedance audio output signals.

(22) **AUDIO OUTPUT**—A phone jack for headphone monitoring and testing using the audio.

(23) **AURAL ONLY**—When the MAN gain, SPLIT AUDIO SOURCE, and AURAL ONLY buttons are all pushed in, the demodulator will lock to the transmitter aural carrier with no picture carrier present.

CARRIER LOSS

(24) **AURAL Alarm Light**—A red LED, when lit, indicates loss of the aural carrier. In the **agc** mode, a loss of the visual carrier will also cause the AURAL alarm to light. In the MANUAL GAIN mode, the AURAL alarm acts independently.

(25) **VISUAL Alarm Light**—A red LED, when lit, indicates loss of the visual carrier. The instrument must be in the **agc** mode.

(26) **RF OUT**—A 50 Ω SMA connector provides output of the **rf** (radio frequency) signal from the rear-panel RF INPUT through the 0 to 30 dB attenuator. A 50 Ω SMA-to-SMA cable makes a reliable connection of the signal path from the mainframe to the plug-in.

(27) **IF IN**—A 50 Ω **bnc** input. Accepts the specified **if** at −64 dBm to −20 dBm from the DOWN CONVERTER or from an external 50 Ω source (i.e., transmitter **if**).

NOTE

An external signal applied directly to the IF IN connector will cause the readout to read 4.7 dB less than the actual signal level. For example, a −20 dBm signal at the IF Input will cause a readout display of −24.7 dBm.

(28) **DOWN CONVERTER Plug-In**—Contains the **rf** front end tuned to the specified channel frequencies. Converts the **rf** to the specified **if** with the aural **if** 5.5 MHz below the visual **if**.

Rear Panel (See Fig. 2-2)

(29) **AURAL INTERCARRIER IN**—A 50 Ω **bnc** input for an external 5.5 MHz **fm** (frequency modulation) drive signal.

(30) **AURAL INTERCARRIER OUT**—A 50 Ω **bnc** output for an external 5.5 MHz audio subcarrier.

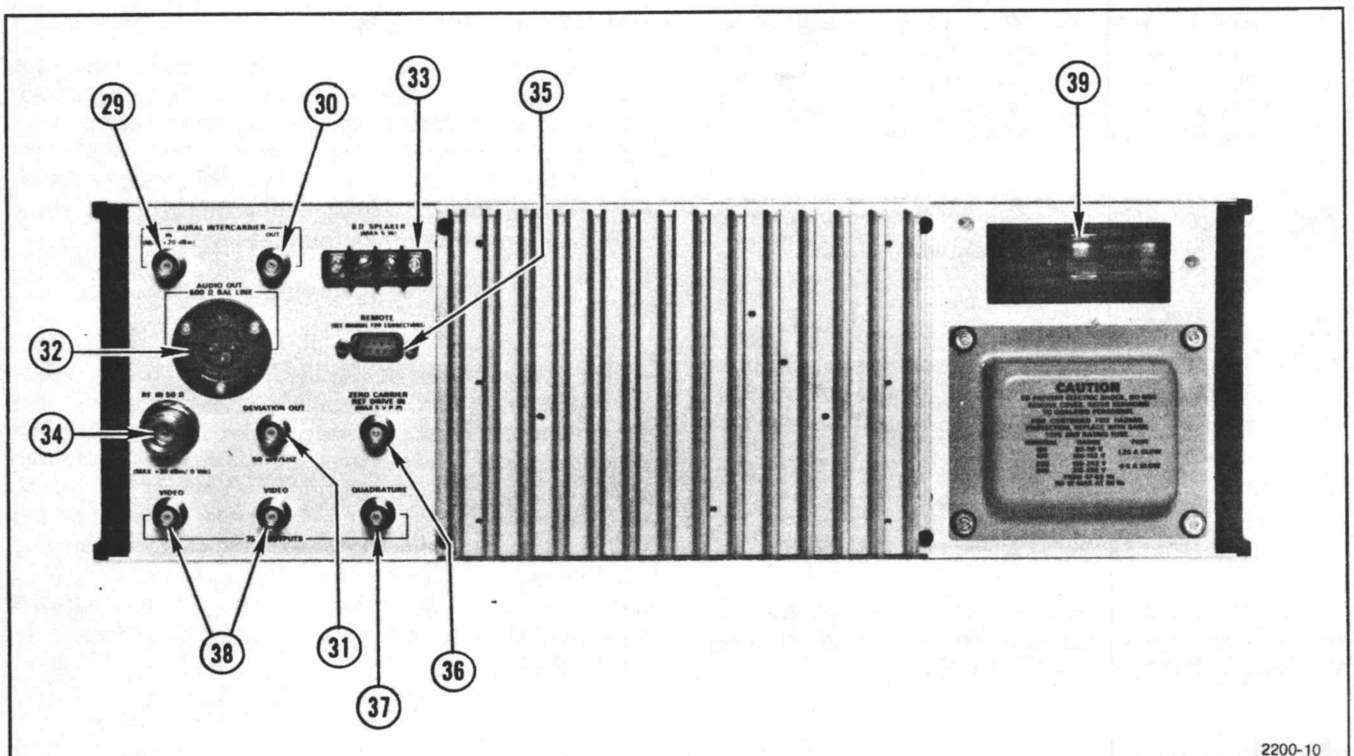


Fig. 2-2. Rear Panel Connectors.

(31) **DEVIATION OUT**—Audio directly out of the discriminator, calibrated for 50 mV peak/kHz deviation. A sine wave signal with ±25 kHz deviation produces a 2.5 V p-p output signal.

(32) **600 Ω BALANCED LINE**—600 Ω audio output. (XLR-3-14 male connector; mates with a Cannon XLR-3-11SC or equivalent.)

(33) **8 Ω SPEAKER**—A two-terminal barrier strip for connection of an 8 Ω speaker.

(34) **RF INPUT**—A 50 Ω input (N connector).

(35) **REMOTE**—A connector which supplies open and closed circuit contacts corresponding to a loss of carrier. These contacts can be used to drive a remote carrier-loss alarm. A remote envelope-detection mode switch line is also included.

(36) **ZERO CARRIER REF DRIVE INPUT**—Accepts a positive-going external Zero Carrier Reference pulse (from TEKTRONIX 1460).

(37) **QUADRATURE**—75 Ω output of the quadrature detector. This signal can be used in conjunction with the video output on a high-frequency XY monitor or a 1480-Series Waveform Monitor with an external phase graticule (Tektronix Part No. 331-0393-15) and low-pass filter to provide a vector presentation of the **rf** signal.

(38) **VIDEO OUTPUT**—Two 75 Ω **bnc** connectors provide the demodulator video.

(39) **POWER CONNECTOR/FUSE HOLDER**—Contains the power-cord receptacle, the fuse holder, and the line-voltage selector. Line-voltage selection is done via a plug-in circuit board.

USING THE DEMODULATOR

The 1450-2 Television Demodulator may be used for accurate transmitter measurements, and for monitoring and rebroadcast of broadcast signals.

Applying a Signal

The RF IN impedance to the 1450-2 is 50 Ω. At high frequencies, impedance mismatches between the RF IN and the signal source can cause reflections in the transmission line, and degrade instrument performance. To reduce mismatch, use good quality 50 Ω coaxial cable to connect the signal source to the RF IN, and keep the cable as short as possible to reduce cable losses.

The 1450-2 can be used with a 75 Ω signal source by using a 75 Ω-to-50 Ω minimum loss pad or matching transformer. If an antenna is used, its bandpass characteristics should be known.

Sensitivity and power levels are often rated in dBm (dB with reference to 1 mW, regardless of impedance). Sensitivity and power levels for 75 Ω systems are usually rated in dBmV (dB with reference to 1 mV across 75 Ω). Figure 2-3 gives a convenient chart for converting volts to dBm to watts. To convert dBm to dBmV, add 48.75 to dBm.

Signals fed to the 1450-2 should be between −69 dBm and −3 dBm. The front-panel 10 dB and 20 dB ATTENUATORS may be switched in to accept signals to +27 dBm. If signals larger than +27 dBm are encountered at transmitter test points, external pads should be inserted to bring the signal within the **agc** range.

Verifying the Demodulator

In the 1450-2, effects of the demodulation process are minimized and allowed for in the instrument specification. However, to improve the accuracy of some measurements it is useful to know how the demodulator affects a test signal. This information can be included in the evaluation of a demodulated signal to determine more precisely how the circuit under test is performing.

The demodulator may be verified by feeding a set of test signals through an **rf** modulator with known characteristics to the demodulator. To determine the demodulator characteristics, combine (normalize) the characteristics of the modulator with the output obtained from the demodulator, and compare the results with the input signal. If the modulator has negligible effect on the signal, a set of waveform photographs may be taken, and used as a record of the demodulator performance. Figure 2-4 shows a set of test-signal waveform photographs obtained from a typical 1450-2 driven by a good quality test modulator.

If a modulator is not available, the waveforms in Fig. 2-4 may be used to get an idea of how any 1450-2 is probably affecting the signal.

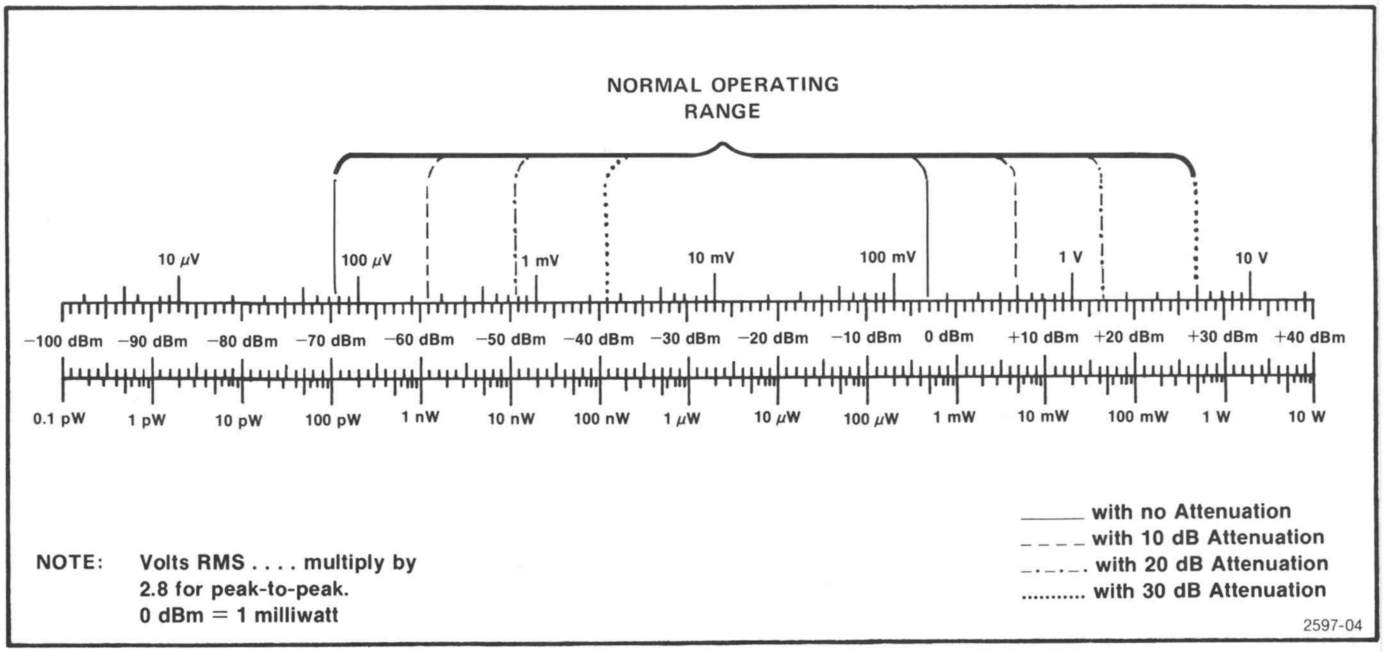


Fig. 2-3. Volts-dBm-Watts Conversion Chart for 50 Ω Impedance.

Monitoring and Rebroadcast

The 1450-2 may be used as an in-service transmitter demodulator to monitor VIT signals, either at the transmitter or at a remote site. It may also be used as a high-quality receiver for CATV or to pick up a network feed from another station for rebroadcast.

Typical 1450-2 control settings for the monitoring mode are:

DETECTION MODE	SYNCHRONOUS, BACK PORCH
SYNCHRONOUS TIME CONSTANT	NORM
SOUND TRAP	IN
INTERNAL ZERO CARRIER REF	ON
ATTENUATOR	As needed
Gain Control	BACK PORCH AGC
AGC SPEED	FAST for Rebroadcast, SLOW for Monitoring
AURAL ONLY	Out
AUDIO SOURCE	SPLIT (INTR to check Intercarrier buzz)
DE-EMPHASIS	IN

Synchronous detection will give the most accurate results; except in the special case where the transmitter has appreciable incidental carrier phase modulation (**icpm**) that cannot be corrected, and has been adjusted using envelope detection. In this case, envelope detection should also be used for monitoring. (**Icpm** is discussed later in this section.)

Measuring the Visual Transmitter

Most visual transmitter adjustments and measurements should be made with the demodulator in the synchronous detection mode and the wideband **if** filter selected. The visual transmitter envelope-delay pre-correction, and the aural transmitter should be off. Figure 2-6 shows some typical transmitter measurement points.

Typical 1450-2 control settings are:

DETECTION MODE	SYNCHRONOUS, BACK PORCH (ENV for phase and delay checks)
SYNCHRONOUS TIME CONSTANT	NORM
SOUND TRAP	OUT
INTERNAL ZERO CARRIER REF	ON
ATTENUATOR	As needed
Gain Control	BACK PORCH AGC
AURAL ONLY	Out

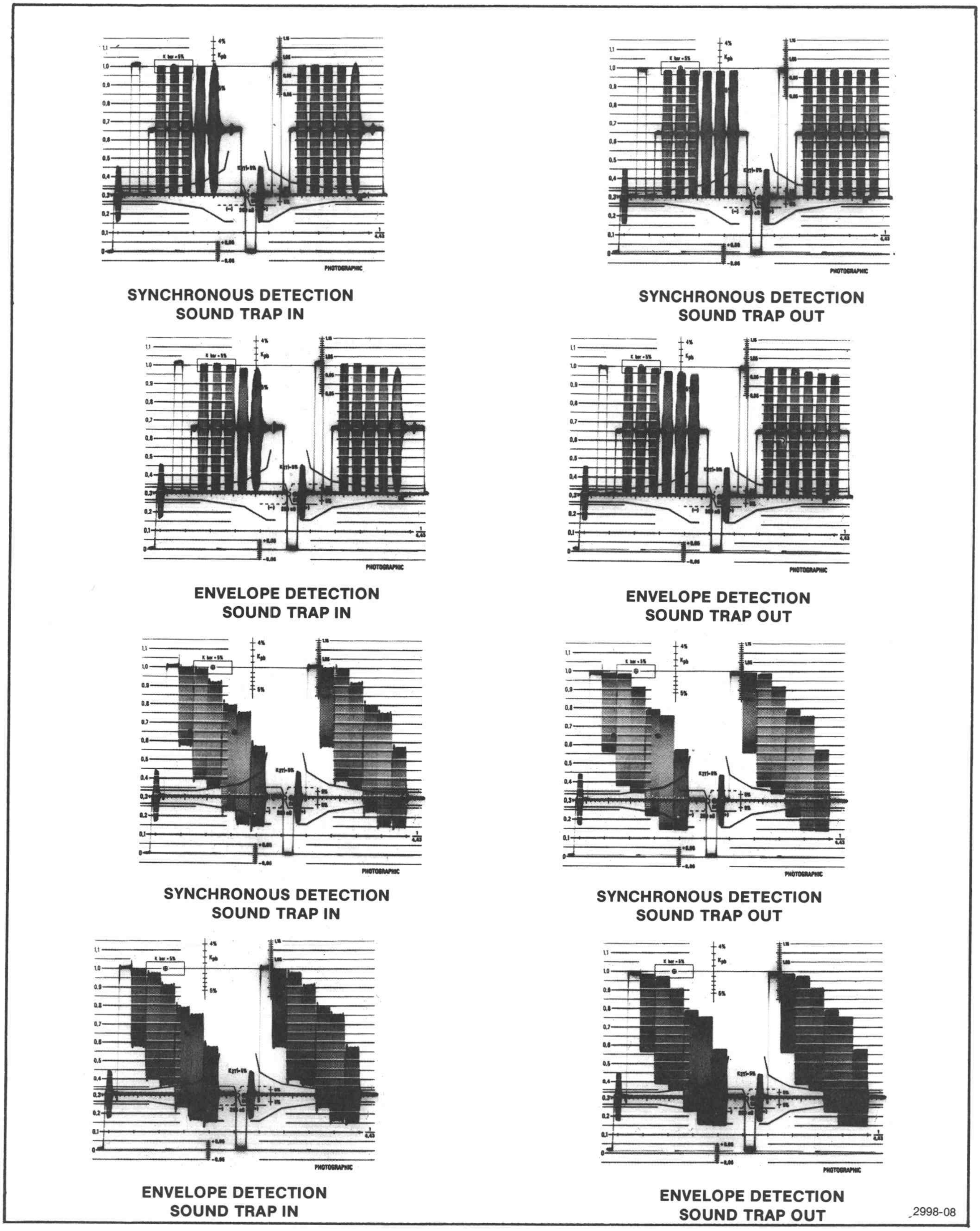
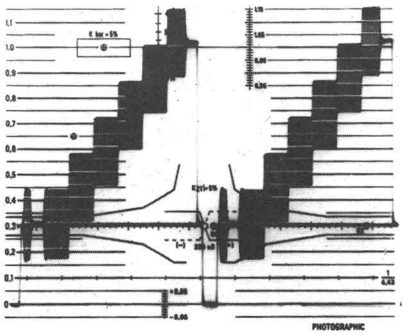
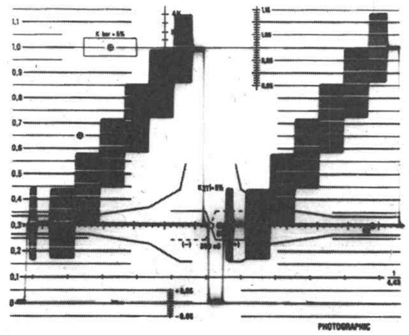


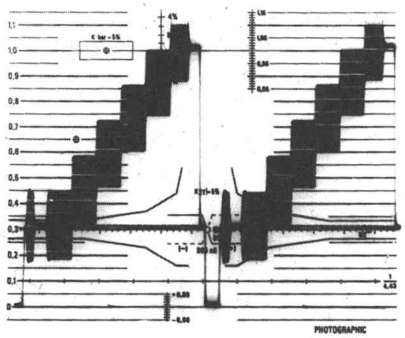
Fig. 2-4. 1450-2 Response to Typical Video Test Signals.



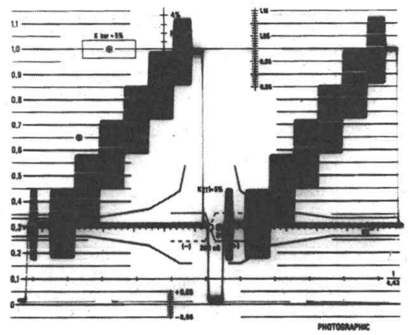
SYNCHRONOUS DETECTION
SOUND TRAP IN



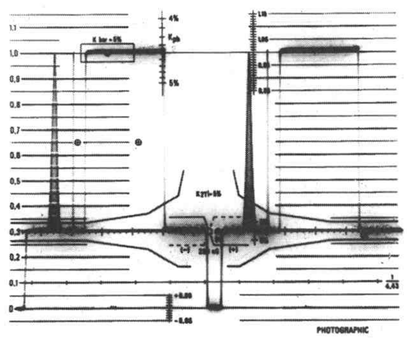
SYNCHRONOUS DETECTION
SOUND TRAP OUT



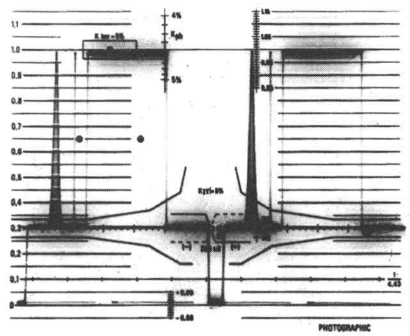
ENVELOPE DETECTION
SOUND TRAP IN



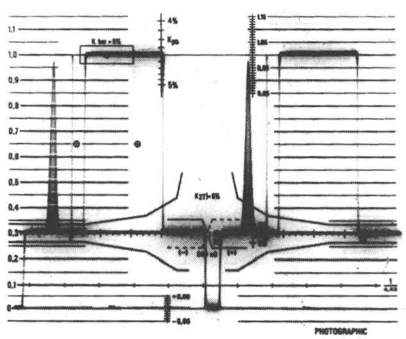
ENVELOPE DETECTION
SOUND TRAP OUT



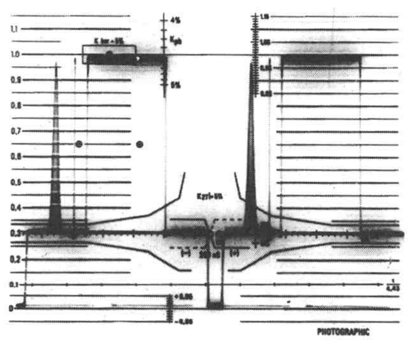
SYNCHRONOUS DETECTION
SOUND TRAP IN



SYNCHRONOUS DETECTION
SOUND TRAP OUT



ENVELOPE DETECTION
SOUND TRAP IN



ENVELOPE DETECTION
SOUND TRAP OUT

2998-09

Fig. 2-5. 1450-2 Response to Typical Video Test Signals.

Differential phase, burst-to-subcarrier phase, and envelope delay should be measured in the envelope detection mode, and then verified with synchronous detection. Any differences observed when switching between the envelope and synchronous modes are indications of incidental carrier phase modulation (**icpm**). If the **icpm** cannot be corrected, adjust the transmitter using the envelope detector for these measurements. This should result in the best picture on a typical home receiver.

Incidental Carrier Phase Modulation. Icpm is a change in carrier phase with a signal level change. This shows up as apparent differences between measurements made in synchronous and envelope detection modes. Differential phase, Color Bar phase errors, low-frequency delay, and other test-signal errors are affected. On home receivers, with envelope detectors, the picture will be unaffected if the visual transmitter has been adjusted using envelope detection when there is appreciable **icpm**. However, the **icpm** can show up in the home receiver's audio as intercarrier buzz.

Icpm can have many sources. The following changes with signal level are some of the sources: input impedance and other changes in linear amplifiers, carrier feed-through, and electrical-length changes in **uhf** klystron and traveling-wave tubes.

With the 1450-2 in the SYNCHRONOUS DETECTION MODE, a very useful polar coordinate display can be created to measure **icpm**. Using an XY monitor, or an oscilloscope or waveform monitor with an external horizontal input, the in-phase VIDEO OUT signal is applied to the vertical input (as usual), and the QUADRATURE OUT signal is applied to the horizontal input. Figure 2-7 shows typical **icpm** test setups.

Use an unmodulated, 700 mV, 10-step staircase or ramp as the test signal. The SYNC TIP DETECTION MODE will cause the sync tip to line up with the zero-carrier reference pulse at 0 degrees. If no **icpm** is present on the carrier, the display between sync and zero carrier will line up on the vertical axis. If **icpm** is present, the display will tilt. The amount of **icpm** can be found by measuring the angle of the tilt from the vertical axis. Find the point of maximum tilt, and measure the amount of deflection horizontally and vertically from the zero-carrier reference pulse. Calculate the amount of **icpm** using the formula:

ICPM (in degrees) = arctan (horizontal deflection/vertical deflection)

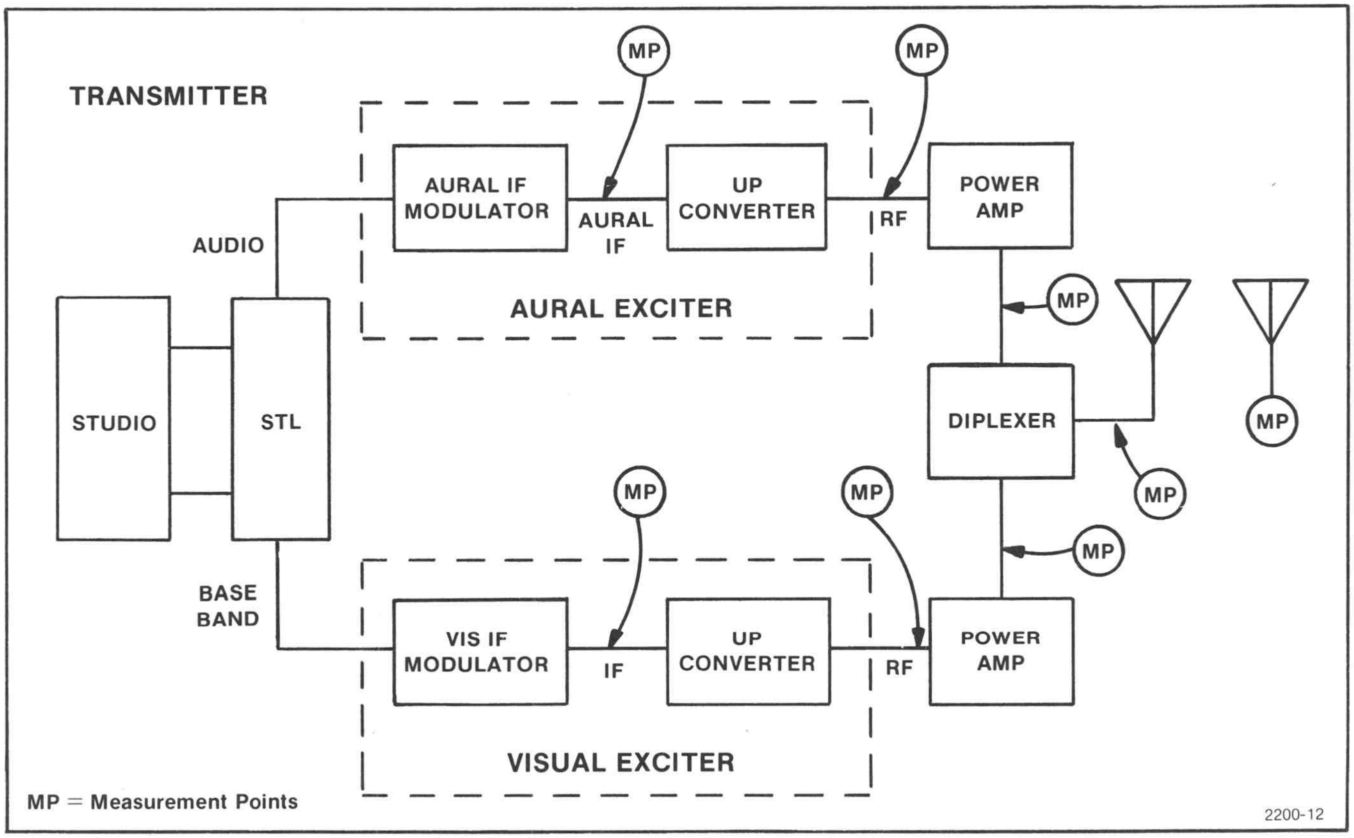


Fig. 2-6. Typical Transmitter Measurement Points.

EXAMPLE: An oscilloscope set up for XY operation gives the display shown in Fig. 2-8. The back porch of a 10-step staircase signal is the maximum point of tilt from the center (0 degree line). The vertical amplifier is set for 0.2 V/div, and the horizontal amplifier is set for 20 mV/div. The back porch is located 4.5 vertical divisions and 2 horizontal divisions from the zero-carrier reference pulse. Find the amount of **icpm**.

SOLUTION: Vertical deflection = 0.2 V/div X 4.5 div = 900 mV

Horizontal deflection = 20 mV/div X 2 div = 40 mV

ICPM = arctan (40 mV/900 mV)
= arctan 0.0444
= 2.5 degrees

For all but very clean test signals, a low-pass filter in both the horizontal and vertical channels will be helpful in reducing clutter on the display. A filter designed for this purpose is available from Tektronix, Inc. (Tektronix Part No. 015-0352-00). Figure 2-9 shows the effect of low-pass filtering on a typical test signal.

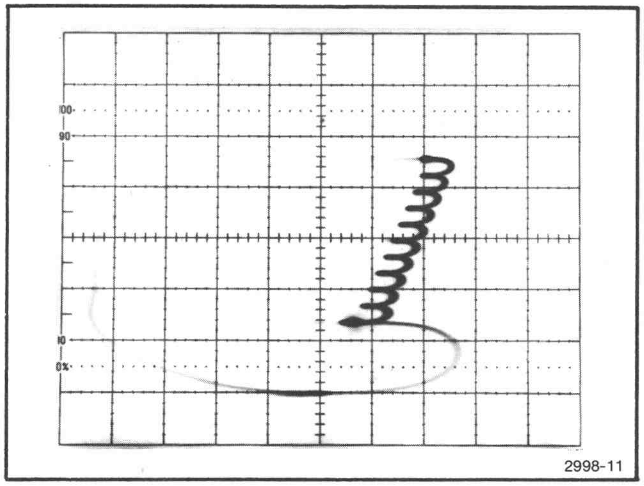


Fig. 2-8. Incidental Carrier Phase Modulation Example.

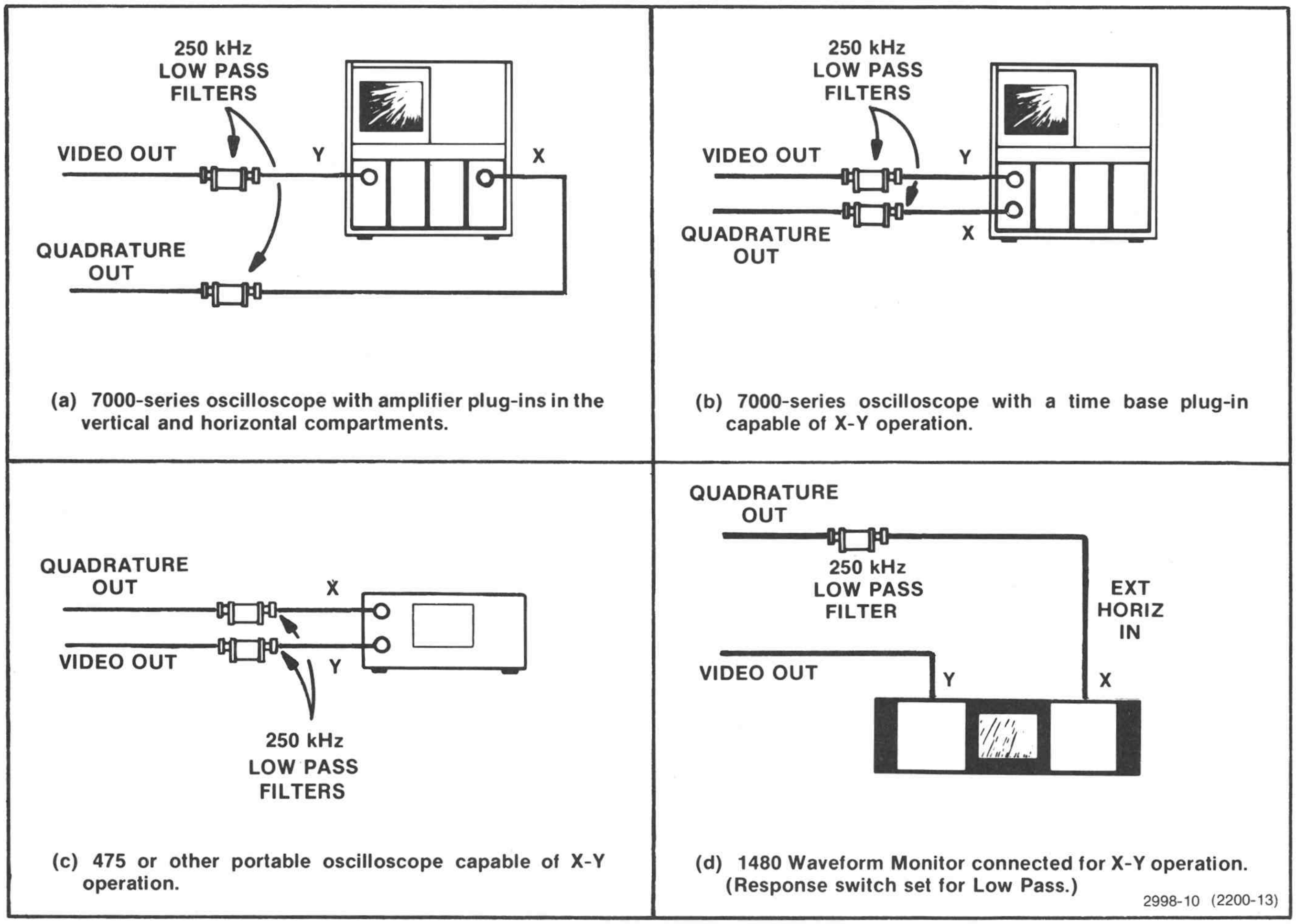


Fig. 2-7. Incidental Carrier Phase Modulation Measurement Setups.

An external graticule (Tektronix Part No. 331-0393-15) for the TEKTRONIX 1480-Series Waveform Monitor has been developed to measure **icpm**. (See Fig. 2-10.) To use this graticule, connect the QUADRATURE OUT through a 250 kHz low-pass filter to the 1480-Series External Horizontal input, and the VIDEO OUT directly to a vertical input. Set the 1480-Series for Low-Pass Response, appropriate vertical input channel, 1.0 Volts Full Scale, X25 Magnifier, and Ext Horizontal.

NOTE

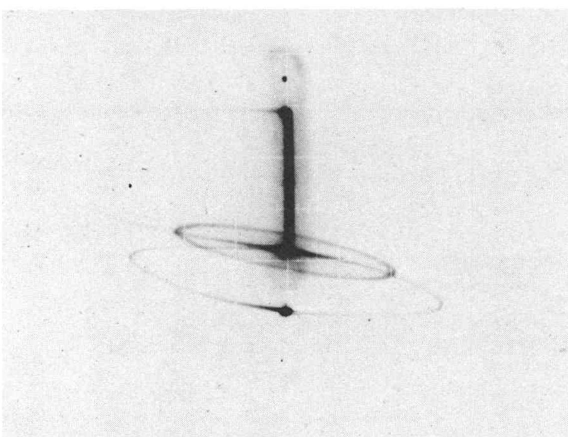
TEKTRONIX 1480-Series Waveform Monitors are shipped from the factory with the Ext Horizontal function disabled to prevent accidental **crt** *burns. Qualified service personnel should consult the 1480-Series Instruction manual or contact their local Tektronix Field Office for information on connecting the 1480-Series for External Horizontal operation.*

Position the zero-carrier reference pulse (top of the displayed signal) to the location marked on the graticule. The graticule is calibrated for 2 degrees per radial division when the Magnifier is set for X25, and 1 degree per division with X50 magnification. Measure any **icpm** directly from the graticule.

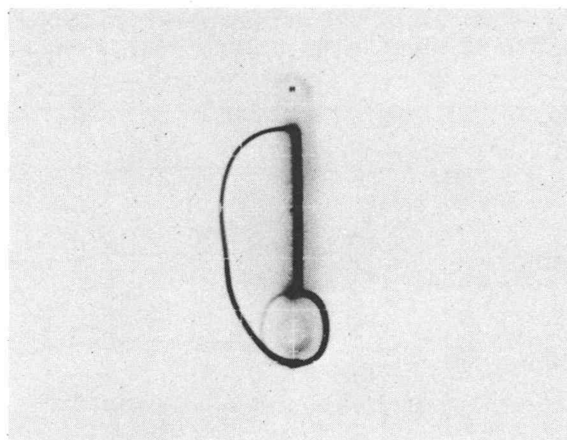
TEKTRONIX 465/475 portable oscilloscopes and 7000-Series oscilloscopes with appropriate plug-ins both make very good XY displays. Low-pass filters should be installed in both the horizontal and vertical inputs with these oscilloscopes. Consult the appropriate instruction manual for information on XY operation.

Visual Transmitter Precorrection

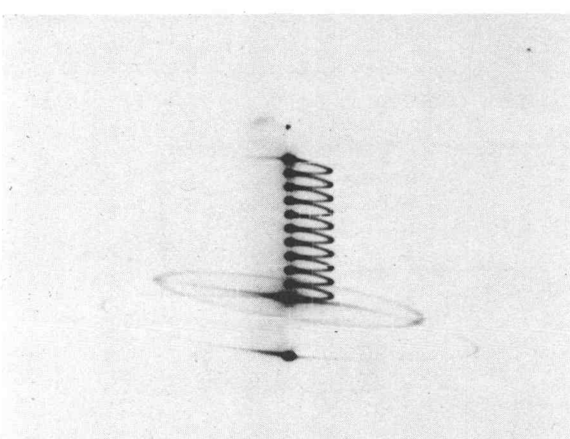
The 1450-2 may be used with the TEKTRONIX 1460 Automatic Video Corrector in a loop around the transmitter for automatic transmitter precorrection.



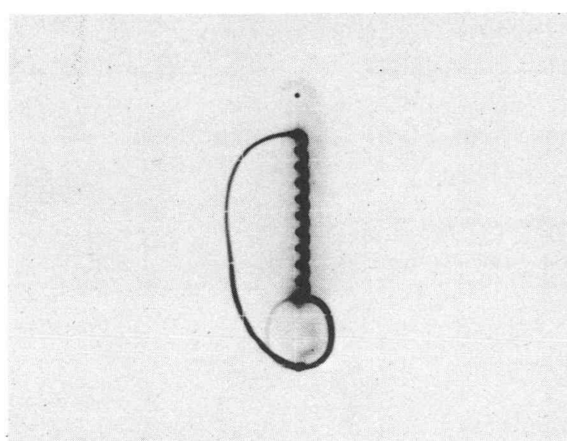
(a) Ramp without filters.



(b) Ramp with filters.



(c) 10 step staircase without filters.



(d) 10 step staircase with filters.

2998-12

Fig. 2-9. Effect of Low Pass Filters on Incidental Carrier Phase Modulation Measurements.

Refer to the 1460 Instruction manual for further information about precorrection.

NOTE

The 1450-2 requires a positive-going External Zero-Carrier Reference Pulse. The TEKTRONIX 1460 is factory-set with a negative-going pulse. A qualified service technician should refer to the Installation and Programming section in the 1460 Instruction manual for information regarding changing the Zero-Carrier Reference Pulse polarity.

Measuring the Aural Transmitter

The 1450-2 has a high-quality audio section. Both split- and intercarrier-sound systems are used. An external AURAL INTERCARRIER IN is also available.

The SPLIT sound mode uses a reference oscillator at the picture-carrier frequency to beat with the aural **if**, producing the 5.5 MHz intercarrier frequency. This results in very clean audio from the demodulator.

The INTR (Intercarrier) AUDIO SOURCE uses the picture carrier, which has been limited, to beat with the aural **if**. Any **fm** or **pm** in the picture signal will show up in the audio in this mode.

Out-of-service aural transmitter measurements and adjustments may be performed using the AURAL ONLY mode. This mode locks the 1450-2 to the aural carrier when the visual carrier is off.

Typical 1450-2 control settings for the AURAL ONLY mode are:

ATTENUATOR	As needed
Gain Control	MAN
GAIN	Set for about 0 dBm (0.6 V p-p into 50 Ω) signal at AURAL INTERCARRIER OUT
AURAL ONLY	In
AUDIO SOURCE	SPLIT
DE-EMPHASIS	OUT (except when testing Pre-emphasis)
AUDIO LEVEL	As needed

The rear-panel DEVIATION OUTPUT is calibrated to 50 mV/kHz. This signal is useful for checking deviation output on an oscilloscope. Figure 2-11 shows a waveform photograph of the DEVIATION OUTPUT signal with 25 kHz deviation.

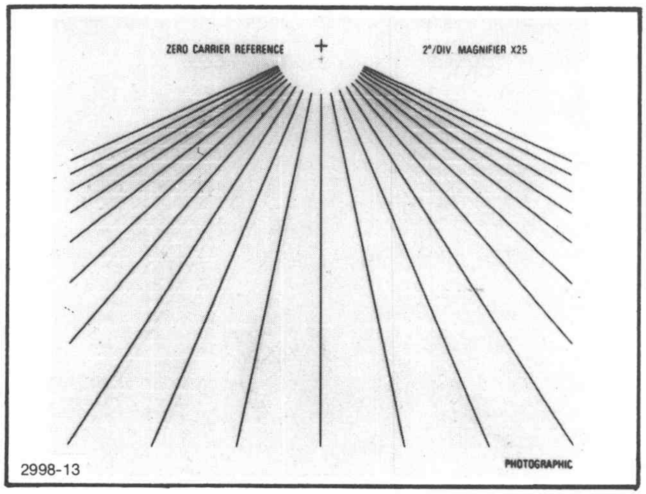


Fig. 2-10. External Phase Graticule for TEKTRONIX 1480-Series Waveform Monitors.

INSTALLATION

Shipping Carton

At installation time, save the shipping carton and packing materials for repackaging in case reshipment becomes necessary.

ELECTRICAL INSTALLATION

Down Converter

Slide the TDC (Television Down Converter) for the desired channel into the slot in the 1450-2 mainframe. Be sure that the TDC is firmly seated; then secure it in place with the two thumbscrews.

Using the 50 Ω **bnc** and sma cables from the accessories kit, connect the **rf** and **if** signal lines between the mainframe and the TDC. The SMA connectors should be screwed down at least finger tight.

Power Source

This instrument is intended to operate from a single-phase power source having one of its current-carrying conductors at or near earth ground (the neutral conductor). Only the Line conductor is fused for over-current protection. Systems that have both current-carrying conductors live with respect to ground (such as phase-to-phase on multi-phase systems) are not recommended power sources.

Mains Frequency and Voltage Ranges

The 1450-2 operates over a frequency range of 48 to 62 Hz, and at nominal mains voltages of 100 Vac, 120 Vac, 220 Vac, or 240 Vac.

A rear-panel voltage selector eases selection of any of these nominal voltages.

WARNING

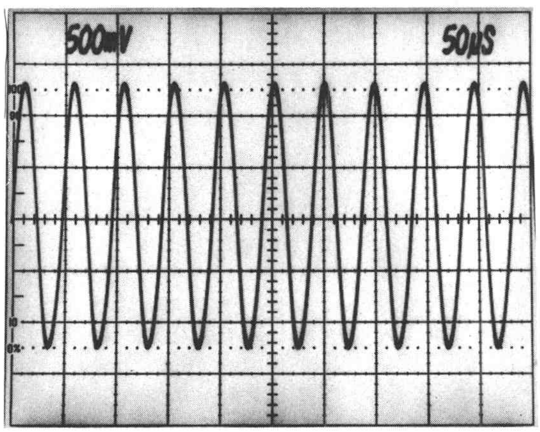
When changing to 220 Vac or 240 Vac operation, use a power cable with appropriate voltage ratings (i.e., Tektronix Part No. 161-0066-01).

Mains Conversion

Mains voltage selection is accomplished by means of a small circuit board in the power connector-fuse holder assembly on the rear panel. See Fig. 2-12.

To change mains voltage ranges, remove the power cord, open the cover, and pull the fuse lever down.

Insert a pointed tool in the hole at the edge of the voltage-change board and gently pull out of the holder.



2998-14

Fig. 2-11. Measuring Deviation on an Oscilloscope.

Remote Connections

The REMOTE connector on the rear panel may be wired for remote selection of the envelope detection mode, and for an external carrier-loss alarm. See Fig. 2-13 for the pin locations of the REMOTE connector.

Remote Envelope Switch. Some measurements require that the demodulator be switched between the envelope and synchronous detection modes. If other measuring equipment is located away from the demodulator, it may be useful to have an external envelope/synchronous switch. This can be accomplished by setting the demodulator for the synchronous mode, and connecting an external switch between pin 6 of the REMOTE connector and ground. Grounding pin 6 will put the 1450-2 in the envelope mode.

Remote Carrier Loss Alarm. The demodulator can be used to activate an alarm circuit that will indicate the loss of a transmitter carrier. A **spdt** relay inside the 1450-2 switches when either the visual or aural carrier is missing. The relay contacts are wired to the REMOTE connector, as shown in Fig. 2-13. Pins 8 and 9 close for an alarm, and pins 7 and 8 are open for an alarm. The relay contacts are rated for maximums of 28 volts and 3 amperes.

The relay is energized with normal operation. Therefore, the alarm will also indicate that the instrument power has been shut off inadvertently, or that the mains power has failed (assuming an independent power source for the alarm).

Wiring the REMOTE Connector. To wire the external REMOTE connector, the connector must first be disassembled. See Fig. 2-14. Back the hold-down screws into the clamps about three turns (enough to clear the connector body plate). Remove the clamps. Separate the connector body and hood. Feed the wires through the neck of the hood and solder to the appropriate pins on the connector body. Fit the hood over the connector body and replace the clamps. Tighten the neck screws on the hood for a firm fit around the wire cable. Attach the assembled connector to the rear-panel REMOTE connector, and screw in the hold-down screws through the clamps and into the rear-panel standoffs.

MECHANICAL INSTALLATION

Latching

The 1450-2 incorporates a spring-latch design built into the rack handle. To release, grasp the handles, press the latch knobs toward the center of the instrument, and pull the 1450-2 forward. To re-latch, push the 1450-2 in until the spring-latches catch.

Thumbscrews

If additional latch strength is needed, the front castings have mounting holes for thumbscrew hold-downs (not supplied with the 1450-2). To gain access to these mounting holes, remove the cover plates under each handle by removing the two screws holding each assembly on. Remove the cover plates and reinstall the handles with these same screws. See Fig. 2-15 for mounting hole details.

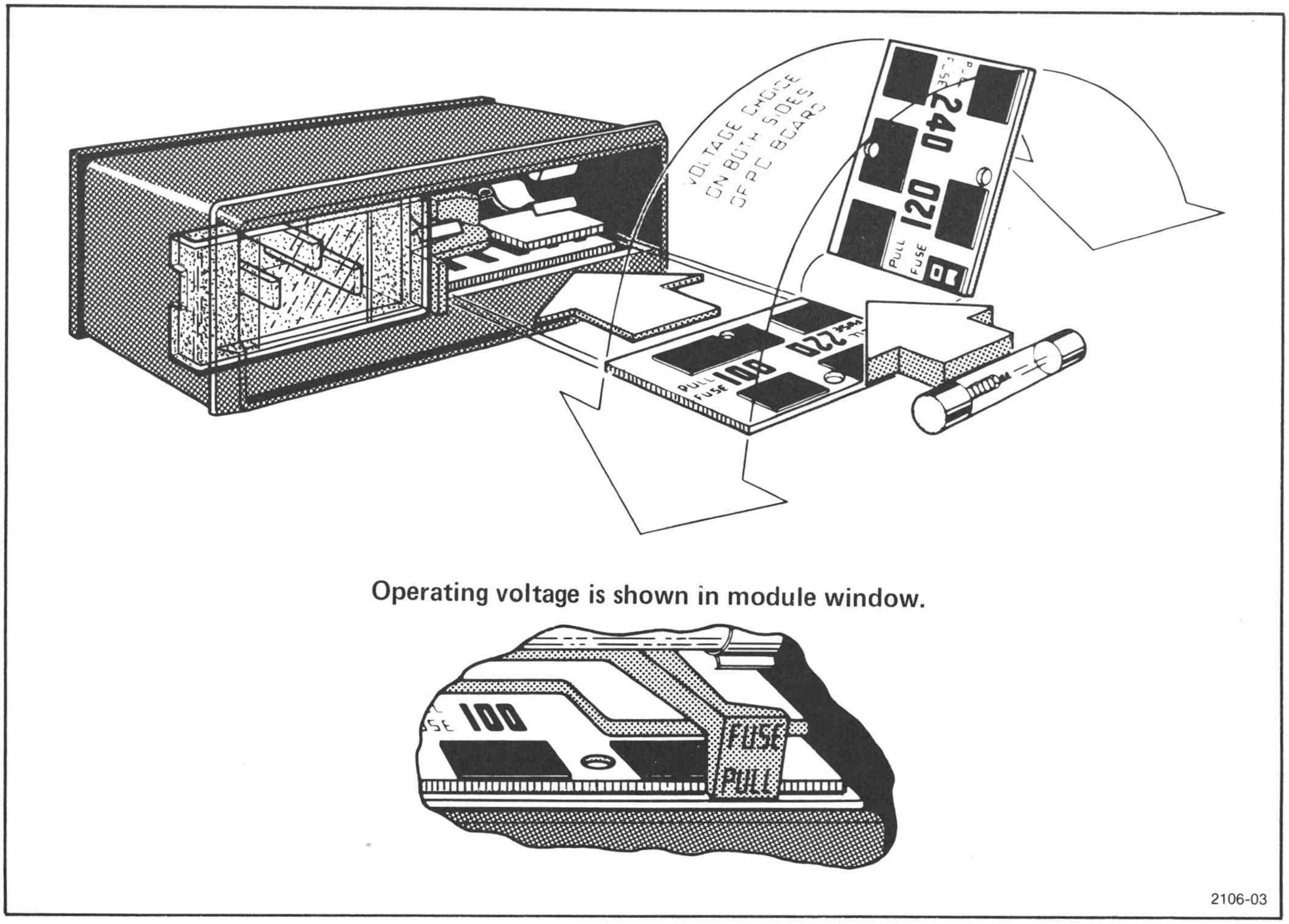


Fig. 2-12. Changing Mains Voltage.

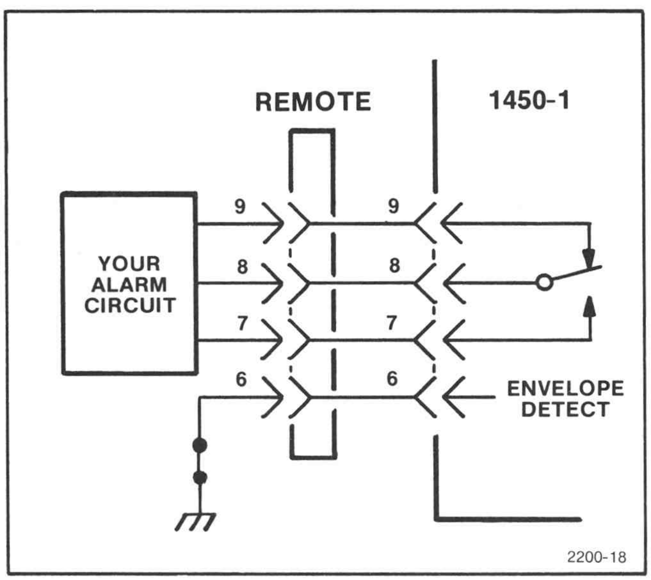


Fig. 2-13. REMOTE Connector Wiring.

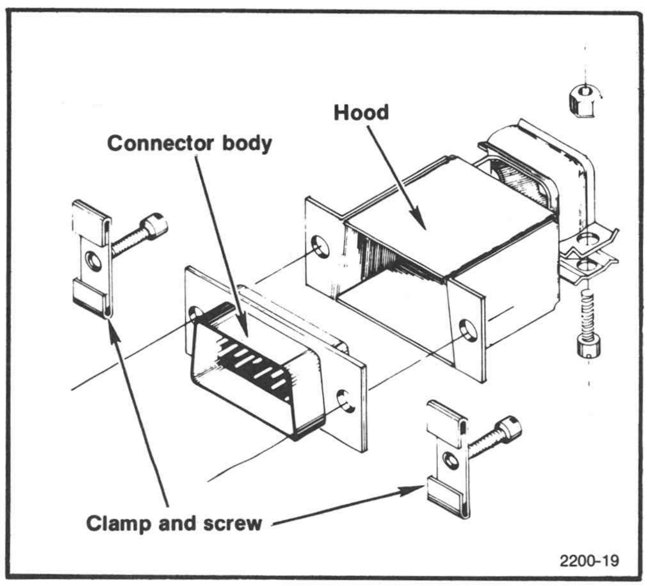


Fig. 2-14. REMOTE Connector Exploded View.

NOTE

Because of the spring-latch feature, the 1450-2 cannot be racked in already installed stationary slide sections unless thumbscrew hold-downs are used. The slide tracks supplied with the 1450-2 are required to accommodate the spring latches. The new slides provide a cut-out in the stationary section to catch the shoulder of the spring-latch. See Fig. 2-16.

Rackmounting

The 1450-2 will fit most commercial consoles and 19-inch wide racks whose rail holes conform to universal spacing. See Fig. 2-15 for hole spacing details.

Allow at least two inches of clearance between the 1450-2 rear panel and the rack enclosure to ensure an adequate supply of cooling air.

The slide-out tracks mount easily to the rack front and rear vertical mounting rails if the inside distance between the rails is within 10 1/2 to 24 1/2 inches.

If the tracks are going to be installed in a rack whose inside dimension is not within 10 1/2 and 24 1/2 inches, some means of support (for example, extensions to the rear mounting brackets) is needed for the rear ends of the slide-out tracks.

The 1450-2 is 5 1/4 inches high, a multiple of 1.75 inches (the standard rack spacing). As long as the 1450-2 is positioned in the rack some multiple of 1.75 inches from the bottom or top, all the holes should line up and no drilling will be necessary.

The dimensions of the opening between front rack rails must be at least 17 5/8 inches. The front lip of the stationary-track section mounts in front of the rail. Use bar nuts behind untapped front rails. The front lip of the stationary-track section must mount in front of the front rail to allow the 1450-2 spring-latch to function properly.

The slide-out tracks consist of two assemblies, one for each side of the instrument. Each assembly consists of three sections. See Fig. 2-17. The stationary section of each track attaches to rack rails as illustrated in Fig. 2-18.

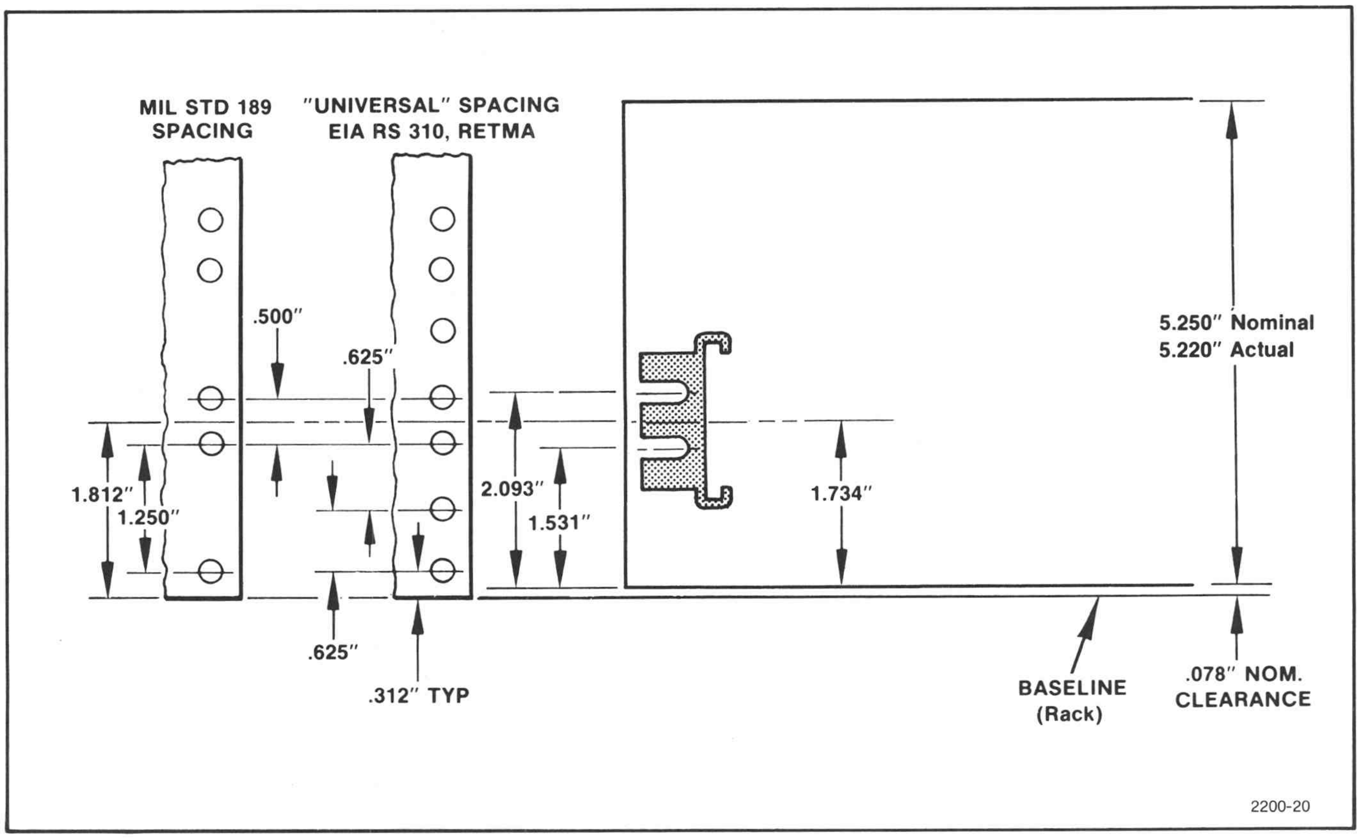


Fig. 2-15. Rackmount Hole Spacing.

The chassis section mounts on the instrument and is installed at the factory. The intermediate section fits between the other two sections, allowing the instrument to be fully extended out of the rack.

The stationary and intermediate sections for both sides are shipped as a matched set and should not be separated. The package includes matched sets for both sides, and mounting hardware. To identify the assemblies, note that the automatic latch and intermediate-section stop are located near the top of the matched sets when properly mated to the chasses sections.

To mount the instrument in a rack, select the appropriate holes in the rack rail, using Fig. 2-15 as a guide.

Mount the stationary-track sections to the rear rails, using one of the methods in Fig. 2-18. Note that the rear mounting bracket can be installed to fit either a deep or shallow cabinet rack.

Mount the stationary-track sections to the rear rails, using one of the methods in Fig. 2-17. Note that the rear mounting bracket can be installed to fit either a deep or shallow cabinet rack.

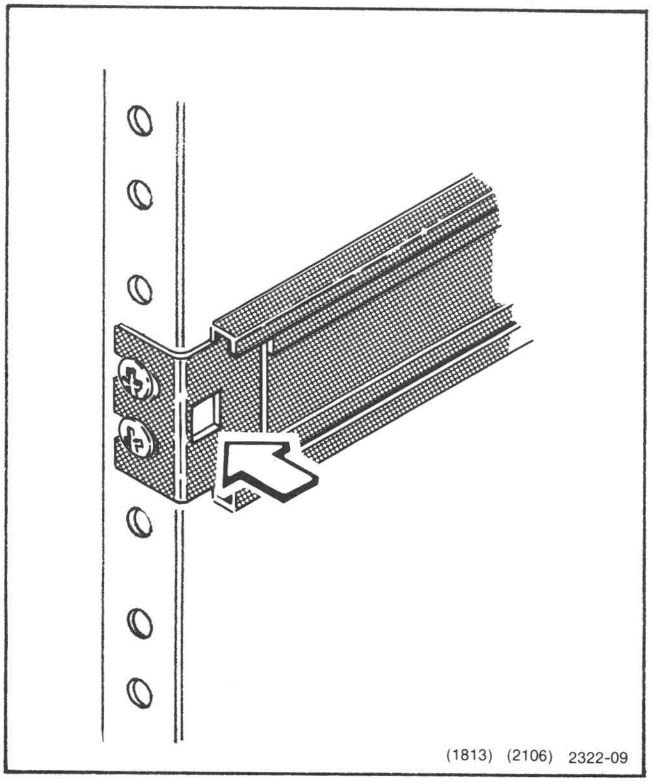


Fig. 2-16. Spring Latch Catch (Rackmounting).

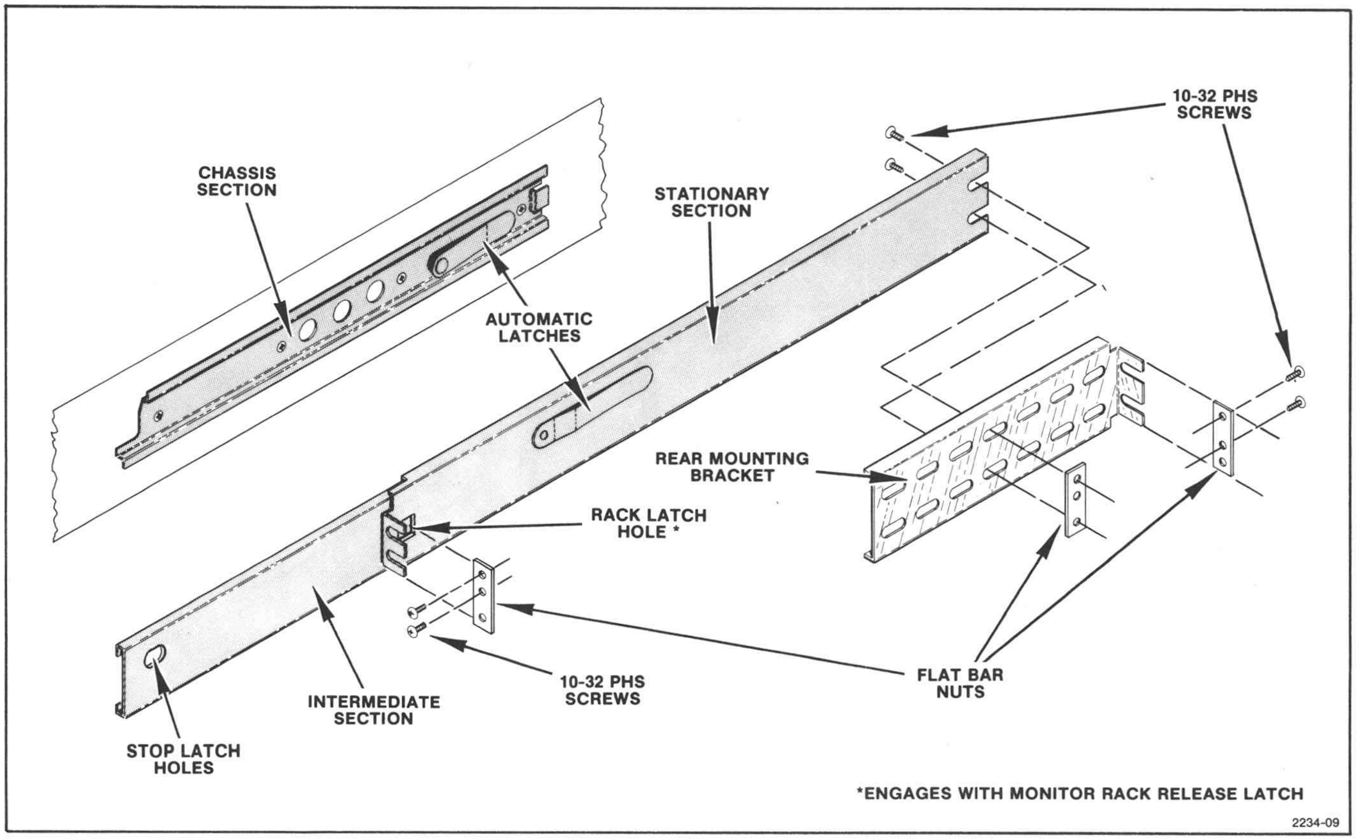


Fig. 2-17. Rackmounting Hardware.

After mounting the instrument in the slide-out tracks, adjust for proper width by loosening the front screws and allowing the slides to seek the proper width. Be sure that the instrument is centered, and re-tighten the screws.

When the instrument is pushed into the rack, an automatic spring-latch engages the back of the front rack rail to hold the instrument in place. To extend the instrument out of the rack, just press in the spring latch on each handle and pull the instrument out.

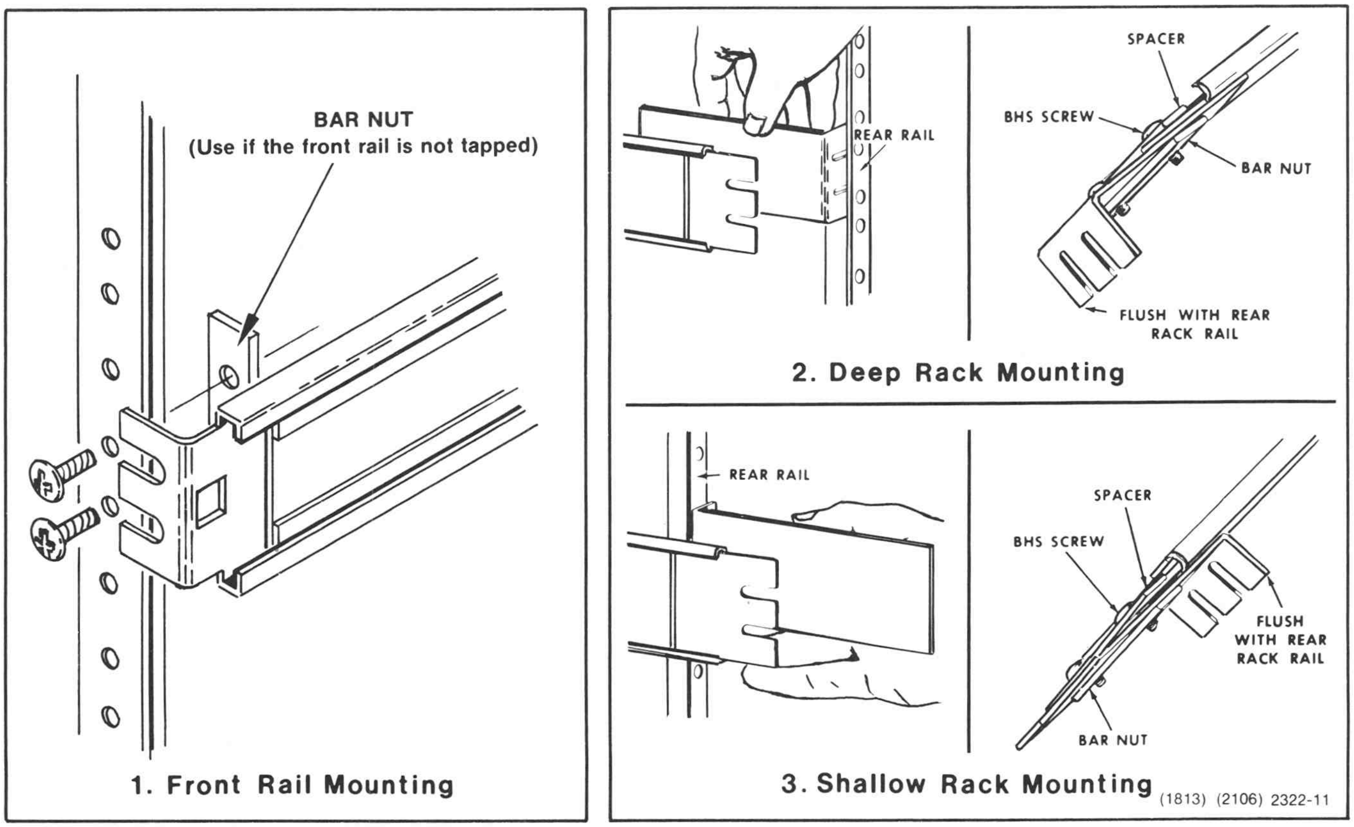


Fig. 2-18. Mounting Stationary Rackmount Sections.

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.

Part II

SERVICE INFORMATION

THEORY OF OPERATION

GENERAL CIRCUIT DESCRIPTION

Introduction

The 1450-2 is a television demodulator that converts the picture and sound carriers at an intermediate frequency (**if**) to baseband video and audio signals. The demodulator is basically a multiple conversion superheterodyne television receiver. Figure 3-1 shows a simple block diagram.

A plug-in front end down converter is used to convert the radio frequency (**rf**) input signal to the first **if**. Most gain control and amplification occurs in the down converter and first **if** stages. The second **if** provides precise Nyquist slope filtering, using Surface Acoustic Wave (SAW) devices, provides the sound **if** pick off, and establishes the zero-carrier reference level for the picture signal.

The video detector is a product detector that may be used as either an envelope detector or a synchronous detector, depending on the source of the local oscillator (**lo**) signal driving it. A quadrature video detector provides an output that can be used to make transmitter incidental carrier-phase modulation measurements in SYNC TIP (SYNCHRONOUS DETECTION MODE).

The audio section uses a pulse count discriminator to linearly convert the frequency modulation (**fm**) sound signal to low-distortion audio. Both Intercarrier and Split sound modes are provided by selection of the local oscillator (**lo**) source to the first audio mixer.

The phase-lock section produces a temperature-compensated **if** reference frequency, a phase-locked **lo** source for the **if** mixer, and **lo** sources for the aural mixer and the video detector.

The automatic gain control (**agc**) section samples the level of the video output signal, and generates a digital control signal to address read only memories (rom) that are programmed to operate **p.i.n.** (positive doped-intrinsic-negative doped) diode attenuators in the down converter and first **if** stages. A fine **agc** is also provided. The digital signal also controls the front-panel LED readout to indicate the input power.

RF SECTION

RF input signal levels from −65 dBm to −3 dBm can be fed to the input. For stronger signals, an attenuator in the mainframe extends the maximum input range (in 10 dB steps) to +27 dBm. The attenuator is a slab-line, thickfilm device which, in addition to attenuation, provides a broadband 50 Ω load for the incoming signal and a 50 Ω source for the filter that follows.

From the input attenuator, the signal goes to a front-panel connector where it is patched to the RF Input of the down converter. The output of the down converter at the **if** is similarly patched back to the mainframe front panel.

IF SECTION

First IF

The intermediate frequency (**if**) of the down converter and mainframe is 38.9 MHz (Option 2 IF). This frequency corresponds to the most popular **if** for transmitters, and allows the 1450-2 to be used for testing the **if** output of **if** modulated transmitters.

The signal at the first **if** goes through four amplifier stages, two gain control attenuators, and two bandpass filters. The amplifiers are operated at constant gain while the signal level is varied by **p.i.n.** diode attenuators controlled by the gain-control section. The bandpass filters help reject unwanted signals while providing flat frequency-response across the frist **if** passband.

22 MHz IF

The **IF** signal is converted to about 22 MHz. The **IF** converter mixer is a conventional ring-diode mixer, with care taken to minimize feedthrough. Typically, the unwanted feedthrough is 60 dB down from the desired output signal.

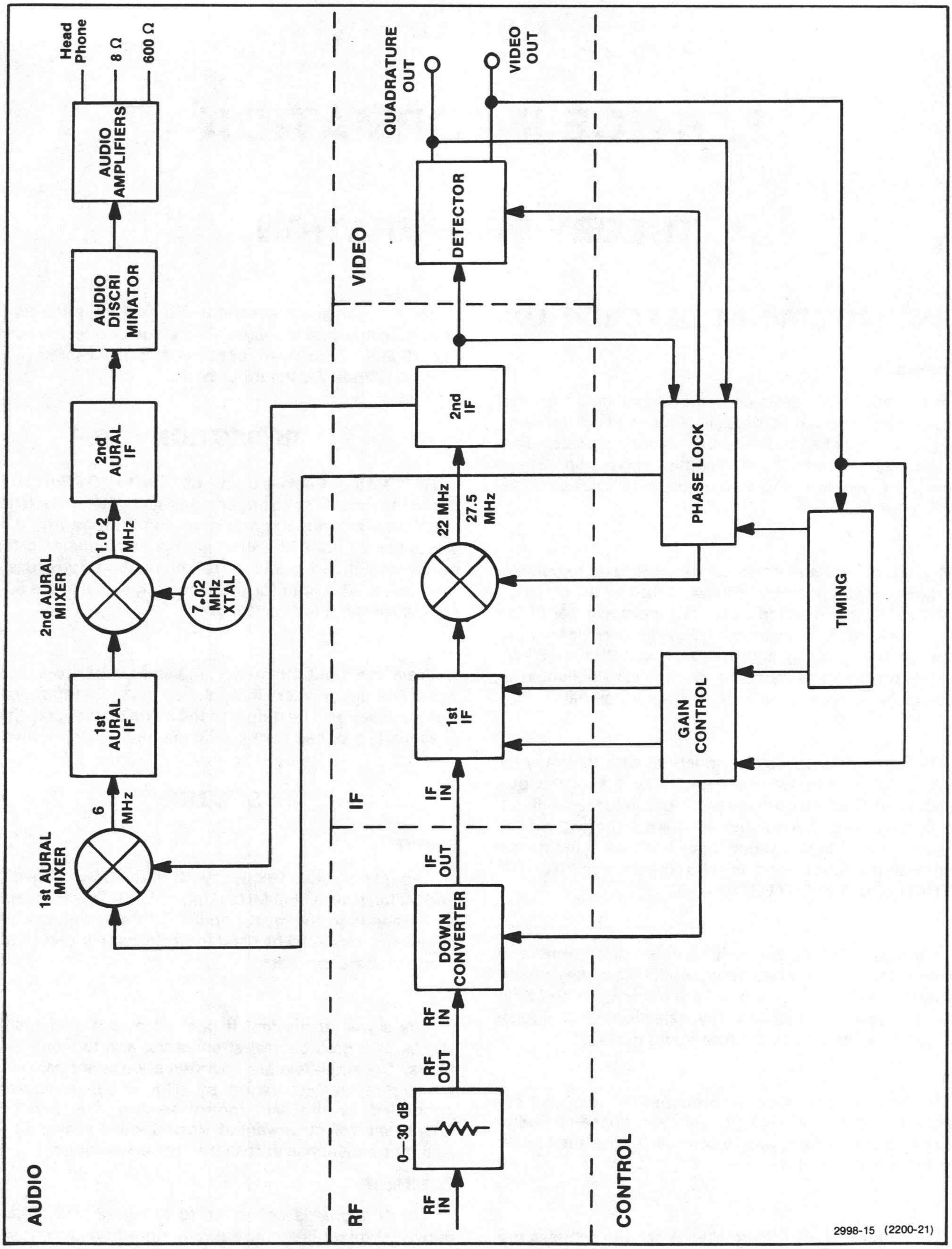


Fig. 3-1. Simplified Block Diagram.

The 22 MHz signal is filtered to remove extraneous mixer-output signals, and then goes to the SAW (Surface Acoustic Wave) filter preamplifier, and to a pick-off amplifier to provide the Aural IF signal.

SAW Filter

The 1450-2 uses SAW filters to obtain the precise Nyquist slope characteristics. Two SAW filters are used in the **if** chain. A wide band unit is used for making out-of-service measurements with only the transmitter visual carrier on. A narrow band unit (which attenuates the aural carrier by greater than 55 dB) is used for making in-service measurements with the aural carrier on.

SAW filters offer several advantages over discrete-component designs. The desired bandpass characteristics are more easily achieved. The conventional all-pass sections required to correct the group envelope delay problems of an LC filter are not required since the SAW design allows independent control of amplitude and phase characteristics. The filter requires much less space. There are no calibration adjustments. Characteristics of the filters do not change with mechanical or thermal shock.

While relative response characteristics remain constant with changes in temperature, the absolute frequency does not. A SAW filter is also difficult to drive. It requires low driving- and load-impedances ($\approx 10\ \Omega$) and has an insertion loss of about 30 dB. This insertion loss, and the fact that the ultimate out-of-band rejection desired is greater than 60 dB, means that at least 90 dB of isolation between input and output is required to achieve the desired performance.

The temperature-induced change in operating point is compensated for by placing a temperature sensor near the filter to generate a correcting signal that shifts the 22 MHz **if** frequency to track the filter. Extensive shielding at the input and output of the filter eliminates the undesired coupling. The 30 dB insertion loss requires that the SAW filter preamplifier be extremely linear to drive the SAW filter with a high-level, intermodulation-free signal; and the post amplifier must have relatively low noise to prevent degrading the signal-to-noise ratio.

Zero Carrier Switch

The zero-carrier reference level is established by opening the 22 MHz **if** signal path with a diode switch during the zero-carrier pulse time. This causes the carrier to be reduced by at least 50 dB, allowing a very accurate zero-carrier reference.

Synchronous Detector

The synchronous detector consists of two product detectors—one supplying the video output, the other the quadrature output. The **if** signal to the video detector passes through a delay line of approximately 10 ns, which corresponds to 90 degrees of the 22 MHz **if** frequency. The **if** signal to the quadrature detector, on the other hand, passes through a bandpass filter which has the same 10 ns of delay at 22 MHz, but introduces no phase shift of the **if** carrier. Thus, two signals in time coherence but phase quadrature are produced to be detected by the product detectors.

The detector/amplifier combinations have a stringent stability requirement because the quadrature output is the control signal for the phase lock. Any errors in that signal, such as those caused by thermal drift, will cause the phase coherence between the **if** signal and the reference local oscillator (**lo**) to be in error. Since accurate phase measurements must be made and good transient response maintained, the phase error cannot be allowed to exceed 1 degree. This means the quiescent output of the quadrature detector/amplifier combination must not change by more than ±10 mV over the operating temperature range. This kind of performance is typically achieved only with chopper stabilization techniques.

In the 1450-2, the required stability is achieved with innovative circuit design. An integrated-circuit (IC) doubly-balanced mixer is used as a current-mode switching detector. The bias current of the IC is set up to change with temperature, to maintain constant transconductance. The transconductance is stabilized if the dynamic emitter resistances are held constant, which is done by allowing the emitter current to cancel out the effects of temperature.

A current-mirror circuit (described later) provides **dc** stability, and converts the mixer output from double-ended to single-ended. A delay-compensated low-pass filter following the current mirror rejects the unwanted components, passing only the baseband video signal. The output amplifier that follows the detector is a feedback amplifier that terminates the low-pass filter and provides source-terminated video and quadrature outputs.

Further, to ensure that the potential stability is actually achieved, the instrument is subjected to environmental temperature cycling in the calibration process, during which a single compensating resistor is selected and installed.

The same detector/amplifier circuitry used in the quadrature channel is also used in the video channel. As noted earlier, the video output signal is sampled and used as the control signal for the automatic gain control (**agc**) system. Any errors in its output will affect the video output amplitude stability of the instrument.

Envelope Detection

Envelope detection is accomplished by using the limiter signal as the **lo** for the video product detector. This provides good linearity to low levels, and thus permits accurate measurement of transmitter modulation depth.

AUDIO SYSTEM

With an audio-section bandwidth of 30 Hz to 20 kHz, a high signal-to-noise ratio, and a low distortion of 0.2%, the 1450-2 allows the broadcaster to make critical measurements of the aural transmitter.

The 27.5 MHz aural **if** carrier is converted to 6 MHz using either the 22 MHz phase-lock reference oscillator ("Split" mode), or the limiter output ("Intercarrier" mode), as the first **lo**. The 6 MHz signal is amplified and filtered, then converted to 1 MHz using a 7.02MHz crystal oscillator for the second **lo**. A limiter removes any amplitude variations, and the 1 MHz signal is then demodulated using a pulse-count discriminator.

The pulse-count discriminator is operated at about 1 MHz to increase the available output signal, thereby improving the signal-to-noise ratio over the same circuit operating at 6 MHz. The discriminator puts out pulses of constant amplitude and duration, with repetition rate varying with the modulating frequency. The discriminator is an **fm** detector which exhibits high linearity and is the main factor in achieving the low 0.2% maximum harmonic distortion specification.

Multiple audio outputs are provided, including 600 Ω balanced line, 8 Ω speaker, and front panel headphone jack. Other outputs include an aural alarm to indicate loss of the aural carrier, a calibrated deviation output, and a 6 MHz aural intercarrier output.

GAIN CONTROL SECTION

The **if** circuitry must handle a wide range of input signal levels (−20 dBm to −64 dBm) and yet maintain a constant bandpass. This is accomplished by operating the amplifiers at a constant gain and providing gain control with variable attenuation between stages. **p.i.n.** diode attenuators similar to that used in the down converter are located ahead of the second and third **if** amplifiers, and provide up to 43.7 dB of gain-control range. (The attenuator in the down converter adds another 21.7 dB of attenuation, and the fine gain control fills in between steps with 0.7 dB, for a total **agc** range of 66 dB.)

The 1450-2 provides a calibrated digital readout of the input power level with an accuracy of ±2 dB and a resolution of ±0.1 dB. Accordingly, the currents in the attenuator diodes must be set precisely, and differences in diode characteristics must be compensated for. Adjustments are accomplished through digital control of the diode currents. During the calibration process, each attenuator is characterized and the respective values are digitized and burned into Programmable Read Only Memories (PROM). The PROMs then control digital-to-analog converters (**dac**) that generate the required diode currents.

Selection of **agc**, and selection of the **agc** reference level (back porch or sync tip) are accomplished by means of front-panel controls. For **agc**, the video output level is sampled at the selected time and applied to a tracking analog-to-digital converter (**adc**). The output of the **adc** drives a decoder which in turn sequentially controls the **p.i.n.** diode attenuators via PROMs and **dacs**. The attenuators are controlled sequentially in order to optimize the system signal-to-noise ratio at any particular setting. Fine **agc** is applied to the IF Post Amplifier to fill in the 0.7 dB steps of the **p.i.n.** diode attenuators.

The speed of the **agc** loop can also be set by a front-panel control to allow the operator to either observe (SLOW mode), or eliminate (FAST mode), variations in input signal levels such as hum modulation or airplane flutter.

The **agc** circuitry also supplies control signals to actuate alarms in case of loss of the visual or aural carrier.

TIMING SECTION

This section supplies timing pulses corresponding to the back porch and sync tip times for use in the **agc** and phase-lock sampling circuits. Zero-carrier timing pulses are also generated in this section by digital counting techniques.

PHASE LOCK SECTION

This section provides a phase-locked **lo** source for the **if** mixer, and **lo** sources for the aural mixer and video detector.

The reference **lo**, through calibration and temperature compensation, is kept at exactly the frequency that the incoming **if** signal must be converted to pass through the SAW filter properly. The limiter output, because it is the same frequency as the converted **if** signal, is then compared to the reference **lo** by the converter phase-lock circuitry. Any frequency difference between the two signals is representative of the frequency shift that must be obtained from the converter **lo** to bring the converted **if** signal "on frequency".

Converter and Reference Local Oscillators

The voltage-controlled oscillators (**vco**) for the converter **lo** and the reference **lo** meet two conflicting requirements: low phase noise generation and a wide frequency range capability. Phase noise must be low, because any phase variations in these oscillators are added directly to the overall detected signals. This could obscure the phase measurements that the 1450-2 can provide. Wide pull-in range is needed to accommodate the ±120 kHz variation in the incoming **if**, and also to thermally track the SAW filter.

The converter **lo** and the reference **lo** are of similar design. Both are composite oscillators, combining the low phase-noise of a crystal-controlled oscillator with the wide frequency range of an LC oscillator.

In both cases, the **vco** output is compared to that of a crystal oscillator, and the resulting difference is converted to a linearly-porportional signal by a pulse-count discriminator. This signal is compared to the input-control signal and the resulting difference is used to control the **vco**. Thus, the **vco** frequency is linearly proportional to the control signal, and most **vco** noise will be adjusted out.

The frequency-lock circuitry of the reference **vco** also accepts a correction signal from a temperature sensor to allow for temperature tracking of the SAW filter characteristics.

Limiter

This stage picks off the **if** signal and amplifies it through limiting amplifiers to remove any amplitude variations. The limiter output serves as the **lo** source for the video detector in the envelope-detection mode, and for the first aural mixer in the Intercarrier sound-detection mode.

The limiter has some stringent requirements. It must accommodate a wide range of signal levels (up to 40 dB with modulation), yet introduce less than one degree of phase shift, at about 22 MHz.

Four differential amplifier stages provide a total gain of 60 dB. Adjustable current sources for the amplifiers provide a delay versus amplitude adjustment mechanism for the limiter.

Phase Shifter

The frequency-lock system does not have the capability of responding to fast phase disturbances in the incoming **rf** signal. The reference **lo**/converter **lo** phase lock must work through the SAW filter, which has about 7 μs of delay. This limits the rate at which corrections can be applied to that loop.

This difficulty is overcome by providing a method of shifting the phase of the reference **lo** before it is used to synchronous detect the visual **if** signal. Absence of delay or storage elements in this control loop allow the phase to be changed as rapidly as desired.

The response time of the reference **lo** phase-control loop is made selectable so that phase errors in the incoming signal can be displayed and measured (SLOW mode) or tracked out and either eliminated or reduced (FAST mode).

The correction signal for the phase shifter is derived by sampling the output of the quadrature detector during some "resting time", such as back porch or sync tip (front-panel selectable). Since the output of the quadrature detector should be zero at those times, it can be used as the control signal for the phase shifter. (A continuous mode of correction is also available by front-panel selection, if desired.) The control loop will adjust the phase of the reference **lo** to make the output voltage of the quadrature detector be zero at the selected time.

The correction voltage from the quadrature output is shaped by diode matrices into sine and cosine functions and applied to two mixers, driven 90° apart by the 22 MHz reference oscillator. The outputs of the two mixers are combined to give a constant-amplitude sine wave whose phase can be shifted linearly with voltage. The bandwidth of this system is such that corrections can be made at a tv line rate, which is actually a limit imposed by the sampling of the reference time (sync tip or back porch).

MECHANICAL DESIGN

Small circuit boards housed in extruded aluminum compartments comprise the major circuitry. The compartments provide essential shielding between the many oscillators and the sensitive circuitry. Individual covers for the compartments give maximum isolation. Interconnection between circuit boards is accomplished with interface boards and a few rigid coaxial lines. Easy access to components is provided by use of a circuit-board extender.

DETAILED CIRCUIT DESCRIPTION

Introduction

Use the following discussion along with the schematic diagrams to understand the operation of the 1450-2 Demodulator.

IF INPUT ⟨1⟩

IF Filter Amplifier Board (A20)

This board provides rejection of unwanted signals, and about 21 dB of power gain for the IF Input signal from the down converter or other **if** source. The circuits on this board include an input amplifier, a bandpass filter, and an output amplifier. The amplifiers provide good source- and load-terminations, as well as amplification.

The signal from the IF INPUT connector drives the board at pin 2. For instruments B010120 and up, high-frequency mixer products from the down converter are terminated by R28B through C28B (these components may be located on the back of the circuit board). The **if** signal drives one winding of T18, which is part of a feedback circuit around Q16. Transistor Q16 operates as a low-noise, grounded-base, high-linearity amplifier. The input impedance of Q16 is determined by R07, which is factory selected to provide 50 Ω at the **if** input connector. The resistance of R07 reflected through T18 determines the input impedance. The output from Q16 drives the emitter of Q04. Voltage gain is provided by grounded-base stages Q16 and Q04 due to the higher collector load impedance versus input impedance. A voltage gain of about 1.6 V is provided from the input of L26 to the junction of T18 and R07, and about 1.6 V from this point to the junction of L02 and C20. Thermistor RT12 provides gain compensation with temperature. Parasitic oscillations are prevented by LR13. Input impedance to the bandpass filter is approximately 50 Ω determined by R02, R03, and RT12 reflected through T11, a nine-to-one impedance transformer.

The **if** bandpass filter is essentially flat over the **if** frequency range. Also included is a trap for the upper alternate **rf** (second adjacent) channel video carrier. This carrier is located at the low end of the **if** passband due to frequency inversion in the down converter. During calibration, capacitors are connected across the inductors via the terminals shown. These capacitors form resonant circuits, allowing the inductors to be adjusted to the correct values.

The output load impedance for the filter is determined by the 1.5 dB, 50 Ω pad consisting of R66, R71, R72, R73, and the input impedance of Q72. Transistors Q72 and Q85 are identical in operation with Q16 and Q04.

Emitter follower Q47 supplies +3 Vdc to the bases of the four amplifier transistors.

Signals feed from the output of Q85 and T89 at 50 Ω impedance through a 50 Ω coaxial cable to the input of the first **if** attenuator.

IF Attenuator-Amplifier Board (A21)

This board takes the signal from the IF Filter Amp board (A20) and feeds it through a variable **p.i.n.** diode attenuator for up to 21.7 dB of gain control, and then through an amplifier with a constant gain of about 22 dB.

This attenuator is configured as a bridged-T network with CR86 as the series **p.i.n.** diode attenuator and CR96 and CR98 as the shunt diode elements. See Fig. 3-2. To decrease the **if** signal attenuation, the series current through CR86 increases, and the shunt current through CR96 and CR98 decreases. This action reduces the series resistance of CR86, and increases the resistance of CR96 and CR98.

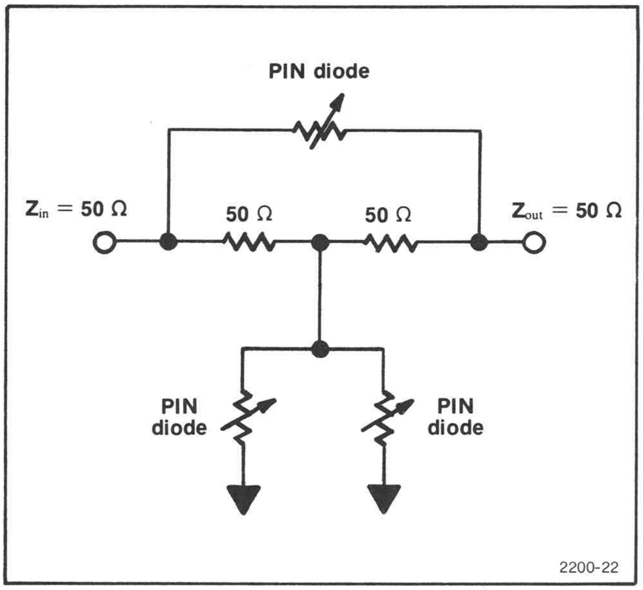


Fig. 3-2. Equivalent Circuit of a Bridged Tee PIN Attenuator.

The overall effect increases the signal to the base of Q75 while maintaining a constant 50 Ω impedance at the attenuator input. For increased attenuation, more signal current shunts to ground and less current is passed through the series elements. Inductors L75, L76, and L98 supply control current while preventing the signal current from passing to ground.

Transistors Q75 and Q62 form an operational amplifier. The input impedance at the base of Q75 is a virtual ground.

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AC feedback takes place from the emitter of Q62 to the base of Q75 through R63 and C67. Potentiometer R62 sets the gain of the amplifier, while R46 sets the **dc** bias for optimum linearity. The voltage gain to the emitter of Q75 is determined by the ratio R63/R84. The voltage across R63, R65, R62, and R54 determines the emitter current for Q62. This current developes a voltage across the collector load (R61) for Q62. The voltage gain to this point is about 22.

The signal output is taken from the collector of Q62 through E42, a ferrite-bead parasitic suppressor. Transistors Q42 and Q31 provide current gain for the **if** signal, and lower the output impedance to a few ohms. The output passes to the next attenuator and amplifier through R27 and C37.

The output impedance is set at 50 Ω by R27. The overall stage gain is about 22 dB.

IF MIXER AND AURAL DRIVE ⟨2⟩

IF Attenuator-Mixer-Filter Board (A22)

The circuits on this board provide **agc** attenuation, two stages of amplification, and conversion to the second **if**. This board has about 11 dB of loss with minimum attenuation, and about 33 dB loss with maximum attenuation.

The signal from the previous **if** circuitry is applied through a **p.i.n.** diode attenuator to the emitter of Q02. This attenuator operates in a similar manner as previously described under IF Attenuator-Amplifier Board (A21). Diodes CR08 and CR09 are the shunt elements, and CR17 is the series element.

The amplifier composed of Q02 and Q23 operates in the same manner as the previously described **if** amplifiers. The load impedance for Q23 is approximately 450 Ω, with RT22 providing temperature compensation for the stage gain.

The mixer input filter transforms the load impedance of Q23 to 50 Ω, and prevents harmonics generated in the **if** amplifier from passing to the mixer and generating spurious outputs. The filter also provides overall bandpass tilt adjustment for the **if**.

The filter output goes through a 50 Ω 4 dB attenuator to provide a broadband 50 Ω load for the filter, and a broadband source for the mixer input, while isolating the two stages. Jumper P53 allows the filter output or the mixer input to be accessed for test and calibration purposes.

The local oscillator input at approximately +20 dBm, and frequency equal to the first **if** plus 22 MHz, is converted by T58 from an unbalanced 50 Ω input impedance to a balanced output, and applied to the mixer.

The mixer is a diode-ring type using matched Schottky diodes. The high-level local-oscillator signal from T58 alternately switches alternate pairs of diodes on and off at the local-oscillator rate. The first **if** signal is fed via T54. The diode ring alternately grounds the secondary leads of T54 through T58 so that the sum and difference of the local-oscillator frequency and the first **if** are present at the center tap of the secondary of T54. The difference frequency is the 22 MHz second **if**. The two input frequencies are reduced by the balanced action of the mixer. Figure 3-3 shows an example of diode-ring mixer operation.

Mixer balance is optimized by adjusting R51 and C63. Either R52 or R53 may be selected or removed to help center the range of R51.

The output from the mixer is taken single-ended at the wiper arm of R51. R62 terminates the mixer output and provides a 50 Ω reflected impedance at the mixer input. The signal through the attenuator drives the emitter of Q81. Transistors Q81 and Q84 form an **if** amplifier at 22 MHz that is similar in operation to the **if** amplifiers discussed previously.

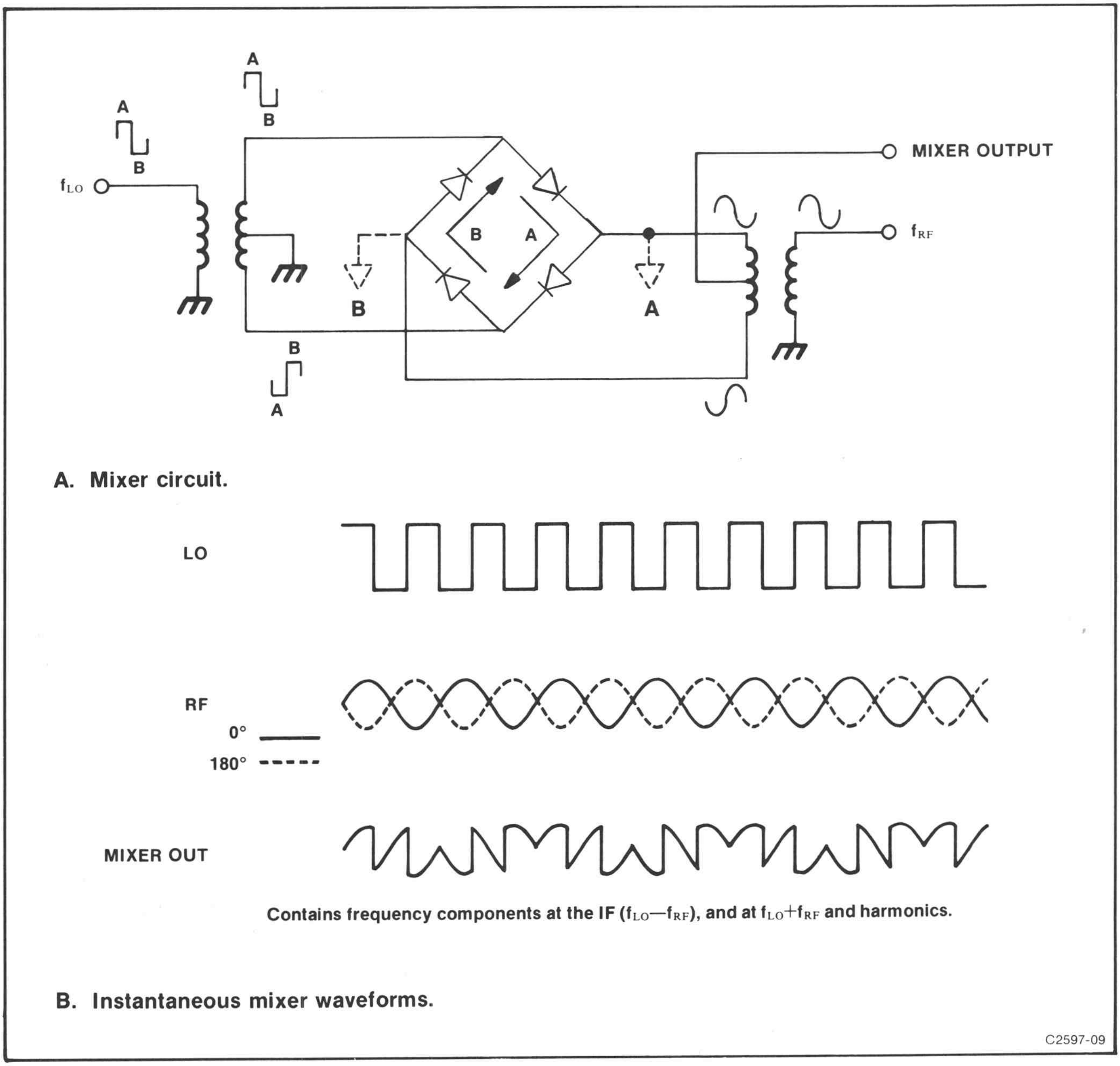
IF Switch-Aural Drive Board (A23)

This board adds further selectivity to the **if** system, provides an **if** signal to drive the audio circuitry, and provides a diode-switch circuit to switch the **if** signal to either the wide-band or narrow-band SAW filters. The board has about 10 dB of loss.

Output from the previous amplifier feeds through a 50 Ω coaxial cable to a 4 dB pad composed of R64, R65, and R66. This pad provides a stable source impedance for the 22 MHz bandpass filter. The 22 MHz bandpass filter rejects undesired mixing products and supplements the SAW filter. The 22 MHz bandpass filter has about 1 dB of insertion loss.

The aural signal is taken from the junction of C71 and R82, and fed to the base of Q13. This transistor and Q17 form an operational amplifier with the output taken from the collector of Q17. Feedback occurs through C15 and R24. The output to the audio mixer is taken from transformer T29.

The video **if** signal from the 22 MHz bandpass filter feeds through a 4 dB pad composed of R81, R82, and R83



A. Mixer circuit.

B. Instantaneous mixer waveforms.

Fig. 3-3. Diode Ring Mixer Operation.

to a switch that selects the narrow- or wide-band Surface Acoustic Wave (SAW) filters. This pad provides a stable output termination for the 22 MHz bandpass filter.

The front-panel SOUND TRAP IN button selects the input to the narrow-band SAW Filter. Under these conditions, −15 V is applied to R78. This action forward biases CR95, and back biases CR94 and CR97, preventing any **if** signal from passing to the wide-band filter. Diodes CR84 and CR88 are forward biased and CR83 is back-biased. This allows the **if** signal to pass to the narrow-band filter.

When the SOUND TRAP OUT button is pressed, +15 V is applied to R78. This voltage back biases CR84, CR88, and CR95 and forward biases CR83, CR94, and CR97. This opens the narrow-band signal path, shorts to ground the input to the narrow-band filter, and allows the signal to pass to the wide-band filter through the appropriate diodes.

IF NYQUIST FILTERING ③

IF SAW Amplifier Boards (A24 and A25)

These boards precisely shape the **if** bandpass, and add additional selectivity. This filtering is accomplished by SAW filters. The narrow-band SAW filter (SOUND TRAP IN) is located on A24, and the wide-band SAW filter (SOUND TRAP OUT) is located on A25. Each SAW filter has about 30 dB of insertion loss, and the Nyquist slope places the 22 MHz visual **if** down another 6 dB. The amplifier on the board has about 30 dB of gain, giving a stage gain of 0 dB in the middle of the passband and −6 dB at the 22 MHz visual **if**.

The **if** passes to the wide- or narrow-band SAW filter as selected. The filter circuits are identical to each other except for the frequency response of the SAW filter elements and several minor component value changes. SAW filters are piezoelectric crystals through which electrical signals are converted into surface acoustic waves. They are relatively small devices and require no tuning or maintenance. Their bandpass and group-delay characteristics are very precise. Figure 3-4 shows the typical bandpass and group-delay characteristics of the SAW filters.

Transistors Q97 and Q85 form operational amplifiers. Feedback occurs through R93, the gain adjustment, and R97. The operating bias is set by R76. The wide- or narrow-band filter amplifier not used is biased off. When the narrow-band filter is selected, R52 and the cathode of CR78 is at −15 V. Transistor Q52, located on the IF Interface board (A32), is off and CR78 on the narrow-band filter board, is conducting. With no emitter-return path, Q97 and Q85 in the wide-band filter are inoperative. The switching line goes to +15 V if the sound trap is switched out. This opens the emitter-return path for Q97 and Q85 in the narrow-band filter and causes Q52 to conduct, thus providing an emitter-return path for Q97 and Q85 in the wide-band filter. Power to the unused amplifier is turned off, as just described, to improve the signal isolation through the switch and unused amplifier.

The output from these amplifiers is taken from the collector of Q85. The **ac** collector load, composed of C90 and R90, is test selected to obtain the correct SAW filter bandpass tilt. The signal feeds to a unity-gain, low output-impedance, feedback amplifier composed of Q87 and Q71. The amplifier output voltage is doubled by transformer T55 and drives the SAW filter. The source impedance provided at the output of T55 is about 10 Ω. Adjustable inductor L52 neutralizes the input capacitance of the SAW filter.

The SAW filter passband shifts with temperature. Diode CR18 senses the temperature of the wide-band SAW filter.

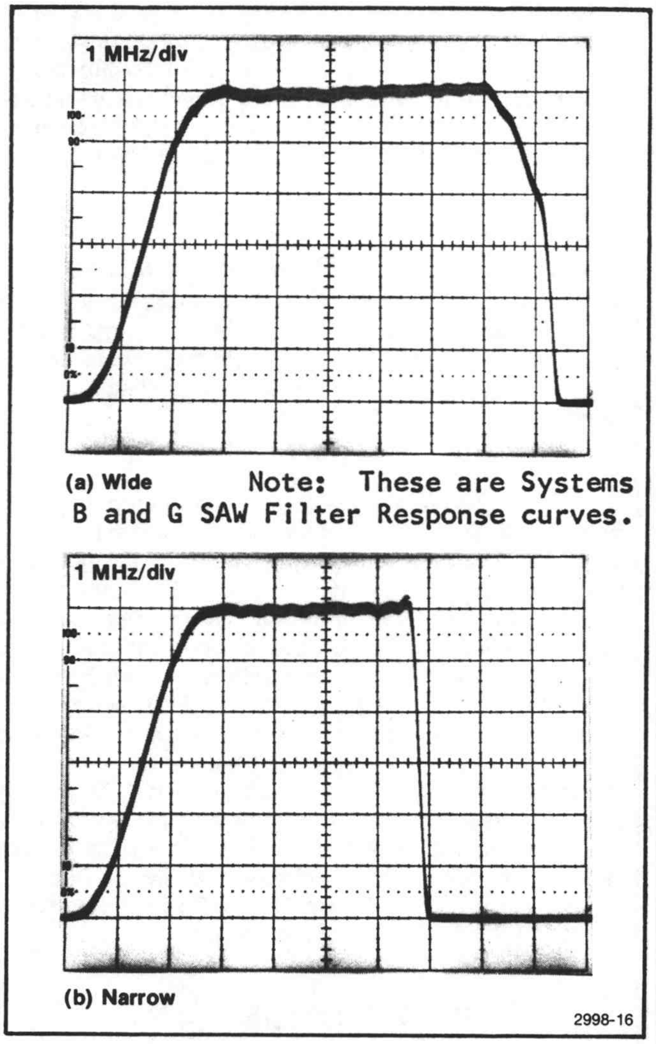


Fig. 3-4. Surface Acoustic Wave (SAW) Filters Bandpass Characteristics.

The temperature coefficient of this diode is −2.2 mV/°C. Temperature coefficient of the SAW filters is about −90 ppm/°C. The diode voltage drop is sensed, and the frequency of the Converter Local Oscillator shifts to maintain the 22 MHz Visual IF signal precisely at the correct point on the Nyquist slope of the SAW filters.

IF Post Amplifier (A26)

This circuit amplifies the signal from either the wide- or narrow-band filter sufficiently to drive the next stages. The Post Amplifier output goes to the IF Zero Carrier/Phase Shifter board (A27), and also drives the Limiter board (A55). There is an analog gain control in this circuit, controlled by the fine **agc** circuit, that has about a ±0.7 dB range. The stage gain for this board is about 27 dB.

The wide-band filter outputs to the emitter of Q13 and the narrow-band filter to the emitter of Q23. These transistors operate as common-base amplifiers with a current summing point and virtual ground at the junction of R21 and C22. The dual common-base isolation stages prevent SAW filter bandpass characteristics from interacting with each other. Damping for spurious oscillations is accomplished by ferrite beads, E13 and E23, in the base circuits.

Transistors Q33 and Q53 form an operational amplifier with feedback through C52, R41, and R32. Gain for this amplifier is adjusted by R41. The operating point is adjusted by R64, which supplies emitter current to Q53. Ferrite bead E33 serves to suppress oscillations in this stage.

The fine automatic gain control current inputs at pin 5 from the Pin Drive Decoder on A60. This current varies the conduction of CR56, a **p.i.n.** diode. With increasing current through CR56, R53 is effectively shunted for **ac** currents through C58 and C55. This increases the **ac** current through Q53 and consequently the gain of this stage. The **p.i.n.** diode current path is through R58 to the −15 V supply. Transistors Q71 and Q81 operate in a similar manner to Q71 and Q82 located in the SAW drive amplifier on A24 and A25, except that a variable capacitor is added to the base of Q71. This capacitor, C70, provides an adjustment for the tilt of the amplitude frequency response. Output is taken at a low-impedance point at the collector of Q81. R87 and R96 provide 50 Ω source impedance, and feed IF Zero Carrier/Phase Shift circuitry on A27, and the Limiter circuit on A55.

IF DETECTION ⟨4⟩

IF Zero Carrier Switch/Phase Shifter Board (A27)

This circuit provides a means of shutting off the **if** signal to establish a zero-carrier level for modulation percentage checks. Another part of this circuit splits the **if** signal into two paths, phase shifts the two signals precisely by 90° over the full bandwidth, and equalizes the delay between the two paths. One output feeds an inphase 22 MHz **if** signal to the video detector, and the other output feeds a quadrature phase 22 MHz **if** signal to the quadrature detector. The output impedances are 100 Ω. The **if** signal is reduced by about 14 dB between the input and each of the two outputs (into 100 Ω).

The **if** signal is turned off during the time of the zero-carrier pulse. The signal turning the carrier off comes from the Zero Carrier Timing circuitry shown on schematic 11. A TTL high is applied to the base of Q58 during zero-carrier time, switching Q58 off. With Q58 off, the junction of R55, R66 and T65 goes negative, back-biasing diodes CR53, CR66, CR84 and CR85. This action prevents the **if** signal from passing to T55 from T94. Potentiometer R72 adjusts current through both diode-signal paths so that equal switching signals flow to both inputs of T55, minimizing switching transients. When off, this switch provides about 55 dB of signal isolation.

Delay is introduced by L89, C88, C95 and L98 and by networks directly supplying the **if** signal to the video and quadrature detectors so that the signal supplied by the limiter, for envelope detection, arrives at the detectors at the same time.

Output from the zero-carrier switch passes through a network composed of L48 and C55 to the video detector. This network provides a uniform 10 ns of delay to the video **if** carrier and sidebands.

The output from the zero-carrier switch is also fed to the quadrature detector through a network consisting of C31, L21, L25, C27, L13, C03, and C10. L13 is used as a coarse adjustment, and C10 is a fine adjustment that is accessible without using an extender board. This filter has a bandpass from about 20 MHz to 30 MHz with relatively flat amplitude response. The output from this filter to the quadrature detector is the carrier frequency delayed by 10 ns with no phase shift and sidebands that are shifted in phase depending on frequency.

The resulting signal outputs of both filters are identical in amplitude and shifted in phase by 90°. The impedance looking into the detectors is approximately 100 Ω.

IF Detector/Video Amplifier Boards (A28 and A29)

These boards convert the 22 MHz **if** signal to baseband signals, filter any unwanted outputs from the converter, and amplify the resulting signal. A28 provides the quadrature signal to the phase-lock circuit and to the QUADRATURE OUTPUT port. A29 provides the video output signal to the **agc** circuit and to the two VIDEO OUTPUT ports. Power gain of this stage is about 23 dB for 100 Ω input and 75 Ω output impedances. (If measured with 50 Ω source- and load-impedance test equipment, the apparent gain will be 0.7 dB less.)

As both detectors, with the exception of input phase and output signal, are identical, the following discussion covers both circuits. Both detector circuits operate as product detectors, and provide envelope or synchronous detection depending on the signal driving the local oscillator source.

The signal from the limiter (envelope detector) or the local oscillator controlled by the transmitted carrier (synchronous detection) is fed to the balanced demodulator, U14, through T27. See Fig. 3-5. Input impedance to T27 is about 100 Ω. The output of T27 drives U14.

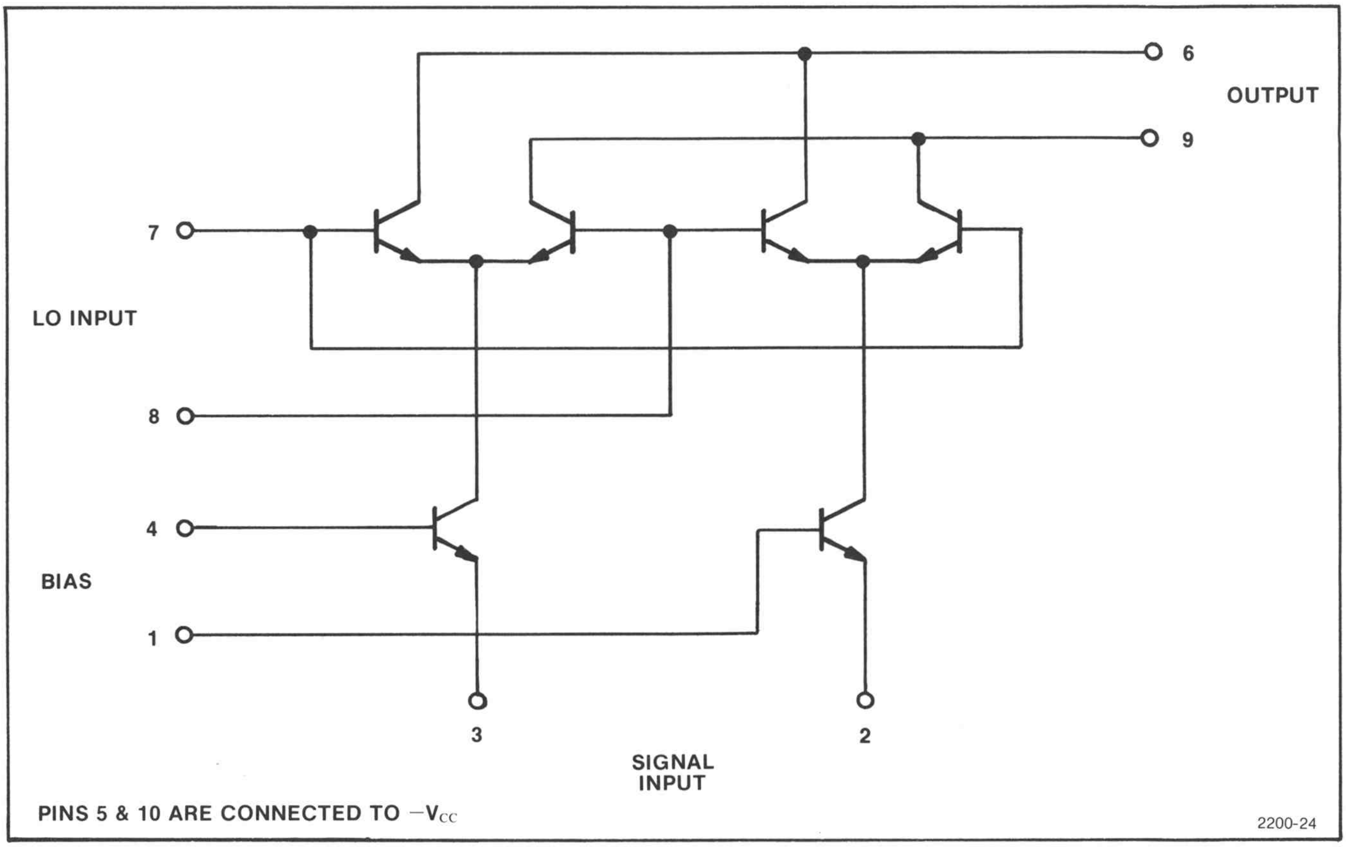


Fig. 3-5. Simplified Balanced Demodulator IC as Used in the Video and Quadrature Detectors.

The **if** signal passes to the demodulator through transformer T09. Input balance for the demodulator is accomplished by R11 and associated components connected to −15 V. Pins 1 and 4 of U14 provide proper **dc** bias for the circuit. The output at pins 9 and 6 of the video detector is a full-wave rectified (envelope or synchronous) **if** signal. The main signal components are base-band video and modulated 44 MHz. Transistors Q11 and Q20 operate in a grounded-base mode, and are housed in a common heat sink for thermal compensation. They provide constant voltage at pins 9 and 6 of U14. This assures constant power dissipation so that U14 switches consistently at the same point with respect to the driving waveforms.

Transistors Q21 and Q31 form a current mirror. Current flowing in the collector of Q31 is inverted by Q21 and added to the signal from pin 6. The result is a signal at the collector of Q20 with twice the amplitude of either signal at the output of U14. The emitter resistors, R40 and R43, of Q21 and Q31 are selected to compensate for any **dc** unbalance in the demodulator circuit due to temperature.

Output from the demodulator is fed to the low-pass filter composed of L44, L54, and L64, along with associated capacitors. Inductor L64, and C66 form an all-pass section providing group-delay compensation. The filter passes frequencies below about 12 MHz. The signal is amplified by Q71, Q81, Q83, and Q86. Transistors Q81, Q83, and Q86 form an operational amplifier. Transistor Q71 provides temperature compensation for Q81, which operates as a grounded-base stage. The collector of Q81 drives Q83 which drives emitter-follower Q86. Feedback path is through R83.

In the synchronous detection mode, the quadrature output signals, when terminated in 75 Ω, are 0 V at **dc** and up to 700 mV peak-to-peak for frequencies above about 1 MHz. The quadrature output is 0 V in the envelope detection mode. The video output signal, into 75 Ω, is about 1 V maximum with the blanking level at 0 V and zero-carrier level at 0.811 V. See Fig. 3-6. As the boards are identical, placing the Quad/Video jumper in the respective position changes the **dc** level of the output amplifier, and makes these boards interchangeable for test and troubleshooting purposes.

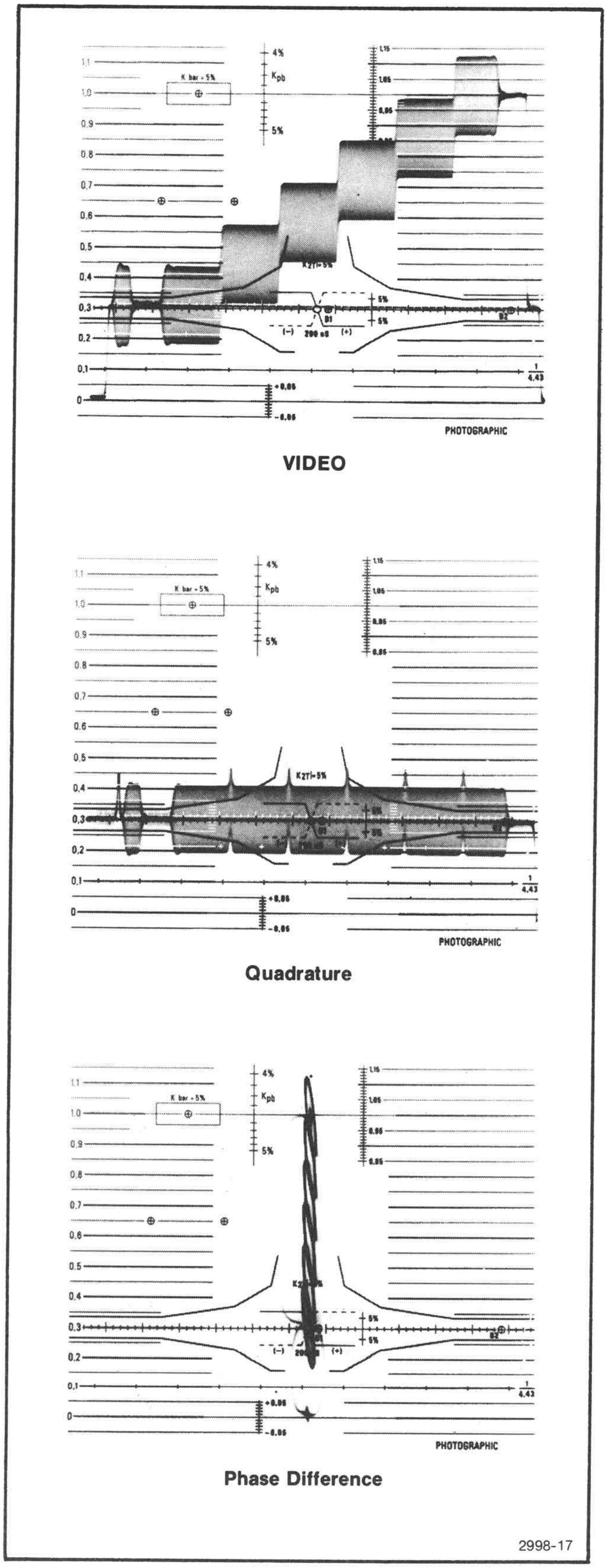


Fig. 3-6. Relationship of the Video and Quadrature Outputs.

PIN DRIVER ⟨5⟩ and ⟨5⟩ a

General

The PIN Driver circuits (A30-A31) are controlled by the **agc** circuit, and set the currents that drive the **p.i.n.** attenuators. The board input is a 5-bit parallel-binary signal. Three Programmable Read Only Memories (PROM) transform the 5-bit input code into two 12-bit parallel-binary signals that switch two sets of binary-weighted current sources. The current sources drive the series- and shunt-diodes in the **p.i.n.** attenuators on A21 and A22. (See Fig. 3-7.)

The desired effect is to have the **p.i.n.** attenuator change its attenuation in equal steps when required by the **agc**. Nonlinearity of the **p.i.n.** diodes is compensated for by programming the PROM outputs to switch the correct amount of current from the current sources to the attenuator. This results in 32 levels of attenuation that are separated by 0.7 dB each. To achieve this accuracy, the PROM must be specially programmed for the individual **p.i.n.** diode characteristics. This is done by inserting a PROM simulator into the PROM sockets, determining the correct program for each step, and programming the PROM.

NOTE

To maintain the accuracy should a ***p.i.n.*** *diode or PROM fail, we recommend that the instrument be returned to Tektronix, Inc. for repair and recalibration of this circuit. (See the Maintenance section of this manual for further information.)*

PROM

The PIN Driver PROM (U44, U64, and U14) each have 256 memory locations. Each memory location may be programmed as a binary "1" or "0". The memory is formatted in 32 words (or bytes) of 8 bits of memory each. The 5-bit input to the board is fed to address lines A0 through A4 of each PROM. All combinations of the input signal (2 to the 5th power) account for the 32 input-address locations.

The memory of U64 is shared between U44 and U14 to get the 12-bit binary output required to drive the current sources. The shunt-memory output consists of U44 B0 through B7, and U64 B0 through B3. The series-memory output consists of U64 B4 through B7, and U14 B0 through B7. This gives a possible 4096 (2 to the 12th power) output codes to choose from in programming the PROM to drive each of the current sources.

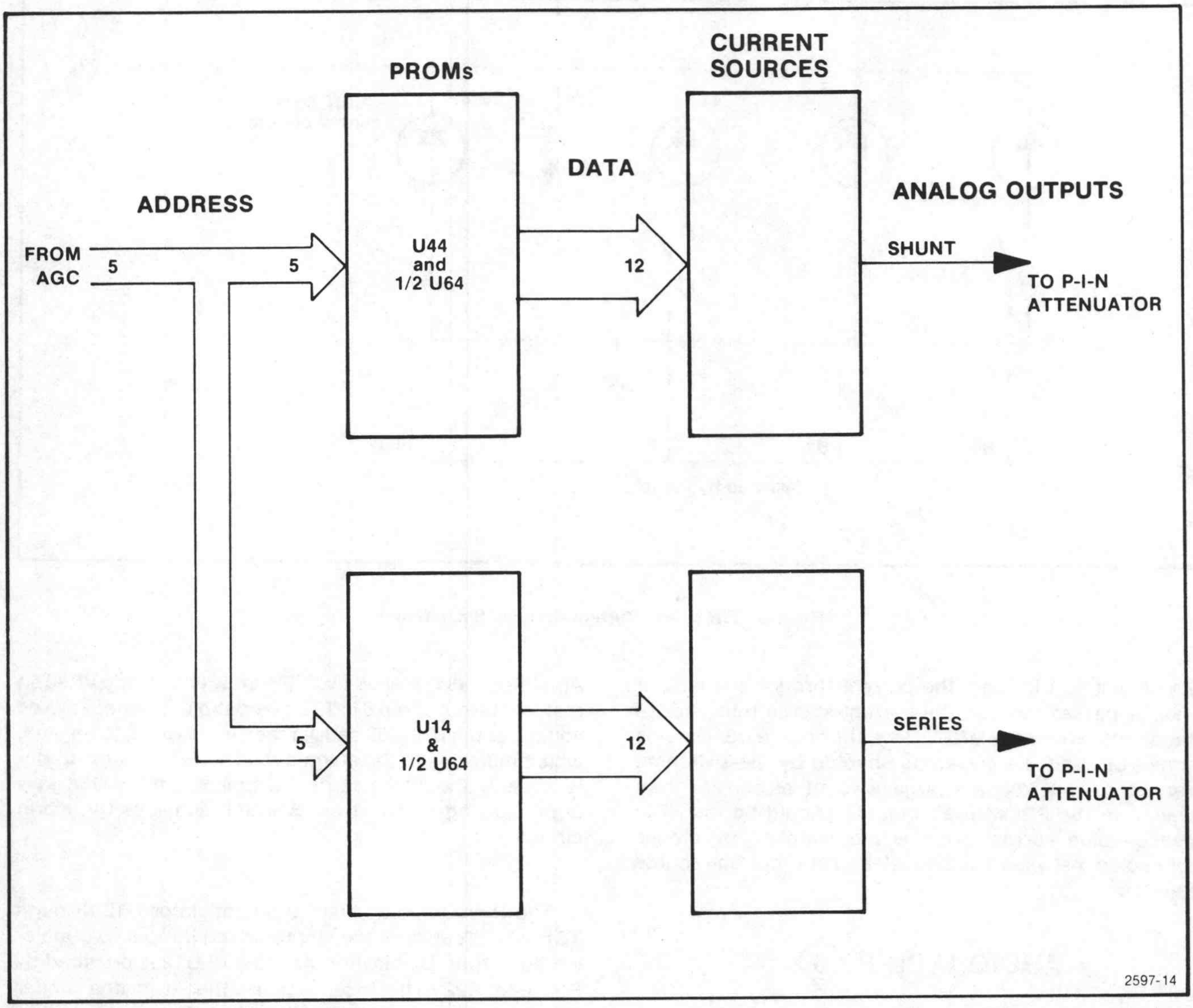


Fig. 3-7. PIN Driver Block Diagram.

Current Sources (See Fig. 3-8)

There are two sets of current sources. They provide shunt and series currents for the RF PIN Attenuator (A3). The shunt sources are the upper row of transistors and resistors shown in the schematic. The series sources are shown in the lower row.

Resistors R93 and R92 form a voltage divider at the base of Q81. Q81 provides temperature compensation, and sets the level at the bases of all the current-source transistors. When a current source is switched on, its emitter voltage is the same as that at the base of Q81. This makes the current through the transistors dependent upon the value of the emitter resistors. The collectors of each set of current-source transistors are connected together, thus summing the currents at the outputs. The series-current output is at P08-1, and the shunt-current output is at P08-2.

The current sources are binary weighted. The smallest current available is from Q19 in the shunt circuit, and Q80 in the series circuit. This can be considered as a reference current (Ir) for this description. The smallest current-source then supplies Ir X 1. The next larger current source supplies Ir X 2, the next Ir X 4, and so on. This progression of powers of 2 continues for the twelve current sources, so that the largest current available from a single source is Ir X 2048. If all current sources in one set were on at once, the total current available would be Ir X 4095. Therefore, there are 4096 possible currents to choose from to drive the PIN Attenuator.

The current sources are switched on when the corresponding PROM outputs are high. The high-current sources, Q88 and Q10, are switched by transistors Q89 and Q00 respectively. When the PROM MSB (Most

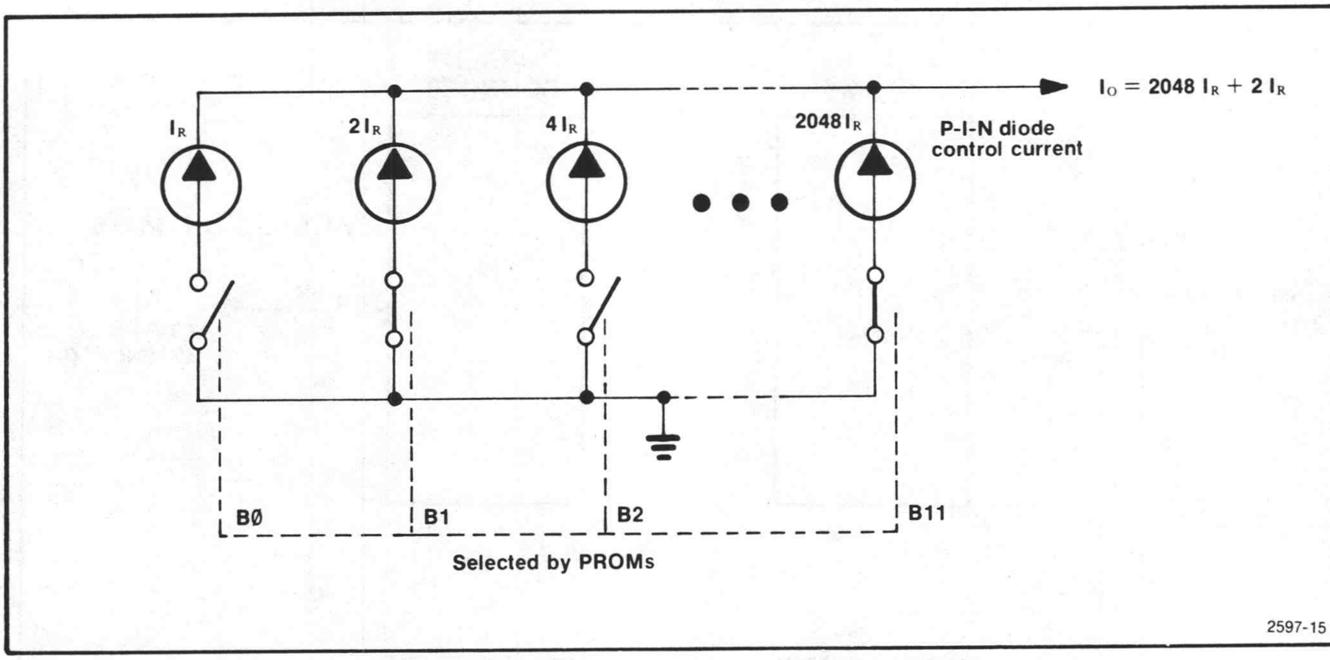


Fig. 3-8. PIN Driver Current Sources Simplified.

Significant Bit) is high, the current through the emitter resistor passes through the current-source transistor to the output. When the MSB is low, the source transistor is turned off, and the current is shunted by the switching transistor. This keeps a large amount of current from sinking in the PROM if all outputs should be low. The smaller-value current sources are switched by diodes connected between the PROM and the current-source emitters.

AUDIO INPUT ⟨6⟩

First Audio Mixer Board (A40)

This board converts the aural **if** from about 28 MHz to 6 MHz. The board also allows switching between an external Aural Intercarrier signal and the internal 6 MHz aural **if**, and provides a 28 MHz detector for an aural alarm circuit.

The **if** signal is applied to the 28 MHz bandpass filter. This filter, tuned 6 MHz above the 22 MHz **if** picture carrier, eliminates most of the video information present. After the filter, the signal goes to the first audio mixer, and to the alarm circuitry.

Transistor Q74 amplifies the sound carrier to drive Q84; these transistors are configured as an operational amplifier. Transistor Q84 has a parallel-tuned circuit as a collector load. If the aural carrier is present, the collector of Q84 developes a voltage which is rectified by CR96, causing a negative voltage to appear at pin 2 of U88. Amplifier U88 is biased by CR85 and zener diode VR98 so that the output at pin 6 is TTL compatible. The negative **dc** voltage at pin 2 of U88 causes the output, pin 6, to go high, which indicates to the alarm circuitry that an aural carrier is present. Should the carrier disappear, pin 2 of U88 goes high, causing a low at pin 6 which activates the alarm circuitry.

The **if** signal is applied to demodulator U12 through T31, which converts the single-ended **if** input to double-ended output. Dc bias for the input of U12 is provided by R21 and R22. The local signal either from the limiter (intercarrier) or the phase-locked local oscillator (split), inputs at T19. This transformer provides single- to double-ended conversion, as well as impedance matching. Proper bias is provided by R01, R02, and R16. Inductors LR05, LR15, and LR19 impedance match the input.

The resultant 6 MHz aural intercarrier output from U12 is taken single-ended at pin 9. This output feeds to the diode switch circuit. The rear-panel AURAL INTERCARRIER IN feeds through CR49 to common-base amplifier Q46. CR49 provides temperature compensation for Q46. The output of Q46 feeds to the diode switch circuit.

Diodes CR25, CR26, CR36, and CR45 form a switch to select either the external or internal aural intercarrier. With S04 in the external position, +15 V is applied to the cathode of CR45 and the anode of CR25. This action causes CR25 to conduct, shorting the internal signal to ground and back-biases CR26, preventing the internally-generated sound carrier from passing to the 2nd Audio Mixer board (A41). Diode CR45 is back-biased and CR36 passes the external aural intercarrier signal. In the internal position, CR45 and CR26 are forward-biased and CR36 and CR25 back-biased. The internal signal passes to the Second Audio Mixer board (A41).

Second Audio Mixer Board (A41)

This board converts the 6 MHz signal to about 1.02 MHz. An Aural Intercarrier Output amplifier is also included on the board.

Transformer T17 serves as a 6 MHz bandpass filter and single- to double-ended converter transformer. Input bias for amplifier U11 is provided by R12, R14, and R22 connected to −15 V. This amplifier is a dual-differential pair and provides enough gain to drive demodulator U51. The output from U11 also drives T31 which serves as a 6 MHz bandpass filter and double-ended to single-ended converter. The output of T31 drives Q36, a grounded-base amplifier which in turn drives emitter follower Q44. The emitter of Q44 drives the rear-panel AURAL INTERCARRIER OUT jack.

Transistor Q70 serves as the 7.02 MHz local oscillator for conversion of the sound carrier to 1.02 MHz. The 7.02MHz oscillator is a Pierce or crystal-type Colpitts. The if signal and local oscillator output are mixed in U51 and the output is fed to the Audio Limiter board (A42).

Audio Limiter Board (A42)

This board filters the second audio mixer output, and limits the signal to a fixed amplitude.

The signal from the Second Audio Mixer drives a 1 MHz bandpass filter. The filter is composed of L95, L75, L55, L45 and associated components, and has a Butterworth response characteristic. The output from this filter feeds to U15, an amplitude limiter, which provides up to 60 dB of amplitude limiting. The differential output of U15 is converted to single-ended output by T18.

AUDIO OUTPUT 7

Audio Discriminator Board (A43)

The circuits on this board include a limiting amplifier, a pulse-count discriminator (fm detector), a calibrated amplifier, and an automatic frequency control (afc) circuit for the Aural Only mode of operation.

The 1.02 MHz Aural IF from the Audio Limiter board (A42) is a 50% duty-cycle square wave, with the frequency shifting according to the modulation. This signal drives another limiting amplifier that is composed of Q19 and Q18. Emitter follower Q19 switches a common base stage, Q18. Zener diode VR12 and resistor R03 form a +5 V supply for these transistors and the following circuit.

The pulse count discriminator converts the 1.02 MHz Aural IF signal to audio. The discriminator consists of a pulse-forming circuit, Q08 and Q13; a common base switch, Q14; and a low-pass filter. Figure 3-9 shows waveforms found in the discriminator circuits.

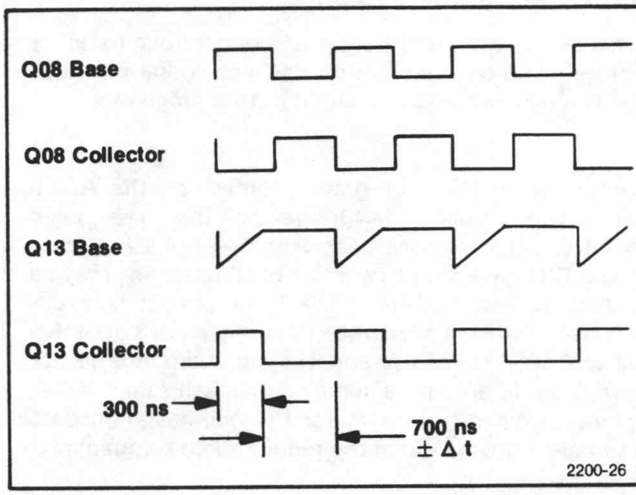


Fig. 3-9. Waveforms Associated with the Pulse Count Discriminator.

The pulse forming circuit converts the 50% duty cycle signal to a signal with the duty cycle proportional to frequency. Transistor Q08 is switched on and off at the Aural IF rate. When the collector of Q08 switches from about +6 V to 0 V, Q13 is driven off by timing capacitor C05. C05 charges through R02 at a time constant such that, after 300 ns, the base of Q13 reaches the level required to saturate. This forms a 300 ns pulse at the collector of Q13.

Each 300 ns pulse diverts R11 current from Q13 to Q14 and thus to R36. The average current through R36 over a period of time is proportional to the number of pulses during that time. Because the number of pulses changes with the frequency deviation, the average voltage developed across R36 changes in proportion to the frequency deviation.

The output of the pulse count discriminator feeds a 40 kHz low-pass filter composed of L41, L61 and associated components. This filter removes the 1.02 MHz carrier, components leaving only the audio. The output of this filter is terminated by R72, which is the input resistor of the 40 dB gain amplifier composed of operational amplifiers U84A and U84B. Potentiometer R80, and R93 provide negative feedback and set the amplifier gain so that the signal at the rear-panel DEVIATION OUT connector is calibrated for 50 mV p-p/kHz.

The collector of Q14 also feeds U58. This operational amplifier has a bandwidth of about one or two Hertz. The output of U58 shifts the frequency of the converter local-oscillator so that in the aural mode only the sound carrier remains in the **if** passband.

Audio Interface Board (A44)

This board provides intercircuit connections for all of the plug-in audio circuit boards, and also contains the de-emphasis network and two audio output amplifiers.

Output from the high-gain amplifier on the Audio Discriminator board (A43) feeds the rear-panel DEVIATION OUT connector and the de-emphasis circuit. R48 and C39 have a time constant of 50 μs, which may be switched in and out from the front panel. This de-emphasis network is a low-pass filter that has a 3 dB down point at 3.183 kHz and attenuates the audio at 6 dB per octave. This de-emphasis curve compensates for the pre-emphasis curve at the transmitter. Pre-emphasis improves the signal-to-noise ratio at the higher audio frequencies.

Transistors Q28 and Q29 are connected as a unity-gain buffer amplifier to provide isolation between the de-emphasis network and the output amplifiers.

The 8 Ω output stage is a non-inverting feedback amplifier capable of delivering up to 5 W continuously into an 8 Ω load. The amplifier is protected against accidental short circuits at the SPEAKER output by fuse F06. A spare fuse is included on the board.

The audio signal input is through the AUDIO LEVEL control, R3, on the front panel. The signal then drives Q16A, part of a differential amplifier with Q16B. Field-effect diode CR18 acts as a constant 1.2 mA current source for Q16A and B. The collector of Q16A drives a complimentary symmetry paraphase amplifier, Q17 and Q24. Voltage divider R26, R24, and CR14 supplies the base voltage for Q24 (and Q14 in the 600 Ω amplifier). CR14 provides temperature compensation for base-emitter voltage changes in Q17 and Q24. The output transistors, Q55 and Q57, are complimentary Darlington types. These transistors provide sufficient current gain for the required output power, with very low distortion of the signal. Q56 acts as a base-emitter voltage multiplier. This transistor is mounted on a common heat sink with the Darlington transistors. This provides excellent temperature compensation, and prevents thermal runaway in the output transistors. The AUDIO OUTPUT headphone jack is wired to accept either stereo- or mono-type headphones.

The 600 Ω output amplifier is similar to the 8 Ω amplifier, except that it is connected as an inverting amplifier, and the output is transformer coupled. The Gain adjustment, R05, acts as the feedback resistor and, along with R06, the input resistance. Output transformer T21 contains a feedback winding that is coupled through C03. This arrangement compensates for effects on low-frequency response and distortion caused by the transformer.

IF REFERENCE OSCILLATOR AND PHASE SHIFTER ⟨8⟩

Reference Control Board (A50)

The 22 MHz reference oscillator and control circuitry provide the locally generated signal for use in the **if**, synchronous detector, and aural converter.

The 22.25 MHz crystal oscillator is composed of transistor Q02 with associated components. As the crystal operates in an overtone mode, L13 and C03 assure operation at the correct overtone. The output from the collector of Q02 drives mixer U23 at pin 8.

The output of the reference oscillator drives mixer U23 at pin 2 through emitter follower Q35. Resistor R36 terminates the reference oscillator input.

The voltage controlled oscillator (**vco**) is designed to operate at nominally 22 MHz, 250 kHz below the crystal oscillator. The circuitry will accommodate a frequency difference from −50 kHz to −500 kHz.

The mixer output is at pin 6 of U23. When the circuitry operates at design center, the frequency at pin 6 of U23 is about 250 kHz, the difference frequency between the voltage controlled and crystal oscillators.

The signal passes from pin 6 of U23 through a low pass filter, composed of L52, L62 and associated components, to the base of Q70. This transistor pair, Q70 and Q80, form a Schmitt multivibrator. The signal at the collector of Q80 is essentially a square wave with an amplitude of approximately 6 V peak-to-peak. Transistor Q80 either saturates or the collector is clamped by CR91 in the most positive direction. During each cycle, C85 charges through CR85, and discharges through Q87. The current (charges per second) from the collector of Q87 is proportional to the difference frequency. The current through Q87 always matches the current through Q88 when the voltage controlled oscillator frequency is stable.

The current through Q88 is determined by the temperature of the wide-band SAW filter as sensed by CR18 on the A25 filter board, and by the setting of R40 and R50 (Wide Band and Sound Trap adjustments). The voltage from CR18 varies at −2.2 mV/° C. A temperature increase causes pin 5 of U56 to move in the negative direction, which increases current through Q88 to lower the frequency of the voltage controlled oscillator. This action matches the change in SAW filter center frequency, which decreases with temperature at the rate of 90 parts per million/° C.

When the voltage controlled oscillator frequency decreases, the frequency of the signal at pin 6 of U23 increases, causing an increase in average current through Q87.

Transistor Q92 and associated components form a +6 V power supply to provide voltage for CR91 and several other points in this circuitry.

Reference Oscillator Board (A51)

The circuitry on this board generates the 22 MHz reference signal. This signal is used in the phase-lock circuits; and also functions as the local oscillator (**lo**) signal for the video and quadrature detectors in the synchronous detection mode, and as **lo** for the first audio mixer in the SPLIT audio mode.

Transistor Q22 operates as a Clapp oscillator. The tank circuit consists of L03, C07, C08, CR09, C13 and C16. Inductor L03 is adjusted to center the oscillator frequency. The control voltage from the Reference Control board (A50) sets the capacitance of varactor CR09 to produce the oscillator frequency control required for lockup.

Transistor Q16 is in series with the emitter of Q22 at **dc** and low frequencies, and operates as one-half of a differential pair with Q22 at higher frequencies. This assures that Q22 switches at the signal zero-crossings, and effectively eliminates the second harmonic from the oscillator waveform. Power supply noise is removed by Q35. The oscillator signal from Q22 feeds Q32. These transistors form a cascode amplifier.

The filter connected to the collector of Q32 is tuned to 22 MHz to attenuate any remaining harmonics. The filter output drives to the base of Q72 which, in conjunction with Q74, forms a unity-gain isolation/distribution amplifier. The addition of Q74 lowers the output impedance, raises the input impedance, and lowers harmonic distortion. This amplifier provides the Reference Oscillator signal to the Reference Control board (A50), the Converter Phase Lock board (A53), and through the Phase Lock Switch board (A58) to the 1st Audio Mixer board (A40). Diodes CR47 and CR48, in conjunction with the Phase Lock Switch board (A58), provide switching, with a constant load impedance, of the Reference oscillator signal for the SPLIT mode of aural conversion.

Phase Shifter Board (A52)

In the synchronous detection mode, the circuits on this board sample the output signal from the quadrature video detector, and shift the phase of the signal to the product detectors. This provides a stable phase-adjustable reference frequency with adjustable reaction times for driving the product detectors.

A **dc** signal proportional to the difference between the picture carrier phase and the local regenerated carrier phase is applied to the drain of FET Q03. The source of Q03 connects through R13 to pin 2 of U22. Current may flow, depending on signal amplitude, through Q03 continuously in the front-panel selected CONT mode, during the sync tip time (SYNC TIP mode), or during the back porch time (BACK PORCH mode). During the selected time, the emitter of Q17 goes positive. This action causes the collector of Q17 to go positive, which causes Q03 to conduct the phase error signal from the quadrature detector to U22. Neutralization for spurious switching components is accomplished by Q15, C01 and associated components.

When the envelope detection mode is selected, the base of Q18 goes negative (−0.7 V). This action saturates Q18, causing the emitter of Q17 to go more negative, which causes the collector of Q17 to go toward −15 V. This action turns Q03 off and prevents the quadrature phase-error signal from passing to U22, a FET input operational amplifier.

Operational amplifier U22 operates as an integrator. The feedback capacitance is provided by C22 and capacitors selected through the SYNCHRONOUS TIME CONSTANT switch. The capacitor values depend on the reaction time selected. The value of the shunt capacitance is different for the continuous mode and the sync tip or back porch mode. This is necessary to maintain approximately the same loop bandwidth, as the error signal is passed to U22 only during sync or back porch time.

When switching to the envelope mode from the synchronous mode, the integrating capacitors maintain the output of U22 constant for some period even though Q18 has disabled the error signal. This prevents loss of phase adjustment and consequent video output disruption when rapidly switching from synchronous to envelope detection. Diodes CR32 and CR33 are protective diodes.

The voltage at pin 6 of U22 stabilizes at some value proportional to the quadrature-error signal. This voltage drives the sine- and cosine-shaping diode arrays connected to mixers U81 and U84. The diode arrays cause the outputs at pins 6 and 9 of U81 and U84 to vary such that the reference-oscillator signal is shifted in phase in proportion to the voltage at pin 6 of U22. See Fig. 3-10.

The reference oscillator signal drives U81 through a 20 dB attenuator composed of R82 and R92, and drives U84 through a 90° phase-shift network (L98, C90, and C95) and 20 dB attenuator (R64 and R84).

The mixers operate in the linear region at these low signal levels (around 50 mV). The outputs of U81 and U84 are summed at the primary of T58. The secondary feeds Q59, which provides isolation and gain. Transistors Q38 and Q37 operate as a unity-gain isolation amplifier, with high input impedance and low output impedance.

CONVERTER PHASE LOCK AND DETECTOR LO SWITCH ⟨9⟩

Converter Phase Lock Board (A53)

This circuitry compares the frequency and phase of the 22 MHz **if** carrier signal to the 22 MHz reference oscillator signal, and adjusts the frequency and phase of the converter oscillator so that no difference exists between the 22 MHz signals. Signals from Q42 and Q32 provide the control voltage for frequency differences between the 22 MHz reference oscillator and the limiter output, via the converter oscillator, from about 500 kHz to about 100 Hz. When the frequency difference is less than about 100 Hz, the output from U13 provides the control voltage for the converter oscillator. Integrated circuit U03 provides the control voltage to the Converter Oscillator in the Aural Only mode.

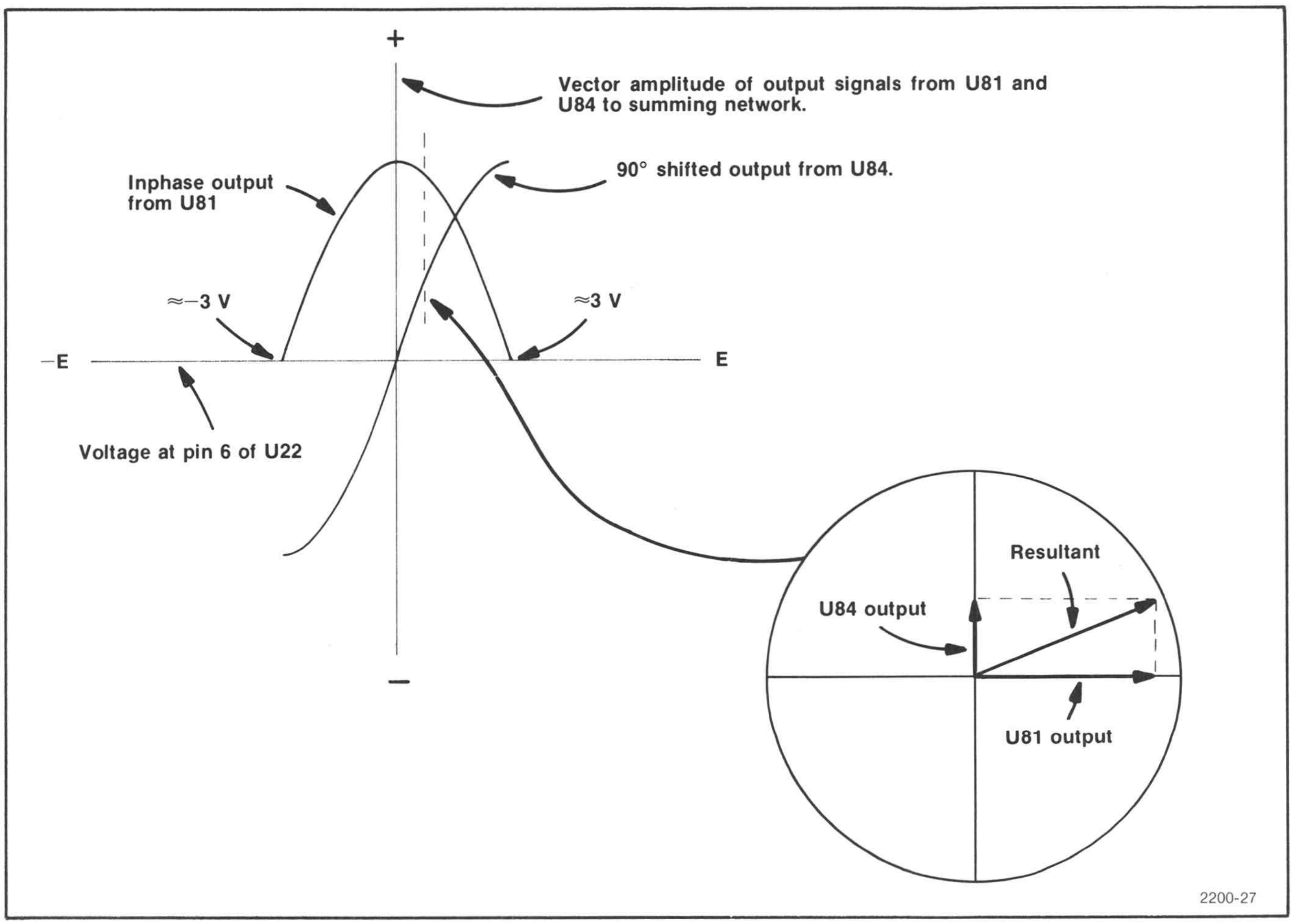


Fig. 3-10. Relationship of U22 (on A52) Output Voltage and Phase of Local Oscillator Synchronous Signal at Summing Network Output.

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The limiter signal from the Detector Local Oscillator Switch board (A54), is applied to pins 7 of U81 and U87. The 22 MHz reference oscillator signal is applied to the base of emitter follower Q95 and then to pin 2 of U81. Also, the 22 MHz reference oscillator signal is shifted 90° in phase by L89, C79 and C99. From there, it is applied through emitter follower Q94 to pin 3 of U87.

The differential output of U81, when phase locked, controls the frequency of the converter oscillator through U13. This differential signal is 0 V when phase locked, regardless of the converter-oscillator frequency. The differential output of U87, when the loop is phase locked, is a **dc** voltage of about 1 V with pin 9 more positive than pin 6 (about +7 V and +6 V respectively).

When the loop is out of lock, the waveforms from the mixers are triangular in shape, about 1 V peak-to-peak (differentially about 2 V), at a frequency varying with the amount of phase- and frequency-difference of the 22 MHz reference oscillator and limiter outputs. The output of U87 is shifted 90° from the output of U81. Outputs from both IC's pass through low-pass filters. These filters remove color- and sound-carrier components.

The quadrature output, from U87, passes to the input of U59A. No voltage appears across the input of U59A when triangle waves are present at the output of U87 because of the low-pass filter composed of R47, R48, and C57. As the circuit approaches lockup, the output of the mixers becomes closer to direct current. Very close to lockup, pin 3 of U59A becomes more positive than pin 2. Thus, pin 1 of U59A goes positive, resulting in the following: pin 7 of U59B goes positive, opening the common-emitter current path for Q45 and Q46, thus disabling the frequency lock; Q08 is switched off, allowing the back porch timing pulse to pass to the control input of U13; the unlocked light is switched off, and the video detector is allowed to switch to synchronous detection if selected.

When locked, the converter local oscillator is controlled through U13 by a **dc** signal at its input. A positive-going voltage at pin 6 of U13 decreases the converter frequency, and a negative-going output increases the frequency. When the circuit is not in lock, triangle waveforms pass through U13. These waveforms are averaged by C33 and have no effect on the frequency of the converter oscillator.

If the Converter Control board (A56) is removed, R23 provides a ground path for C33.

Integrated circuit U13 is a variable-transconductance amplifier that samples continuously during unlocked time, and is gated during lock time. Continuous sampling while unlocked prevents the phase lock from side-locking to a multiple of the sampling frequency. U13 is gated during lock to prevent any composite video present at its input, due to incidental carrier-phase modulation in the transmitter, from varying the converter-oscillator frequency. When the curcuitry is out of lock, the current flowing through pin 5 of U13 is about 5 μA from R18 through CR19, providing relatively low continuous gain for U13. As the circuitry approaches lock up, Q08 turns off. This allows the positive-going back porch timing pulse to gate the current to pin 5 of U13 between 150 μA when the pulse is positive (increasing the gain by a factor of about 30), and 0 μA (0 gain) during the low portion of the cycle. The average current to pin 5 of U13 is still 5 μA.

The major frequency-locking function is accomplished by combining the signals from Q53 with Q45, and from Q43 with Q46. The triangle waveforms driving the bases of these transistors cause them to switch at the midpoints of the triangles, forming square waves. Pins 9 and 6 are 180° out of phase with each other for both U81 and U87; and the outputs from U87 are shifted 90° from those of U81. The output from Q50 is inverted by Q43 so that the gating signals at the emitters of Q42 and Q32 are in phase.

The waveforms at the collectors of Q45 and Q46 are differentiated by C44 and C45, and combined with the gating signals from the collectors of Q43 and Q53. The phase of the gating signals from Q43 and Q53 changes 180° (+90° to −90°) from the phase of the differentiated spikes, depending on whether the 22 MHz limiter output frequency (**if** picture carrier) is above or below the reference oscillator. The leading edge of the differentiated pulse is always delayed 90° from the leading edge of the gating waveform.

If, for example, the limited picture **if** is above the reference frequency, the following events re-occur. Because Q53 is off, a positive differentiated pulse from C44 appears at the emitter, and thus the collector of Q42, delivering a positive charge to C33. The negative-going spike from C45 occurs when Q43 is on, simply decreasing current flow through CR23, and does not appear at the collector of Q32. The next differentiated negative-going spike occurs when Q53 is conducting current through CR42. The spike does not appear at the collector of Q42, but simply increases current flow through CR42. The positive-going spike from C45, when Q43 is off, is conducted through CR23 and does not appear at the collector of Q32. The net result is that the voltage across C33 increases, lowering the converter **lo** frequency, thus lowering the picture **if** frequency.

As the limiter output shifts in frequency toward the reference frequency, the frequency of the positive- or negative-going spikes decreases. The negative spikes pass through Q32 if the limiter frequency is below the reference frequency, and the positive-going spikes pass through Q42 if the limiter frequency is above. This action continues until the **dc** voltage on C33 is such that the two signals are the same frequency. At this time, Q45 and Q46 are disabled and U13 completes the final phase adjustment as described previously.

The circuit at the collectors of Q45 and Q46 forms an adaptive low-pass filter. Its purpose is to eliminate "noise" pulses when the signal is low frequency and approaching lock. When Q45 and Q46 have a low-frequency output, CR24 and CR26 connect C15 and C34 across the collectors, shorting the signal. When the output is a high frequency, the RC time constant of C15-R13 and C34-R14 maintains the charge on the capacitors, reverse-biasing the diodes, and allowing the signal to pass.

When the AURAL ONLY and SPLIT switches on A44 are engaged, the audio **afc** (Automatic Frequency Control) signal, also from A44, is used to set the Converter-Oscillator frequency. This places the aural signal in the frequency-lock feedback loop, ensuring that the Converter Oscillator converts the aural **if** carrier to the center frequency of the audio discriminator. (This mode is usually used when only the aural carrier is present.) In this mode, about +15 V is applied to pin 3 of this board. That voltage causes Q18 to saturate, shutting off U13; pulls the input of U59B high, causing CR47 to reverse-bias and shut off Q45 and Q46; and provides current to pin 5 of variable-transconductance amplifier U03, allowing the audio **afc** signal to be amplified and drive the converter control output.

Detector, Local Oscillator Switch Board (A54)

This board includes circuits to distribute the limiter signal and to switch between the limiter signal (for envelope detection) and the reference oscillator (for synchronous detection) as the local-oscillator source to the video detector.

A unity-gain isolation amplifier consisting of Q62 and Q72 provides a low-impedance output for the limiter signal. This amplifier drives the Converter Phase Lock board (A53), the Audio Source switch circuit on the Phase Lock Switch board (A58), and the video **lo** switch circuit on this board.

When the intercarrier mode of sound detection is chosen, a negative voltage (−15 V) appears on the cathode of CR78. This permits the limiter output to pass to the 22.5 MHz sound mixer through CR78. The limiter signal terminates to ground through CR59 in the split mode of sound detection, maintaining a constant load on the isolation amplifier.

The bases of Q03 and Q19 are low when envelope detection is selected, or when the phase-lock loop is unlocked. This lowers the junction of R50 and R12, which turns CR41, CR61, and CR15 on. This action allows the limiter signal to pass to Q34, and terminates the reference-oscillator signal through R25, C13, and CR15.

When the bases of Q03 and Q19 are high, the junction of R50 and R05 goes high, turning CR14, CR22, and CR63 on and CR15, CR61, and CR41 off. The reference oscillator is now fed to the base of Q34, and the limiter output is terminated.

The reference-oscillator signal is an approximate sine wave, and the limiter-output signal is a square wave. Transistors Q34 and Q35 operate as an emitter-coupled wave shaper. The output at the collector of Q35 is an approximate square wave.

CONVERTER LO AND LIMITER ⟨10⟩

Converter Control Board (A56)

The Converter Local Oscillator circuits are similar to those found in the Reference Oscillator and Control boards described earlier and shown on diagram 8. The major difference is the frequency of operation.

The Converter Control oscillator circuit is a Pierce crystal oscillator consisting of Q02 and associated components. The crystal frequency is 22.25 MHz above the visual **if**. Series-resonant circuit, L13 and C13, connects the feedback capacitors C15 and C05 only at the operating frequency. This ensures that Y18 operates on the correct overtone.

Mixer U22 combines the output of the converter crystal-oscillator and the converter **vco** output from A57. The **vco** feeds through Q35 to pin 2 of U22.

When the circuitry operates at design center, the frequency at pin 6 of U22 is 250 kHz. The signal passes through L50 and L60 which, with associated components, forms a low-pass filter.

Transistors Q91 and Q92 form a Schmitt multivibrator. Feedback is accomplished through R83. The signal at the collector of Q92 is a square wave with a voltage of approximately 6 V p-p. Transistor Q95 supplies 6 V for the collectors of Q91 and Q92. During each cycle, C73 charges through CR62 and discharges through Q74. The current (charge/cycle X cycles/second) from the collector of Q74 is proportional to the difference frequency.

During stable operation, current flowing through Q74 will equal current flowing through Q64. Current through Q64 is controlled by Q55A, which in turn is controlled by the **dc** voltage at the output of the Converter Phase Lock board (A53). FET Q55B provides constant current for Q55A. Transistor Q64 acts as a voltage-to-current converter.

If the converter oscillator goes low in frequency, the output at pin 6 of U22 increases in frequency. This causes more current to flow through Q74, decreasing the voltage to the frequency control of the converter oscillator, which in turn increases the frequency of the converter oscillator. This action continues until the frequency difference is such that the current through Q74 matches the current through Q64. Should the phase-lock loop indicate that a change in **vco** frequency is required, the current through Q64 changes and the frequency adjusts until the currents are equal.

Converter Oscillator Board (A57)

The voltage-controlled oscillator center frequency is about 250 kHz below the crystal oscillator.

Transistor Q22 operates as a series-tuned Colpitts oscillator. Tank-circuit inductance is provided by L03. Positive feedback occurs via C14 and C15. Frequency control is provided by CR09. A negative-going control signal at pin 3 of A57 causes the frequency to increase. Power supply variations are filtered out by Q35. The output signal from the collector of Q22 feeds to Q32, forming a cascode stage. This stage isolates the filter, composed of L41 and C30, from the oscillator. Power gain is provided by Q62, which drives an impedance-transforming bandpass filter. This filter is necessary to minimize **if** feedthrough in the **if** mixer.

Limiter Board (A55)

This circuitry picks off the **if** signal at the output of the IF Post Amp, and eliminates any amplitude modulation. The output is essentially square waves at the 22 MHz visual **if** rate. Any frequency or phase modulation of the **rf** visual carrier will appear on this signal.

The limiter is essentially four stages of emitter-coupled amplification and limiting. The four pairs of amplifiers are Q15 and Q22, Q35 and Q43, Q55 and Q63, and Q75 and Q92. Current for these transistor pairs are provided by four sets of transistors Q02 and Q21, Q32 and Q41, Q52 and Q60, and Q81 and Q90.

The first amplifier pair is driven by Q09, operated in grounded base for isolation purposes. The inductors in the emitter circuits, L15 and others, provide necessary peaking. Power supply isolation is provided by L17 and C14, and other associated components connected in a similar manner.

Both constant-current transistors in each state supply equal current to each half of the amplifying transistor pairs. Limiting action takes place as the signal current exceeds the emitter-bias current. The amplifier pairs are capacitively coupled to ensure precise switching at zero crossings. The delay through this circuit is adjusted by the potentiometers connected to the bases of the constant-current transistors. This delay is set so that the quadrature output is zero when the unit is operating in the envelope detection mode. Overall circuit gain is about 80 dB.

AGC SAMPLE AND HOLD AND ZERO CARRIER TIMING ⟨11⟩

Sync Stripper

The composite video is applied through a 1.5 MHz low pass filter (luminance signal only) to the base of Q17. This emitter follower drives U24, which provides continuous negative-going horizontal sync pulses at pin 7 and a negative-going pulse at pin 4 during the first 3 μs of the back porch time. A back porch pulse from U24 cannot occur more often than 63 μs. Inverter U33F provides a positive-going pulse, with the leading edge coincidental with the beginning of the back porch, to the phase shifter and other circuitry. The pulse is also inverted by U33C and passed to U41 at pins 3 and 4.

The regenerated horizontal-sync pulses also feed a pulse generator composed of Q20, R20, and C20. This timing circuit provides a 1 μs pulse during and for each horizontal sync tip time. This action allows sampling of equalizing pulses during the vertical interval. From the collector of Q20, these pulses feed U33A and U33B. These inverters, and also U33F, protect their associated circuitry from overvoltage if the Phase Lock boards are misconnected when used with a circuit-board extender.

Sample and Hold

A **dc** voltage level at either back porch or horizontal sync tip time is provided for the automatic gain control circuitry. The time of sampling is selected by front panel push buttons. A positive-going pulse from the back porch output, or the sync tip sampling pulse, appears at pin 11 of U31D. This is the sample time for the sample and hold circuitry composed of U18, Q14, and Q12. Composite video (Luminance) is present at pin 3 of U18. When the SYNC TIP button is activated, Q09 conducts. This raises the **dc** level of the composite video to the Sample/Hold equal to the difference between back porch and sync tip. The average output level from Q12 does not shift with respect to the sampling time selected.

The positive pulse at pin 11 of U31D is **ac** coupled to pin 5 of U18. Integrated circuit U18 is a variable transconductance amplifier used as a sample-and-hold device. When pin 5 goes high, U18 turns on and the **dc** level corresponding to the synt tip or back porch appears across C14, the hold capacitor. When the pulse at pin 5 disappears, U18 turns off until the next pulse. When no pulse is present at pin 5 of U18 for several seconds (**cw** signal with no modulation applied to the demodulator input), pin 5 is so biased that U18 begins conduction, providing a **dc** output level relative to the average level. FET Q14 drives Q12, which provides a **dc** level proportional to the signal strength to the **agc** circuitry. When the emitter of Q12 goes more negative, the **if** attenuation increases.

Operational amplifier U45A provides drive for the "high" and "low" indicator lights on the front panel. The range that both lights are off is determined by R44.

Clock

The clock pulses for the A/D Converter and readout circuitry are generated by U64A. This circuit operates as a free-running oscillator. The outputs from pin 8 of U53B and pin 5 of U53A are square waves shifted by 90° at one-half the oscillator frequency.

Zero Carrier Timing

Integrated circuit U41, a retriggerable one-shot multivibrator, outputs a low at pin 6 on the first back porch of a field and stays low until approximately 150 μs after the last back-porch pulse from U24 during the vertical blanking interval. Pin 6 remains high until the falling edge of the first back porch pulse appears. Pin 6 then goes low and remains low until the next vertical interval. Shortly after pin 6 of U41 goes high, pin 6 of U43A and pin 1 of U34 also go high.

When pin 1 of U34 went low, after the previous vertical interval, the binary number 3 was loaded into the counter (pins 4 and 10 high and pins 3 and 11 low) and appeared at the output with pin 5 high, the B output (unused) high and pin 2 low. See Fig. 3-11. The next regenerated horizontal-sync pulse from pin 7 of U24 clocks pin 2 of U34 high. This action sets the input to shift register, U61, high. On the next back porch pulse to pin 8 of U61, pin 3 of U61 goes high. When pin 2 of U34 goes high, U34 commences counting. See Fig. 3-12 for U34 truth table. Each count, processed as a regenerated horizontal sync pulse, appears at pin 8 of U34. On the fifth sync pulse, pin 2 of U34 goes low. This action causes the preset, pin 4, of U43A to go low which lowers Q, pin 6, of U43A. This action loads U34 with a binary 3 as shown in the truth table, and the cycle repeats at the next vertical interval. When the data input to U61 goes low, the pulse width from the shift register is determined. At the next horizontal sync pulse, after pin 3 of U61 went high, pin 4 of U61 goes high and remains high for the same time as pin 3. This action continues for 25 lines with U65 following the count from U61. The instrument is shipped with jumper P73 selected for the internal zero-carrier pulse at horizontal line 16.

The purpose of U62B is to set the commencement of the zero-carrier timing pulse into active video time. The purpose of U62A is to determine the pulse width.

The negative-going output from U61 or U65 cause the Q, pin 12, of U62B to go low and stay low for about 14 μs. When pin 12 of U62B again goes high, it triggers a negative-going 30 μs duration pulse at pin 4 of U26A. This pulse gates through U64C as the zero-carrier timing pulse. An external zero carrier timing pulse can be fed from J17 on the rear panel, to the base of Q51, which inverts the pulse for the input of U64C.

If the internal and external zero carrier pulses are on different lines, both will appear at the output of U64C. If the pulses are on the same line, the output pulse width will depend on the start and stop times of the two inputs.

The internal zero carrier reference pulse can be turned off from the front panel. This is done by grounding the clear pin of U62A.

Attenuator Control

The attenuator switches provide control for the front-end **rf** Attenuator A1, and offset the readout to compensate for the added attenuation.

The attenuator clock signal from the Readout Driver board, A61, drives Q11. This supplies pulses of current through the ATTENUATOR switches to the latching solenoids of the Attenuator, A1. When a switch is in, the current pulses latch the attenuator in. When the switch is out, the attenuator leads are reversed, and the attenuator is latched out. The resistor from the +15 V supply to the collector of Q11 provides holding current to keep the solenoid latched without drawing excessive power.

Each ATTENUATOR switch also has a section that, when activated, grounds inputs to the Readout Driver circuitry on A61. This causes the readout to be offset by the amount of attenuation.

AGC A/D CONVERTER AND PIN DRIVE DECODER ⟨12⟩

The **agc** circuit takes the sample and hold level from diagram 11 and converts it to a digital signal to control the

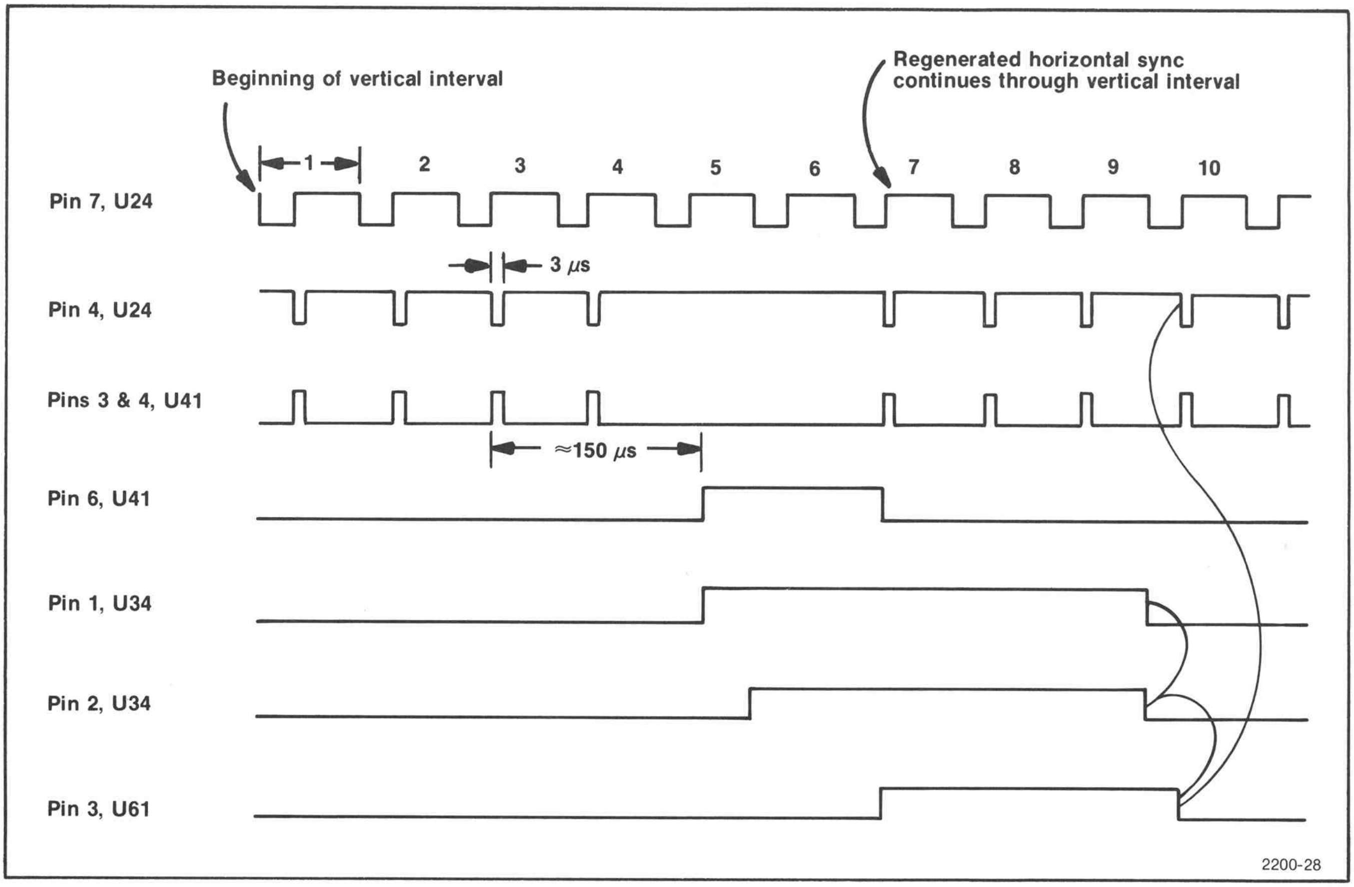

Fig. 3-11. Zero Carrier Timing Diagram.

Unused

Pin 5 Pin 2

	A	B	C	D	
Load	1	1	0	0	Pin 1 (load) low
1st horiz sync after load goes high	0	0	1	0	Pin 1 (load) high
2nd horiz sync	1	0	1	0	
3rd horiz sync	0	1	1	0	
4th horiz sync	1	1	1	0	
5th horiz sync	0	0	0	1	
Load	1	1	0	0	Pin 1 (load) low

2200-29

Fig. 3-12. Truth Table for U34 on A60.

p.i.n. attenuators, and to provide readout of the input power.

Gain Control

In the AUTO mode, integrating operational amplifier U12 averages the transitions between samples. This appears as a ramp of opposite polarity at the integrator output. The speed of this averaging is determined by the setting of the AGC SPEED control, R1, on the front panel. At the fastest speed, the **agc** loop bandwidth is about 320 Hz, and averages about 11 lines, therefore averaging out any sampling errors, and changing the gain fast enough for most signal variations (e.g., airplane flutter) to be corrected before they appear at the output. At the slowest speed setting, the **agc** bandwidth is about 7 Hz, and the integrator averages almost 800 lines. This changes the gain at a slow enough rate that low frequency effects (e.g., mains hum) will show up at the output. CR16 clamps the output of U12 from going below −0.6 V.

In the MANUAL mode, the **agc** loop is opened and the gain control circuitry is driven by R2 on the front panel (a 3-turn potentiometer labeled MANUAL GAIN). U17A is connected in the feedback loop around U12, turning the circuit into a follower. R2 is connected as a variable voltage divider, with the low voltage end connected to a forward-biased diode, CR34, for temperature tracking. R2 sets a voltage at the negative input of U17A, which in turn causes an offset in the output of U12, thus changing the gain control signal.

Integrated circuit U17A is connected across U12 and integrating capacitor C15. This precharges C15. In the normal case of the MANUAL GAIN control being set close to the correct **agc** level, the capacitor is already charged close to the correct level, thus eliminating an annoying change in the output signal while waiting for the **agc** to recharge C15 to the correct level.

A/D Converter

The circuitry in this block takes the analog gain control signal from integrator U12, and converts it to a parallel 7-bit binary signal used by the PIN Drive Decoder, the D/A Converter, and the readout circuits. This circuitry also supplies an analog fine **agc** current that drives a **p.i.n.** diode in the IF Post Amp (A26) shown on diagram 3, and an analog signal and a reference level for the Readout A/D Converter shown on diagram 13.

The circuits in this block consist of inverting operational amplifier U45B, fine **agc** circuit Q37, comparators U48A and U48B, counter control circuits U66A, U66B, U73B, and U64B, and up/down counters U86 and U76.

Inverting operational amplifier U45B provides the fine **agc** signal, the analog signal for the Readout A/D Converter on diagram 13, and drives the counter control circuits in this block. Inputs are received from the Gain Control circuit through R32, and the D/A Converter circuit. Transistor Q36 provides a positive clamp at about +4.6 V, and diode CR37 provides a negative clamp at about 0 V, for out-of-range signals. R35 sets the output level to about +3 V when the other two input currents cancel each other.

Transistor Q37 provides the fine **agc** current to the IF Post Amplifier (A26) on diagram 3. Fine AGC Adjust, R47, calibrates the amount of gain control from this circuit.

Comparators U48A and U48B monitor the output of U45B, and when the output level goes under +2 V or over +4 V, a comparator switches. The resistor string R36, R49, and R37 form a voltage divider to set the upper clamp level of the output of U45B. The comparator output goes high when the positive input is higher than the negative input. U48A goes low when the input signal is above +4 V. U48B goes low when the input goes below +2 V.

Type D flip-flops, U66A and U66B, are driven by the comparator outputs, and receive a clock signal from diagram 11. If the output at pin 5 of U66A is high, counters U86 and U76 will count down; if low, they will count up. NAND gate U64B enables clock pulses from diagram 11 when the output of U45B is out of its 2 to 4 V window. These clock pulses are used to clock binary counters U86 and U76.

A total of 7 data outputs are used from the 2 counter IC, U86 and U76. Q_a of U86 is the least significant bit (LSB), and Q_c of U76 is the most significant bit (MSB). The ripple-carry (R/C) output of U86 goes low to enable U76 when U86 overflows or underflows. The 7 parallel data lines drive the D/A Converter, the PIN Drive Decoder, and the readout circuit. When the counter output reaches the binary equivalent of 0 or 95, pin 9 of PROM U94 goes high, disabling the counter. This provides a total counter range of 94 steps.

Figure 3-13 shows some waveforms that may be used to help understand the operation of the A/D circuit. (It should be noted that these waveforms do not account for the effect of the **p.i.n.** attenuators on the input signal, and therefore will not occur in the actual circuit. They are presented here for learning the circuit only.) If the input signal changes by some amount, that change will be integrated by the Gain Control circuitry, and fed to U45B as a current through R32. As the current through R32 increases, the output voltage of U45B decreases until the level reaches +2 V. At this point, comparator U48B switches to a TTL low. The low is transferred, at the appropriate time, through U66A to set the binary counters, U76 and U86, to count up. At the same time, the Q output of U66A is transferred through U73B to enable the counter clock through U64B. The next counter-clock pulse causes the counters to increase their count by one. This causes the D/A Converter to add a step of current in the opposite polarity, effectively canceling the current through R32, and driving the output of U45B back to a midpoint of about +3 V.

When the input signal decreases, the circuit works in the opposite manner. The output of U45B goes more positive, and at +4 V, comparator U48A switches, causing the binary counters to count down. This decreases the current from the D/A Converter, and again returns the output of U45B to +3 V.

D/A Converter

The D/A (digital-to-analog) Converter is driven by the binary counters in the A/D Converter block to provide steps of analog currents for offsetting the gain control current into U45B. The D/A Converter consists of a set of seven inverters driving seven diode-switched binary-weighted current sources. The current sources are a set of binary-weighted resistances connected between the low-impedance points of the −15 V power supply and the negative input of U45B. The resistances selected by the four most significant bits are adjustable. When an inverter output is low, the diode at that point is shut off, and current flows from the associated resistor through a series diode,

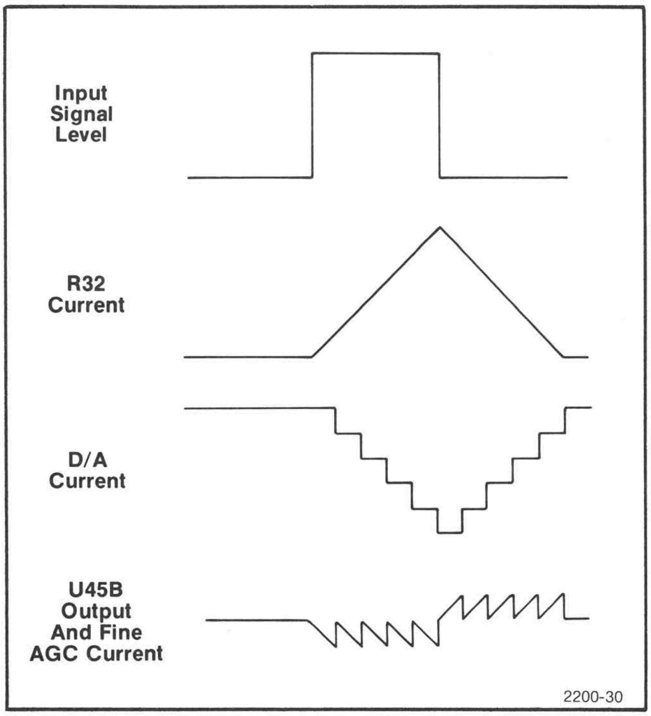

Fig. 3-13. Understanding the AGC Analog-to-Digital Converter Operation.

and into the negative input of U45B. If an inverter output is high, the diode at the inverter is on, turning the diode to U45B off, and sinking the current from the resistors into the inverter.

PIN Drive Decoder

The PIN Drive Decoder circuitry converts the 96-count binary signal from the A/D Converter to three 32-count binary signals for driving the three PIN Driver circuits.

The circuit consists of PROM U74 and U94, and an array of logic gates. The upper set of gates, U73A, and U71A, B, C, and D provide the output for PIN Driver A31; the middle set of gates, U91A, B, C, and D, and U93A provide the output for the PIN Drive in the Down Converter; and U83D selects between A30 and the Down Converter PIN Drivers.

The PROM has a 256 X 4 bit format. The seven binary data lines from the A/D Converter feeds the A0 through A6 input address lines of both IC in parallel The A7 input of U94 is controlled by the counter up/down control line, and the A7 input of U74 is not used.

The eight output lines of the two PROMs are used to provide several functions. 0_1 through 0_4 of U74, and 0_1 of U94 provide the five data output lines, with 0_1 of U74 the least significant bit, and 0_1 of U94 the most significant bit.

Pins 0_2 and 0_3 of U94 provide selection of the output gates. Pin 0_4 of U94 disables the counters in the A/D Converter and enables U79B in the Alarm circuit when the count is maximum or minimum, indicating that the input signal is out of the **agc** range.

Figure 3-14 lists data useful in understanding the operation of this circuit. As the input binary signal counts from 0 (base 10) to 93 (base 10), the output data lines count from 0 (base 10) to 31 (base 10) three times, to drive the gate arrays.

When the counters are at count 0 (base 10) through 31 (base 10), pin 0_2 of U94 is low, enabling the output data to pass through the upper set of output gates to PIN Driver A31. At this time, pin 0_3 of U94 is also low, disabling the middle set of AND gates, and thus inhibiting the data from driving PIN Driver A30 and holding these outputs low. Exclusive OR U83D senses the lows on pins 0_2 and 0_3 of U94, and gives a low output, holding the lower set of AND gates low.

For counts of 32 (base 10) through 62 (base 10), both pins 0_2 and 0_3 of U94 go high. This holds the outputs of the upper set of gates high (data output of 31 [base 10]), enables the data through the middle set of gates, and holds the lower set of gates low.

For counts of 63 (base 10) through 93 (base 10), pin 0_3 of U94 is low. This continues holding the upper gates high, disables the middle AND gates and sets the exclusive ORs high, and enables the data through the lower set of gates.

Alarm

In case of a loss of visual or aural carrier, the Alarm circuit gives a visual warning on the front panel and provides switched relay contacts to drive an external alarm circuit.

When the visual carrier is lost, or below the **agc** range, the output of U79B goes low. This lights the VISUAL CARRIER LOSS light, DS4, and causes pin 11 of U79D to go low, lighting the AURAL CARRIER LOSS light, DS3. With pin 11 of U79D low, CR88 turns off, and C88 is discharged through R83. After about a one-half second delay, C88 is discharged enough to switch of Q89, thus de-energizing relay K97. CR98 turns on when the field for the relay coil collapses, protecting Q89 from possible damage by the reverse-voltage spike that would otherwise occur. The relay contacts are available at the rear panel REMOTE CONNECTOR, J14, for controlling external alarm circuits. Refer to the Installation portion of the Operating Instructions in Section 2 of this manual for further details about the external connections.

Pin Driver Addresses				Output Gate Select		Counter Enable
Count	A31	A30	Down Converter	U94 Pin 11	U94 Pin 10	U94 Pin 9
0	0	0	0	LO	LO	HI
1	1	0	0	LO	LO	LO
2	2	0	0	LO	LO	LO
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
31	31	0	0	LO	LO	LO
32	31	1	0	HI	HI	LO
33	31	2	0	HI	HI	LO
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
62	31	31	0	HI	HI	LO
63	31	31	1	HI	LO	LO
64	31	31	2	HI	LO	LO
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
93	31	31	31	HI	LO	HI

2200-31

Fig. 3-14. PIN Driver Decoder Data.

In the case where only the aural carrier is lost, the aural alarm signal from A44 goes low, causing U79D pin 11 to go low, via U79A, activating the relay alarm circuit, and the AURAL CARRIER LOSS light.

+10 V Supply

Voltage divider R19 and R06 provides +10 V to the positive input of voltage follower U17B. The follower supplies +10 V to the comparator divider in the A/D Converter, and the MANUAL GAIN control, R2. The voltage is also supplied to the sync-tip offset circuit shown in the Sample and Hold block on diagram 11.

READOUT DRIVER 13

This circuitry converts the digital and analog **agc** signal to a signal capable of driving the front panel display.

Clock

A clock signal at about 2 Hz is generated by U91. This signal feeds to the base of Q11 shown on the Zero Carrier Timing schematic 11. The signal at the collector of Q11 is switched to the A1 Attenuator latching relays. Switch S03 changes the direction of the current through the latching-relay coils, thus changing the attenuation as selected. When pin 3 of U91 goes low, U63B is preset through CR91. This action causes a low on pin 8 of U63B. This low remains until the readout clock pulse goes high. On the rising edge at the clock input, pin 11, of U63A, the output, pin 8 goes high. This action causes pin 13 of U60D to go high. Pin 8 of U60C went low but pin 12 of U60D remains high for a short time while C72 discharges through R62. The low then creates a short negative-going pulse at pin 11 of U60D with a falling edge coincident with the positive-going edge of the readout clock. This low at pin 11 of U60D feeds to U60B, which resets U81, loads the data bits present on the **agc** data bus into binary counters U88 and U98 and the preset inputs to decimal counters U43, U46 and U48.

Binary Counters

Pin 5 of U60B goes low about every one-half second. Pin 6 of U60B goes high at the same time. This action starts U81 counting. The clock to pin 14 triggers the counting on the negative edge. See Fig. 3-15 for the timing diagram for U81. When the binary data (maximum 95 counts) is loaded into U88 and U98, one or both of the maximum-minimum terminals will be low. Also, at least one of the maximum-minimum outputs for the decimal

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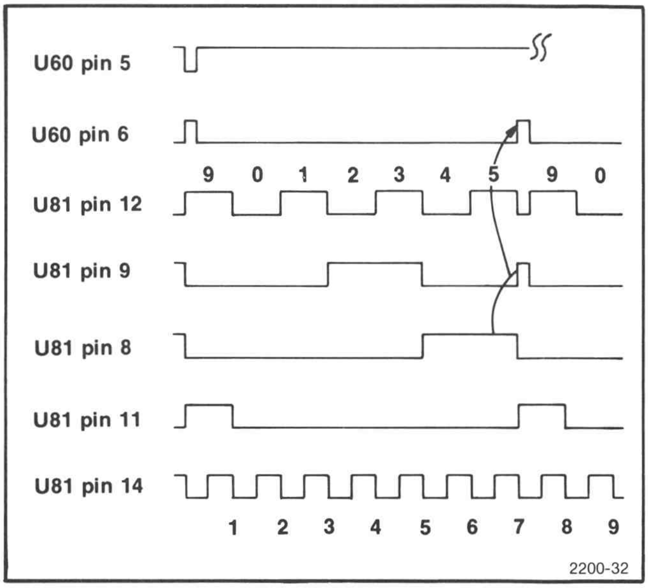


Fig. 3-15. Timing Diagram for Divide-by-Seven Counter, U81 on A61.

counters U43, U46 and U48 is low. These lows at pins 12 or 13 of U68D cause a low at pin 11 of U68D, which enables decimal counter U48 and binary counter U98. On the next clock pulse, at pins 1, 2, and 13 of U65A and at pins 14 of the decimal counters, the counters start to count. As shown in the timing diagram, U81 outputs one pulse to pins 14 of U98 and U88, for each seven readout clock pulses. This accounts for the 0.7 dB change in attenuation for each binary data unit in the **agc** circuit.

Fine A/D Converter

The reference voltage for the fine **agc** range between the 0.7 dB steps is applied to the base of Q96A. The voltage at the emitter of Q96A and pin 2 of U94 is about +3.6 V. The voltage at the emitter of Q96B varies between about +1.6 V and +3.6 V, depending on the amount of attenuation (0 dB to 1.4 dB) required. The voltage at the emitter of Q96B determines the number of clocks, charging and discharging Q93 and C94, necessary to charge C92 to a sufficient voltage so that pin 3 of U94 reaches the same level as pin 2. The capacitance of C94 is adjusted so that when the voltage at the emitter of Q96B is at the lowest value, exactly 14 clock pulses are required to raise the voltage at pin 3 of U94 to equal the voltage at pin 2. After the binary counters stop, the decimal counters continue counting until pin 7 of U94 goes low.

Pins 6 and 9 of U85 are high as previously described. This action causes a high on pin 1 of U68A, with pin 11 of U68D high. On the next negative-going clock, pin 2 of U68A goes low, causing pin 3 of U68A to go low. With pin 6 of U68B high, Q73 conducts and Q92 is off. At the same time, Q83 conducts, bringing the collector near ground. Charge accumulated on C94 and C93 discharges through CR96 to +5 V. When pin 2 of U68A goes low at the next negative-going clock transition, Q83 stops conduction and C93 and C94 charge toward +15 V. All current charging C93 and C94 must be absorbed by C92 through Q95. When the voltage across C92 matches the voltage on pin 2 of U94, pin 7 of U94 goes low, pins 4 and 8 of U85 go high, and pins 6 and 9 low. This action places a high on the enable terminals of the decimal counters, causing them to stop counting.

Readout Offset

The inputs of U43, U46 and U48 are preset, depending on the starting count desired. The start count is determined by the settings of S57 and S59. This count is factory-set at 39.5. See Fig. 3-16. The fixed-attenuation push buttons on the front panel add up to an additional 300 counts, depending on the attenuation selected. When both push buttons are pressed, pins 11 and 7 of U41 are raised to +5 V. If 10 dB of fixed attenuation is inserted, only pin 11 is raised. If 20 dB is inserted, pin 7 is raised to +5 V. This digital information is added to the preset from S57 and S59.

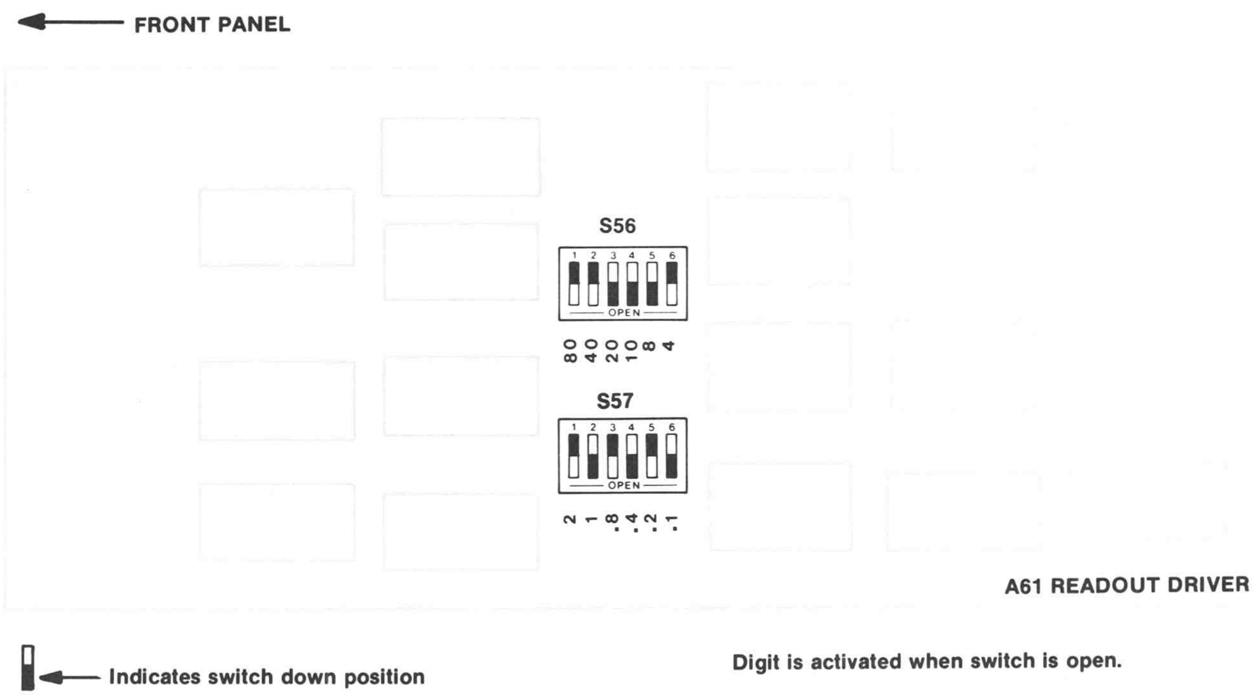
Switches S57 and S59 may be reset to other starting counts within the range of the readout, which is a total of 67.9 dB. For example, if 20 dB of additional gain is added to the input of the 1450-2, to read the actual signal strength, set the counter start to 59.5 (39.5 + 20). The readout will now read from approximately −89.5 to −21.6 with the front panel attenuator push buttons released, or −59.5 to +8.4 with the attenuator push buttons pressed.

Decimal Counters

As the decimal counters start at the most negative reading, progress to 0 dB and then count up for a positive dB reading, the decimal counters must switch from count-down to count-up. When the three decimal counters reach 0, pins 3, 4, and 5 of U65B all go high. This action lowers the clear pin at U63A, causing pin 5 to go low. This action lowers the cathode of the vertical bar in the plus sign of DS24 on the Readout board (A62) and changes the decimal counters to the count-up mode. The counting continues until the count in the binary counters reaches 0. At this time, pins 12 of U88 and U98 both go high, placing a high on pin 9 of U68C and pin 5 of U68B. The decimal counters continue to count as pin 10 of U68C is still low.

LED Drivers

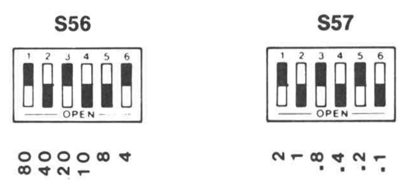
The accumulated count, in the decimal counters, is processed through binary-coded-decimal to 7-segment decoders, U32 for the tens digit, U35 for the ones digit, and U38 for the tenths digit. A high is also placed on the input of U65C, which causes Q50 to conduct. This action applies anode voltage to the polarity sign and the digit-display modules displaying the accumulated count. After the count is displayed, the cycle repeats.



(a) Factory set switch positions for use with TDC Down Converter—Preset counters to −39.5.

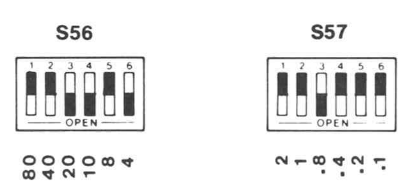
Text example: | **Preset** | **SWITCH SETTINGS**

External +20 dB Preamp | −59.5



With IF signal to IF INPUT only.

−4.7 dB | −34.8 dB



(b) Typical alternative readout offsets.

2998-18 (2200-33)

Fig. 3-16. Readout Offsets.

POWER SUPPLY ⟨14⟩

The +15 V and +5 V supplies are referenced to the −15 V supply, which is referenced to zener diode VR62. All supplies have the series-pass transistors configured as collector outputs. This allows the regulated outputs to operate closer (approximately 1 V drop) to the unregulated busses.

−15 V Supply

In the −15 V supply, the voltage at the base of Q73 holds at −6.2 V. Should the −15 V go more negative, Q72 conducts more current. This causes Q82 to increase conduction, reducing conduction in Q83 and Q95. This action reduces current flow to the −15 V bus, causing the supply to return to the preset level. The regulating circuitry for all three supplies is fast enough to respond to the 120 Hz ripple present from the rectifiers. Should the current from the supply passing through R91 exceed about 2 A, Q81 comes into conduction. This action causes Q82 to conduct, which reduces conduction in Q83, holding the current through Q95 to a safe value. The output impedance of Q72 and Q73 is matched to reduce unequal feedback from collectors to bases, resulting in increased ripple rejection. Loop compensation to prevent oscillation is provided by C84, C85, and R86. Constant voltage across R94, to reduce hum, is provided by VR73. The LED mounted on the power-supply circuit board indicates when voltage is present on the −15 V bus.

+5 V Supply

The +5 V supply operates in a manner similar to the −15 V supply. Reference is obtained at the junction of R51 and R60. Should the +5 V increase in voltage, Q52B increases conduction, causing Q53 to increase conduction. Constant current is provided by Q54. This action reduces conduction in Q43, which in turn reduces conduction in Q34. If the current passing through R41 exceeds about 2 A, Q41 comes into conduction. This action reduces current flow through Q34 to a safe level. Turn-on current for Q43 is provided by current-source Q54, which also aids in ripple reduction. Loop compensation to prevent oscillations is provided by R44, C44, and C54. The 5 V winding on T10 is fused. This is necessary, as a shorted 5 V winding causes insufficient current in the primary winding to open the primary fuse.

+15 V Supply

Reference for the +15 V supply is obtained through divider R20 and R21 connected to the −15 V supply. If the +15 V supply increases in voltage due to decreasing load, Q22B increases conduction. This action increases conduction in Q14 and reduces conduction in Q13 and Q05. The reduced current supplied to the decreased load lowers the voltage to the predetermined level. If more than about 2 A of current flows through R02, Q10 comes into conduction, limiting the current to a safe value. Loop compensation to stop oscillations is provided by C13, C14, and R15. Start-up current for Q13 is provided by Q23, which as a collector current source for Q14, also reduces ripple.

CALIBRATION

Introduction

The procedures in this section serve as guides to perform the calibration steps necessary to ensure the proper operation of the 1450-2 TELEVISION DEMODULATOR. Limits, tolerances, and waveforms appearing in this section are not instrument specifications except as listed in Section 1, Specification.

The 1450-2 front- and rear-panel names are capitalized; e.g., RF IN. Control and connector names on test equipment and internal controls in the 1450-2 have only the first letter capitalized; e.g., Gain.

The capabilities of the test equipment listed are the minimum required to calibrate the 1450-2. If alternative equipment is used, it must meet or exceed the specifications of the listed equipment. Refer to Table 4-1 for test equipment needed to calibrate the 1450-2, and Table 4-2 for frequencies associated with television channels.

The following calibration is in an orderly manner, and will result in a calibrated instrument within the specifications. Note that if an adjustable component is replaced in an LC filter, the filter may be severely misadjusted by the component replaced. In such a case, it is recommended that the adjustment step associated with the circuit board be performed; then perform the overall calibration.

The calibration section is divided into two main parts: Performance Check and Adjustment Procedure. The Performance Check is preceded by an equipment table and a short-form performance check procedure, while the Adjustment Procedure is preceded by a short-form adjustment procedure.

The Table of Contents at the front of this manual lists the page numbers of all the performance checks and adjustment steps.

The 1450-2 must be powered up for at least one hour before any measurements or adjustments are made.

Table 4-1

RECOMMENDED TEST EQUIPMENT

Description	Minimum Specification	Where Used	Equipment Used
Down Converter (TDC)	Down Converter Vision IF must be the same as the 1450-2 IF Option	Performance Check and Calibration	TEKTRONIX TDC Down Converter Option 2, Option 12
Test Modulator	0.1 dB Flatness within IF Bandpass Limits	Performance Check and Calibration	Tektronix Part No. 067-0866-05
Oscilloscope	At least 50 MHz Bandwidth	Performance Check and Calibration	TEKTRONIX 7704
Differential Comparator	At least 20 MHz Bandpass	Performance Check and Calibration	TEKTRONIX 7A13
Time Base Plug-in	5 ns/div to 5 s/div Calibrated Time Base	Return Loss	TEKTRONIX 7B53A

Table 4-1 (cont)

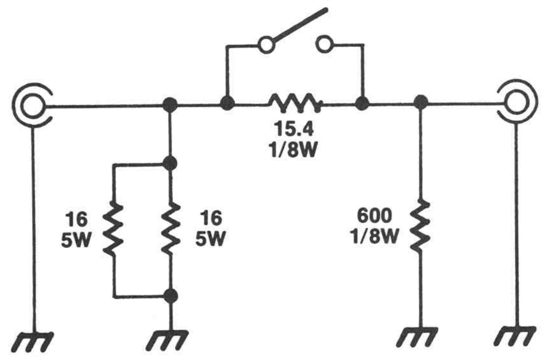
Description	Minimum Specification	Where Used	Equipment Used
Spectrum Analyzer	3 kHz to 3 MHz Resolution in Decade Steps	Performance Check and Calibration	TEKTRONIX 7L13
Tracking Generator	Compatible with the Spectrum Analyzer	Performance Check and Calibration	TEKTRONIX TR 502
Power Supply Module	Capable of driving several loads	Performance Check and Calibration	TEKTRONIX TM 503
Multimeter	0.1% accuracy	Performance Check and Calibration	TEKTRONIX DM 502
Frequency Counter	Compatible with TR 502 Tracking Generator	Performance Check and Calibration	TEKTRONIX DC 508 with Opt. 07
Low-Pass Filter	250 kHz	Calibration Quadrature	Tektronix Part No. 015-0352-00
RF Signal Generator	Low Phase Noise and Stability in the order of 10 ppm/10 min	Performance Check and Adjustment	HP 8640B
Audio Oscillator	30 Hz to 20 kHz Distortion less than 0.035% from 20 Hz to 50 kHz	Performance Check and Adjustment	TEKTRONIX SG 502
Leveled Sine Wave Generator	Up to 100 MHz	Performance Check and Calibration	TEKTRONIX SG 503
Function Generator	1 Hz to 100 Hz with **dc** Offset	Performance Check and Adjustment	TEKTRONIX FG 503
50 Ω Step Attenuator	50 dB in 10 dB Steps	Performance Check and Adjustment	HP 8495A
50 Ω Step Attenuator	9 dB in 1 dB Steps	Performance Check and Adjustment	HP 8494A
Audio Spectrum Analyzer	10 Hz to 3 kHz Resolution; 600 Ω Input; 5 kHz and 10 kHz Frequency Spans	Performance Check and Adjustment	TEKTRONIX 7L5 with L3 Head
Full Field Signal Source	Color Bars, Linearity, 2T Pulse and Bar, Field Sweep, Black Burst	Performance Check and Adjustment	TEKTRONIX 1411 with SPG12, TSG11, TSG13, TSG15, and TSG16
Power Meter	−25 dBm to +20 dBm	Performance Check and Adjustment	HP 435A
Waveform Monitor	Display Field Rate and Line Rate Waveforms, for a 625/50 TV System with a CCIR-compatible graticule (Tektronix Part No. 331-0393-05)	Performance Check and Adjustment	TEKTRONIX 1481 or 1485
Vectorscope	Differential Phase and Differential Gain Displays	Performance Check	TEKTRONIX 521A

Table 4-1 (cont)

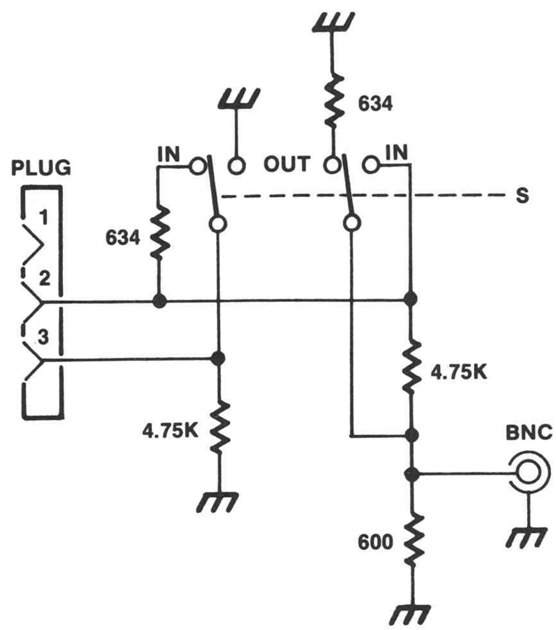
Description	Minimum Specification	Where Used	Equipment Used
Graticule for Waveform Monitor	Phase Graticule	Performance Check	Tektronix Part No. 331-0393-15
8 Ω to 600 Ω Matching with Switchable 30 dB Pad	N/A	Performance Check and Adjustment	See Fig. 4-1a
600 Ω cable with Pad	30 dB N/A	Performance Check and Adjustment	See Fig. 4-2b
Filter	5.5 MHz Low Pass; 75 Ω	Video Signal-to-Noise Ratio	Matthey Part No. FLM550B
Filter	1 kHz Low Pass	Performance Check	See Fig. 4-2
High-Frequency Return Loss Bridge	10 MHz to 1 GHz and 40 dB directivity 50 Ω	IF IN Return Loss Check	Wiltron VSWR Bridge 62N50
Video Return Loss Bridge	54 dB; dc to 10 MHz; 75 Ω	Return Loss Check	Tektronix Part No. 015-0149-00
4 Each SMA Male-to-BNC Female	N/A	Performance Check	Tektronix Part No. 015-1018-00
Calibration Fixture	N/A	Video Low-Pass Filter	See Fig. 4-2
BNC Male-to-Pin Jack Adapter Cable	N/A	IF Filter Flatness Adjustment	Tektronix Part No. 175-1178-00
50 Ω-to-75 Ω Minimum Loss Attenuator	N/A	Performance Check	Tektronix Part No. 011-0057-00
DC Blocking Capacitor	N/A	Calibration	Tektronix Part No. 015-0221-00
BNC-to-Square Pin Adapter Cable	N/A	Calibration	Tektronix Part No. 175-2140-00

NOTE

An SMA Male-to-BNC Female Adapter must be used when making frequency measurements with the DC 508 Option 07, TR 502, and 7L13 combination. This adapter is not provided with either the DC 508 Option 07 or the TR 502, and must be ordered separately.



(a) 8 Ω to 600 Ω Impedance Matching Calibration Fixture with Switchable 30 dB Attenuator.



(b) 600 Ω Audio Output Calibration Fixture with Switchable 30 dB Attenuator.

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Fig. 4-1. Audio Output Calibration Fixtures.

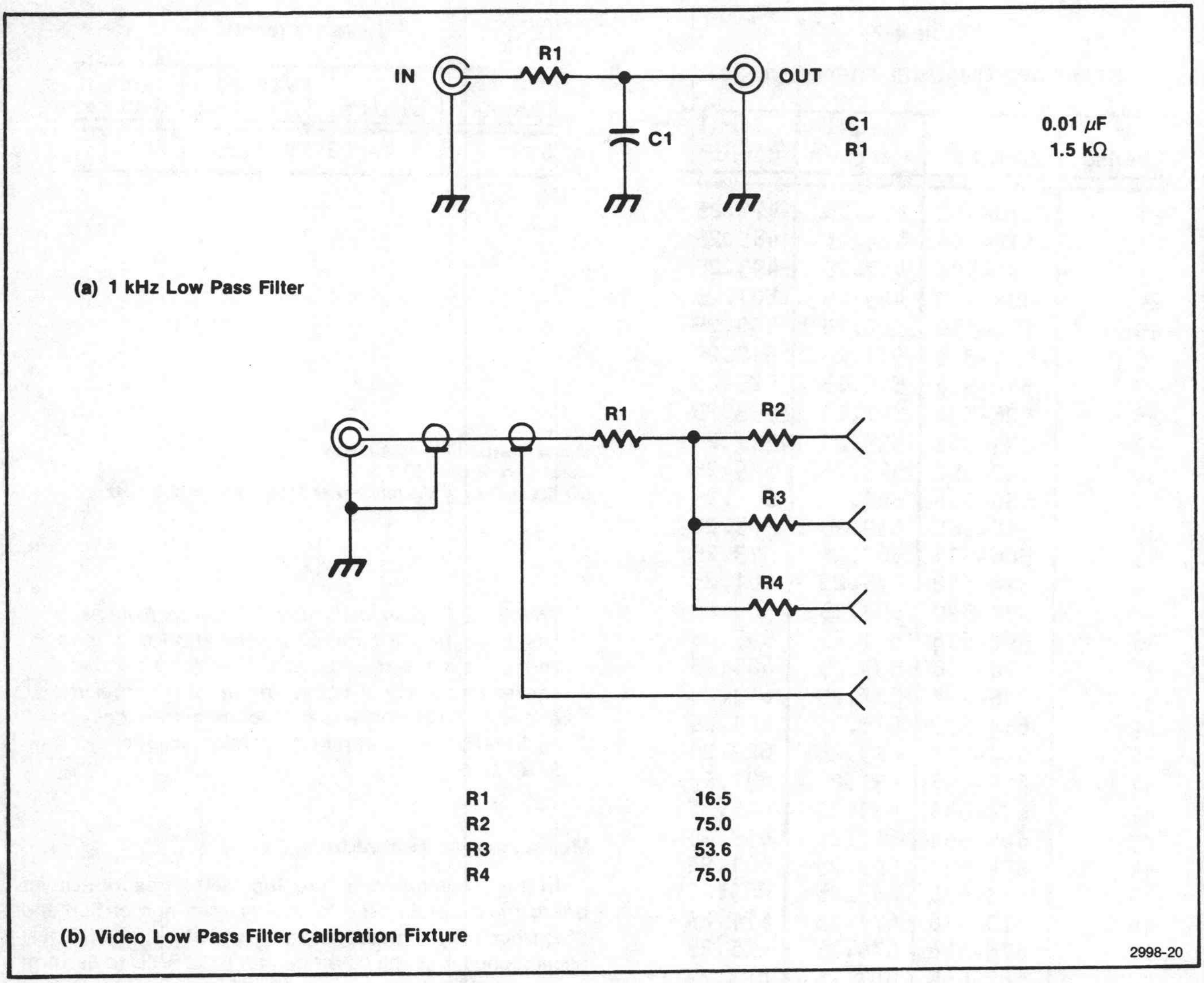


Fig. 4-2. Calibration Fixtures.

Table 4-2

STANDARD CHANNEL FREQUENCIES

Channel	Limits	Visual Carrier	Aural Carrier
21	470-478	471.25	477.25
22	478-486	479.25	485.25
23	486-494	487.25	493.25
24	494-502	495.25	501.25
25	502-510	503.25	509.25
26	510-518	511.25	517.25
27	518-526	519.25	525.25
28	526-534	527.25	533.25
29	534-542	535.25	541.25
30	542-550	543.25	549.25
31	550-558	551.25	557.25
32	558-566	559.25	565.25
33	566-574	567.25	573.25
34	574-582	575.25	581.25
35	582-590	583.25	589.25
36	590-598	591.25	597.25
37	598-606	599.25	605.25
38	606-614	607.25	613.25
39	614-622	615.25	621.25
40	622-630	623.25	629.25
41	630-638	631.25	637.25
42	638-646	639.25	645.25
43	646-654	647.25	653.25
44	654-662	655.25	661.25
45	662-670	663.25	669.25
46	670-678	671.25	677.25
47	678-686	679.25	685.25
48	686-694	687.25	693.25
49	694-702	695.25	701.25
50	702-710	703.25	709.25
51	710-718	711.25	717.25
52	718-726	719.25	725.25
53	726-734	727.25	733.25
54	734-742	735.25	741.25
55	742-750	743.25	749.25
56	750-758	751.25	757.25
57	758-766	759.25	765.25
58	766-774	767.25	773.25
59	774-782	775.25	781.25
60	782-790	783.25	789.25
61	790-798	791.25	797.25
62	798-806	799.25	805.25
63	806-814	807.25	813.25
64	814-822	815.25	821.25
65	822-830	823.25	829.25
66	830-838	831.25	837.25
67	838-846	839.25	845.25
68	846-854	847.25	853.25

Table 4-2 (cont)

Channel	Limits	Visual Carrier	Aural Carrier
69	854-862	855.25	861.25

Visual Carrier IF = 38.9 MHz
Aural Carrier IF = 32.9 MHz
LO Frequency = Visual Carrier Frequency +38.9 MHz

NOTE

The IF OUT signal on the down converter front panel has a frequency bandpass orientation that is inverted from the **rf** *bandpass. That is, the visual* **if** *carrier frequency is above the aural* **if** *carrier frequency. Thus for visual* **if** *carrier frequency = 38.90 MHz, the aural* **if** *carrier frequency is 32.90 MHz.*

Measurement Techniques

In the following precedure, the 1450-2 Readout Driver board must be checked for correct settings of S56 and S57; frequency is measured in several steps; and the test oscilloscope must be calibrated for 0.2 dB/div to perform several tight-tolerance checks. The information that follows provides details on these techniques and must be referred to before starting the procedure.

Calibrating the 1450-2 Readout

The Readout Driver board, (A61) in the 1450-2, should be checked for correct settings of S56 and S57 (Readout Counter Presets—tenths and ones) before any performance parameters are checked.

Refer to Fig. 4-3. S56 and S57 settings on the Readout Driver board on A61 should match Fig. 4-3. This compensates for an insertion gain of 4.7 dB.

Measuring Frequency

The Option 07 feature in the TEKTRONIX DC 508 Frequency Counter and TM 503 power module in conjunction with the 7L13 Spectrum Analyzer, can be used to make accurate frequency measurements.

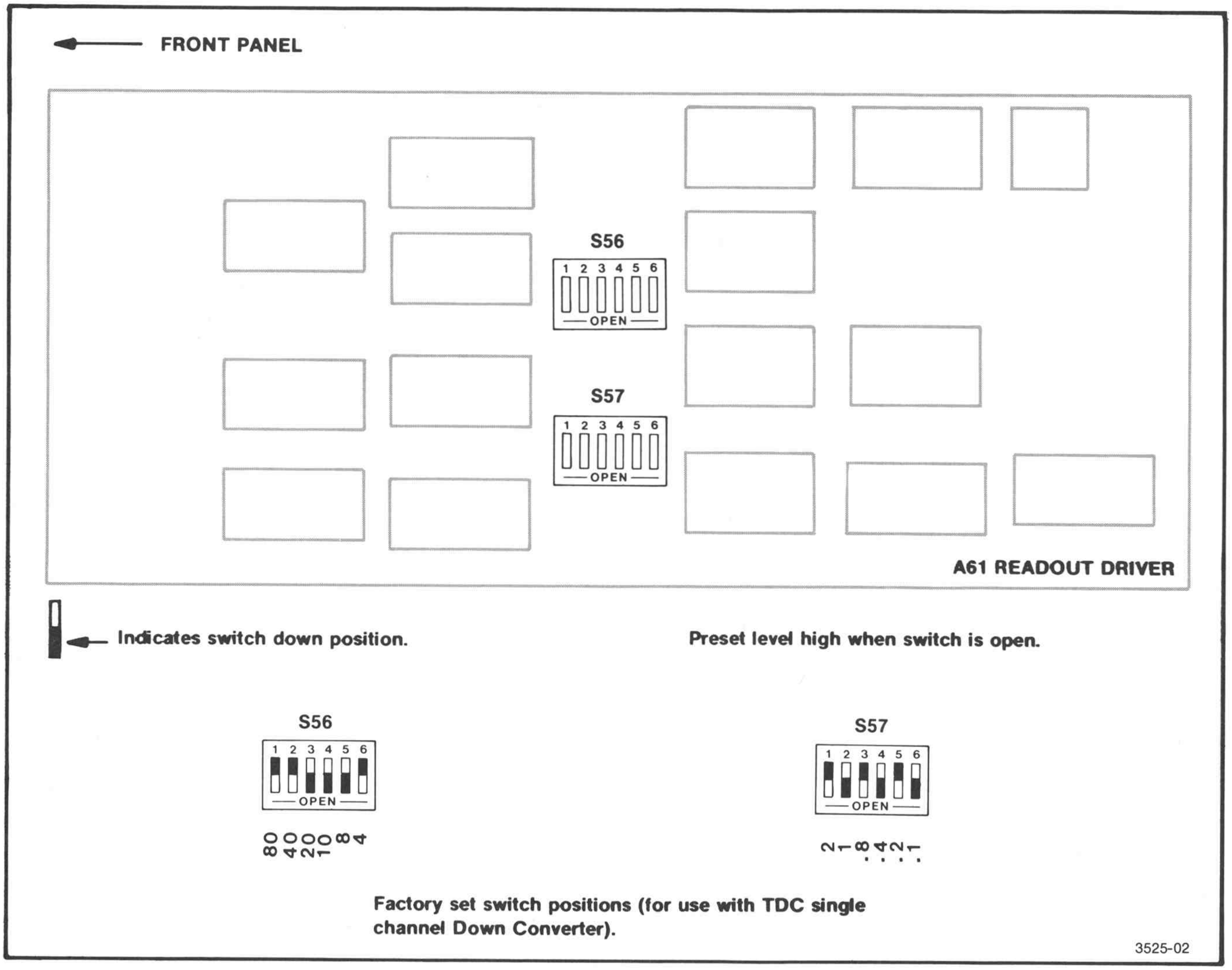


Fig. 4-3. Calibrating the Readout.

(a) Using the cables supplied with the 7L13 accessories kit, connect the TR 502 Tracking Generator 1st and 2nd LO outputs to the 7L13 1st and 2nd LO inputs. Connect the spectrum analyzer Tracking Generator Logic output to the TR 502 Tracking Generator input. Figure 4-4 illustrates the test equipment setup.

(b) Connect the TR 502 Aux RF to the DC 508 input. An SMA-to-BNC adapter is required to complete the connection to the TR 502 Aux RF output connector. Set the TR 502 Dot Intensity control out of detent.

NOTE

The TR 502 features a sweep-stop operational mode that stops the sweep at the center of screen and instructs the frequency counter to take a frequency measurement, then allows the sweep to continue. When the analyzer is phase-locked, the accuracy of the count is to the nearest 10 Hz; and when the analyzer is not phase-locked, the accuracy is to the nearest 100 kHz. This sweep-stop mode can be turned off by the Dot Intensity control on the TR 502 front panel. Thus, when the 7L13 Center Frequency control is set such that the signal is centered about the intensified dot on the analyzer display, the DC 508 counter reads the frequency at the intensified dot accurately.

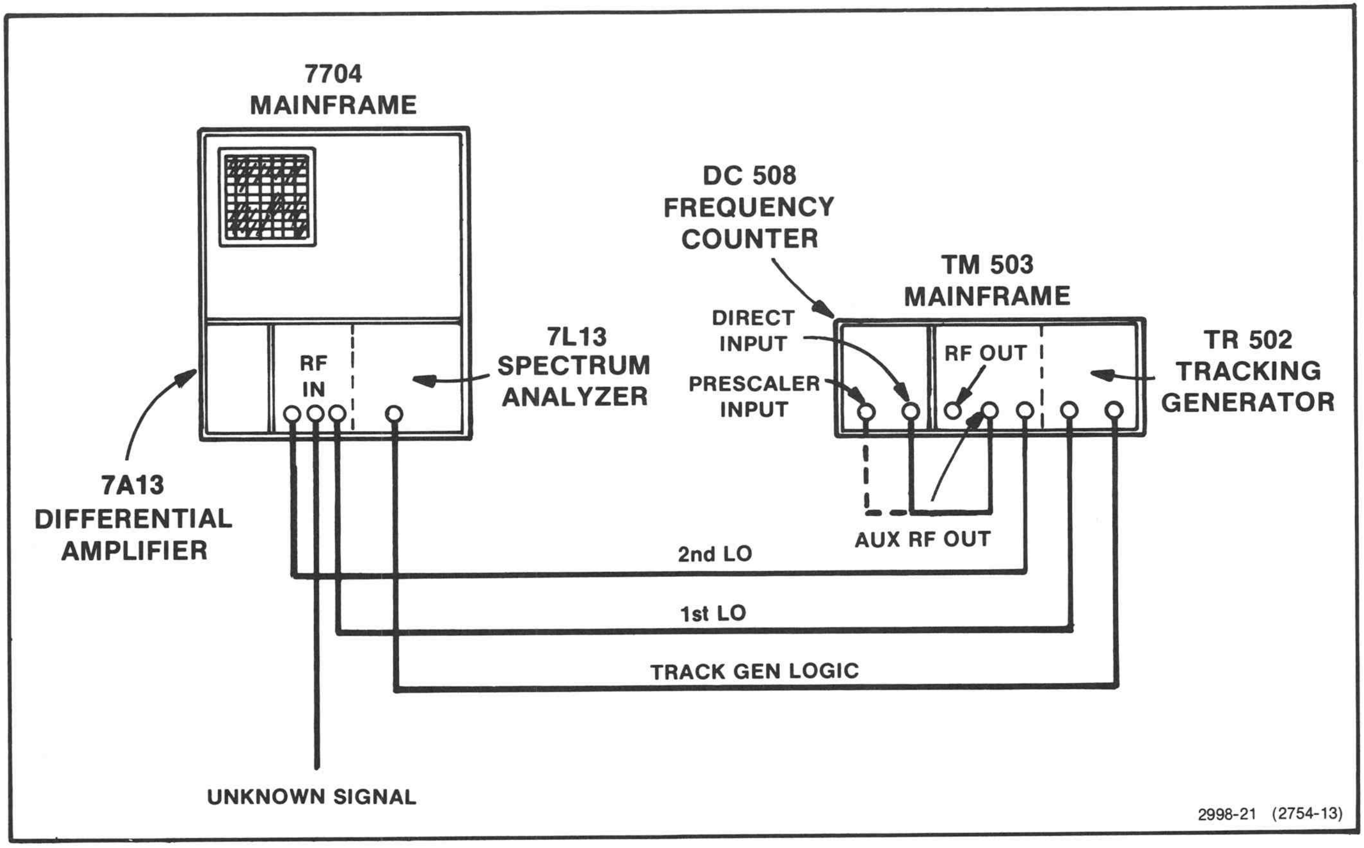


Fig. 4-4. Test Equipment Setup for Measuring Frequency Using the Spectrum Analyzer/Tracking Generator/DC 508 Option 07.

Setting up 0.2 dB/Div Reference Flatness

Some checks and adjustments performed using a spectrum analyzer have tolerances of 1 dB or less. Therefore, the test oscilloscope must be calibrated for 0.2 dB/Div in order to perform these checks and adjustments. Performing the following steps will suffice.

(a) Connect the test equipment as shown in Fig. 4-5. Make the appropriate connections between the tracking generator and the spectrum analyzer (1st LO, 2nd LO, and Track Gen [Logic]).

(b) Set the spectrum analyzer Reference Level to locate the power level set with the tracking generator Output Level control, then push in the test oscilloscope mainframe Left Vertical Mode button.

(c) Use the Comparison Voltage control on the differential comparator plug-in to bring the trace within the viewing area.

(d) Use the Variable Volts/Div control on the differential amplifier to set up a 5-division excursion of the trace as 1 dB of attenuation is added and removed from the tracking generator signal.

(e) The test oscilloscope is now calibrated for 0.2 dB/div. A grease pen may be used to mark the trace on the implosion shield or graticule. This will be the reference flatness at 0.2 dB/div.

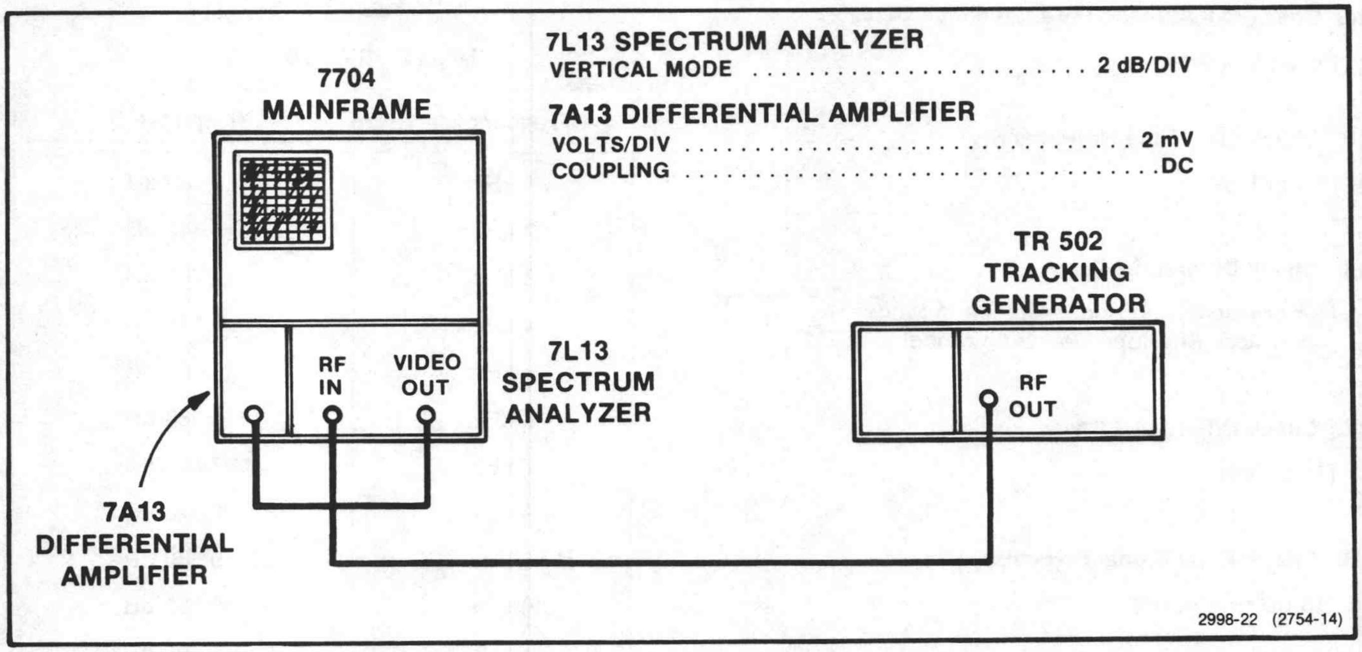


Fig. 4-5. Test Setup for Setting up 0.2 dB/div Reference Flatness.

PERFORMANCE CHECK

Short-Form Performance Check

1. Check Power Supply Ripple

(1 mV)

2. Check Adjacent Channel Cross-Modulation

(±60 dB or less down)

3. Check IF Input Level Range

(−20 dBm to −64 dBm)

4. Check Visual IF Frequency Range

(IF Frequency ±120 kHz)

5. Check AGC Speed

6. Check Synchronous Time Constant

7. Check Sync Stripper Range

8. Check VIDEO OUTPUT Levels

(Blanking level 0 V ±100 mV)
(Sync tip level 600 mV ±12 mV from blanking level)
(Blanking level to zero carrier level ~~1.850~~ V ±~~37~~ mV)
1.9 38

9. Check 2T Bar Overshoot

(1% or less)

10. Check K2T Distortion

(0.5% K or less)

11. Check Line-Time Distortion

(0.5% or less and 1% or less)

12. Check "K" Factor (Kpb) Pulse and Bar Ratio

(0.5% K or less)

13. Check Field-Time Distortion

(0.5% or less)

14. Check Chrominance-to-Luminance Delay

(±20 ns or less)

15. Check Line-Time Non-linearity

(1% or less)

16. Check Differential Gain

(1% or less Synchronous Detection Mode)
(4% or less Envelope Detection Mode)

17. Check Differential Phase

(1° or less)

18. Check Aural Signal Rejection

(46 dB or greater)

19. Check Low-Frequency Signal-to-Noise Ratio

(50 dB or greater)

20. Check Video Signal-to-Noise Ratio

(Mid-frequency coherent)
(60 dB or greater)

21. Check Signal-to-Noise Ratio

(White Noise)
(60 dB or greater)

22. Check Quadrature Phase With Respect to Video and Synchronous Detection Phase Angle

(90° ±2° quadrature phase)
(±2° or less synchronous phase)

23. Check Low Frequency Phase Noise

(0.25° **rms** or less)

24. Check Zero Carrier Reference Gate

(Cutoff 50 dB or greater)
(Half-amplitude duration 30 μs ±3 μs)
(ITS Line 20)

25. Check De-Emphasis In and De-Emphasis Out Frequency Response

(±0.4 dB 30 Hz to 25 kHz with de-emphasis in)
(See Table 4-3: 50 μs De-Emphasis Curve ±0.5 dB)

Table 4-3

50 μs CURVE ±0.5 dB

Frequency	Response
1 kHz	−0.409 dB
2 kHz	−1.445 dB
3 kHz	−2.761 dB
4 kHz	−4.115 dB
5 kHz	−5.400 dB
6 kHz	−6.583 dB
7 kHz	−7.661 dB
8 kHz	−8.643 dB
9 kHz	−9.540 dB
10 kHz	−10.362 dB
11 kHz	−11.120 dB
12 kHz	−11.822 dB
13 kHz	−12.475 dB
14 kHz	−13.084 dB
15 kHz	−13.656 dB
16 kHz	−14.194 dB
17 kHz	−14.702 dB
18 kHz	−15.182 dB
19 kHz	−15.638 dB
20 kHz	−16.072 dB

26. Check Audio Harmonic Distortion

(0.2% or less at full output)

8 Ω SPEAKER output level

(Up to at least 5 W)

Headphone AUDIO OUTPUT level

(Up to at least 50 mW)

600 Ω BALanced LINE AUDIO OUTput level

(+10 dBm)

27. Check Audio Signal-to-Noise Ratio

(Intr 55 dB or greater)
(Split 75 dB or greater)
(Aural only 75 dB or greater)
(Ext 75 dB or greater)

28. Check Aural and Visual Alarms

29. Check DEVIATION OUT

(0.88 Vrms)

30. Check Aural Intercarrier

(30 dB Gain IN/OUT)

31. Check Return Loss

(IF IN 18 dB or greater)
(INTERCARRIER IN 20 dB or greater)
(INTERCARRIER OUT 20 dB or greater)
(VIDEO OUTPUTs 34 dB or greater)
(QUADRATURE OUTPUT 34 dB or greater)

32. Check RF Attenuator Range

(±0.25 dB)

The word "SYSTEM" in this section refers to a 1450-2 with a TEKTRONIX TDC Down Converter installed. All SYSTEM specifications will be satisfied only when both the 1450-2 and the TDC are fully calibrated.

DETAILED PERFORMANCE CHECK

1. Check Power Supply Ripple

(a) Line-voltage capabilities of the 1450-2 can be selected with a circuit card located in the power cord receptacle at the rear of the instrument. Caution should be taken that the correct line fuse is installed in the instrument. See Table 4-4. Select the proper line voltage and range.

(b) CHECK—that the power supply **ac** ripple is 1 mV p-p or less. Check power-supply **ac** ripple across the voltage range according to the following Table 4-4.

NOTE

Refer to the installation instructions in Section 2 for information relating to line voltage selection and fuse data. This information may also be obtained from schematic diagram 14, Power Supply. Table 4-4 lists all the possible line-voltage ranges.

Table 4-4

POSSIBLE LINE-VOLTAGE RANGES

Line	Range	Fuse
115 V	LOW 90 V—110 V HIGH 108 V—132 V	1.25 A
230 V	LOW 198 V—242 V HIGH 216 V—250 V	0.6 A

2. Check Adjacent Channel Cross-Modulation

(60 dB or greater down)

(a) Refer to Fig. 4-6. The frequencies of the two generators must be set up with a frequency counter (such as in the HP 8640B or a TEKTRONIX DC 508). The power levels at the IF IN are critical and must be set up with a spectrum analyzer. The spectrum analyzer center frequency may be set to view any of the three signals individually, then changed to 1 MHz to do the check.

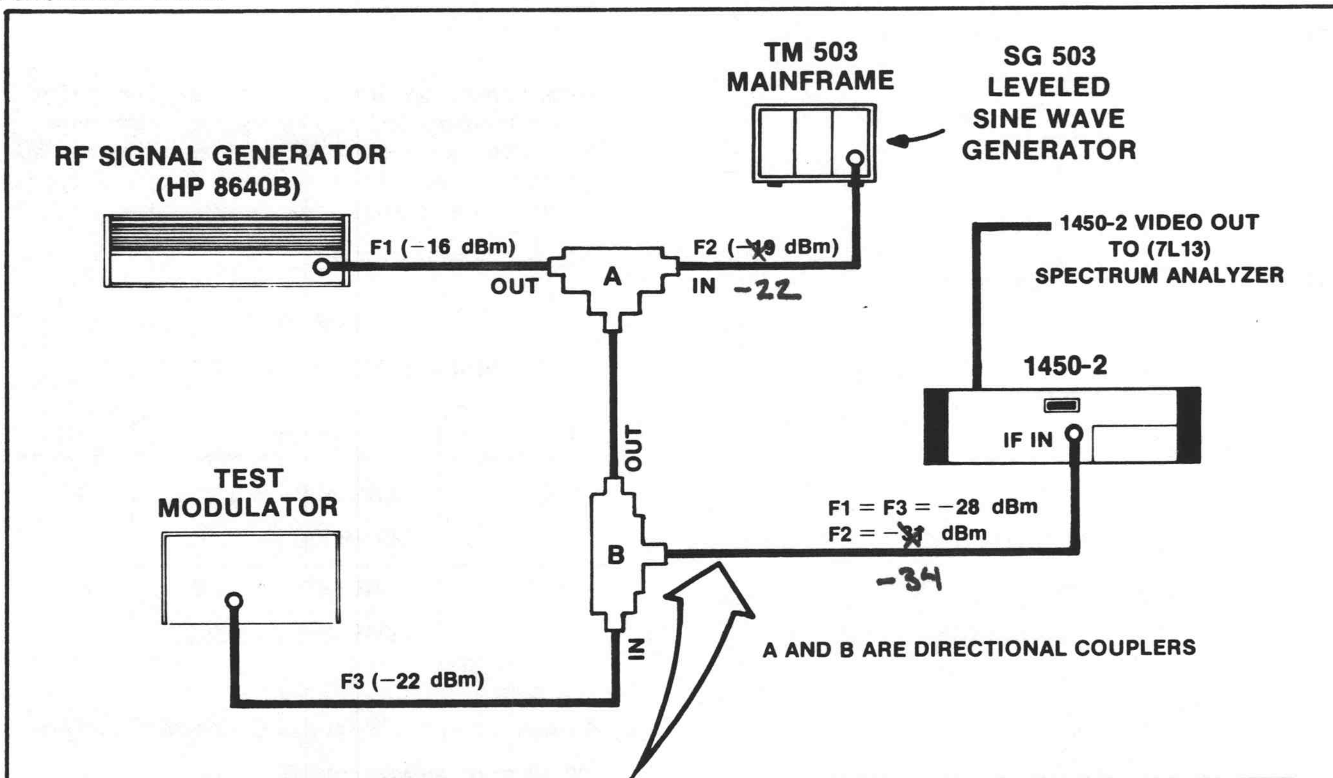
(b) Connect the test equipment as shown in Fig. 4-6, except that the cable connecting to the IF IN is connected to the spectrum analyzer **rf** input connector to set up the power levels. After the power levels are set up, disconnect the cable from the spectrum analyzer **rf** input and connect it to the IF IN connector.

(c) CHECK—that the amplitude of the cross-modulation pulse appearing 1 MHz above zero is −52 dBm (60 dB down).

3. Check IF Input Level Range

(a) Connect the test equipment as shown in Fig. 4-7. Set the step attenuator such that the RF SIGNAL INPUT LEVEL readout indicates −25 dBm. Set VIDEO OUTPUT back porch at the 0 graticule line on the waveform monitor, and note the video amplitude.

(b) Slowly add attenuation to the modulator **if** signal using the step attenuator.



	CHANNEL CARRIER (F3)	ADJACENT CARRIER (F1)	ADJACENT SIDEBAND (F2)
	38.9 MHz	46.9 MHz (UPPER) 30.9 MHz (LOWER)	45.9 MHz (UPPER) 29.9 MHz (LOWER)
POWER	−28 dBm	−28 dBm	−34 dBm

NOTE: POWER LEVELS ARE CRITICAL AND MUST BE CALIBRATED WITH POWER METER

Television Demodulator (1450-2)

DETECTION MODE . . . . SYNCHRONOUS
SYNCHRONOUS TIME CONSTANT . . . . SLOW
INTERNAL ZERO CARRIER REF . . . . OFF
MANUAL AGC . . . . ON
MANUAL GAIN . . . . FULLY COUNTER-CLOCKWISE

Spectrum Analyzer (7L13)

REFERENCE LEVEL . . . . −10 dBm
RF dB . . . . 20 dB
LOG . . . . 10 dB/Div
CENTER FREQUENCY . . . . 1 MHz
FREQ SPAN/DIV . . . . 20 kHz
AUTO PHASE LOCK . . . . ON
RESOLUTION . . . . 30 kHz
300 Hz VIDEO FILTER . . . . ON

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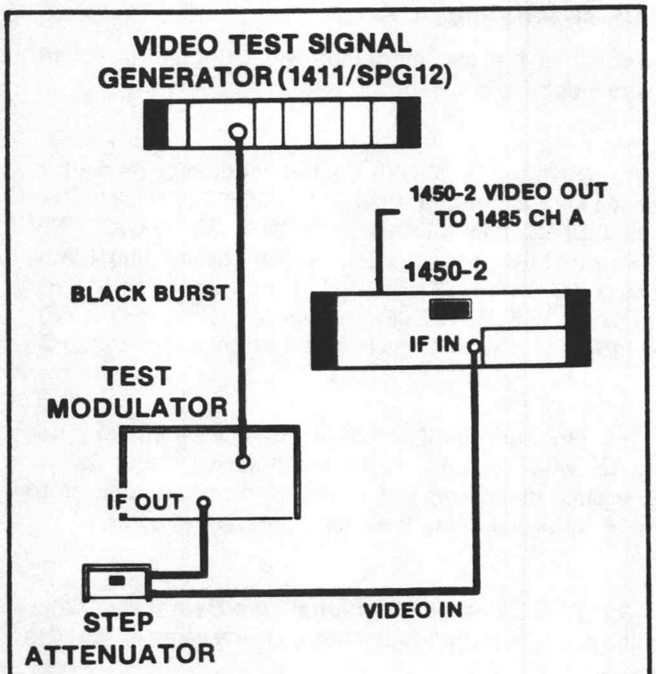
Fig. 4-6. Test Equipment Setup for Checking Adjacent Channel Cross-Modulation.

(c) CHECK—that the VIDEO OUT amplitude and back porch **dc** level, as indicated on the waveform monitor, remain constant between −25 dBm and −69 dBm indicated **rf** signal input levels.

4. Check Visual IF Frequency Range

(a) Connect the test equipment as shown in Fig. 4-8. Vary the signal generator frequency 120 kHz above and below the visual **if** frequency of the 1450-2.

(b) CHECK—that the UNLOCKED light remains off except for momentary unlock while the visual **if** is being changed. Vary the signal generator frequency more than 120 kHz above and below the visual **if** frequency of the 1450-2, and check that the UNLOCKED light on the 1450-2 front panel comes on at some frequency beyond 120 kHz, typically 250 kHz.



Television Demodulator (1450-2)

DETECTION MODE .... CONT
SOUND TRAP .... IN
INTERNAL ZERO CARRIER REF .... OFF
AUTO AGC .... BACK PORCH

Waveform Monitor (1485)

RESPONSE .... FLAT
INPUT .... A DC CPL'D
VOLTS FULL SCALE 1.0
MAG .... OFF
DISPLAY .... 10 μs
LINE SELECTOR .... OFF
DC RESTORER .... OFF
SYNC .... INT

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Fig. 4-7. Test Equipment Setup for Measuring IF Input Level Range.

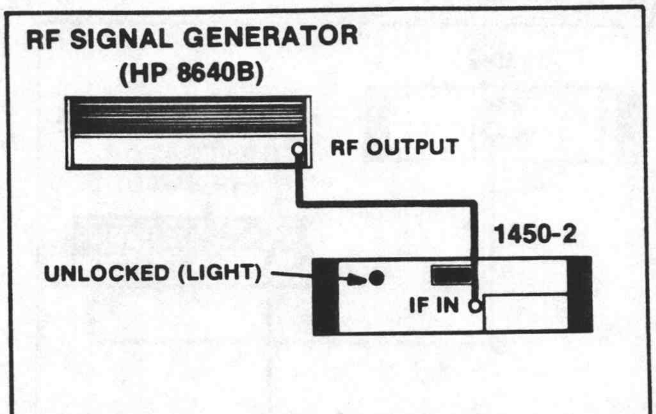
5. Check AGC Speed

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

(b) Monitor the 1450-2 VIDEO OUTPUT with a waveform monitor. Set the waveform monitor to display a 2 Field signal at 0.2 V Full Scale.

(c) Set the AGC SPEED control to FAST.

(d) CHECK—that the 10 Hz signal is not displayed.



Television Demodulator (1450-2)

DETECTION MODE .... CONT (IN)
AUTO AGC .... BACK PORCH

RF Signal Generator (HP 8640B)

FREQUENCY TUNE .... 1450-2 IF
OUTPUT LEVEL .... −20 dBm

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Fig. 4-8. Test Equipment Setup for Measuring IF Frequency Range.

(e) Set the AGC SPEED control to SLOW.

(f) CHECK—that the 10 Hz signal is displayed.

6. Check Synchronous Time Constant

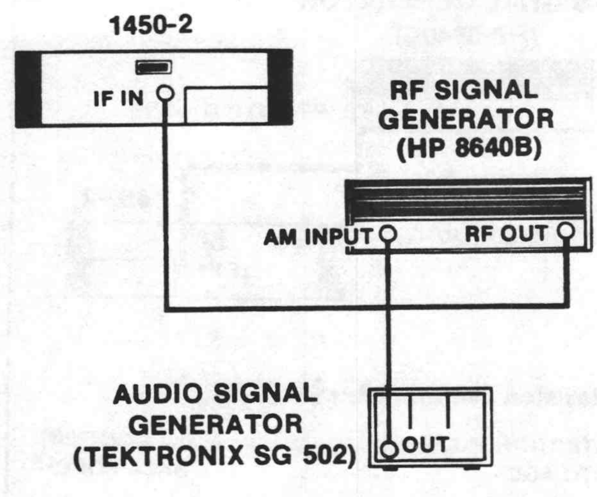
(a) Frequency-modulate an rf signal generator with 100 Hz signal from an audio oscillator. Use the rf signal generator as the local oscillator for the test modulator; that is, connect the rf signal generator rf output to the test modulator LO In connector. Set the rf signal generator frequency for the channel lo of the down converter used in the 1450-2 and output level at −5 dBm.

LO Frequency = Channel Visual Carrier + Visual IF

See Table 4-2 for channel frequencies.

(b) Set the test modulator visual carrier on. Drive the test modulator video input with a 5-step linearity signal from a video test-signal generator, and connect the test modulator rf output to the RF IN connector.

(c) Install a down converter in the 1450-2 and make the appropriate front-panel cable connections to complete the SYSTEM. Push in the CONT (DETECTION MODE), SOUND TRAP IN, (INTERNAL ZERO CARRIER REF) ON, and BACK PORCH (AUTO AGC) buttons. Set the SYNCHRONOUS TIME CONSTANT control to SLOW.



1450-2 TELEVISION DEMODULATOR

DETECTION MODE .... CONT (SYNCHRONOUS)
AUTO (AGC) .... BACK PORCH

AUDIO SIGNAL GENERATOR (TEK SG 502)

FREQUENCY .... 10 Hz
OUTPUT LEVEL .... 1 V

RF SIGNAL GENERATOR (HP 8640B)

RF OUT FREQUENCY .... 38.9 MHz
OUTPUT LEVEL .... −25 dBm
PERCENT MODULATION 20

2998-26

Fig. 4-9. Test Equipment Setup for Measuring AGC Speed.

(d) Connect the QUADRATURE OUTPUT to a 1485 External Horizontal input through a 250 kHz low-pass filter and connect the VIDEO OUTPUT to the waveform monitor Ch A input. Set the waveform monitor controls as follows: Response to Low Pass, Input to Ch A, Volts Full Scale to 1.0, Mag to X25 (.2), and Display to Ext.

(e) Refer to Fig. 4-10. Set deviation on the rf signal generator to match the waveform in Fig. 4-10a. Alternately push in the SYNC TIP, BACK PORCH, and CONT (SYNCHRONOUS DETECTION MODE) buttons while switching the SYNCHRONOUS TIME CONSTANT control through SLOW, NORM, and FAST.

(f) CHECK—that the waveform monitor displays match the displays in Fig. 4-10.

7. Check Sync Stripper Range

(a) Drive the test modulator video input with composite video from a video test signal generator.

(b) Drive the IF IN with the test modulator through a decade step attenuator. Push in the CONT (SYNCHRONOUS DETECTION MODE), INTERNAL ZERO CARRIER REF, and MAN (AGC) buttons. Set the manual GAIN control for a normal signal (High/Low lights on the RF SIGNAL INPUT LEVEL readout off). See Fig. 4-11 for the location of the High/Low lights on the 1450-2.

(c) Monitor the VIDEO OUT with a waveform monitor set to view line 16. Note the Internal Zero Carrier Reference pulse amplitude. Add 20 dB of attenuation to the IF IN signal using the decade step attenuator.

(d) CHECK—that the Internal Zero Carrier Reference pulse position (Line 16) and timing is the same as noted in part c.

8. Check VIDEO OUTPUT Levels

(0 V ±100 mV blanking level)
(Blanking level = zero carrier − ~~1.850~~ 1.9 mV ±~~37~~ 38 mV)
(Sync tip = blanking level − 600 mV ±12 mV)
(Sync tip = zero carrier − ~~2.450~~ 2.50 V ±~~49~~ 50 mV)

NOTE

Values apply to unterminated outputs. For terminated outputs, divide values by 2.

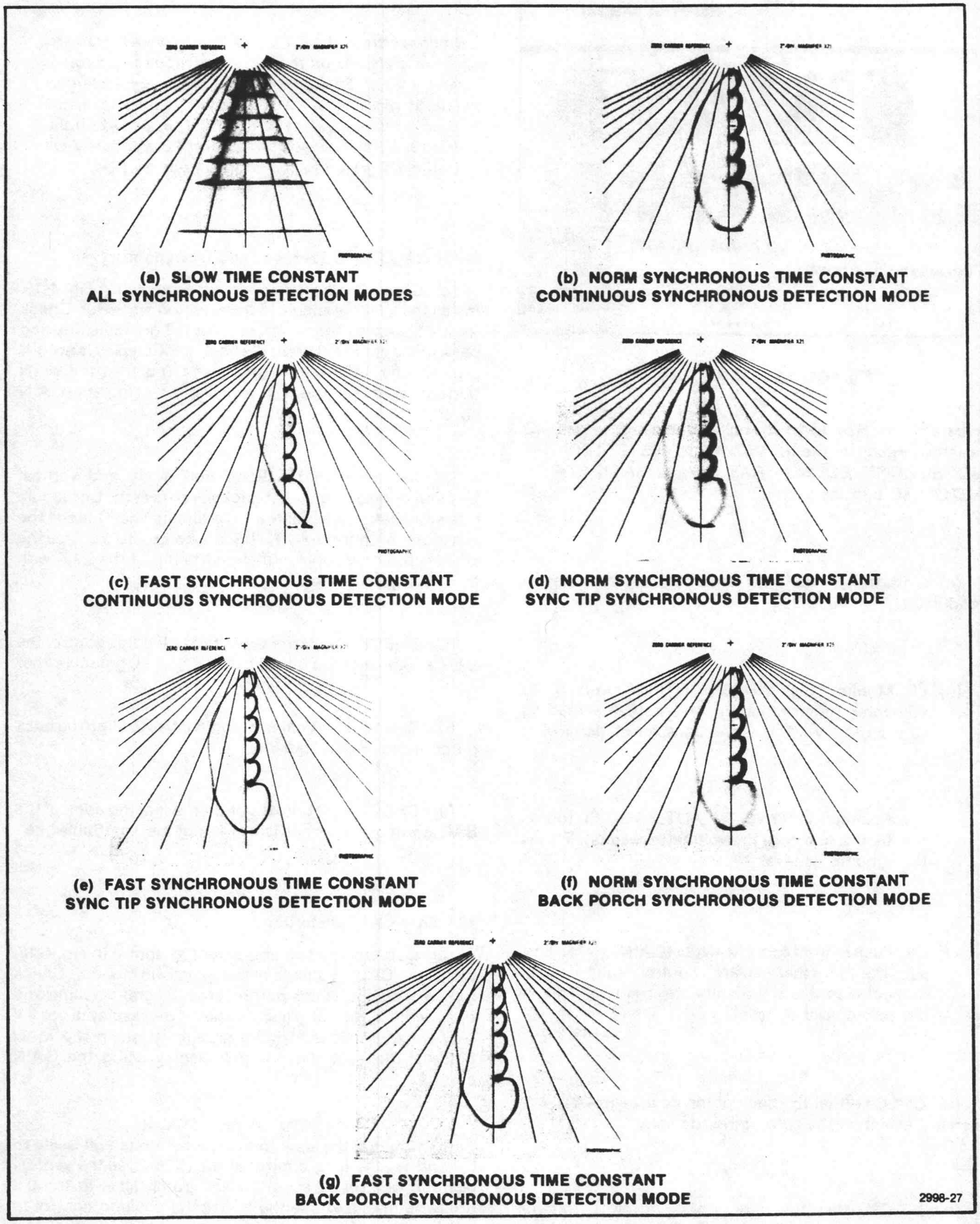
(a) It is necessary to remove Readout Driver board A61 from the 1450-2 in order to access R26 on AGC Control board A60. Refer to Fig. 8-8 for the locations of the harmonica connectors and screws on the Readout Driver board. To remove the Readout Driver board, follow these steps:

(1) Turn the 1450-2 power off. Remove all harmonica connectors from the Readout Driver board A61.

(2) Remove the two Phillips-head screws from the rear corners of the board.

(3) Gently disengage the Readout Driver board from the Readout board A62 by pulling the Readout Driver board toward the rear of the 1450-2.

(b) Inject composite sync into pin 16 of U24 on A60 by connecting composite sync from a video test signal



(a) SLOW TIME CONSTANT
ALL SYNCHRONOUS DETECTION MODES

(b) NORM SYNCHRONOUS TIME CONSTANT
CONTINUOUS SYNCHRONOUS DETECTION MODE

(c) FAST SYNCHRONOUS TIME CONSTANT
CONTINUOUS SYNCHRONOUS DETECTION MODE

(d) NORM SYNCHRONOUS TIME CONSTANT
SYNC TIP SYNCHRONOUS DETECTION MODE

(e) FAST SYNCHRONOUS TIME CONSTANT
SYNC TIP SYNCHRONOUS DETECTION MODE

(f) NORM SYNCHRONOUS TIME CONSTANT
BACK PORCH SYNCHRONOUS DETECTION MODE

(g) FAST SYNCHRONOUS TIME CONSTANT
BACK PORCH SYNCHRONOUS DETECTION MODE

2998-27

Fig. 4-10. Synchronous Time Constant Effects.

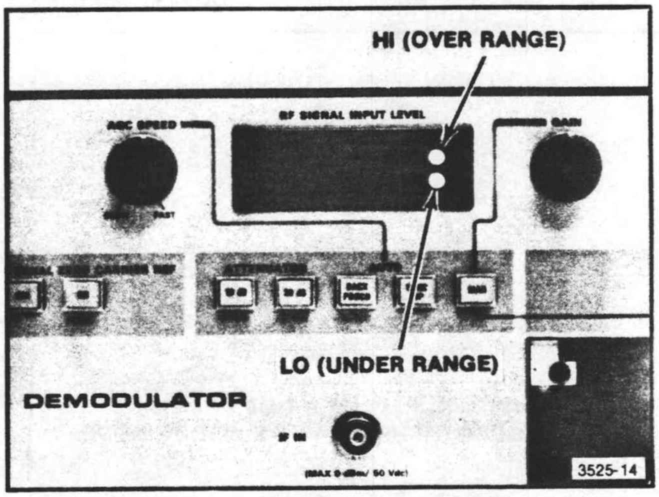


Fig. 4-11. Hi/Lo Lights Location.

generator to R26 (5.1 kΩ) on A60 through a 100 kΩ resistor. Push in the (SYNCHRONOUS DETECTION MODE) CONT, SOUND TRAP IN, and BACK PORCH AUTO AGC buttons.

(c) Drive the IF INput with visual if carrier from the test modulator.

(d) (1) Monitor the VIDEO OUTPUT with a **dc** voltmeter (unterminated), and note the reading (0 V ±100 mV). This is the back porch **dc** level.

(2) Push in the SYNC TIP AUTO AGC button on the 1450-2 and note the voltmeter reading. This is the sync tip **dc** level.

(3) Push in the 1450-2 MANual (GAIN) button and set the MANual GAIN control fully counterclockwise. Note the voltmeter reading. This is the zero carrier **dc** level.

(e) CHECK—that the back porch **dc** level is ~~1.850~~ 1.90 mV ~~±37~~ 38 mV less than the zero carrier **dc** level.

(f) CHECK—that the sync tip **dc** level is 600 mV ±12 mV less than the back porch **dc** level, and is ~~2.450~~ 2.50 V ~~±49~~ 50 mV less than the zero carrier **dc** level.

NOTE

In check steps 9, 11, 12, and 13 reference is made to major divisions on the waveform monitor graticule. At 1.0 V Full Scale, a major division is equivalent to 0.05 V (5%). At 0.2 V Full Scale (X5), this major division is equivalent to 0.01 V (1%). For example, from halfway between the 0.9 and 1.0 graticule lines to the 1.0 graticule line is one major division.

9. Check 2T BAR Preshoot and Overshoot

(a) Connect the test equipment as shown in Fig. 4-12. Install the CCIR graticule in the waveform monitor. Check for a 1 V display (back porch at the 0.3 graticule line and peak white at the 1.0 graticule line). If the display is not 1 V p-p, set the 1450-2 in MANual **agc** (push in the MAN button), then set the 1 V p-p display using the GAIN control.

(b) Set the Variable Volts Full Scale and vertical position controls such that back porch is at the 0 graticule line and peak white is at the 1.0 graticule line. Change the waveform monitor Volts Full Scale control to 0.2. Use the vertical position control to align the top of the BAR with the 1.0 graticule line.

(c) CHECK—that overshoot on the leading edge of the BAR is within a major division (1%) of the 1.0 graticule line.

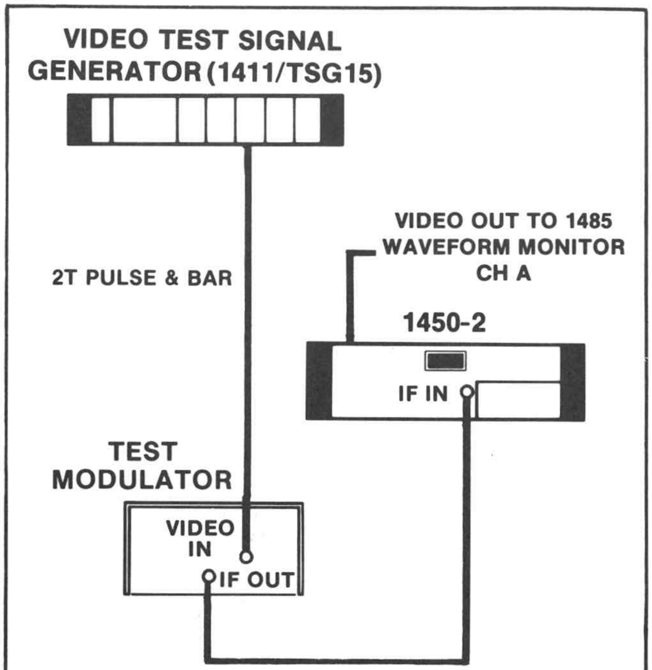
(d) Reset the vertical position control to align the back porch at the 0 graticule line.

(e) CHECK—that preshoot on the leading edge of the BAR is within a major division (1%) of the 0 graticule line.

10. Check K2T Distortion

(a) Connect the test equipment as shown in Fig. 4-12. Install the CCIR graticule in the waveform monitor. Check for a 1 V display (back porch at the 0.3 graticule line and peak white at the 1.0 graticule line). If the display is not 1 V p-p, set the 1450-2 in MANual **agc** (push in the MAN button), then set the 1 V p-p display using the GAIN control.

(b) Change the waveform monitor Volts Full Scale to 0.2 and set the Mag control at 0.2 (X25). Use the vertical position control to set the back porch level at the 0.3 graticule line, and use the horizontal position control to position the 2T Pulse within the measurement area. The K2T measurement area is now calibrated for 1%.



Television Demodulator (1450-2)

SYNCHRONOUS DETECTION MODE . BACK PORCH
SOUND TRAP . . . . IN
AUTO AGC . . . . BACK PORCH

Test Modulator

VISUAL CARRIER . . . . ON
AURAL CARRIER . . . . OFF

Video Test Signal Generator (1411/TSG15)

MOD BUTTON . . . . IN
2T PULSE BUTTON . . . . IN
2T BAR BUTTON . . . . IN

Waveform Monitor (1485)

INPUT . . . . CH A
VOLTS FULL SCALE 1.0
MAG . . . . OFF
DISPLAY . . . . 5 μs

2998-28 (2200-41)

Fig. 4-12. Test Equipment Setup for Checking Linear Distortions.

(c) CHECK—that the 2T Pulse distortion is within 0.5%. See Fig. 4-13.

11. Check Line-Time Distortion

(a) Connect the test equipment as shown in Fig. 4-12. Install the CCIR graticule in the waveform monitor. Check for a 1 V display (back porch at the 0.3 graticule line and peak white at the 1.0 graticule line). If the display is not 1 V

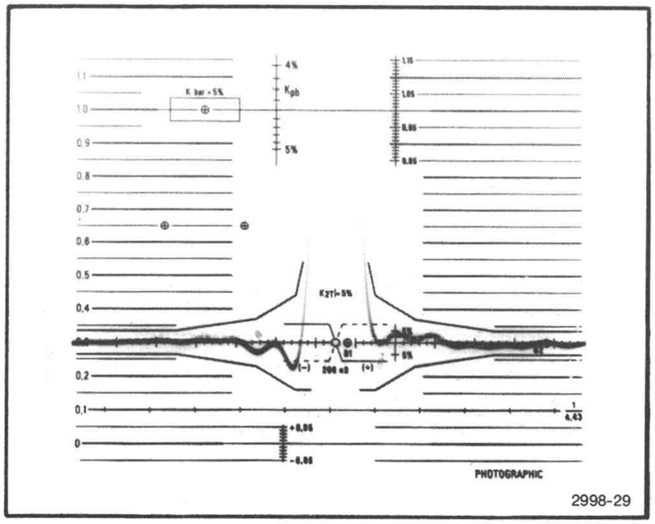


Fig. 4-13. Checking 2T Pulse (K2T) Distortion.

p-p, set the 1450-2 in MANual **agc** (push in the MAN button), then set the 1 V p-p display using the GAIN control.

(b) Set the Variable Volts Full Scale and vertical position controls such that back porch is at the 0 graticule line and peak white is at the 1.0 graticule line. Change the waveform monitor Volts Full Scale control to 0.2. Use the vertical position control to align the top of the BAR with the 1.0 graticule line.

(c) CHECK—that Line-Time Distortion is within half a major division with the 1450-2 SOUND TRAP OUT and in any SYNCHRONOUS DETECTION MODE. That is, the top of the Bar does not tilt more than half a major division (0.5%).

(d) Push in the 1450-2 SOUND TRAP IN button and any of the SYNCHRONOUS DETECTION MODE buttons.

(e) CHECK—that Line-Time Distortion is within one major division (1%).

(f) Push in the 1450-2 ENV DETECTION MODE button. Disregard the **dc** shift and check tilt.

(g) CHECK—that Line-Time Distortion is within one major division (1%).

12. Check 2T Pulse and Bar Ratio "K" Factor (Kpb)

(a) Connect the test equipment as shown in Fig. 4-12. Install the CCIR graticule in the waveform monitor. Check for a 1 V display (back porch at the 0.3 graticule line and peak white at the 1.0 graticule line). If the display is not 1 V p-p, set the 1450-2 in MANual **agc** (push in the MAN button), then set the 1 V p-p display using the GAIN control.

(b) Change the waveform monitor Volts Full Scale control to 0.2. Use the vertical position control to align the top of the BAR with the 1.0 graticule line. Use the horizontal position control to set the 2T Pulse on the Kpb graticule divisions.

(c) Change the waveform monitor Volts Full Scale to 0.2 and position the top of the Bar at the 1.0 graticule line using the waveform monitor vertical position control. The Kpb scale is now calibrated for 0.2%/div.

(d) CHECK—that the 2T Pulse is within 0.5% of the 1.0 graticule line as read on the Kpb scale (half a major division).

13. Check Field-Time Distortion

(a) Connect the test equipment as shown in Fig. 4-14. Install the CCIR graticule in the waveform monitor. Check for a 1 V display (back porch at the 0.3 graticule line and peak white at the 1.0 graticule line). If the display is not 1 V p-p, set the 1450-2 in MANual **agc** (push in the MAN button), then set the 1 V p-p display using the GAIN control.

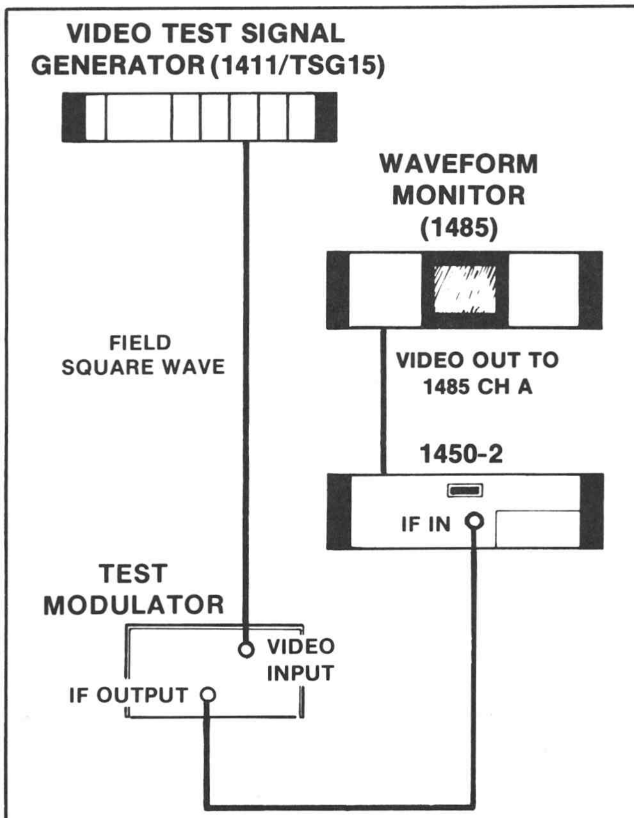
(b) Set the Variable Volts Full Scale and vertical position controls such that back porch is at the 0 graticule line and peak white is at the 1.0 graticule line. Change the waveform monitor Volts Full Scale control to 0.2. Position peak white on the 1.0 graticule line.

(c) CHECK—that tilt of the field square-wave top is less than half a major division (0.5%).

14. Check Chrominance-to-Luminance Delay

(a) Connect the test equipment as shown in Fig. 4-12. Install the CCIR graticule in the waveform monitor. Check for a 1 V display (back porch at the 0.3 graticule line and peak white at the 1.0 graticule line). If the display is not 1 V p-p, set the 1450-2 in MANual **agc** (push in the MAN button), then set the 1 V p-p display using the GAIN control.

(b) Reset the waveform monitor Volts Full Scale control to 0.2. Chrominance-to-luminance delay can be



Television Demodulator (1450-2)

SYNCHRONOUS DETECTION MODE . BACK PORCH
SOUND TRAP . . . . IN
AGC . . . . MAN IN

Test Modulator

VISUAL CARRIER . . . . ON
AURAL CARRIER . . . . OFF

Video Test Signal Generator (1411/TSG15)

FIELD SQ WAVE BUTTON . . . . IN

Waveform Monitor (1485)

RESPONSE . . . . FLAT
INPUT . . . . CH A
VOLTS FULL SCALE 1.0
DISPLAY . . . . 2 FIELD

2998-30 (2200-43)

Fig. 4-14. Test Equipment Setup for Checking Field Time Distortion.

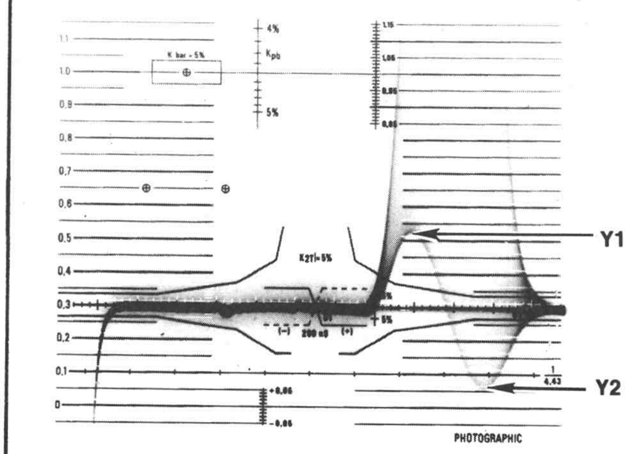
20

determined by measuring the baseline errors on the modulated 2T Pulse. The sum of the absolute values of the left peak (Y1) and right peak (Y2) in Fig. 4-15 will be 0.1 V p-p for every 200 ns delay on the 2T Pulse. Thus, at 0.2 volts full scale, delay time is:

20

$$t = 2000 \text{ ns} \frac{(Y1' + Y2')}{5}$$

@



NOTE: THIS WAVEFORM HAS BEEN EXAGGERATED FOR ILLUSTRATION PURPOSES.

2998-31

Fig. 4-15. Waveform for Checking Chrominance-to-Luminance Delay.

where $Y1'$ and $Y2'$ are absolute values of Y1 and Y2.

$= 400\,(Y1' + Y2')$ns.

Make sure that the 1450-2 is in wide-band mode (SOUND TRAP OUT button pushed in) before making the check.

(c) CHECK—that chrominance-to-luminance delay is 20 ns or less.

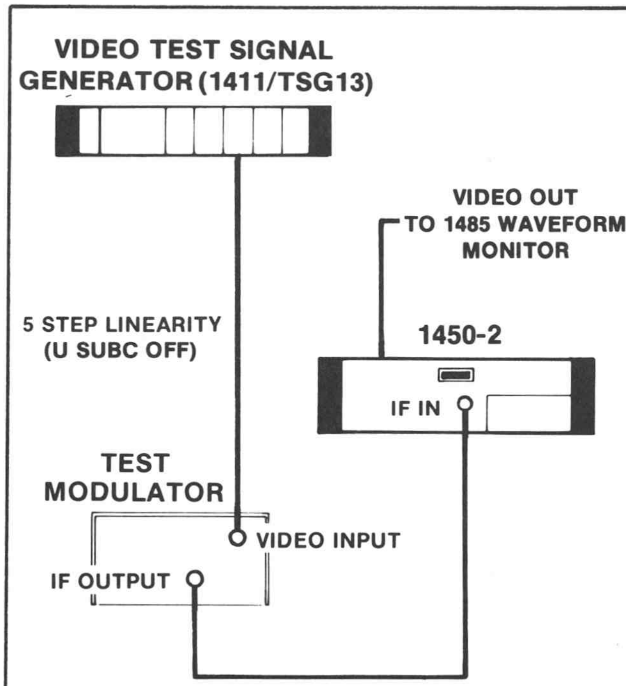
(d) Push in the 1450-2 SOUND TRAP IN button and switch in the Precorrector in the test modulator (170 ns).

(e) CHECK—that chrominance-to-luminance delay is 20 ns or less.

15. Check Line-Time Non-linearity

(a) Connect the test equipment as shown in Fig. 4-16. Install the CCIR graticule in the waveform monitor.

(b) Set the waveform monitor Var Volts Full Scale control such that when back porch is at the 0 graticule line, peak white of the largest differentiated step is at the 1.0 graticule line. Use the horizontal position control to position the smallest step at the top right linear scale on the graticule. See Fig. 4-17. This scale is now calibrated for 1%/minor division.



Television Demodulator (1450-2)

DETECTION MODE .... ENV (IN)
SOUND TRAP .... IN (IN)
AUTO AGC .... BACK PORCH

Test Modulator

VISUAL CARRIER .... ON
AURAL CARRIER .... OFF

Video Test Signal Generator (1411/TSG13)

S STEPS BUTTON .... ON
U SUBCARRIER BUTTON .... OFF

Waveform Monitor (1485)

RESPONSE .... DIFF'D STEP
INPUT .... A
VOLTS FULL SCALE 1.0
DISPLAY .... 5 μs

2998-32

Fig. 4-16. Test Equipment Setup for Checking Line Time Non-Linearity.

(c) CHECK—that the amplitude of the smallest differentiated step is within one minor division of the 1.0 graticule line. Check non-linearity in all detection modes, with SOUND TRAP IN and SOUND TRAP OUT. See Fig. 4-17.

16. Check Differential Gain

(a) Connect the test equipment as shown in Fig. 4-18. Use the Ch A Phase control on the vectorscope to align the

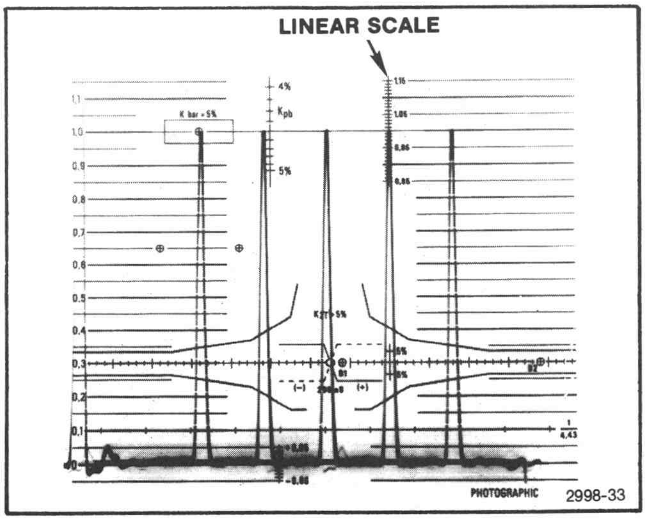


Fig. 4-17. Waveform for Measuring Line Time Non-Linearity.

U subcarrier vector with the U graticule line. Disregard the burst vector.

(b) Set the Channel A 100%—75%—Max Gain switch on the vectorscope at Max Gain, and adjust the Vertical Position Clamp and Horizontal Position Clamp controls to center the vector origin.

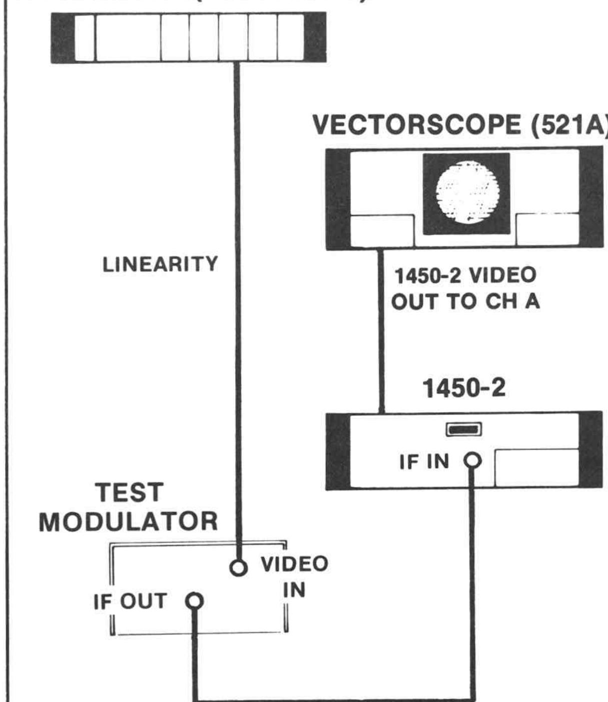
(c) Adjust the vectorscope Channel A Gain control to set the U subcarrier at the circumference of the graticule circle, and readjust the Ch A Phase control to align the U subcarrier vector with the U graticule line.

(d) Push in the Diff Gain button on the vectorscope and use the Vertical Position control to position the first luminance step at the 0% Diff Gain graticule line for a reference.

(e) CHECK that with the exception of the last two steps, the rest of the luminance steps are within 1% or less of the reference step. The last two steps are near white average picture level with chrominance beyond the specified limits for a transmitted signal. Therefore, they do not yield a valid test.

(f) Push in the ENV DETECTION MODE button on the 1450-2 front panel and reset the reference luminance step at the 0% Diff Gain graticule line on the vectorscope.

(g) CHECK—that the rest of the luminance steps are within 4% of the reference step. Again disregard the last two steps. See Fig. 4-19.



Television Demodulator (1450-2)

SYNCHRONOUS DETECTION MODE
SOUND TRAP . . . . IN
AUTO AGC . . . . BACK PORCH

Test Modulator

VISUAL CARRIER . . . . ON
AURAL CARRIER . . . . OFF

Video Test Signal Generator (1411/TSG13)

SET TSG13 FOR MODULATED 10 STEP LINEARITY SIGNAL—INTERNALLY ADJUST TSG13 FOR 90% LUMINANCE.

Vectorscope (521A)

VECTOR PAL BUTTON . . . . IN
100%—75% MAX . . . . MAX
CH A BUTTON . . . . IN

2998-34 (2200-47)

Fig. 4-18. Test Equipment for Checking Differential Gain.

17. Check Differential Phase

(a) Connect the test equipment as shown in Fig. 4-20. Use the Ch A Phase control on the vectorscope to align the U subcarrier vector with the U graticule line. Disregard the burst vector.

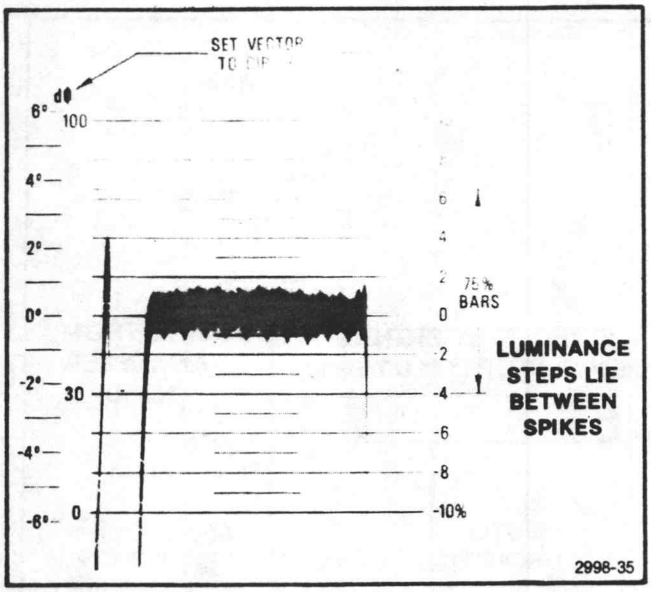


Fig. 4-19. Waveform for Checking Differential Gain.

(b) Set the Channel A 100%—75%—Max Gain switch on the vectorscope to Max Gain, and adjust the Vertical Position Clamp and Horizontal Position Clamp controls to center the vector origin.

(c) Push in the Diff Phase button on the vectorscope and set the Diff Phase Display switch to Double. Set the Calibrated Phase control to indicate 0° and use the Ch A Phase control to overlay the first luminance steps on the vectorscope display. See Fig. 4-21.

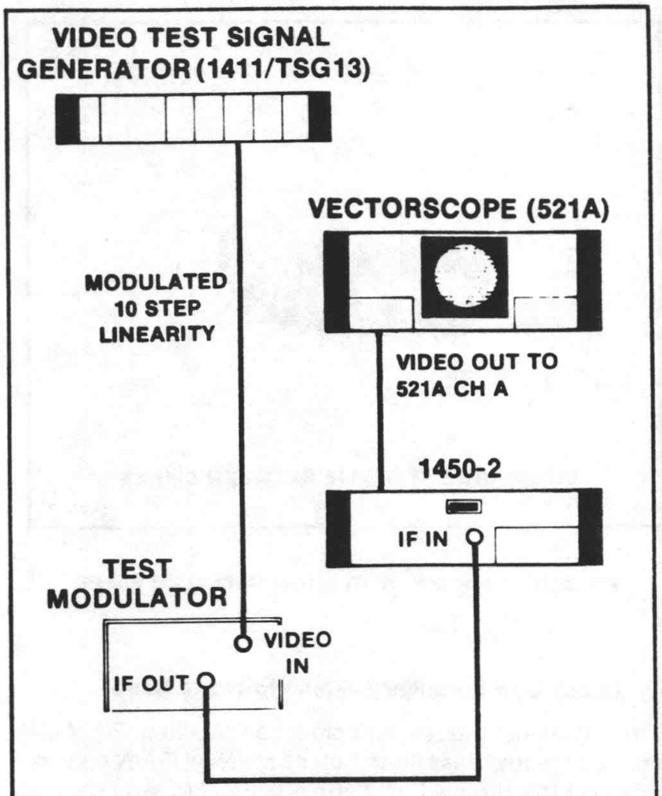
(d) CHECK—differential phase by adjusting the Calibrated Phase control on the 521A to overlay the steps that are farthest apart. Read the differential phase directly on the Calibrated Phase indicator. Check that differential phase is 1° or less.

18. Check Aural Signal Rejection

(a) Connect the test modulator if output to the IF IN connector and connect the INTERCARRIER OUT to a frequency counter (DC 508). Set the test modulator visual and aural carriers on. Set the test modulator center frequency such that the frequency counter indicates 6 MHz.

(b) Connect the test equipment as shown in Fig. 4-22. Push in the CONT DETECTION MODE, SOUND TRAP OUT, and BACK PORCH AGC buttons. Set the test modulator visual and aural carriers on and note the audio amplitude on the spectrum analyzer display. See Fig. 4-23.

(c) Push in the SOUND TRAP IN button.



Television Demodulator (1450-2)

SYNCHRONOUS DETECTION MODE .... CONT
SOUND TRAP .... OUT
AUTO AGC .... BACK PORCH

Test Modulator

VISUAL CARRIER .... ON
AURAL CARRIER .... OFF

Video Test Signal Generator (1411/TSG13)

SET TSG3 FOR 10 STEP LINEARITY SIGNAL WITH U SUBCARRIER ON

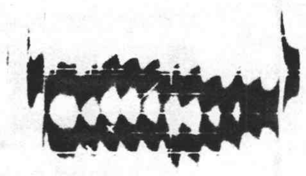
Vectorscope (521A)

CH A .... IN
FULL FIELD .... IN
AØ .... IN
VECTOR .... IN
CHANNEL A VECTORS 75%

2998-36 (2200-49)

Fig. 4-20. Test Equipment for Checking Differential Phase.

(d) CHECK—that the audio amplitude is now at least ~~46~~ dB less than was noted before (typically 60 dB down).
56



LUMINANCE STEPS LIE BETWEEN SPIKES

2998-37

Fig. 4-21. Waveform for Checking Differential Phase.

19. Check Low Frequency Signal-to-Noise Ratio

(a) Connect the test equipment as shown in Fig. 4-24 omitting the low-pass filter. Set the MANual GAIN control such that the Hi/Low lights are 'off'. See Fig. 4-11 for the location of the Hi/Low lights.

(b) Set the waveform monitor variable Volts Full Scale and Vertical Position controls such that blanking level is at the 0 V graticule line and peak white is at the 1.0 graticule line.

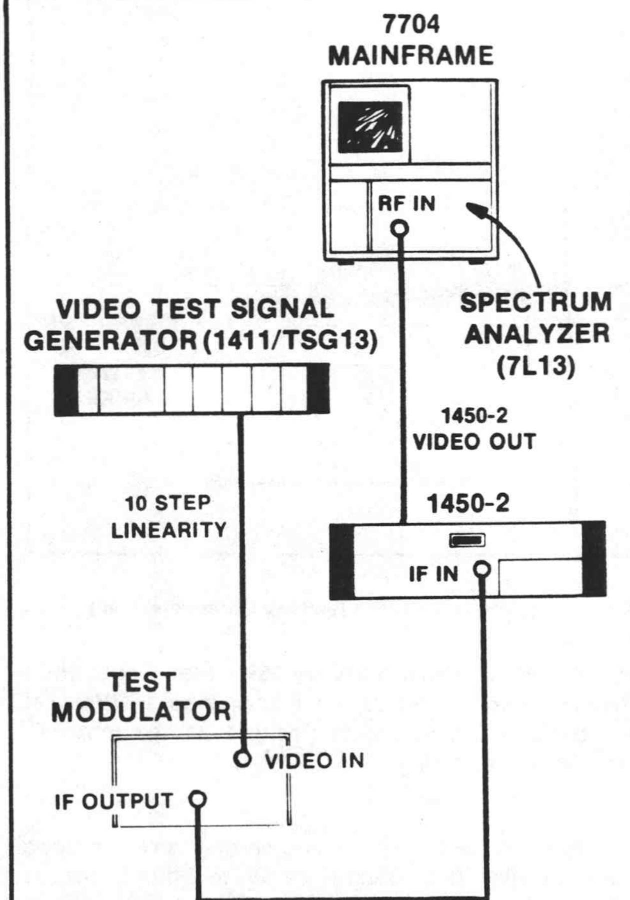
(c) Set the step attenuator for 0 dB attenuation and insert the low-pass filter in the test setup. See Fig. 4-24. Turn the video test signal generator power off and set the waveform monitor Volts Full Scale at 0.2.

(d) CHECK—that the low-frequency noise displayed on the waveform monitor is less than two major divisions (or 3.5 mV p-p).

20. Check Video Signal-to-Noise Ratio (Mid-Frequency Coherent)

(a) Connect the test equipment as shown in Fig. 4-25. Set the spectrum analyzer Center Frequency at 0 MHz, Reference Level at 10 dBm, RF dB at 40, and (vertical) Mode at 10 dB/Div.

(b) Push in the ENV (DETECTION MODE), SOUND TRAP IN, INTERNAL ZERO CARRIER REF OFF, and BACK PORCH (AGC) buttons on the 1450-2 front panel.



Television Demodulator (1450-2)

SYNCHRONOUS DETECTION MODE . BACK PORCH
SOUND TRAP .... OUT
AUTO AGC .... BACK PORCH

Test Modulator

AURAL CARRIER .... ON
VISUAL CARRIER .... ON

Video Test Signal Generator (1411/TSG13)

SET FOR 10 STEP LINEARITY SIGNAL WITH U SUBCARRIER ON

Spectrum Analyzer (7L13)

REFERENCE LEVEL .... +10 dBm
LOG (VERT) .... 10 dB/DIV
TIME/DIV .... 10 ms
FREQ SPAN .... 1 MHz
RESOLUTION .... 300 kHz
CENTER FREQUENCY .... 1 MHz
CENTER FREQUENCY SET TO POSITION AURAL CARRIER IN THE VIEWING AREA.

2998-38 (2200-51)

Fig. 4-22. Test Equipment Setup for Checking Aural Signal Rejection.

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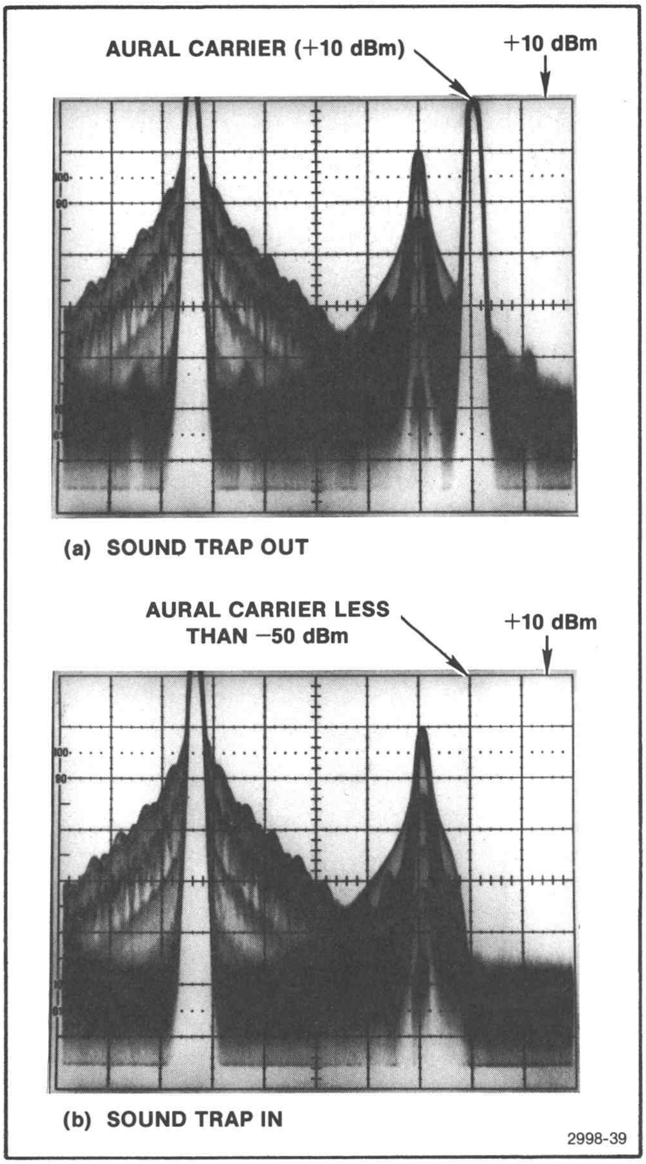


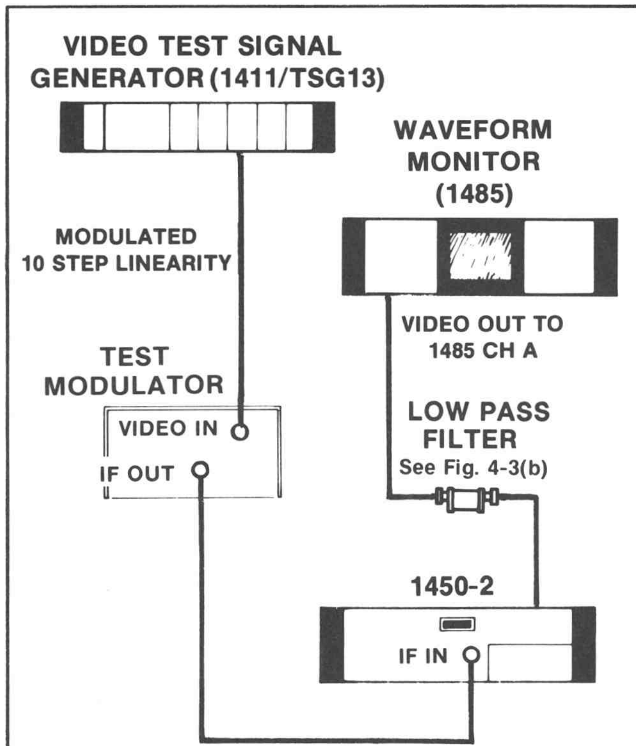
Fig. 4-23. Waveform for Checking Aural Signal Rejection.

(c) Note the amplitude of the Multiburst signals on the spectrum analyzer; then disconnect the Multiburst from the test modulator.

(d) CHECK—that any signals are at least 50 dB down from the signals noted above. See Fig. 4-26.

21. Check Signal-to-Noise Ratio (White Noise)

(a) Connect the test equipment as shown in Fig. 4-27. Make sure that P60 jumper on A58, Phase Lock Switch board, is in the Test Only position; that is, pins 2 and 3 on P60 are jumpered. See Fig. 8-7 for the location of A58 and P60.



Television Demodulator (1450-2)

SYNCHRONOUS DETECTION MODE
SOUND TRAP .... IN
AUTO AGC .... BACK PORCH

Test Modulator

VISUAL CARRIER .... ON
AUDIO CARRIER .... OFF

Video Test Signal Generator (1411/TSG13)

SET FOR MODULATED 10 STEP LINEARITY SIGNAL (280 mV SUBCARRIER)

Waveform Monitor (1485)

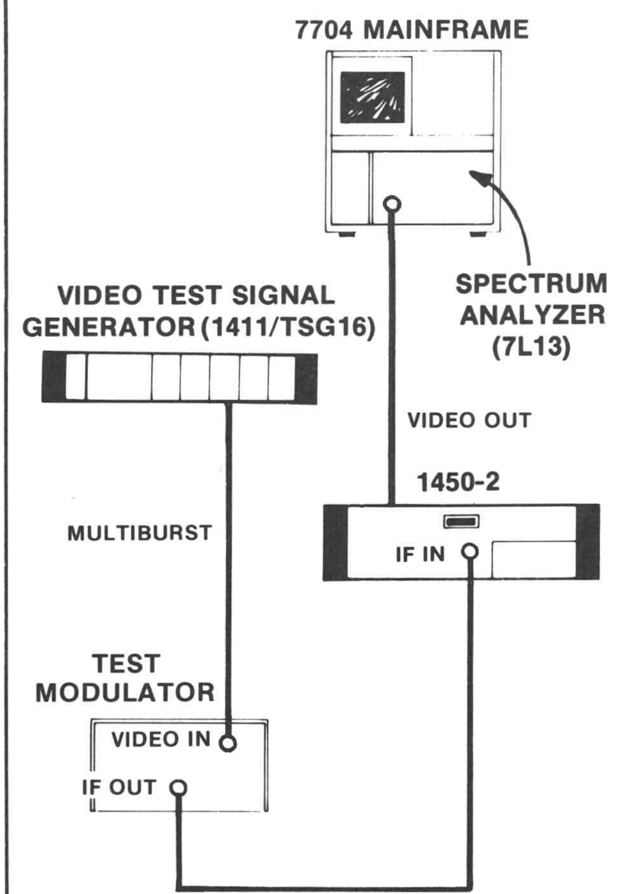
CH A
VOLTS FULL SCALE 1.0
DISPLAY .... 10 μs

2998-40 (2200-53)

Fig. 4-24. Test Equipment Setup for Checking Low Frequency Signal-to-Noise Ratio.

(b) Set the MANual GAIN control such that the RF SIGNAL INPUT LEVEL readout indicates −20 dBm. Read the noise level directly on the HP 3400A.

(c) Check that the noise level indicated on the true **rms** voltmeter is −60 dB or less (noise level less than 0.7 mV).



Television Demodulator (1450-2)

SYNCHRONOUS DETECTION MODE
SOUND TRAP . . . . IN
AUTO AGC . . . . BACK PORCH

Test Modulator

VISUAL CARRIER . . . . ON

Video Test Signal Generator (1411/TSG16)

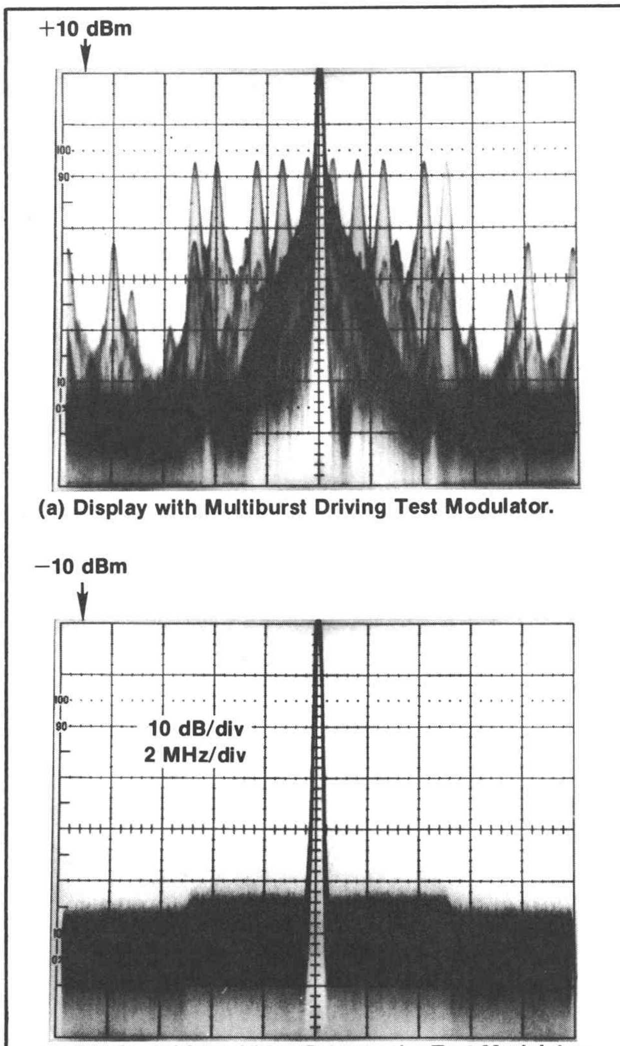
TSG16 SET FOR COMPOSITE MULTIBURST, FULL AMPLITUDE, AND LOW FREQUENCY RANGE

Spectrum Analyzer (7L13)

REFERENCE LEVEL . . . . −10 dBm
CENTER FREQUENCY . . . . .0000 MHz
FREQ SPAN . . . . 2 MHz
RESOLUTION . . . . 300 kHz
VIDEO FILTER . . . . 30 kHz

2998-41 (2200-54)

Fig. 4-25. Test Equipment for Checking Video Signal-to-Noise Ratio.



(a) Display with Multiburst Driving Test Modulator.

(b) Display with no Video Drive to the Test Modulator.

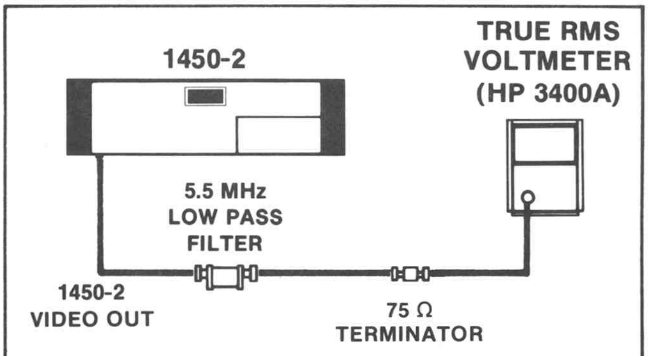
2998-42

Fig. 4-26. Waveform for Checking Video Signal-to-Noise Ratio.

22. Check Quadrature Phase with Respect to Video and synchronous Detection Phase Angle

(a) Connect the test equipment as shown in Fig. 4-28. Slowly vary the potentiometer until the test oscilloscope indicates maximum video. The potentiometer may have to be peaked a few times in order to get maximum video output from the 1450-2. Maximum video output from the 1450-2 will be acquired when the voltage on the wiper arm of the potentiometer is close to 0 Vdc. Use the vectorscope Ch A Gain controls to set the burst dot at the circle, and use the Ch A Phase control to align the burst dot with the U graticule line. Do not disturb the phase control after this.

@



Television Demodulator (1450-2)

SYNCHRONOUS DETECTION MODE . . . . CONT
SOUND TRAP . . . . IN
AGC . . . . MAN
AUDIO SOURCE . . . . INTR

P60 JUMPER ON A58 PHASE LOCK SWITCH BOARD MUST BE IN THE 'TEST ONLY' POSITION

2998-43 (2200-56)

Fig. 4-27. Test Equipment Setup for Checking Signal-to-Noise Ratio (White Noise).

(b) Remove the cable connected to the vectorscope from the VIDEO OUTPUT and connect it to the QUADRATURE OUTPUT.

(c) CHECK—that the burst vector is 90° ±2° away from the VIDEO OUT burst vector.

(d) Remove the potentiometer from P34-2 on A52, and replace the jumper to P34 pins 1 and 2. Remove the cable from the QUADRATURE OUTPUT and connect it to the VIDEO OUTPUT.

(e) CHECK—that the burst vector displayed on the vectorscope is within 3° of the previous setting.

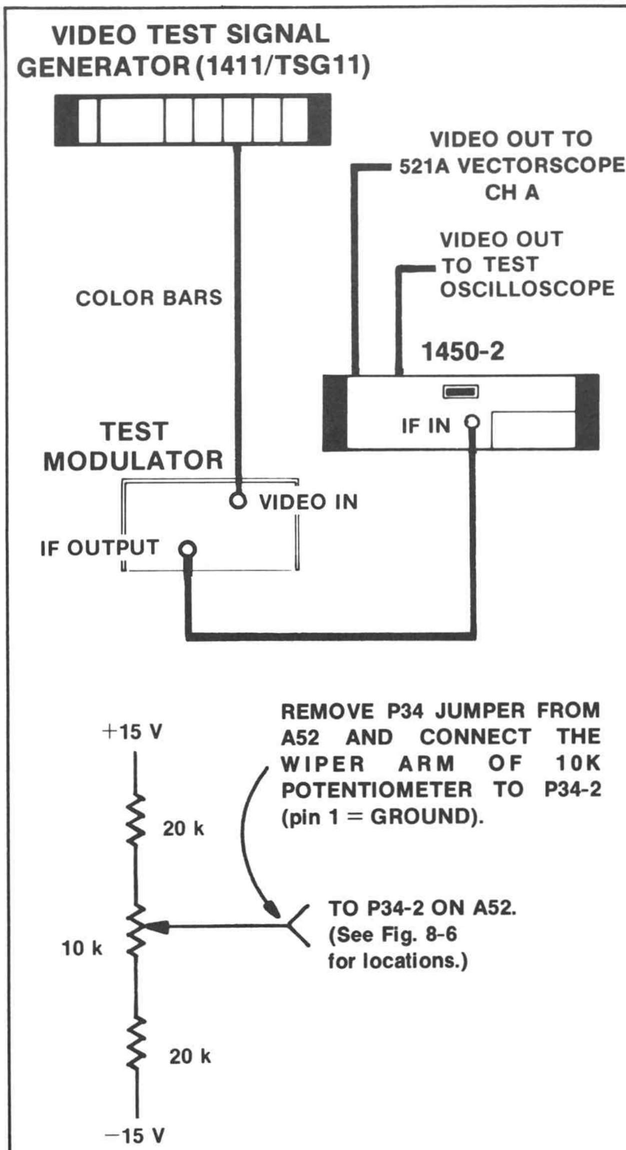
23. Check Low-Frequency Phase Noise

(a) Refer to Fig. 4-29 for test equipment setup. Install a phase graticule in the waveform monitor.

(b) CHECK—that the phase display jitter is 1.25° p-p or less (1° is equal to 1 radial division).

24. Check Zero Carrier Reference Gate

(a) Drive the 1450-2 with multiburst from the video test signal generator through the test modulator. See Fig. 4-30. Look at the VIDEO OUT with a waveform monitor set to view line 22, and Volts Full Scale setting of 1.0. Use the



Television Demodulator (1450-2)

SYNCHRONOUS DETECTION MODE . . . . CONT
SOUND TRAP . . . . IN
AUTO AGC . . . . BACK PORCH

Test Modulator

VISUAL CARRIER . . . . ON

Video Test Signal Generator (1411/TSG11)

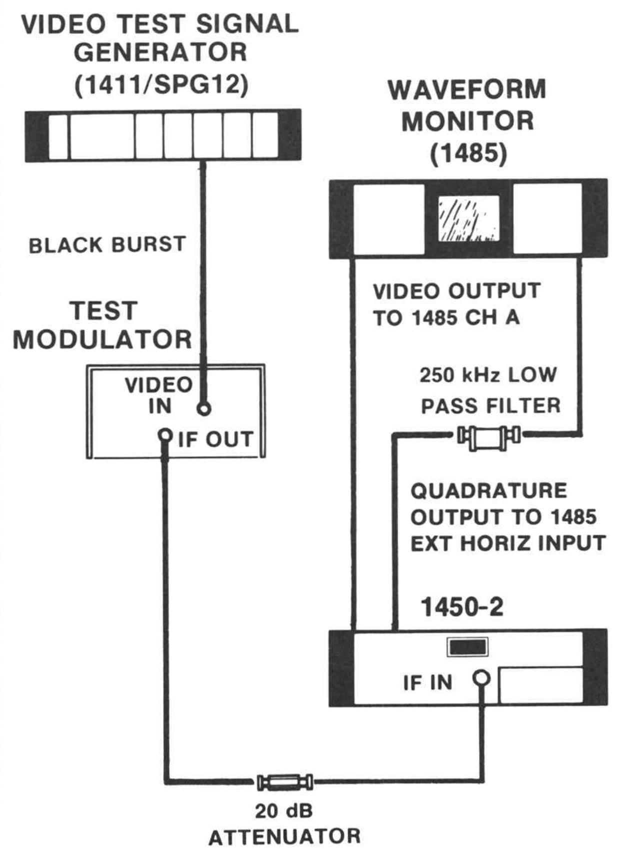
SET FOR FULL FIELD COLOR BARS

Vectorscope (521A)

CH A BUTTON . . . . IN
AØ BUTTON . . . . IN
FULL FIELD BUTTON . . . . IN

2998-44 (2200-57)

Fig. 4-28. Test Equipment Setup for Measuring Quadrature Phase with Respect to Video.



Television Demodulator (1450-2)

DETECTION MODE . . . . . . SYNCHRONOUS (CONT)
SOUND TRAP . . . . IN
INTERNAL ZERO CARRIER REF . . . . ON
AGC . . . . BACK PORCH

Test Modulator

VISUAL CARRIER . . . . ON

Waveform Monitor (1485)

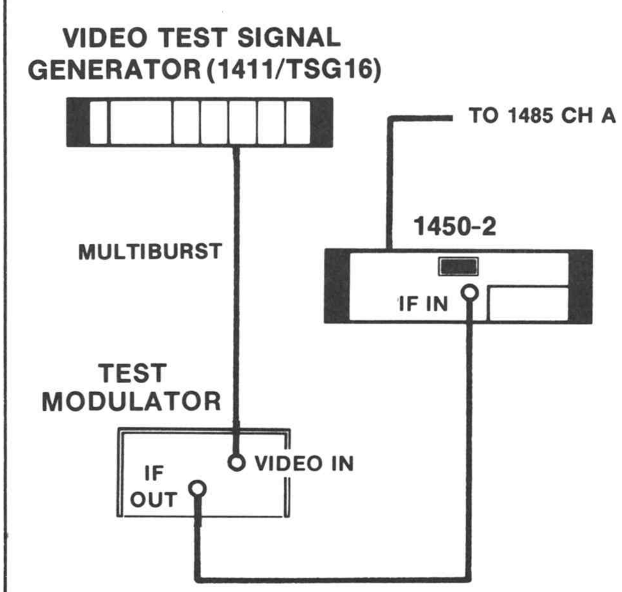
RESPONSE . . . . LOW PASS
INPUT . . . . A
VOLTS FULL SCALE 1.0
DISPLAY . . . . EXT
MAGNIFIER . . . . X50 (.1)

2998-45 (2200-58)

Fig. 4-29. Test Equipment Setup for Measuring Low Frequency Phase Noise.

waveform monitor Volts Full Scale Variable control to set a 1 V p-p multiburst display on the waveform monitor.

(b) Move jumper P73 on AGC Control board A60 in the 1450-2 from line 16 to line 22. See Fig. 8-8 for the location of A60 and P73.



Television Demodulator (1450-2)

SYNCHRONOUS DETECTION MODE . BACK PORCH
SOUND TRAP . . . . IN
AUTO AGC . . . . BACK PORCH

Test Modulator

VISUAL CARRIER . . . . ON

Video Test Signal Generator (1411/TSG16)

SET FOR MULTIBURST, FULL AMPLITUDE, AND LOW FREQUENCY RANGE

2998-46 (2200-59)

Fig. 4-30. Test Equipment Setup for Measuring Zero Carrier Chopper.

(c) CHECK—for less than 15 mV of multiburst at the top of the Zero Carrier Reference pulse when the Volts Full Scale control on the waveform monitor is set at 0.2.

(d) CHECK—that the Zero Carrier Reference Gate half amplitude duration is 30 $\mu s \pm 3 \mu s$.

(e) Set the waveform monitor front-panel controls to display line 20 of the video signal. Reset P73 in the 1450-2 to line 16.

(f) CHECK—that the Zero Carrier Reference Gate is present in all four fields; that is, push in the waveform monitor Field buttons 1, 2, 3, and 4, and check that the zero carrier reference gate is present.

(g) CHECK—that the Zero Carrier Gate extends from blanking up 811 mV ±3.5 mV.

25. Check De-Emphasis In and De-Emphasis Out Audio Frequency Response

(Flat within 0.4 dB from 30 Hz to 25 kHz—De-Emphasis In)
(See Table 4-5: 50 μs Curve ±0.5 dB)

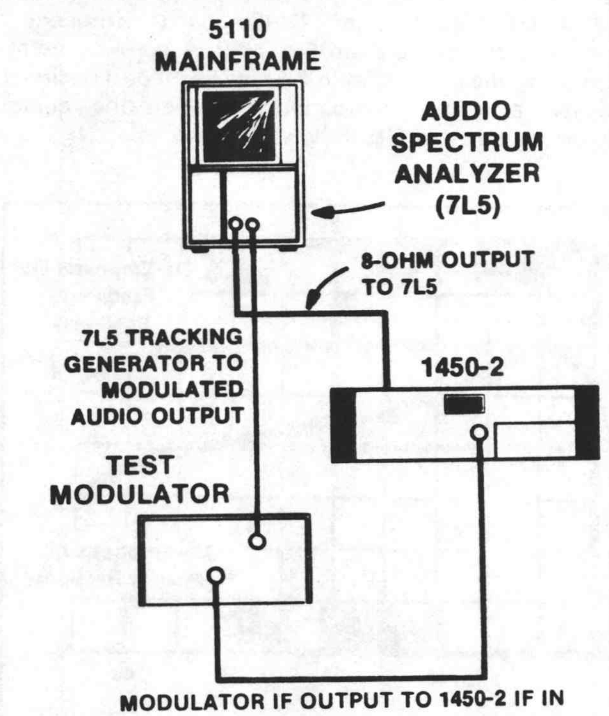
Table 4-5

50 μs DE-EMPHASIS CURVE

Frequency	Response
1 kHz	−0.409 dB
2 kHz	−1.445 dB
3 kHz	−2.761 dB
4 kHz	−4.115 dB
5 kHz	−5.400 dB
6 kHz	−6.583 dB
7 kHz	−7.661 dB
8 kHz	−8.643 dB
9 kHz	−9.540 dB
10 kHz	−10.362 dB
11 kHz	−11.120 dB
12 kHz	−11.822 dB
13 kHz	−12.475 dB
14 kHz	−13.084 dB
15 kHz	−13.656 dB
16 kHz	−14.194 dB
17 kHz	−14.702 dB
18 kHz	−15.182 dB
19 kHz	−15.638 dB
20 kHz	−16.072 dB

(a) Connect the test equipment as shown in Fig. 4-31. Use the AUDIO LEVEL control to set the audio output level at −30 dBm.

(b) CHECK—that the frequency response displayed on the TEKTRONIX 7L5/7704 Audio Analyzer is flat within 0.4 dB from 30 Hz to at least 25 kHz. See Fig. 4-32.



Television Demodulator (1450-2)

MAN (AGC) .... IN
SPLIT AUDIO SOURCE .... IN
GAIN CONTROL .... FULLY COUNTER-CLOCKWISE
AUDIO SOURCE .... SPLIT (IN)
DE-EMPHASIS .... OUT

Test Modulator

VISUAL CARRIER .... ON
AURAL CARRIER .... ON
AURAL CARRIER LEVEL .... MIDRANGE

Audio Spectrum Analyzer (7L5)

FREQUENCY 000
VERT MODE .... 2 dB/DIV
LOG REF .... −20 dB
SPAN/DIV .... 5 kHz
RESOLUTION .... AUTO
TRKG GEN .... IN (ON CAL)
S/DIV .... 10 ms

2998-47 (2200-60)

Fig. 4-31. Test Equipment Setup for Checking Audio Frequency Response.

(c) Push in the DE-EMPHASIS button on the 1450-2 front panel.

(d) CHECK—that the De-Emphasis frequency response is the same as in Fig. 4-32. A point-by-point check using the data in Table 4-5 may be made if desired. However, a simple comparison between the audio analyzer display and Fig. 4-32 will suffice.

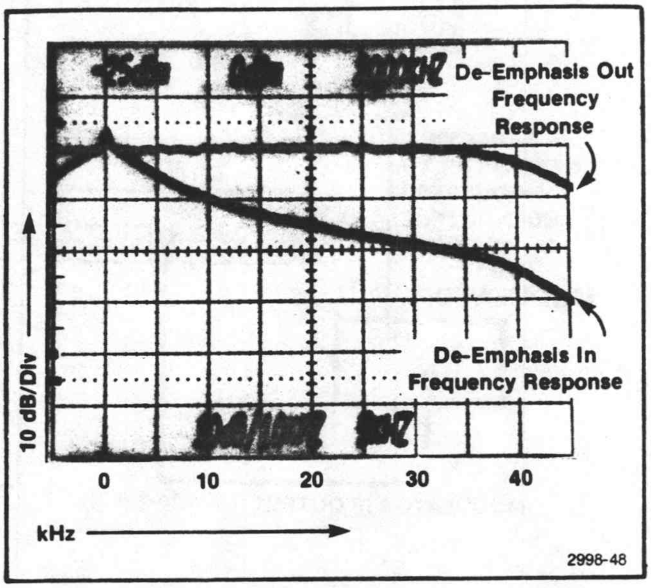


Fig. 4-32. Audio Frequency Response (DE-EMPHASIS IN and DE-EMPHASIS OUT).

26. Check Audio Harmonic Distortion

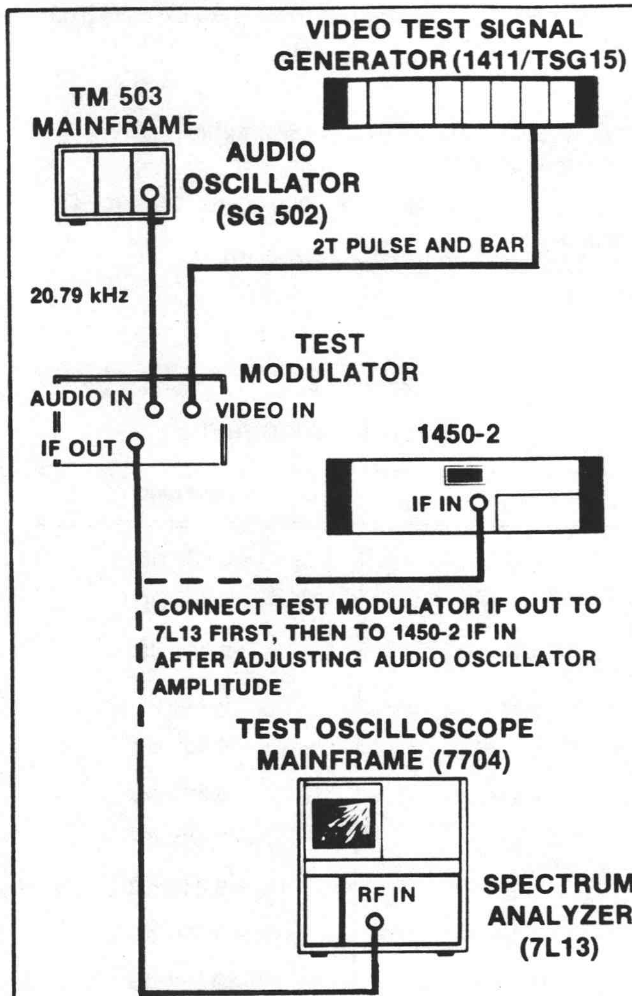
(Less than 54 dB [0.2%] at full output)
(8 Ω SPEAKER output level, 5 W)
(Headphone AUDIO OUTUPT level, 50 mW)
(600 Ω BALanced LINE AUDIO OUTput level, +10 dBm)

(a) Connect the test equipment as shown in Fig. 4-33. Set up the test modulator for 50 kHz deviation by varying the output level control on the audio signal generator until the audio-carrier signal at the middle of the spectrum analyzer display disappears. See Fig. 4-34.

(b) Connect the test modulator if output to the IF INput of the 1450-2, and connect the INTERCARRIER OUT to the frequency counter. Set the test modulator Center Frequency such that the counter indicates 6 MHz.

(c) Connect an 8 Ω/10 W load across the 1450-2 8 Ω output (J12) and connect a voltmeter across the 8 Ω load. Set the voltmeter for ac volts, and set the AUDIO LEVEL control fully clockwise.

(d) CHECK—that the voltmeter indicates at least 6.32 Vrms across the 8 Ω load, then reset the AUDIO LEVEL control to indicate 6.32 V (5 W) on the voltmeter. Do not change this AUDIO LEVEL setting for the duration of this step.



Television Demodulator (1450-2)

SYNCHRONOUS DETECTION MODE . BACK PORCH
SOUND TRAP .... IN
AGC .... MANUAL GAIN
AUDIO SOURCE .... SPLIT

Test Modulator

AURAL CARRIER .... ON
VISUAL CARRIER .... ON
AURAL CARRIER LEVEL .... SET 10 dB BELOW VISUAL CARRIER LEVEL

Video Test Signal Generator (1411/TSG15)

SET FOR 2T PULSE AND BAR WITH 12.5T MODULATED PULSE

Spectrum Analyzer (7L13)

CENTER FREQUENCY .... (IF −5.5 MHz)
SPAN/DIV .... 10 kHz
RESOLUTION .... 3 kHz
TIME/DIV .... 20 ms

2998-49 (2200-63)

Fig. 4-33. Test Equipment for Checking Audio Harmonic Distortion.

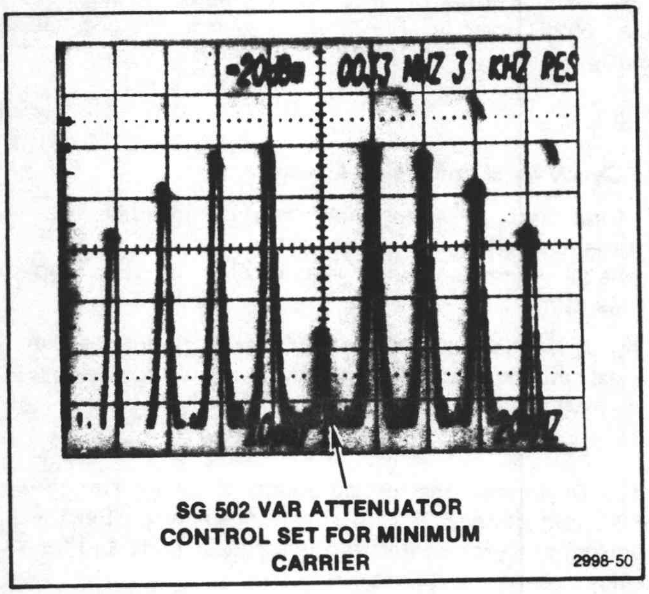


Fig. 4-34. Waveform for Setting 50 kHz Peak Deviation.

(e) Connect an 8 Ω load across the headphone AUDIO OUTPUT terminals, and connect the voltmeter across the 8 Ω load.

(f) CHECK—that the voltmeter readout indicates an output level of at least 0.632 V (50 mW).

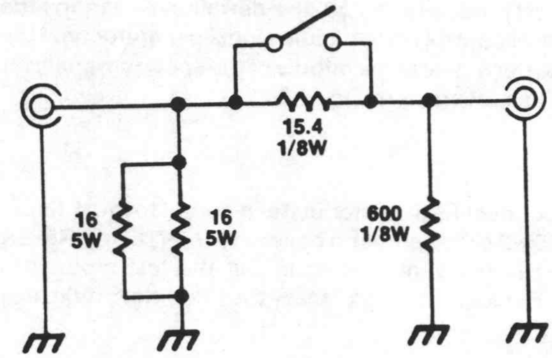
(g) Monitor the 600 Ω BALanced LINE AUDIO OUTput (J13) with the voltmeter using the test fixture shown in Fig. 4-35a. Switch out the 30 dB pad in the test fixture. Push in SPLIT and MAN (AGC) buttons on the 1450-2 front panel.

(h) CHECK—that the 600 Ω BALanced LINE output level is 2.45 V (10 mW into 600 Ω).

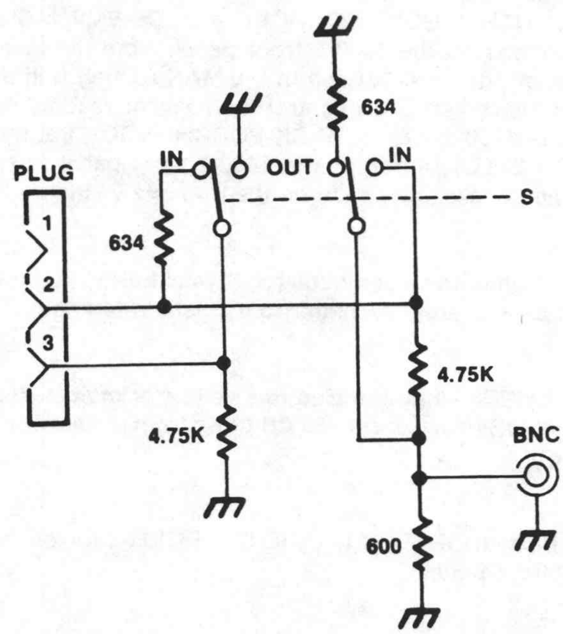
(i) Monitor the 8 Ω SPEAKER output (J12) at the 1450-2 rear panel with the 7L5 Audio Analyzer using the 8 Ω-to-600 Ω pad shown in Fig. 4-35b. Switch in the 30 dB pad in the 8 Ω-to-600 Ω test fixture. Set the 7L5 frequency span/div at 5 kHz, resolution to Coupled, time/div to Auto, vertical reference at −20 dBm, vertical mode to 10 dB/div, termination to 600 Ω, reference to 600 Ω, and triggering to Internal Auto.

(j) CHECK—that the 2nd and 3rd harmonics on the 7L5 display are at least 54 dB (0.2%) down at each of the following settings of the audio signal generator: 100 Hz, 1 kHz, and 10 kHz.

(k) Monitor J13 (600 Ω BALanced LINE OUTput) with the 7L5 Audio Analyzer using the 600 Ω/30 dB pad shown



(a) 8 Ω to 600 Ω Impedance Matching Calibration Fixture with Switchable 30 dB Attenuator.



(b) 600 Ω Audio Output Calibration Fixture with Switchable 30 dB Attenuator.

2998-19

Fig. 4-35. Audio Output Calibration fixtures.

in Fig. 4-35a. Switch in the 30 dB pad in the 600 Ω/30 dB pad test fixture.

(l) CHECK—that the 2nd and 3rd harmonics on the audio analyzer display are at least 54 dB (0.2%) down at each of the following settings of the audio signal generator: 100 Hz, 1 kHz, and 10 kHz.

27. Check Audio Signal-to-Noise Ratio

(SPLIT, AURAL ONLY, and EXTERNAL = 75 dB)
(Intercarrier = 55 dB)

(a) Connect the test equipment as shown in Fig. 4-33. Set the test modulator for 50 kHz deviation by varying the output level control on the audio signal generator until the audio-carrier signal at the middle of the spectrum analyzer display disappears. See Fig. 4-34.

(b) Connect the test modulator **if** output to the IF INput of the 1450-2 connector and connect the INTERCARRIER OUT to the frequency counter. Set the test modulator Center Frequency such that the counter indicates 6 MHz.

(c) Monitor the 1450-2 8 Ω SPEAKER output with a true **rms** voltmeter using the 8 Ω-to-600 Ω pad shown in Fig. 4-35b. Push in the SOUND TRAP IN, BACK PORCH (AGC), INTR (AUDIO SOURCE), and DE-EMPHASIS OUT buttons on the 1450-2 front panel. Note the level readout on the 1450-2. Push in the MAN (GAIN) button and set the (MAN) GAIN control for the same readout as when the 1450-2 was in BACK PORCH (AGC). Set the AUDIO LEVEL control on the 1450-2 front panel for a 10 dB audio level indication on the true **rms** voltmeter.

(d) Push in the test modulator Crystal button (set the test modulator aural oscillator to a crystal reference).

(e) CHECK—that the true **rms** voltmeter indicates at least −45 dB noise level (−55 dB down from the previous reading).

(f) Push in the SPLIT (AUDIO SOURCE) button on the 1450-2 front panel.

(g) CHECK—that the true **rms** voltmeter indicates at least −65 dB noise level (−75 dB down from the original reading).

(h) Set the test modulator visual carrier "off". Push in the AURAL ONLY (AUDIO SOURCE) button on the 1450-2 front panel.

(i) CHECK—that the true **rms** voltmeter indicates at least −65 dB noise level (−75 dB down from the original reading).

(j) Connect an **rf** generator output to the 1450-2 AURAL INTERCARRIER INput. Set the generator output for −30 dBm at 6 MHz using a power meter and a frequency counter. Push in the EXT (AUDIO SOURCE) button.

(k) CHECK—that the true **rms** voltmeter indicates at least −65 dB noise level (−75 dB down from the original reading).

28. Check Aural and Visual Alarms

(Aural Alarm on when aural carrier is 15 dB less than visual carrier)
(Visual Alarm on when visual carrier is less than −69 dBm)

(a) Drive the 1450-2 IF INput with a test modulator. Set the test modulator aural Carrier Level control such that the aural alarm LED on the 1450-2 front panel lights.

(b) Disconnect the test modulator **if** output from the 1450-2 and connect it to a spectrum analyzer. Set the spectrum analyzer center frequency at 36 MHz and frequency span/div at 2 MHz.

(c) CHECK—that the aural carrier (33.4 MHz) is at least 15 dB down from the visual carrier.

(d) Disconnect the test modulator **if** output from the spectrum analyzer and connect it to the 1450-2 IF INput.

(e) Increase the aural carrier (remove attenuation from the aural carrier) to the previous level and add attenuation to the visual carrier until the visual alarm LED lights.

(f) Disconnect the test modulator **if** output from the 1450-2 and connect it to the spectrum analyzer. The spectrum analyzer center frequency should still be at 36 MHz and frequency span/div at 2 MHz.

(g) CHECK—that the visual carrier is less than −69 dBm.

29. Check DEVIATION OUT

(50 mV peak/kHz)

(a) Connect the test equipment as shown in Fig. 4-33. Set the test modulator for 50 kHz deviation by varying the output level control on the audio signal generator until the audio carrier signal at the middle of the spectrum analyzer display disappears. See Fig. 4-34.

(b) Connect the test modulator **if** output to the IF IN connector and connect the INTERCARRIER OUT to a frequency counter. Set the test modulator center frequency control such that the counter indicates 6 MHz.

(c) Connect the DEVIATION OUTput of the 1450-2 to a voltmeter.

(d) CHECK—that the DEVIATION OUTput level is 0.884 Vrms.

30. Check Aural Intercarrier Frequency and AURAL INTERCARRIER IN Gain

(Aural intercarrier frequency = 6 MHz)
(AURAL INTERCARRIER IN gain = 30 dB)

(a) Drive the 1450-2 with a test modulator and drive the AURAL INTERCARRIER IN with an **rf** signal generator.

(b) Using a spectrum analyzer and a frequency counter, set the **rf** signal generator output amplitude at 30 dBm, and frequency at 6 MHz. Set the test modulator aural carrier and visual carrier on. Push in the test modulator Crystal button.

(c) Push in the INTR button and monitor the AURAL INTERCARRIER OUT with a spectrum analyzer.

(d) CHECK—for an intercarrier signal at 6 MHz ±1 kHz. Its level will depend on the setting of the test modulator aural carrier level.

(e) Push in the EXT button.

(f) CHECK—for an intercarrier signal (6 MHz) at 0 dBm. The external-intercarrier input circuit must not be driven with a signal over −20 dBm.

31. Check Return Loss

(a) Parts b through h are performed using a high-frequency return loss bridge (**vswr** bridge) such as a Wiltron Model 62NF50; and parts i through u are performed using a video return loss bridge such as a Tektronix Part No. 015-0149-00.

(b) Connect the test equipment as shown in Fig. 4-36. Establish a reference level on the spectrum analyzer.

(c) Connect point "A" to the 1450-2 IF IN connector.

(d) CHECK—that return loss is at least 18 dB; that is, the trace is down at least 18 dB from the reference established in part b. Check return loss across the bandpass (33.15 MHz to 39.65 MHz).

(e) Disconnect the **vswr** bridge from the IF IN connector and connect it to the INTERCARRIER IN connector. Set the spectrum analyzer center frequency at 6 MHz.

(f) CHECK—that return loss is 20 dB or better.

(g) Disconnect the **vswr** bridge from the INTERCARRIER IN connector and connect it to the INTERCARRIER OUT connector.

(h) CHECK—that return loss is 20 dB or better. Disconnect the **vswr** bridge from the 1450-2.

(i) Use the video return loss bridge to check return loss from part i through part u. Connect the return loss bridge to a Differential Comparator plug-in in the test oscilloscope. DC couple the + and − inputs on the plug-in.

(j) Connect a leveled sine wave generator to the return loss bridge input through a 50 Ω-to-75 Ω Minimum Loss Attenuator.

(k) Set the leveled sine wave generator frequency to 5 MHz and the test oscilloscope volts/div to 0.1 V.

(l) Remove the 75 Ω termination from the return loss bridge Unknown arm and adjust the leveled sine wave generator output for a 500 mV p-p display as viewed on the test oscilloscope.

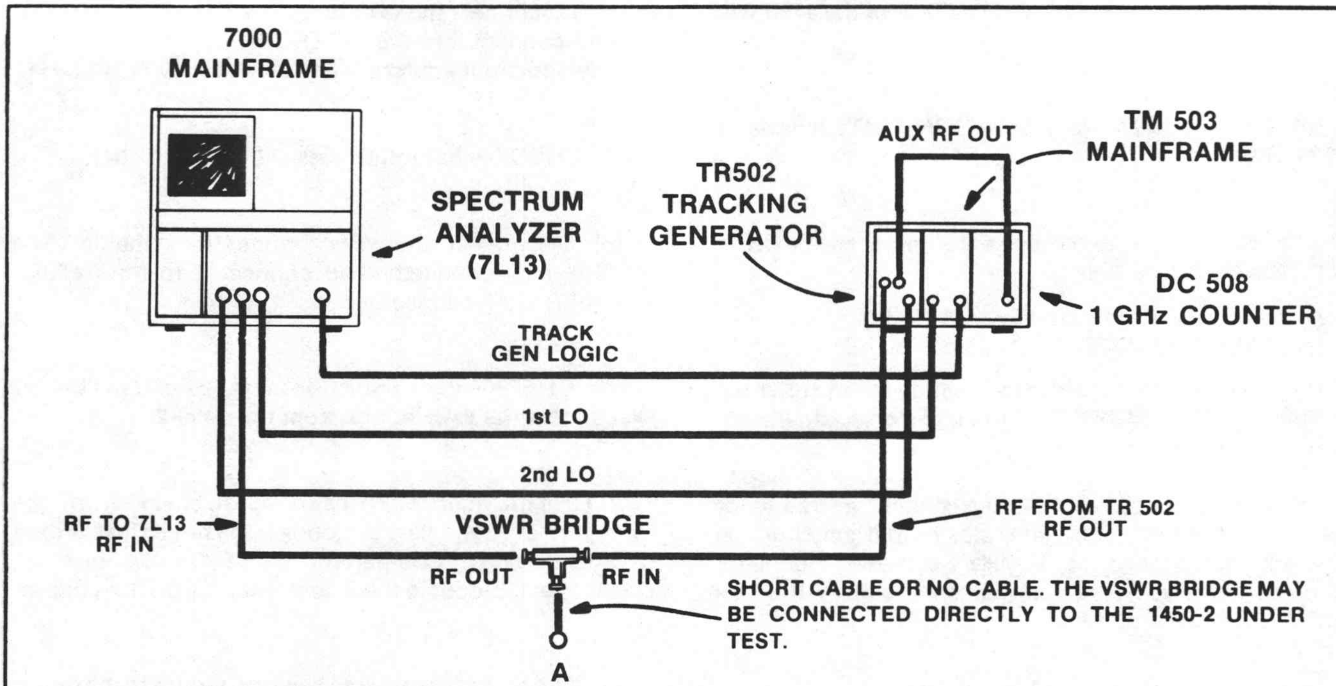
(m) Replace the 75 Ω termination to the return loss bridge Unknown arm.

(n) Set the test oscilloscope volts/div at 10 mV and adjust the return loss bridge Bal control for minimum display on the test oscilloscope.

(o) Remove the 75 Ω termination from the return loss bridge Unknown arm and connect the Unknown arm to the QUADRATURE OUTPUT connector.

(p) CHECK—that the test oscilloscope display (return loss) is 10 mV or less (34 dB or better).

(q) Disconnect the return loss bridge Unknown arm from the QUADRATURE OUTPUT and connect it to one of the VIDEO OUTPUTs.



Spectrum Analyzer (7L13)

MODE	10 dB/DIV
REFERENCE LEVEL	−30 dBm
REF dB	0
TRIGGERING	Source = INT Mode = NORM
TIME/DIV	10 ms
FREQ SPAN/DIV	5 MHz
RESOLUTION	3 MHz
CENTER FREQUENCY	IF FREQUENCY

Tracking Generator (TR 502)

OUTPUT LEVEL	−30 dBm
VAR dB	0

(2200-67) 2998-51

Fig. 4-36. Test Equipment Setup for Measuring Return Loss.

(r) CHECK—that the test oscilloscope display (return loss) is 10 mV or less (34 dB or better).

(s) Disconnect the return loss bridge Unknown arm from the one VIDEO OUTPUT and connect it to the other VIDEO OUTPUT.

(t) CHECK—that the test oscilloscope display (return loss) is 10 mV or less (34 dB or better).

(u) Disconnect the return loss bridge from the 1450-2 and the test oscilloscope.

32. Check RF Attenuator Range

(30 dB in decade steps ±0.25 dB)

(a) Set the **cw** generator output frequency at 50 MHz and set the output level at 0 dBm using a power meter. Connect the **cw** generator **rf** output to the 1450-2 RF INput connector and connect the RF OUTput to the power meter.

(b) Push in the 10 dB button on the 1450-2 front panel.

(c) CHECK—that the power meter reading decreases by 10 dB ±0.25 dB.

(d) Release the 10 dB button on the 1450-2 and push in the 20 dB button.

(e) CHECK—that the power meter reading decreases by 20 dB ±0.25 dB from the original reading (original reading = both attenuator buttons out).

(f) Push in both the 10 dB and 20 dB buttons on the 1450-2 front panel.

(g) CHECK—that the power meter reading decreases by 30 dB ±0.25 dB from the original reading (original reading = both attenuator buttons out).

ADJUSTMENT PROCEDURE

The 1450-2 must be powered up at least one hour before any adjustments are made to the instrument.

Refer to Section 8 Diagrams for the location of all adjustments. To find an adjustment location, first determine the assembly number for the circuit board on which the adjustment is located. Scan the grey tabbed pages in Section 8 for the assembly number. Pull out the tabbed page with the assembly number and locate the adjustment.

SHORT-FORM ADJUSTMENT PROCEDURE

1. **Adjust Power Supply**

   (R66 on A70)

2. **Adjust AGC Low-Pass Filter**

   (L28 and L38 on A60)

3. **Adjust AGC Current**

   (R59, R58, R57, R55, and R33 on A60)

4. **Adjust Reference Oscillator**

   (L03 and L41 on A51)

5. **Adjust Temperature Tracking Balance**

   (R60 and R70 on A50)

6. **Adjust Converter LO**

   (L03, L41, and C84 on A57)

7. **Adjust IF Atten/Amp Bias**

   (R46 on A21)

8. **Adjust Narrow IF SAW Amp Bias**

   (R76 on A24)

9. **Adjust Wide IF SAW Amp Bias**

   (R76 on A25)

10. **Adjust Post Amp Bias**

    (R64 on A26)

11. **Adjust IF Input Filter**

    (L22, L32, L45, L52, L62, C35, and C55 on A20)

12. **Adjust IF Mixer Filter**

    (L43, L36, and C48 on A22)

13. **Adjust IF Mixer Balance**

    (C63 and R51 on A22)

14. **Adjust 24 MHz Bandpass Filter**

    (L58, L54, L61, C48, C44, and C41 on A23)

15. **Adjust Video Detector Low-Pass Filter**

    (L44, L54, and L64 on A29)

16. **Adjust Quadrature Detector Low-Pass Filter**

    (L44, L54, and L64 on A28)

17. **Adjust Video-to-Quadrature Phase**

    (L48, C10, and L13 on A27)

18. **Adjust Limiter**

    (R00, R30, and R50 on A55)

19. **Adjust IF Delay**

    (L98 on A27)

20. **Adjust Quadrature DC Level**

    (R60 on A28)

21. **Adjust Narrow-Band and Wide-Band Frequencies**

    (R50 and R40 on A50)

22. **Adjust IF Mixer Filter**

    (L43, L36, and C48 on A22)

23. **Adjust Detector Balance**
(R11 on A28)

24. **Adjust Video Amp DC Level**
(R60 on A29)

25. **Adjust Switch Current Balance**
(R72 on A27)

26. **Adjust Phase Shifter Quadrature**
(L98 on A52)

27. **Adjust Phase Sampler Balance**
(C01 on A52)

28. **Adjust Quadrature Carrier Phase**
(C10 on A27)

29. **Adjust Fine AGC**
(R47 on A60)

30. **Adjust Sync Tip Level**
(R17 on A60)

31. **Adjust A/D Cal**
(C94 on A61)

32. **Adjust IF Atten/Amp Gain**
(R51 on A21)

33. **Adjust Narrow IF SAW Amp Gain**
(R93 on A24)

34. **Adjust IF Post Amp Gain**
(R41 on A26)

35. **Adjust Wide IF SAW Amp Gain**
(R93 on A25)

36. **Readjust IF Mixer Filter**
(L43, L36, and C48 on A22 IF Mixer board)

37. **Adjust 28 MHz and Aural Alarm Bandpass Filters**
(L62, L65, and L92 on A40)

38. **Adjust 6 MHz Input and Output Bandpass Filters**
(T17 and T31 on A41)

39. **Adjust Output Amp Bias**
(R56 and R53 on A44)

40. **Adjust DEVIATION OUT**
(R76 and R30 on A43)

41. **Adjust 1 MHz Bandpass Filter**
(L45, L55, L75, and L95 on A42)

42. **Adjust 600 Ω BALanced LINE OUTput Level**
(R05 on A44)

43. **Adjust Temperature Tracking Gain (Range)**
(R60 on A50)

DETAILED ADJUSTMENT PROCEDURE

1. Adjust Power Supply (R66)

NOTE

Refer to Fig. 8-8 for interconnection plug locations and the adjustment location of R66 (−15 V Adjust).

(a) Monitor P80-1 on the A70 Power Supply board with a voltmeter.

(b) ADJUST—R66 (−15 V Adjust) on the A70 Power Supply board for −15 V ±0.5% at P80-1.

(c) Connect the voltmeter to P30-1 and check that the +5 V power supply is within ±1%.

(d) Connect the voltmeter to P10-1 and check that the +15 V power supply is within ±1%.

NOTE

(1) The following adjustments involve circuit boards that have hard-to-reach adjustable inductors. These circuit boards should be installed in the 1450-2 using the Extender board.

(2) An Extender board is included in the Standard Accessories Kit. This board allows the shield-mounted boards to be extended out of the shield for adjustment.

(3) Extra pins are added to the interface boards where necessary to provide grounds for signal connections. To look at the output of a stage, remove the board it drives and connect the **bnc**-*to-square-pin adapter cable to the input pins of the board just removed. Also, in order to drive the input of a stage with an external signal, remove the board driving that stage. Drive the output pins of the board just removed with the external signal using the* **bnc**-*to-square-pin adapter cable provided.*

(4) Each shield-mounted board has a tooling hole that can be used to extract the board from the shield. A small screwdriver, or the tip of a pair of needle-nose pliers, inserted in the tooling hole may be used as a lever to pull the board out.

(5) The oscillators will have to be slightly misadjusted to compensate for operation on the Extender board. The amount of misadjustment can be determined by comparing the frequency of the oscillator when the circuit board involved is in its extrusion compartment against the frequency of the oscillator when the board is mounted on an extender board.

(6) When a spectrum analyzer is used to monitor square pins on an interface board using a **bnc**-*to-square-pin adapter cable, caution must be taken that the square-pin end of the adapter cable is not connected across power supply pins. Dc voltages applied to the spectrum analyzer will destroy the mixer in the spectrum analyzer. It is suggested that a* **dc**-*blocking capacitor be used in line with the signal being monitored when there is some doubt about the* **dc** *level of any point in the 1450-2 that has to be monitored with a spectrum analyzer.*

2. Adjust AGC Low-Pass Filter

(L28 and L38 on A60 AGC Control board)

(a) It is necessary to remove Readout Driver board A61 from the 1450-2 in order to access the adjustments on the AGC Control board. Refer to Fig. 8-8 for the locations of the harmonica connectors and screws on the Readout Driver board. To remove the Readout board, follow these steps:

(1) Turn the 1450-2 power off. Remove all harmonica connectors from the Readout Driver board A61.

(2) Remove the two Phillips-head screws from the rear corners of the board.

(3) Gently disengage the Readout Driver board from the Readout board A62 by pulling the Readout Driver board toward the rear of the 1450-2.

(b) Remove P29 from the A60 AGC Control board and use a **bnc**-to-square-pin adapter cable to connect the output of the video test signal generator to P29 pin 1 using the signal (center) conductor only. Set the video test signal generator front panel controls for a 1 V flat-field output.

(c) Turn the 1450-2 on and connect a X10 probe from the test oscilloscope vertical input to TP27 on the A60 AGC Control board.

(d) Set the test oscilloscope Volts/Div at 10 mV and the Time/Div at 10 μs. Externally trigger the test oscilloscope with Composite Sync from the video test signal generator. Use the vertical position control on the test oscilloscope to position the leading edge of the display within the viewing area.

(e) ADJUST—L28 and L38 for the best transient response at TP27. Refer to Fig. 8-8 for adjustment locations and see Fig. 4-37 for typical waveforms.

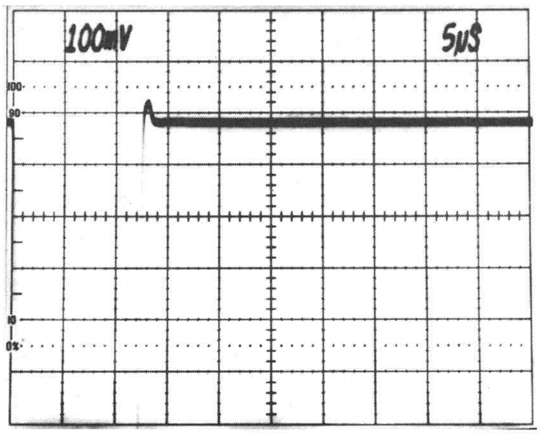
3. Adjust AGC Current

(R59, R58, R57, R55, and R33 on A60 AGC Control board)

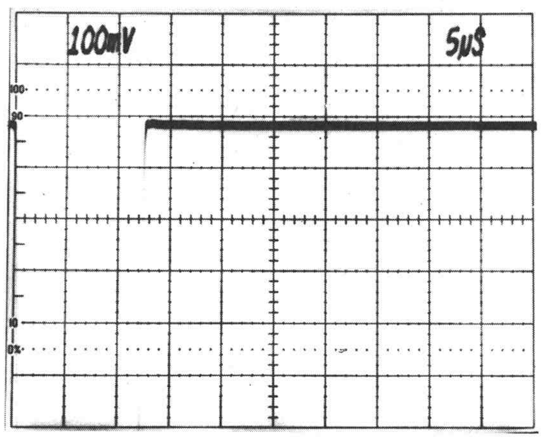
(a) Use a function generator for a 0-to-10 V and 5 Hz triangular waveform signal source.

(b) Monitor the output of the function generator with a test oscilloscope using a differential comparator plug-in in the test oscilloscope vertical and set the function generator output amplitude for 10 V p-p.

(c) Set the function generator offset control such that the negative peak is at 0 V (signal varies between 0 V**dc** and +10 V**dc**).



(a) Waveform at TP27 before adjustment of L28 and L38 on A60 AGC Control board.



(b) Waveform at TP27 after adjustment of L28 and L38 on A60 AGC Control board.

2998-52

Fig. 4-37. Adjustment of L28 and L38 on A60.

(d) Remove P28 from A60 and connect the function generator output to P28-2. See Fig. 8-8 for adjustment and harmonica connector locations. By slightly bending pin 2 on P28, P28 can be replaced in its location while the output of the function generator is still connected to pin 2.

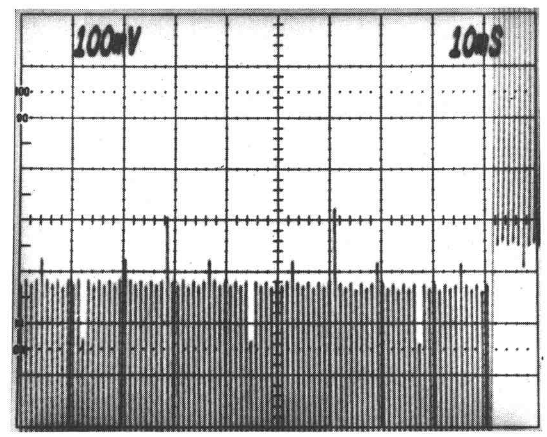
(e) Monitor TP45 on A60 with the test oscilloscope using a 10X probe.

(f) Set the test oscilloscope Volts/Div at 10 mV and Time/Div at 10 ms. Externally trigger the test oscilloscope with the function trigger output.

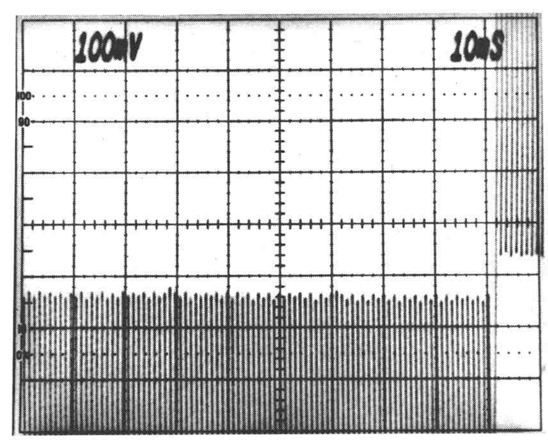
(g) Push in the MAN button on the 1450-2 front panel and set the AGC SPEED control fully counterclockwise. Use the comparison voltage control on the differential comparator plug-in to bring the display within the **crt** viewing area.

(h) ADJUST—R59, R58, R57, and R55 in that order for equal amplitude of the LSBs (smaller amplitude ramps) displayed on the test oscilloscope. See Fig. 4-38 for typical displays.

(i) Reset the test oscilloscope time base to 20 ms/Div. The display on the test oscilloscope should be about the same as in Fig. 4-39a.



(a) Waveform at TP45 before adjustment of R59, R58, R57, and R55 on A60 AGC Control board.

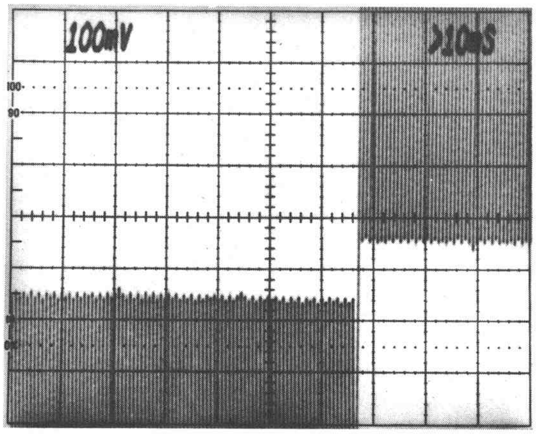


(b) Waveform at TP45 after adjustment of R59, R58, R57, and R55 on AGC Control board.

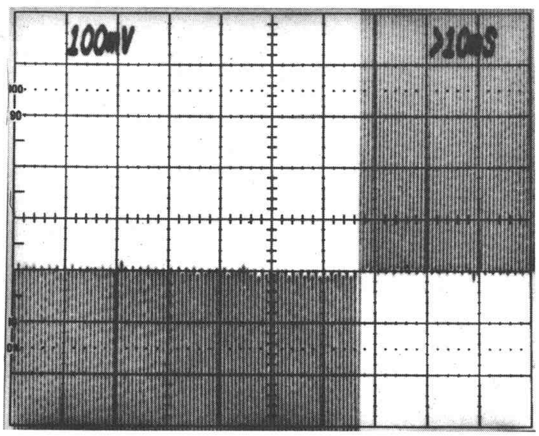
2998-53

Fig. 4-38. Comparative Waveforms for Adjustment of R59, R58, R57, and R55 on A60.

(j) ADJUST—R33 such that the tops of the ramps just barely touch. See Fig. 4-39b for typical displays.



(a) R33 Misadjusted.



(b) R33 Adjusted.

2998-54

Fig. 4-39. Comparative Waveforms for Adjustment of R33 on A60.

(k) Remove the function generator output from P28-2, remove P28 from its location, straighten pin 2 on P28, and replace P28.

(l) Replace the Readout Driver board in the 1450-2 by reversing the removal procedure in part a of Step 2.

4. Adjust Reference Oscillator

(L03 and L41 on A51 Ref Osc board)

(a) Remove U56 from the A50 Ref Control board and monitor TP91 (collector of Q80) on A50 with a test oscilloscope. The signal will be a 6.5 V square wave.

(b) Mount A51 on the Extender board. This circuit board is included in the accessories kit.

(c) ADJUST—L03 on A51 for a zero beat at TP91, typically less than 1 cycle per 0.2 ms. Replace A51 in its location in the 1450-2 and note the test oscilloscope display (number of cycles per division). Now pull A51 out of the 1450-2 and misadjust L03 such that the least number of cycles per division will be displayed on the test oscilloscope when A51 is replaced in the 1450-2. This method of finding the optimum adjustment for L03 is strictly trial and error and may take several tries.

(d) Remove the cable at P89 on the A58 Phase Lock Switch board and monitor P89 with a spectrum analyzer. Push in the SPLIT (AUDIO SOURCE) button on the 1450-2 front panel. Set the spectrum analyzer center frequency at 22 MHz, reference level at +10 dB, frequency span/div at 1 MHz, and resolution at 300 kHz.

(e) ADJUST—L41 on A51 for maximum power at P89, typically 0 dBm or slightly greater.

(f) REPEAT—parts a and b above. Final adjustment of L03 on A51 should result in a frequency of less than 5 kHz after A51 is replaced in the 1450-2.

(g) Replace the cable to P89 on A58 and replace U56 on A50.

5. Adjust Temperature Tracking Balance

(R60 and R70 on A50 Ref Control board)

NOTE

Adjustment of R70 should be made at room temperature. R60, the temperature tracking GAIN adjustment will be made later (Step 43) at an elevated temperature.

(a) Mount A50 in the 1450-2 using an extender board. Connect a voltmeter between pin 7 on U56 and pin 11 on A50.

(b) ADJUST—R70 (labeled BAL) for 0 V between pin 7 on U56 and pin 11 on A50.

6. Adjust Converter LO

(L03, L41, and C84 on A57 Converter Oscillator board)

(a) Remove A53, Converter Phase Lock board, from the 1450-2. Short pins 5 and 6 (marked CONVTR: OUT, GROUND) in A53 location together. Monitor TP70 on the A56 Converter Control board with the test oscilloscope. Set the oscilloscope Time/Div at 20 μs and coupling to **ac**.

The signal will be a sine wave of approximately 1 V p-p amplitude.

(b) ADJUST—L03 on A57 for a zero beat at TP70 on A56.

(c) Remove the cable at P97 on the A59 Phase Lock Interface board and connect P97 to the spectrum analyzer **rf** input using a **bnc**-to-Peltola adapter cable. Set the spectrum analyzer reference level at +20 dB, frequency span/div at 5 MHz, and resolution at 300 kHz.

(d) ADJUST—L41 and C84 on A57 for maximum **lo** amplitude at P97, typically +18 dBm (5 V p-p).

(e) Replace the cable to P97 on A59.

(f) REPEAT—parts a and b above and replace A53 in the 1450-2. Final adjustment of L03 on A57 should result in a difference frequency of less than 10 kHz after A57 is installed in the extrusion (A57 location).

(g) Remove the jumper from A53 location (pins 5 and 6), and replace A53 in the 1450-2.

7. Adjust IF Atten/Amp Bias

(R46 on A21 IF Atten/Amp board)

(a) Connect the test equipment as shown in Fig. 4-40. Connect point "A" in Fig. 4-40 to the spectrum analyzer **rf** input. Set the **rf** signal generator output level at −20 dBm on the spectrum analyzer.

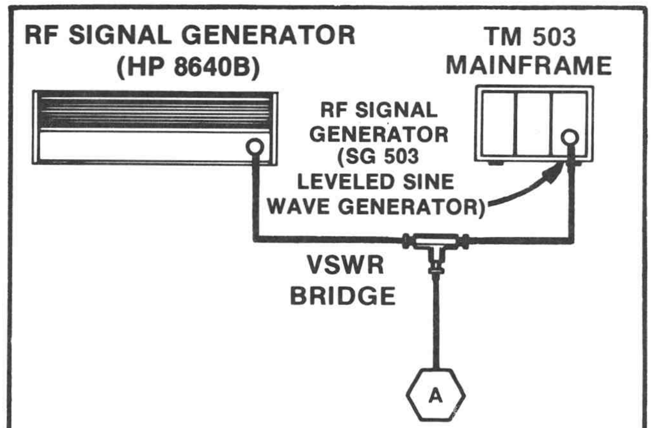
(b) Now connect point "A" in Fig. 4-40 to the output pins (pin 11/pin 12 = ground) in A20 location in the 1450-2 and remove A22 from the 1450-2. Monitor the input pins in A22 location with the spectrum analyzer using the **bnc**-to-square-pin adapter cable. Push in the 1450-2 MAN (**agc**) button and set the GAIN control fully counterclockwise. Set the spectrum analyzer center frequency at 38 MHz.

(c) ADJUST—R46 on A21 for minimum intermodulation products of 38.4 MHz and 38.9 MHz. See Fig. 4-41.

8. Adjust Narrow IF SAW Amp Bias

(R76 on A24 IF SAW Amp board)

(a) Connect the test equipment as shown in Fig. 4-42. Connect point "A" in Fig. 4-42 to the spectrum analyzer **rf** input. Set the **rf** signal generator output levels at −20 dBm as viewed on the spectrum analyzer.



1450-2 IF	HP 8640B FREQUENCY	SG 503 FREQUENCY
38.9 MHz	38.9 MHz	38.4 MHz

2998-55

Fig. 4-40. Test Equipment Setup for Adjusting Bias (R21) on A21.

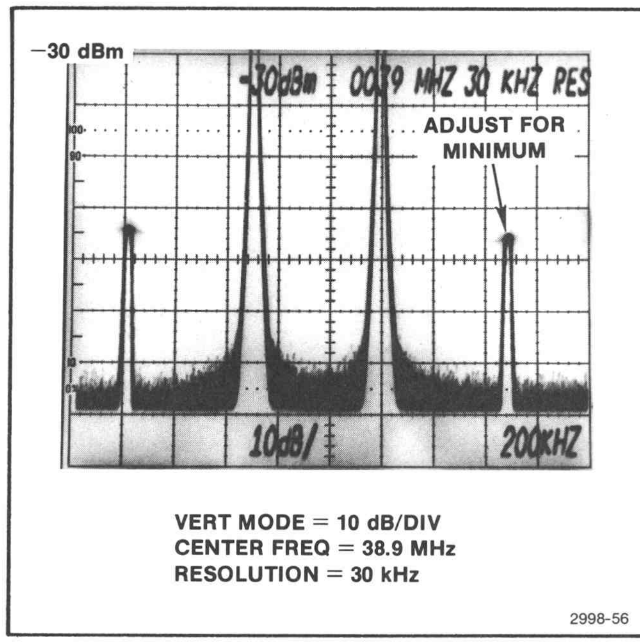


Fig. 4-41. Waveform for Adjusting Bias (R21) on A21.

(b) Remove A23 from the 1450-2 and connect point "A" in Fig. 4-42 to the output pins (pin 10 labeled OUT NARROW/pin 11 = Ground) in A23 location.

(c) Remove A26 from the 1450-2. Monitor the input pins (pin 4 labeled IN NARROW/pin 3 = Ground) in A26 location with the spectrum analyzer using a **bnc**-to-square-pin adapter cable. Push in (SOUND TRAP) IN button.

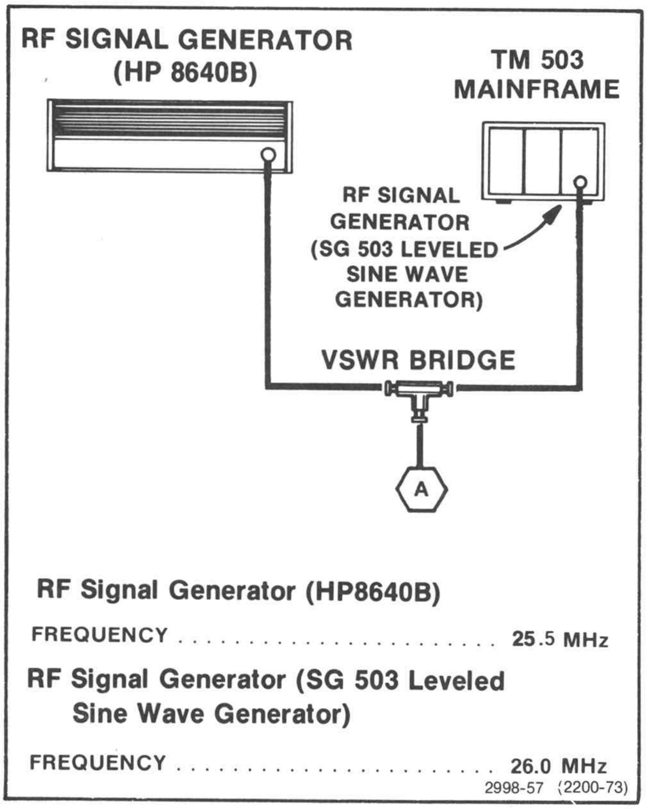


Fig. 4-42. Test Equipment Setup for Adjusting Bias on A24, A25, and A26.

(d) ADJUST—R76 on A24 for minimum intermodulation products of 25.5 MHz and 26.0 MHz. See Fig. 4-43.

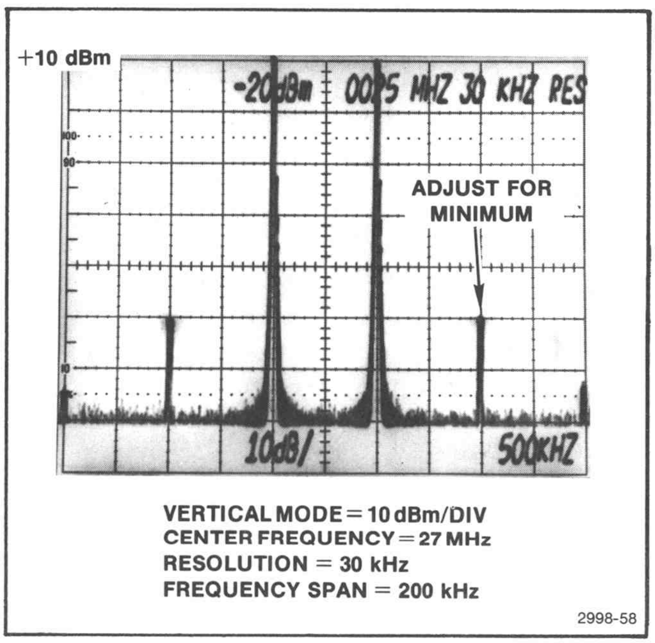


Fig. 4-43. Waveform for Adjusting Bias on A24, A25, and A26.

9. Adjust Wide IF SAW Amp Bias

(R76 on A25 IF SAW Amp board)

(a) Connect the test equipment as shown in Fig. 4-42. Connect point "A" in Fig. 4-42 to the spectrum analyzer **rf** input. Set the **rf** signal generator output levels at −20 dBm as viewed on the spectrum analyzer.

(b) Remove A23 from the 1450-2 and connect point "A" in Fig. 4-42 to the output pins (pin 12 labeled OUT WIDE/pin 11 = Ground) in A23 location.

(c) Remove A26 from the 1450-2. Monitor the input pins (pin 2 labeled IN WIDE/pin 1 = Ground) in A26 location with the spectrum analyzer using a **bnc**-to-square-pin adapter cable. Push in the (SOUND TRAP) OUT button.

(d) ADJUST—R76 on A25 for minimum intermodulation products of 25.5 MHz and 26.0 MHz. See Fig. 4-43.

10. Adjust Post Amp Bias

(R64 on A26 IF Post Amp board)

(a) Connect the test equipment as shown in Fig. 4-42. Connect point "A" in Fig. 4-42 to the spectrum analyzer **rf** input. Set the **rf** signal generator output levels at −20 dBm as viewed on the spectrum analyzer.

(b) Remove A25 from the 1450-2 and connect point "A" in Fig. 4-42 to the output pins (pin 5 labeled OUT/pin 6 = Ground) in A25 location.

(c) Remove A27 from the 1450-2. Monitor the input pins (pin 12 labeled IN/pin 11 = Ground) in A27 location with the spectrum analyzer using a **bnc**-to-square-pin adapter cable.

(d) ADJUST—R64 on A26 for minimum intermodulation products of 25.5 MHz and 26.0 MHz. See Fig. 4-43.

11. Adjust IF Input Filter

(L22, L32, L45, L52, L62, C35, and C55 on A20 IF Filter Amp board)

NOTE

The IF Bandpass Filter on A20 is difficult to adjust. Hence, the following precautionary steps must be taken before this filter is adjusted.

1. Check to see whether the bandpass filter is within instrument specification or not. IT IS SUGGESTED THAT THE BANDPASS FILTERS BE ADJUSTED ONLY WHEN THEY ARE OUT OF INSTRUMENT SPECIFICATION because of the difficulty in adjusting these filters.

2. Before adjusting this filter, connect a 51 pF capacitor across the adjustable coils, one at a time. Note the notch frequencies. These will help in establishing repeatable starting points.

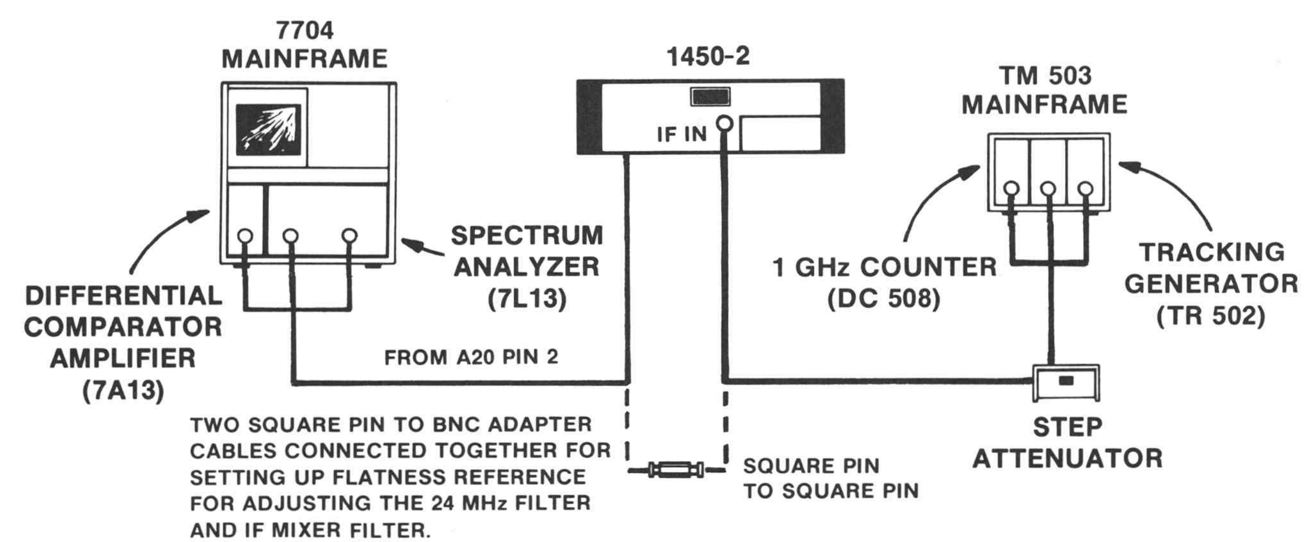
(a) It will be necessary to set up a reference flatness trace and to calibrate a vertical amplifier plug-in for 0.2 dB/div using a tracking generator or any other comparable signal source.

(b) Refer to Fig. 4-44. Connect the tracking generator to the 1450-2 IF INput. Set the tracking generator output level at −18 dBm. Remove A20 from the 1450-2 and connect pin 2 (marked IN/pin 3 = Ground) in A20 location to the spectrum analyzer **rf** input using a **bnc**-to-square-pin adapter cable.

(c) Connect the spectrum analyzer video output to the differential comparator (vertical plug-in) positive input and set the differential comparator vertical sensitivity at 2 mV/Div. Push in the Left Vertical Mode button on the test oscilloscope mainframe and use the differential comparator Comparison Voltage control to bring the trace within the **crt** viewing area.

(d) Vary the vertical variable volts/div control for a 5 division excursion of the trace as 1 dB of attenuation is added and removed from the spectrum analyzer input signal. Attenuation may be added and removed with the tracking generator output level control. The test oscilloscope is now calibrated for 0.2 dB/div, allowing for any cable losses.

(e) Use a grease pen to mark the trace on the implosion shield or graticule. This will be the reference flatness for adjusting the **if** filters.



Spectrum Analyzer (7L13)

FREQ SPAN/DIV	1 MHz
Hz RESOLUTION	3 MHz
REFERENCE LEVEL	−10 dBm
RF dB	+20
CENTER FREQUENCY	SEE TABLE

Tracking Generator (TR 502)

OUTPUT LEVEL	−18 dBm
VAR dB	0

CENTER FREQUENCY (7L13)

IF FILTER & MIXER	37.15 MHz
22 MHz FILTER	23.5 MHz

2998-59 (2200-75)

Fig. 4-44. Test Equipment Setup for Adjusting IF Bandpass Filters.

@

(f) Remove the square-pin adapter cable from the A20 location and leave it connected to the spectrum analyzer. Replace A20 in the 1450-2.

(g) Remove the A22 IF Mixer board from the 1450-2 and connect the **bnc**-to-square-pin adapter cable to pin 1 (labeled IN) in A22 location while the **bnc** end is connected to the spectrum analyzer **rf** input.

(h) Connect the spectrum analyzer video output to the differential comparator + input and dial the spectrum analyzer center frequency to the **if** filter bandpass center (37 MHz).

(i) Set the spectrum analyzer RF dB to +20 and the Reference Level to −10 dBm. Push in the Left Vertical Mode on the test oscilloscope mainframe and use the comparison voltage control on the differential comparator to bring the display within the **crt** viewing area.

(j) ADJUST—L22, L32, L45, L52, L62, C35, and C55 on A20 for 32.0 MHz-to-41 MHz bandwidth and flatness within 0.1 dB of the grease pen trace. The power gain from the IF INput to the output of A22 (pin 1 labeled IN in A22 location) should be about 21 dB.

NOTE

The **if** *input filter cannot be adjusted properly while the board (A20) is mounted on an extender card.*

To adjust properly, remove the board (A20) from the extender card; install the board in its location in the instrument; note the amount of misadjustment; remove from the extrusion; slightly adjust one coil and replace the board in the extrusion; note the flatness of the response. Repeat this process until the desired flatness is achieved.

(k) Remove the cable from pin 1 in A22 location and replace A22.

12. Adjust IF Mixer Filter

(L36, L43, and C48 on A22 IF Mixer board)

(a) It will be necessary to set up a reference flatness trace and to calibrate a vertical amplifier plug-in for 0.2 dB/div using a tracking generator or any other comparable signal source.

(b) Remove A21 from the 1450-2 and use a **bnc**-to-square-pin adapter cable to connect a tracking generator to pin 5 (labeled OUT) in A21 location. Set the spectrum analyzer center frequency at 37 MHz (filter center frequency). Remove A22 from the 1450-2 and install an extender card in A22 location. Connect another square-pin adapter cable from pin 1 (labeled IN/pin 2 = Ground) in A22 location to the spectrum analyzer **rf** input.

(c) Set the tracking generator output level at 0 dBm.

NOTE

Set the spectrum analyzer front-panel controls for a viewable display at 2 dB/div before calibrating the differential comparator for 0.2 dB/div.

(d) Connect the spectrum analyzer video output to the differential comparator positive input and set the differential comparator vertical sensitivity at 2 mV/div. Push in the Left Vertical Mode button on the test oscilloscope mainframe and use the comparison voltage control to bring the display within the **crt** viewing area.

(e) Vary the variable volts/div control for a 5-division excursion of the trace as 1 dB of attenuation is added and removed from the spectrum analyzer input signal. Attenuation may be added and removed with the tracking generator output level control. The test oscilloscope is now calibrated for 0.2 dB/div, allowing for any cable losses.

(f) Use a grease pen to mark the trace on the implosion shield or graticule. This will be the reference flatness for adjusting the **if** filters.

(g) Remove the square-pin adapter cable from the extender card in A22 location and leave connected to the spectrum analyzer.

(h) Install A22 on the extender card in A22 location and remove P40 from A22. Connect the square-pin adapter to P40 pins 1 and ~~2~~ 4 on A22 while the **bnc** end is connected to the spectrum analyzer **rf** input.

(i) Connect the spectrum analyzer video output to the differential comparator + input and dial the spectrum analyzer center frequency to 37 MHz (mixer filter bandpass center).

(j) Set the spectrum analyzer RF dB to +20 and the reference level to −10 dBm. Push in the Left Vertical Mode on the test oscilloscope mainframe and use the comparison voltage control on the vertical plug-in to bring the display within the **crt** viewing area.

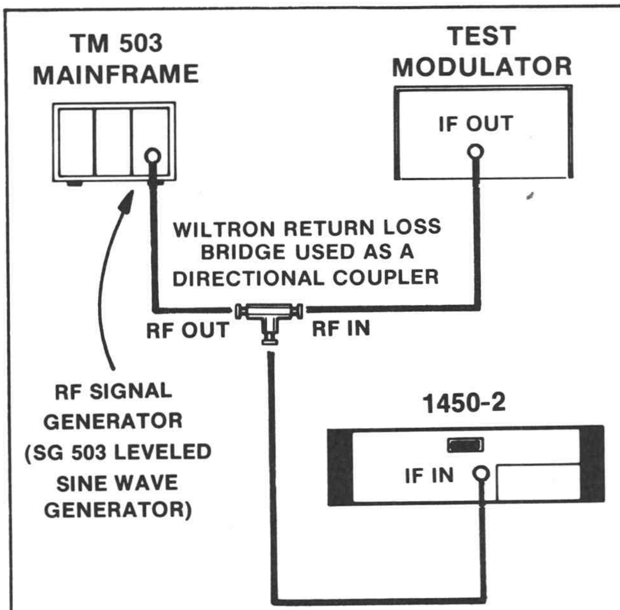
(k) ADJUST—L36, L43, C48 on A22 for 32.9 MHz-to-41 MHz bandpass and flatness within 0.1 dB of the grease pen trace.

(l) Disconnect all **bnc**-to-square-pin adapter cables from the 1450-2 and replace P40 jumper to A22. Remove the extender card from the 1450-2 and replace A22.

13. Adjust IF Mixer Balance

(C63 and R51 on A22 IF Mixer board)

(a) Connect the test equipment as shown in Fig. 4-45. Connect the VIDEO OUT to the spectrum analyzer and set the spectrum analyzer reference level at −10 dBm, vertical mode at 10 dB/Div, center frequency at 6 MHz, frequency span/div at 500 kHz, and resolution at 300 kHz.



Television Demodulator (1450-2)

DETECTION MODE	SYNCHRONOUS BACK PORCH
SOUND TRAP	OUT
AUTO AGC	BACK PORCH

Test Modulator

VISUAL CARRIER	ON

RF Signal Generator (SG 503 Leveled Sine Wave Generator)

FREQUENCY	30 MHz
AMPLITUDE	SAME AS TEST MODULATOR

2998-60 (2200-76)

Fig. 4-45. Test Equipment Setup for Adjusting IF Mixer Balance.

(b) ADJUST—C63 and R41 for minimum **if** feed-through. It may be necessary to select either R52 or R53 to increase the range of R51. In most cases, it is sufficient to remove either R52 or R53 from the circuit and readjust R51.

14. Adjust 22 MHz Bandpass Filter

(L58, L54, L51, L61, C48, C44, and C41 on A23 IF Switch/Aural Drive board)

(a) Set up the 0.2 dB/div reference flatness. Refer to Fig. 4-44 and the associated text.

(b) Remove A23 from the 1450-2 and mount it on an extender card. Remove P60 from A22 and connect the tracking generator to P60 pins 1 and 2 (pin 1 = Ground) through a 50 Ω step attenuator. See Fig. 4-44.

(c) Remove A24 from the 1450-2 and connect a **bnc**-to-square-pin adapter cable from pin 11 (labeled IN, pin 10 = Ground) in A24 location to the spectrum analyzer **rf** input.

(d) Connect the spectrum analyzer video output to the differential comparator + input and set the spectrum analyzer center frequency at 24 MHz.

(e) Push in the Left Vertical Mode on the test oscilloscope mainframe and use the comparison voltage control on the vertical plug-in to bring the display within the **crt** viewing area. Push in the SOUND TRAP IN button and set the step attenuator to 00 dB (no attenuation).

(f) ADJUST—L58, L54, L51, C48, L61, C44, and C41 on A23 for flatness within 0.1 dB of the grease pen trace and a bandwidth of from at least 19 MHz to 29 MHz.

(g) Remove the cable from pin 11 in A24 location and replace A24 and A22 in the 1450-2.

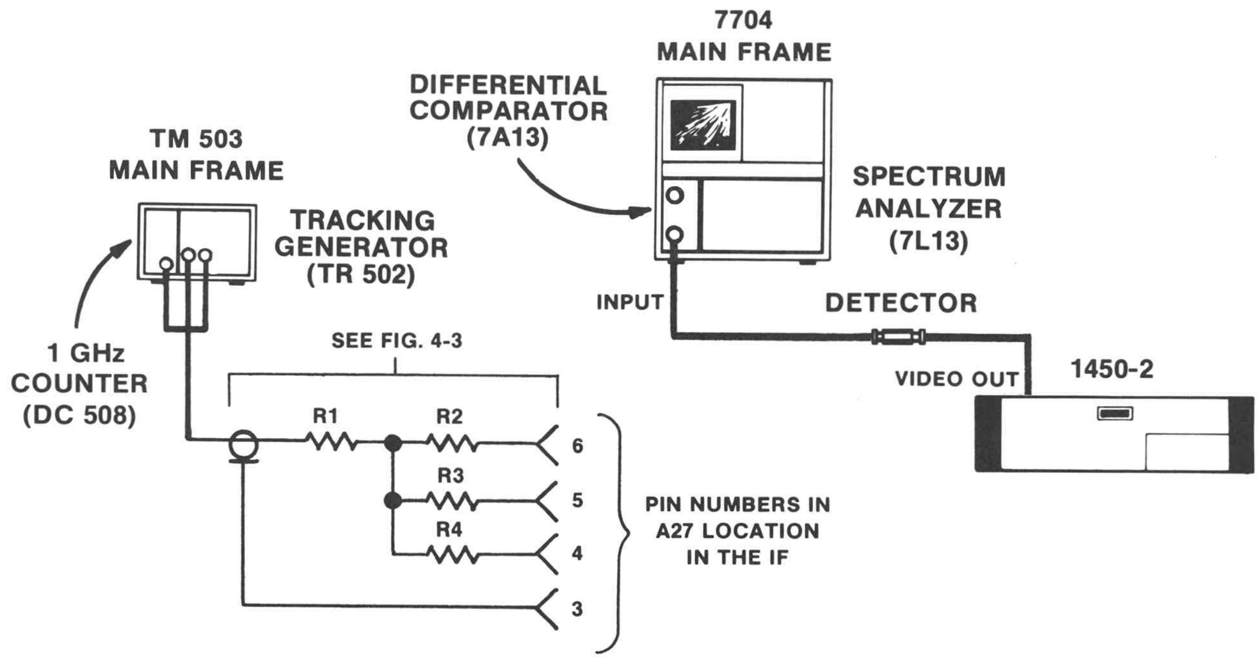
15. Adjust Video Detector Low-Pass Filter

(L44, L54, and L64 on A29 Det-Video Amp board)

(a) Remove A27 from the 1450-2 and connect the test equipment as shown in Fig. 4-46. Remove the detector from the test setup.

(b) Set the tracking generator output level controls for a 2 V p-p display on the test oscilloscope. See Fig. 4-47a.

(c) Replace the detector in the test setup and set the vertical plug-in volts/div control at 10 mV. Use the com-



Spectrum Analyzer (7L13)

FREQ SPAN/DIV .... 2 MHz
CENTER FREQUENCY .... 24 MHz
TIME/DIV .... 10 ms

Differential Comparator (7A13)

VOLTS DIV .... 10 MV

Tracking Generator (TR 502)

OUTPUT LEVEL .... –10 dBm
VAR dB 0
DOT INTENSITY .... ON

7704 Main Frame

VERTICAL MODE .... LEFT

2998-61

Fig. 4-46. Test Equipment Setup for Adjusting the Video Detector Low Pass Filters.

parison voltage control on the vertical plug-in to bring the display within the viewing area. See Fig. 4-47b.

(d) ADJUST—L44, L54, and L64 on A29 for flat response within 1 division from 19 MHz to 29 MHz. See Fig. 4-47b. The intensified dot on the display may be used to locate the frequency limits on the trace by varying the spectrum analyzer center frequency control and reading off the frequency counter.

(d) Disconnect all test equipment and replace all circuit boards in their respective locations in the 1450-2 unless proceeding to Step 16.

16. Adjust Quadrature Detector Low-Pass Filter

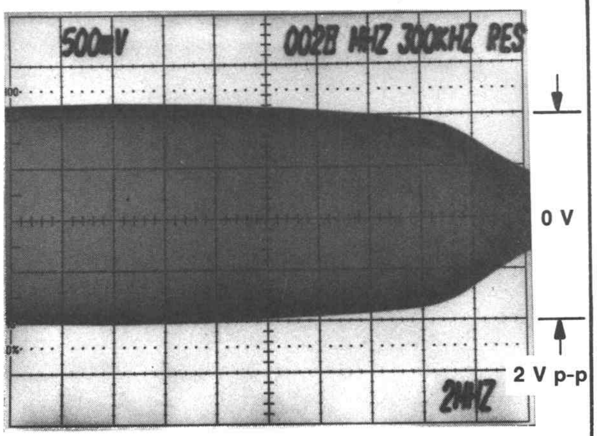
(L44, L54, and L64 on A28 Det-Video Amp board)

NOTE

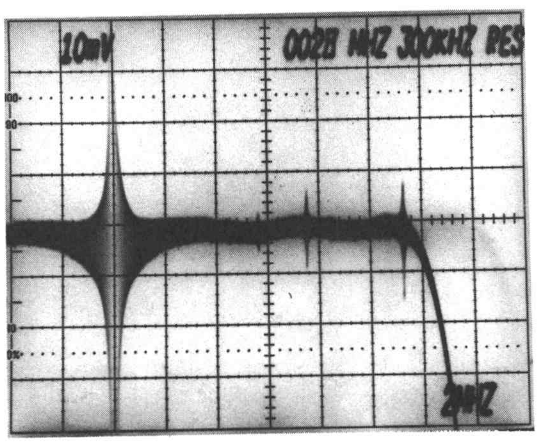
*The Quadrature Detector low-pass filter should be adjusted with the board (A28) installed in A29 location in the **if** strip. This is done so that A28 can be substituted for A29 should A29 fail.*

The two boards (A28 and A29) are identical except for the jumpered pins on P71. The basic board becomes a video detector when pins 1 and 2 on P71 are jumpered, and quadrature detector when pins 2 and 3 are jumpered.

(a) Remove the Video and Quadrature Detector boards (A28 and A29) from the 1450-2. Install the Quadrature Detector board in A29 location and move P71 jumper to pins 1 and 2. At the same time, install the Video Detector board in A28 location and move P71 jumper to pins 2 and 3.



(a) Setup Waveform for Adjusting Video Detector Low Pass Filters on A29 and A28.



(b) Waveform for Adjusting Video Detector Low Pass Filters on A29 and A28.

2998-62

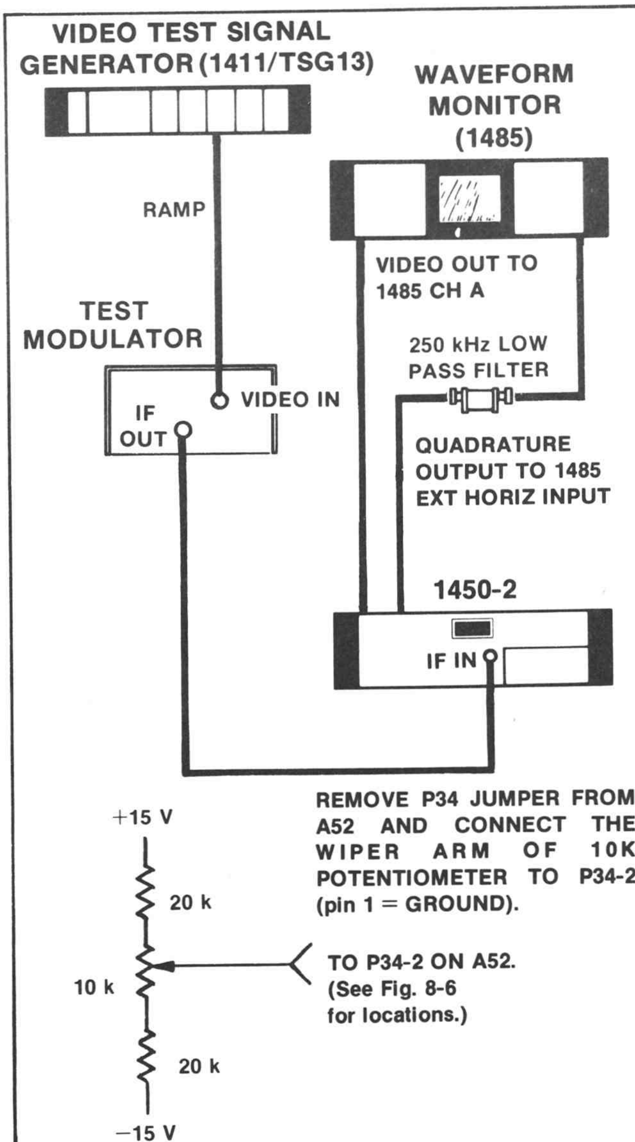
Fig. 4-47. Waveforms for Adjusting the Video Detector Low Pass Filters.

(b) ADJUST—L44, L54, and L64 on the board in A29 location for a flat response within 1 division from 19 MHz to 29 MHz. See Fig. 4-47b.

17. Adjust Video-to-Quadrature Phase

(L48, C10, and L13 on A27 IF Zero Carrier/Phase Shifter board)

(a) Connect the test equipment as shown in Fig. 4-48. Remove P34 jumper from A52 and connect the wiper arm of the potentiometer to P34-2 on A52. Set the potentiometer for maximum H-sync amplitude on the waveform monitor display. Maximum H-sync amplitude occurs when the voltage at the wiper arm of the potentiometer is near 0 V.



Television Demodulator (1450-2)

SYNCHRONOUS DETECTION MODE
SOUND TRAP . . . . IN
AUTO AGC . . . . ~~BACK PORCH~~ MAN IN

Video Test Signal Generator (1411/TSG13)

SET UP FOR A RAMP OUTPUT

Waveform Monitor (1485)

INPUT . . . . CH A DC CPL'D
VOLTS FULL SCALE 0.2
MAG . . . . OFF
DISPLAY . . . . (STEPS 17A THROUGH 17C) 5 μs
(STEPS 17D THROUGH 17F) EXT
RESPONSE . . . . . (STEPS 17A THROUGH 17C) FLAT
(STEPS 17D THROUGH 17F) LOW PASS

(2200-80) 2998-63

Fig. 4-48. Test Equipment Setup for Adjusting L48, C10, and L13 on A27.

@

(b) Push in CONT (DETECTION MODE) and MAN buttons on the 1450-2 front panel and set the GAIN control such that the Hi/Low lights on the RF SIGNAL INPUT LEVEL readout are off. See Fig. 4-11 for the location of the Hi/Low lights.

(c) ADJUST—L48 on A27 for maximum H-sync amplitude as viewed on the waveform monitor display.

(d) Set the waveform monitor display control to Ext. Vary C10 on A27 clockwise and counterclockwise and note the range of the phase display swing.

(e) ADJUST—C10 on A27 for midrange of the phase display swing.

(f) ADJUST—L13 for a vertical display on the test oscilloscope. See Fig. 4-49. Note that L21 and L25 on A27 normally do not have adjustable cores.

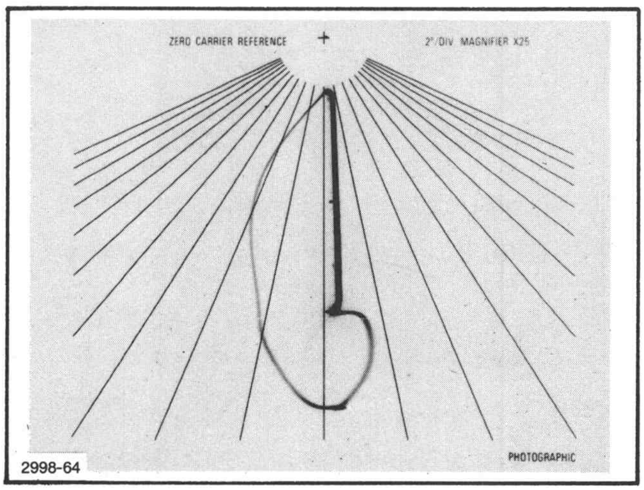


Fig. 4-49. Phase Display for Adjusting L48, C10, and L13 on A27.

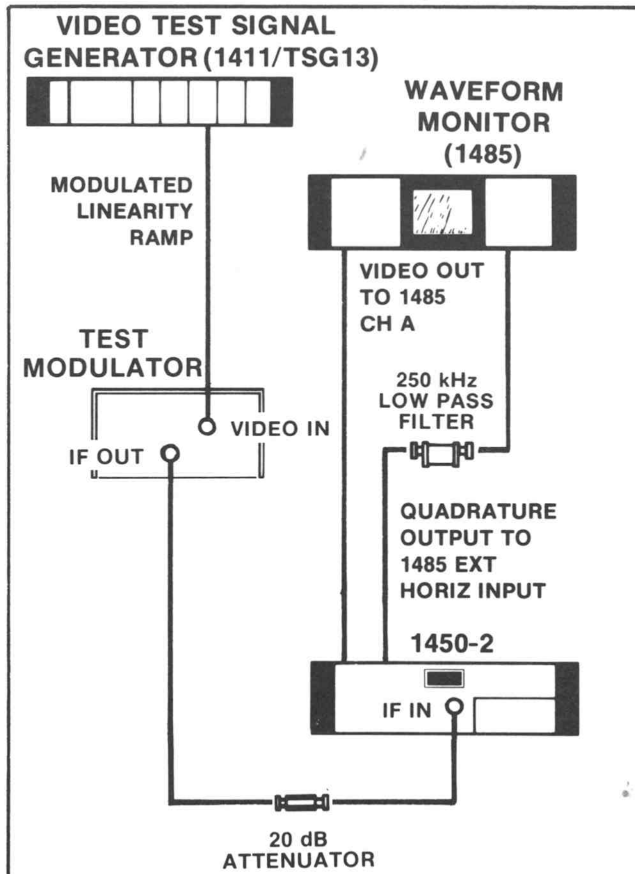
(g) Disconnect the test equipment from the 1450-2 and replace P34 jumper to pins 2 and 3 on A52.

18. Adjust Limiter

(R00, R30, and R50 on A55 Limiter board)

(a) Connect the test equipment as shown in Fig. 4-50.

(b) ADJUST—R00, R30, and R50 for a straight phase display while varying the 1450-2 manual GAIN control between normal and minimum signal amplitude.



Television Demodulator (1450-2)

DETECTION MODE . . . . ENV
SOUND TRAP . . . . IN
INTERNAL ZERO CARRIER REF . . . . ON
AGC . . . . MAN

Test Modulator

VISUAL CARRIER . . . . ON

Waveform Monitor (1485)

RESPONSE . . . . LOW PASS
INPUT . . . . A
VOLTS FULL SCALE 1.0
DISPLAY . . . . EXT

2998-65 (2200-82)

Fig. 4-50. Test Equipment Setup for Adjusting R00, R30, and R50 on A55; and L98 on A27.

(c) Set the waveform monitor magnifier control to X25 (.2).

(d) READJUST—R00, R30, and R50 for a straight phase display while varying the 1450-2 manual GAIN control.

19. Adjust IF Delay

(L98 on A27 IF Zero Carrier/Phase Shifter board)

(a) Connect the test equipment as shown in Fig. 4-50.

(b) ADJUST—L98 on A27 for zero phase error between ENV and SYNCHRONOUS DETECTION MODEs. Hold the 1450-2 SYNC TIP (SYNCHRONOUS DETECTION MODE) button in while pushing and releasing the ENV button and adjust L98 for minimum movement of sync-tip phase shift.

NOTE

L98 must be adjusted with the circuit board (A27) in the extrusion. L98 cannot be adjusted correctly while the board is on an extender card.

To adjust properly, remove the board from the extrusion, adjust L98 a small amount, re-install the board in the extrusion, and check phase.

Repeat until phase is correct.

20. Adjust Quadrature

(R60 on A28 IF Det-Video Amp board)

(a) Connect the test equipment as shown in Fig. 4-50.

(b) Push in CONT (DETECTION MODE) on the 1450-2 front panel and set the MANual GAIN control such that the Hi/Low lights on the 1450-2 RF SIGNAL INPUT LEVEL readout are both out. See Fig. 4-51 for the location of the Hi/Low lights.

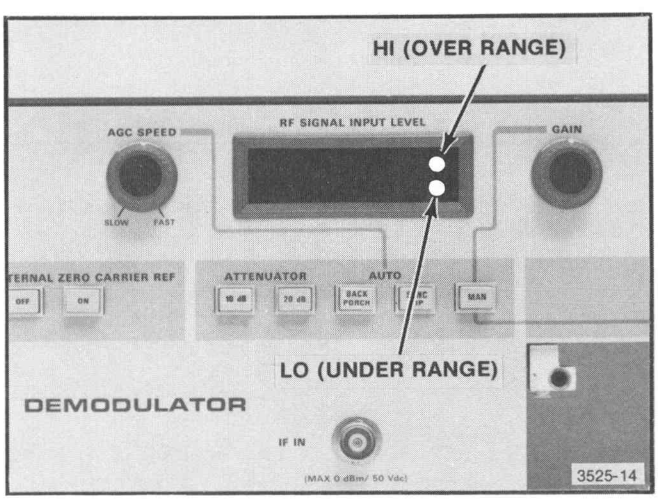


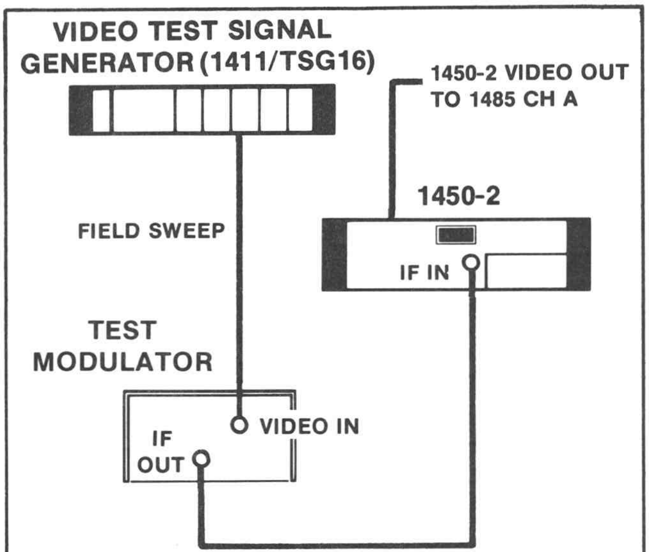
Fig. 4-51. Hi/Lo Lights Location.

(c) ADJUST—R60 on A28 for no phase shift as the MANual GAIN control is varied down from normal setting.

21. Adjust Narrow-Band and Wide-Band Frequencies

(R50 and R40 on A50 Ref Control board)

(a) Connect the test equipment as shown in Fig. 4-52.



Television Demodulator (1450-2)

DETECTION MODE .... SYNCHRONOUS
SOUND TRAP .... IN
AUTO AGC .... BACK PORCH

Video Test Signal Generator (1411/TSG16)

FREQ RANGE .... LOW (IN)
MARKERS .... ON (IN)
COMPOSITE/CONTINUOUS .... COMPOSITE (IN)
SWEEP .... ON (IN)

Waveform Monitor (1485)

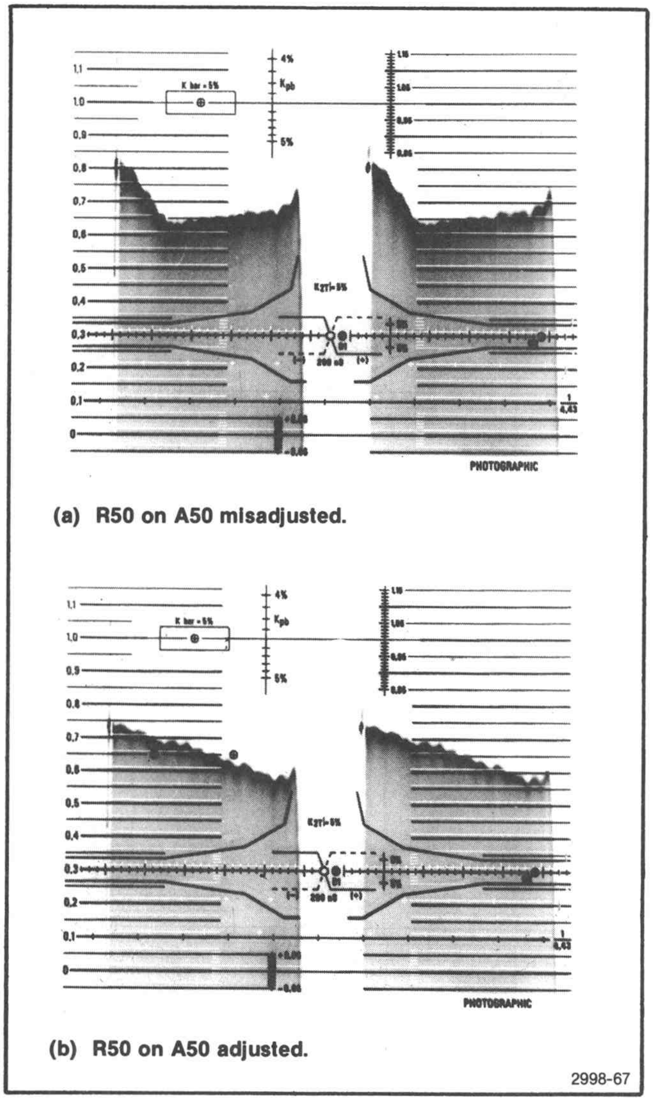
Set up 1485 for 2 Field Display.

2998-66 (2200-83)

Fig. 4-52. Test Equipment Setup for Adjusting Wide Band and Narrow Band Frequencies.

(b) ADJUST—R50 on A50 for a linear field-sweep display on the waveform monitor. See Fig. 4-53 for comparative waveforms.

(c) Push in the SOUND TRAP OUT button on the 1450-2 front panel.

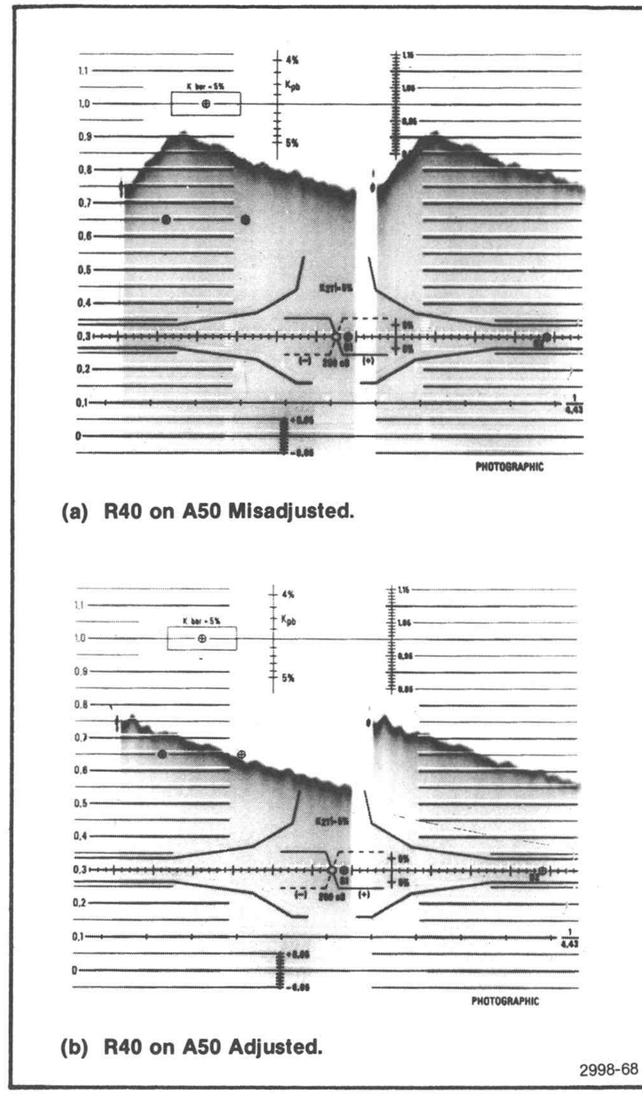


(a) **R50 on A50 misadjusted.**

(b) **R50 on A50 adjusted.**

2998-67

Fig. 4-53. Comparative Waveforms for Adjusting R50 on A50.



(a) **R40 on A50 Misadjusted.**

(b) **R40 on A50 Adjusted.**

2998-68

Fig. 4-54. Comparative Waveforms for Adjusting R40 on A50.

(d) ADJUST—R40 on A50 for a linear field-sweep display on the waveform monitor. See Fig. 4-54 for comparative waveforms.

NOTE

After adjustment of R50 or R40, the display may be flat, tilted down, or tilted up. That is normal since R50 and R40 adjust linearity only and not flatness.

22. Adjust IF Post Amp Tilt

(C70 on A26 IF Post Amp board)

(a) Connect the test equipment as shown in Fig. 4-55.

(b) Adjust C70 on A26 for flatness of the waveform displayed on the waveform monitor. See Fig. 4-56.

23. Adjust Detector Balance

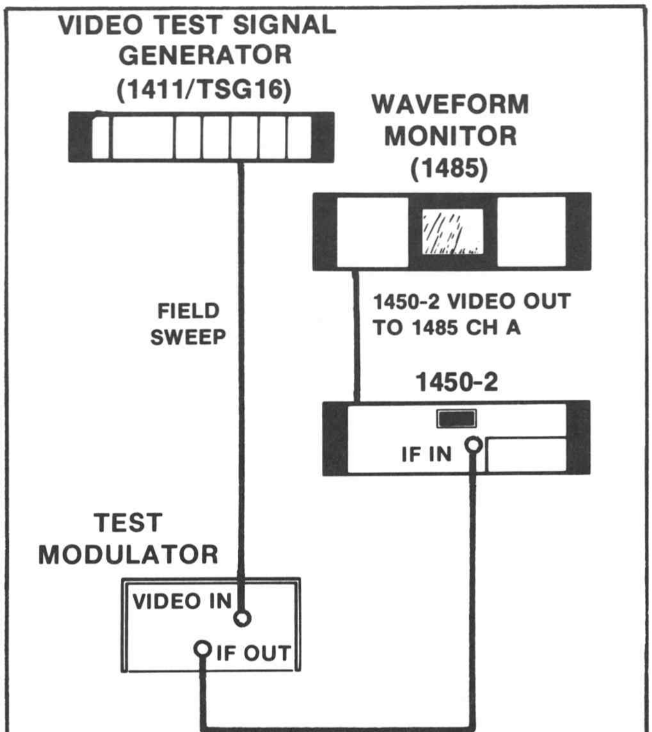
(R11 on A28 and A29 IF Det-Video Amp boards)

(a) Connect the test equipment as shown in Fig. 4-57. Set the waveform monitor horizontal position control to display the 4th burst packet.

(b) ADJUST—R11 on A29 for a distortion-free display on the waveform monitor. See Fig. 4-58.

(c) Remove A29 from the 1450-2 and insert A28 in A29 location. Move the jumper from P71 pins 1 and 2 to pins 2 and 3. Insert A29 in A28 location.

(d) ADJUST—R11 on A28 for a distortion-free display on the waveform monitor. See Fig. 4-58. Replace the



Television Demodulator (1450-2)

SYNCHRONOUS DETECTION MODE	BACK PORCH
SOUND TRAP	OUT
AUTO AGC	BACK PORCH

Video Test Signal Generator (1411/TSG16)

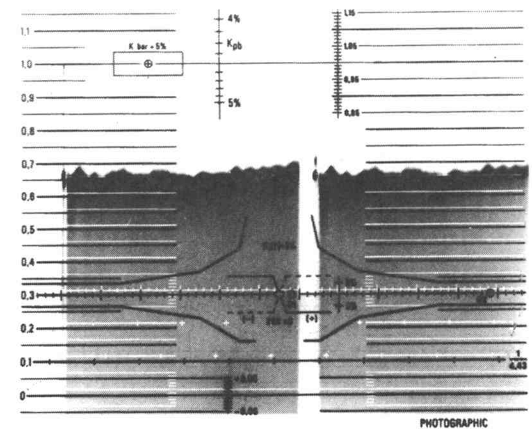
FREQ RANGE	LOW (IN)
MARKERS	ON (IN)
COMPOSITE/CONTINUOUS	ON (IN)

Waveform Monitor (1485)

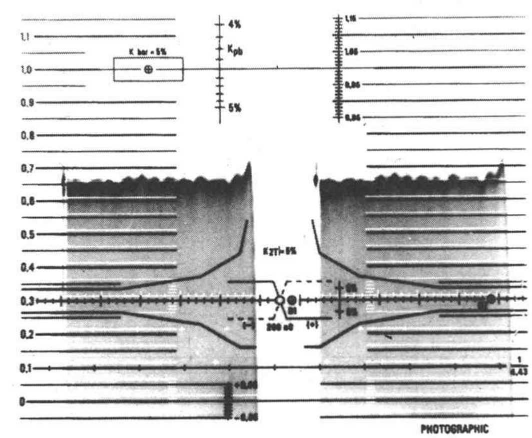
RESPONSE	FLAT
INPUT	A DCPL'D
VOLTS FULLL SCALE	0.2
MAG	OFF
DISPLAY	2 FIELD

2998-69 (2200-86)

Fig. 4-55. Test Equipment Setup for Adjusting the IF Mixer Filter on A22.



(a) Wide Band (SOUND TRAP OUT) display after adjusting Post Amp Tilt on A26.



(b) Narrow Band display (SOUND TRAP IN).

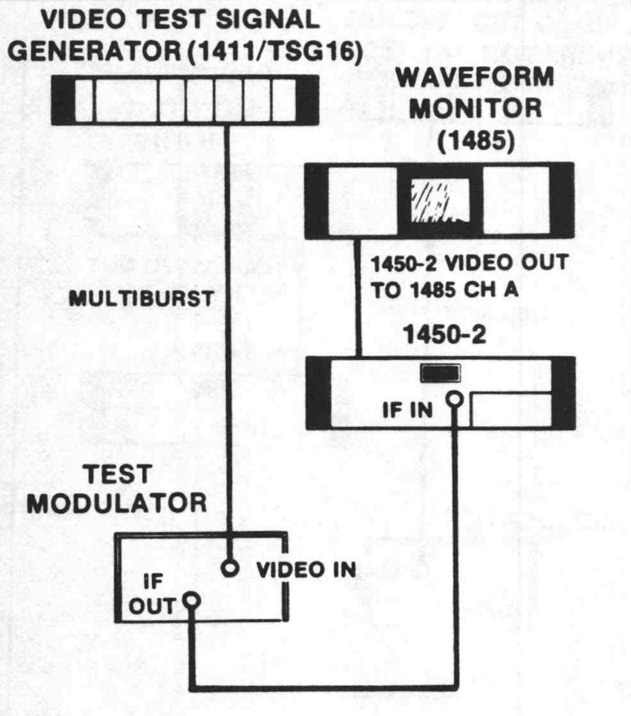
2998-70

Fig. 4-56. IF Mixer Filter Adjustment Waveforms.

boards (A28 and A29) in their original locations after resetting the jumpers at P71 as per the following note:

NOTE

The two boards (A28 and A29) are identical except for jumpered pins on P71. The basic board becomes a video detector when pins 1 and 2 on P71 are jumpered and quadrature detector when pins 2 and 3 are jumpered.



Television Demodulator (1450-2)

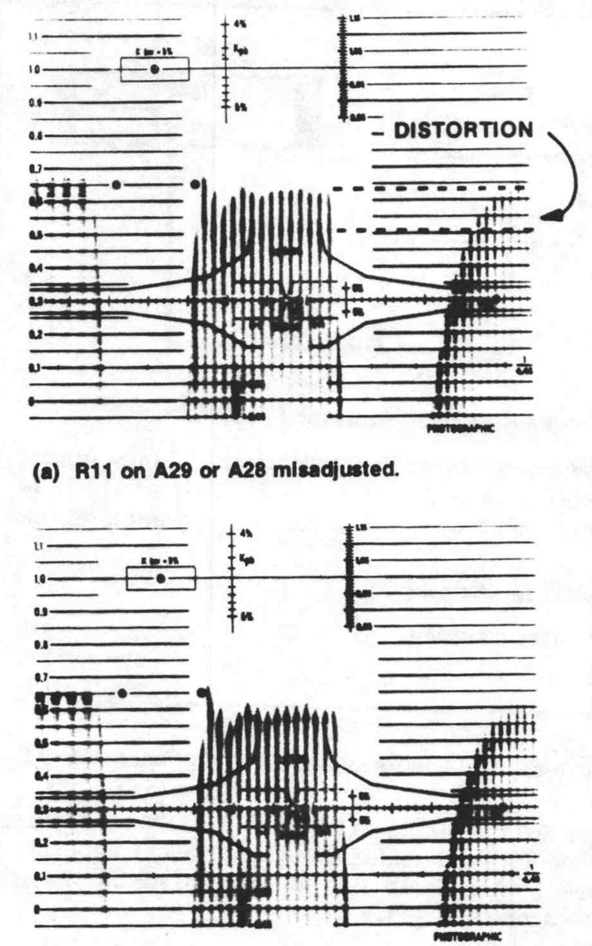
DETECTION MODE	ENV
SOUND TRAP	IN
AUTO AGC	BACK PORCH

Video Test Signal Generator (1411/TSG16)

FREQ RANGE	LOW
AMPL	FULL
MULTIBURST	IN

2998-71 (2200-88)

Fig. 4-57. Test Equipment Setup for Adjusting VIDEO OUT and QUADRATURE OUT Balance (R11 on A28 and A29).



(a) R11 on A29 or A28 misadjusted.

(b) R11 on A29 or A28 adjusted.

2998-72

Fig. 4-58. Comparative Waveforms for Adjusting R11 on A28 and A29.

24. Adjust Video Amp DC Level

(R60 on A29 Video Det-Amp board)

(a) Connect the test equipment as shown in Fig. 4-59.

(b) Monitor VIDEO OUT with a voltmeter. Note the voltmeter reading and add 1.850 V to it. Disconnect the test modulator from the 1450-2 IF INput.

(c) ADJUST—R60 on A29 for the total dc level arrived at in part b using the voltmeter.

25. Adjust Switch Current Balance

(R72 on A27 IF Zero Carrier/Phase Shifter board)

(a) Connect the test equipment as shown in Fig. 4-60.

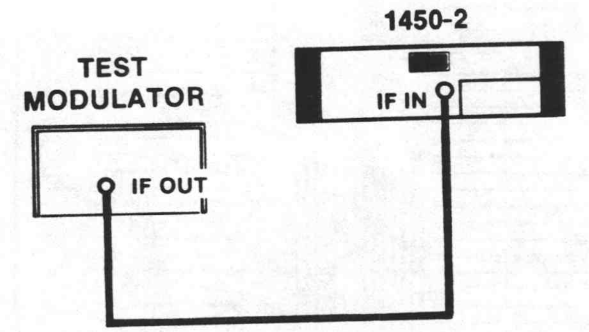
(b) ADJUST—R72 on A27 for the best zero-carrier pulse rise time with no preshoot or overshoot.

26. Adjust Phase Shifter Quadrature

(L98 on A52 Phase Shifter board)

(a) Remove P34 jumper from A52 and connect a low-frequency oscillator to P34 pin 2/pin 1 = Ground using a bnc-to-square-pin adapter cable. Set the oscillator output level at 1 V p-p and frequency at 1 kHz.

(b) Monitor the output of A52 at P29-6 with a test oscilloscope. Set the test oscilloscope time/div at 0.5 ms, and externally trigger the test oscilloscope with the oscillator.



Television Demodulator (1450-2)

SYNCHRONOUS DETECTION MODE . BACK PORCH
SOUND TRAP . . . . IN
AUTO AGC . . . . BACK PORCH

Test Modulator

VISUAL CARRIER . . . . ON
(≈−25 dBm)

2998-73 (2200-90)

Fig. 4-59. Test Equipment Setup for Adjusting R60 on A29.

(c) ADJUST—L98 on the A52 Phase Shifter board for minimum 1 kHz amplitude modulation at the output of the Phase Shifter board (pin 6) as viewed on the test oscilloscope. See Fig. 4-61.

(d) Remove the bnc-to-square-pin adapter cable from P34-2 on A52 and replace the jumper to P34.

27. Adjust Phase Sampler Balance

(C01 on A52 Phase Shifter board)

(a) Connect the test equipment as shown in Fig. 4-62.

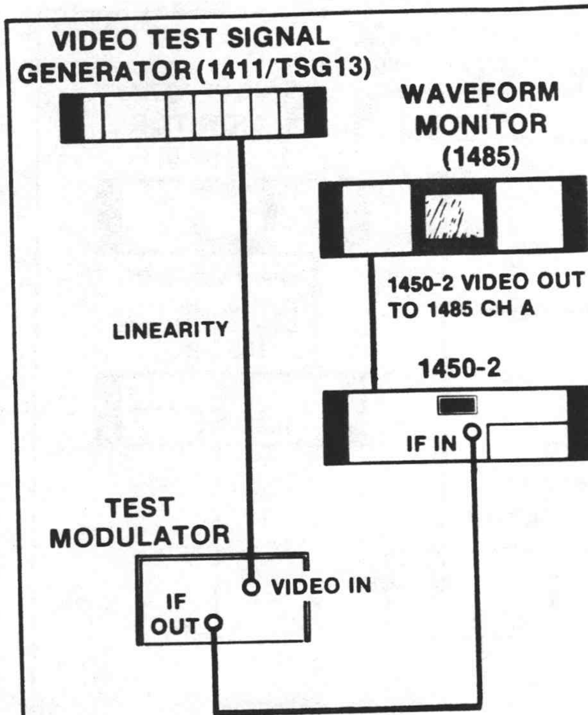
(b) ADJUST—C01 on A52 for no change of the test oscilloscope display as the SYNCHRONOUS TIME CONSTANT control is switched between FAST and SLOW time constants, and SYNC TIP and BACK PORCH DETECTION MODE buttons are switched.

28. Adjust Quadrature Carrier Phase

(C10 on A27 IF Zero Carrier/Phase Shifter board)

(a) Connect the test equipment as shown in Fig. 4-63. Set the waveform monitor horizontal position control to display the 2T Pulse.

(b) ADJUST—C10 for equal overshoot and undershoot of the 2T Pulse leading and trailing edges.



Television Demodulator (1450-2)

SYNCHRONOUS DETECTION MODE
SOUND TRAP . . . . IN
AUTO AGC . . . . BACK PORCH

Video Test Signal Generator (1411/TSG13)

SET UP FOR A 5 STEP LINEARITY OUTPUT.

Waveform Monitor (1485)

INPUT . . . . CH A DC CPL'D
VOLTS FULL SCALE 0.2
MAG . . . . OFF
DISPLAY . . . . 5 μs
LINE SELECTOR . . . . DIG (IN)
LINE SELECTOR CONTROL . . . . SET AT LINE 20

2998-74 (2200-91)

Fig. 4-60. Test Equipment for Adjusting Switch Current Balance (R72 on A27).

29. Adjust Fine AGC

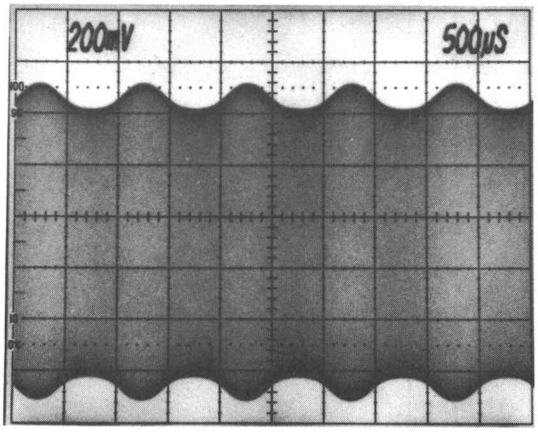
(R47 on A60 AGC Control board)

(a) Connect the test equipment as shown in Fig. 4-64.

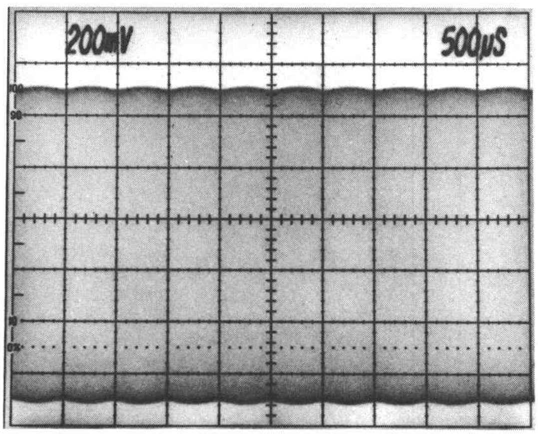
(b) ADJUST—R47 (see Fig. 8-8 for R47 location) for minimum jumps of the blanking level on the 1485 display while rotating the GAIN control counterclockwise and clockwise.

30. Adjust Sync Tip Level

(R17 on A60 AGC Control board)



(a) L98 on A52 misadjusted.



(b) L98 on A52 adjusted.

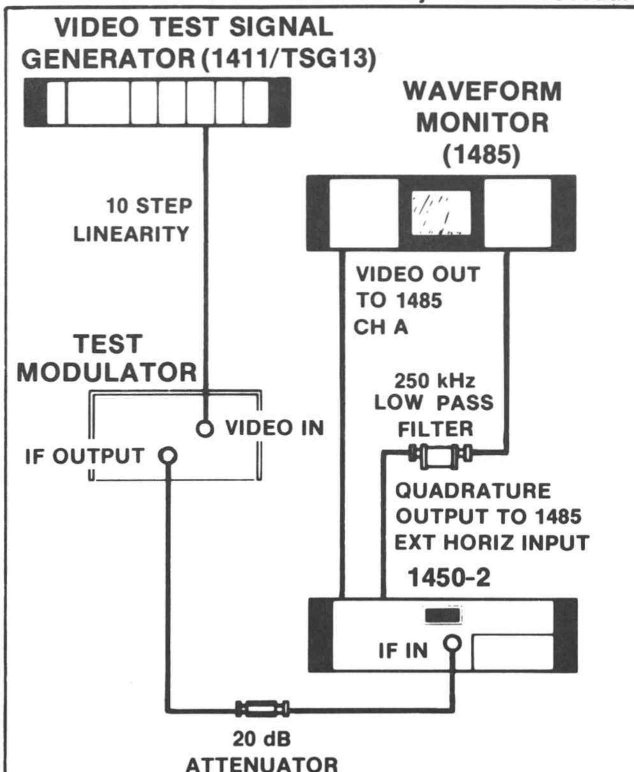
2998-75

Fig. 4-61. Waveforms for Adjusting L98 on A52.

(a) Connect the test modulator **if** output to the 1450-2 IF IN connector. Check to see that nothing is connected to the test modulator video input connector.

(b) Push in CONT, (SOUND TRAP) IN, OFF, and BACK PORCH **agc** buttons.

(c) Connect the 1450-2 VIDEO OUT to a voltmeter set to measure millivolts. Note the voltmeter reading. Push in SYNC TIP (AUTO **agc**) button.



Television Demodulator (1450-2)

DETECTION MODE . . . . SYNCHRONOUS
SOUND TRAP . . . . IN
INTERNAL ZERO CARRIER REF . . . . ON
AGC . . . . MAN

Test Modulator

VISUAL CARRIER . . . . ON

Video Test Signal Generator (1411/TSG13)

SET FOR 10 STEP LINEARITY TEST SIGNAL

Waveform Monitor (1485)

RESPONSE . . . . LOW PASS
INPUT . . . . A
VOLTS FULL SCALE 1.0
DISPLAY . . . . EXT

2998-76 (2200-93)

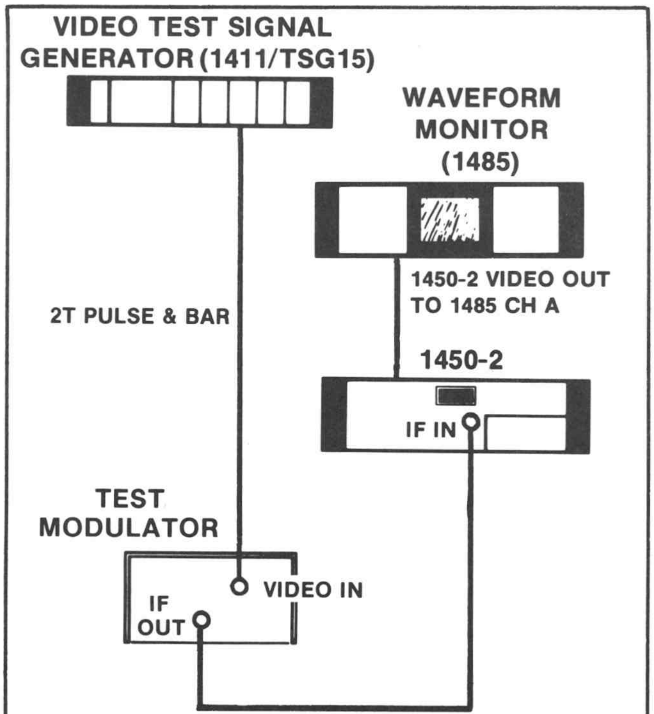
Fig. 4-62. Test Equipment Setup for Adjusting C01 on A52.

(d) ADJUST—R17 (see Fig. 8-8 for R17 location) on A60 until the voltmeter indicates a **dc** level that is (2 X Sync Amplitude) below the reading when the 1450-2 was in BACK PORCH **agc**.

Sync Amplitude = 300mV

NOTE

*R17 is active only when the SYNC TIP **agc** button is depressed.*



Television Demodulator (1450-2)

SYNCHRONOUS DETECTION MODE
SOUND TRAP .... IN
AUTO AGC .... BACK PORCH

Video Test Signal Generator (1411/TSG15)

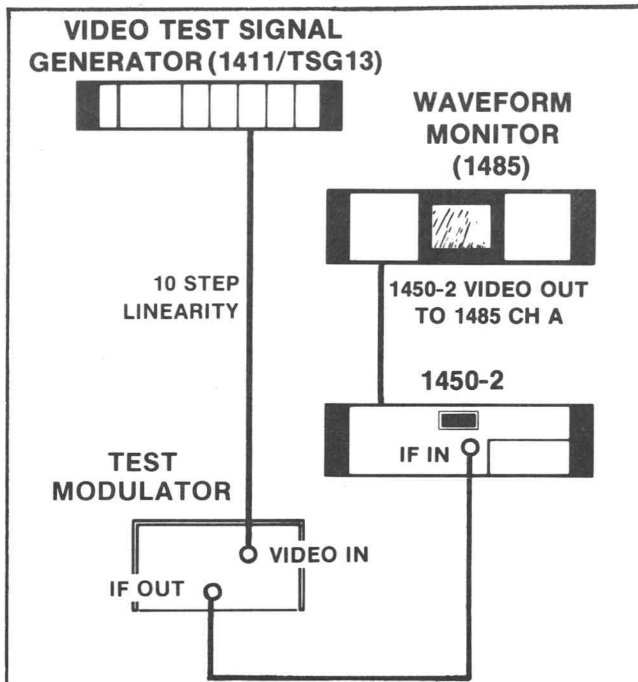
SET UP FOR 2T PULSE & BAR.

Waveform Monitor (1485)

INPUT .... CH A DC CPL'D
VOLTS FULL SCALE 0.2
MAG X10
DISPLAY .... 5 μs

2998-77 (2200-94)

Fig. 4-63. Test Equipment Setup for Adjusting C10 on A27.



Television Demodulator (1450-2)

SYNCHRONOUS DETECTION MODE BACK PORCH
SOUND TRAP .... IN
AUTO AGC .... BACK PORCH

Test Modulator

VISUAL CARRIER .... ON

Video Test Signal Generator (1411/TSG13)

SET FOR 10 STEP LINEARITY

Waveform Monitor (1485)

INPUT .... A DC CPL'D
RESPONSE .... FLAT
VOLTS FULL SCALE 1.0
DISPLAY .... 5 μs
DC RESTORER .... OFF

2998-78 (2200-95)

Fig. 4-64. Test Equipment Setup for Adjusting R47 (Fine AGC) on A61.

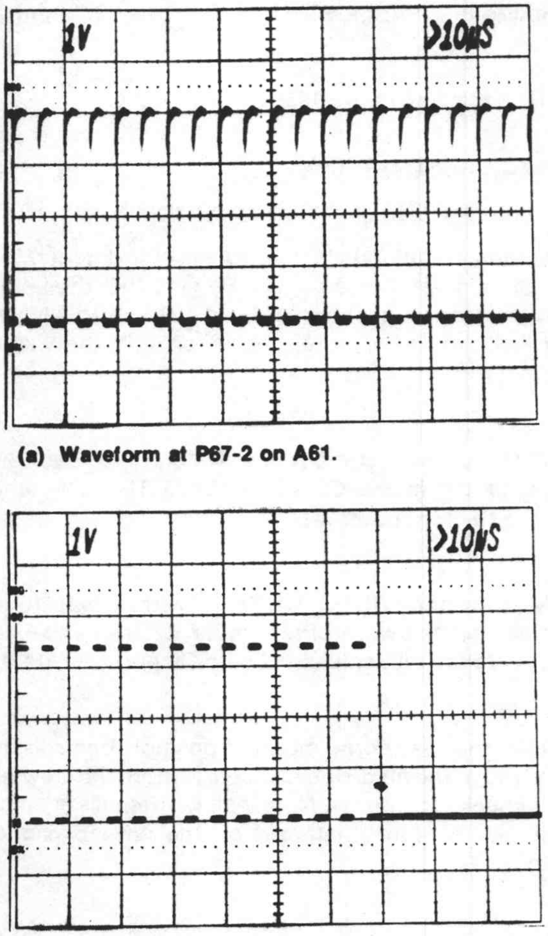
31. Adjust A/D Cal

(C94 on A61 Readout Driver board)

(a) Monitor P67-~~2~~ 1 (see Fig. 8-8 for P67 location) on A61 with a test oscilloscope through a X10 probe. Set the test oscilloscope Time/Div to ~~5~~ 10 μs, Trigger Slope to + (positive), and set the Variable Time/Div to display 2 Hz/Div. Set the test oscilloscope for normal triggering (Norm Mode, AC Coupling, and Int Source). See Fig. 4-65a for a typical waveform.

(b) Push in the MAN button and monitor TP67 on A61 with the test oscilloscope. Slowly vary the GAIN control until the largest number of pulses are displayed on the test oscilloscope. Be sure that the MANual GAIN control is neither fully counterclockwise nor fully clockwise. Refer to Fig. 4-65b for a typical waveform.

(c) ADJUST—C94 for 14 pulses as displayed on the test oscilloscope; that is, 2 pulses per division for seven divisions. See Fig. 4-65b.



(a) Waveform at P67-2 on A61.

(b) Waveform at TP67 on A61.

2998-79

Fig. 4-65. Waveforms for Adjusting C94 on A61.

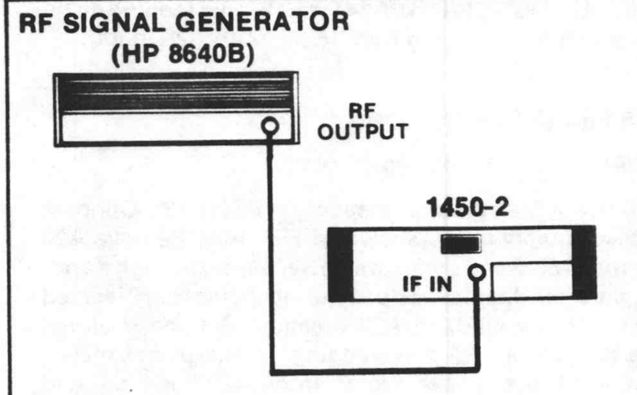
32. Adjust IF Atten/Amp Gain

(R51 on A21 IF Filter Amp board)

(a) Connect the test equipment as shown in Fig. 4-66. Remove A20 from the 1450-2 and connect a power meter (through a **bnc**-to-square-pin adapter cable) to the input pins (pin 2 labeled IN/pin 1 = Ground) in A20 location. Set the **rf** signal generator output level for a −20 dBm reading on the power meter. Disconnect the power meter from A20 location and replace A20.

(b) Remove A24 from the 1450-2 and monitor the input pins (pin 11 labeled IN Narrow/pin 12 = Ground) to A24 location with the power meter using a **bnc-to-square-pin** adapter cable.

(c) Push in (SOUND TRAP) IN, and MAN (**agc**) buttons. Set the GAIN control fully counterclockwise.



Television Demodulator (1450-2)

SYNCHRONOUS DETECTION MODE .... CONT
SOUND TRAP .... OUT
INTERNAL ZERO CARRIER REF .... OFF
MAN GAIN .... FULLY COUNTERCLOCKWISE

RF Signal Generator (HP 8640B)

FREQUENCY .... IF CENTER

2998-80 (2200-97)

Fig. 4-66. Test Equipment Setup for Adjusting Power Levels.

(d) ADJUST—R51 on A21 for −19 dBm reading on the power meter (1 dB gain from IF INput to A24 input).

(e) Replace A24 in the 1450-2.

33. Adjust Narrow IF SAW Amp Gain

(R93 on A24 IF SAW Amp board)

(a) Omit Step 33a if proceeding from Step 32. Connect the test equipment as shown in Fig. 4-66. Remove A20 from the 1450-2 and connect a power meter through a **bnc**-to-square-pin adapter cable to the input pins (pin 2 labeled IN/pin 1 = Ground) in A20 location. Set the **rf** signal generator output level for −20 dBm reading on the power meter. Disconnect the power meter from A20 location and replace A20.

(b) Remove A26 from the 1450-2 and monitor the input pins (pin 4 labeled IN Narrow/pin 3 = Ground) to A26 location with the power meter using a **bnc**-to-square-pin adapter cable.

(c) Push in (SOUND TRAP) IN and MAN (**agc**) buttons. Set the GAIN control fully counterclockwise.

(d) ADJUST—R93 on A24 for −19 dBm reading on the power meter (1 dB gain from IF INput to A26 input).

34. Adjust IF Post Amp Gain

(R41 on A26 IF Post Amp board)

(a) Omit Step 34a if proceeding from Step 33. Connect the test equipment as shown in Fig. 4-66. Remove A20 from the 1450-2 and connect a power meter through a **bnc**-to-square-pin adapter cable to the input pins (pin 2 labeled IN/pin 1 = Ground) in A20 location. Set the **rf** signal generator for a −20 dBm reading on the power meter. Disconnect the power meter from A20 location and replace A20.

(b) Remove A27 from the 1450-2 and monitor the input pins (pin 12 labeled IN/pin 11 = Ground) to A27 location with the power meter using a **bnc**-to-square-pin adapter cable.

(c) Push in (SOUND TRAP) IN and MAN (**agc**) buttons. Set the GAIN control fully counterclockwise; then slowly vary the GAIN control clockwise until the power level reading on the power meter abruptly drops down to the lowest level.

(d) ADJUST—R41 on A26 for +7 dBm reading on the power meter (+27 dB gain from IF INput to A27 input).

(e) Replace A27 in the 1450-2.

35. Adjust Wide IF SAW Amp Gain

(R93 on A25 IF SAW Amp board/Wide)

(a) Omit Step 35a if proceeding from Step 34. Connect the test equipment as shown in Fig. 4-66. Remove A20 from the 1450-2 and connect a power meter through a **bnc**-to-square-pin adapter cable to the input pins (pin 2 labeled IN/pin 1 = Ground) in A20 location. Set the **rf** signal generator for a −20 dBm reading on the power meter. Disconnect the power meter from A20 location and replace A20.

(b) Remove A27 from the 1450-2 and monitor the input pins (pin 12 labeled IN/pin 11 = Ground) to A27 location with the power meter using a **bnc**-to-square-pin adapter cable.

(c) Push in (SOUND TRAP) OUT, and MAN (**agc**) buttons. Set the GAIN control fully counterclockwise; then vary the GAIN control clockwise until the power level reading on the power meter suddenly drops to a lower level.

(d) ADJUST—R93 on A25 for +7 dBm reading on the power meter (+27 dB gain from IF INput to A27 input).

(e) Replace A27 in the 1450-2.

36. Readjust IF Mixer Filter

(L43, L36, and C48 on A22 IF Mixer board)

(a) Connect a composite field-sweep signal generator to the test modulator video input. Be sure that the field-sweep generator ranges from at least 100 kHz to 8 MHz. Set the test modulator aural carrier off and the visual carrier on.

(b) Connect the test modulator **if** output to the IF IN connector. Push in the CONT, SOUND TRAP IN, and BACK PORCH (**agc**) buttons.

(c) Monitor the VIDEO OUTPUT with a waveform monitor and set the waveform monitor Response to Flat, Input to A, Volts Full Scale at 0.2, and Display to 2 Field.

(d) Use the waveform monitor position controls to bring the top of the field-sweep display within the viewing area and check for flatness. Note that this flatness must be checked against the flatness of the sweep signal generator.

(d) ADJUST—L43, L36, and C48 for a flat 2-Field display. In most cases, it is sufficient to adjust L36 only to achieve a flat display.

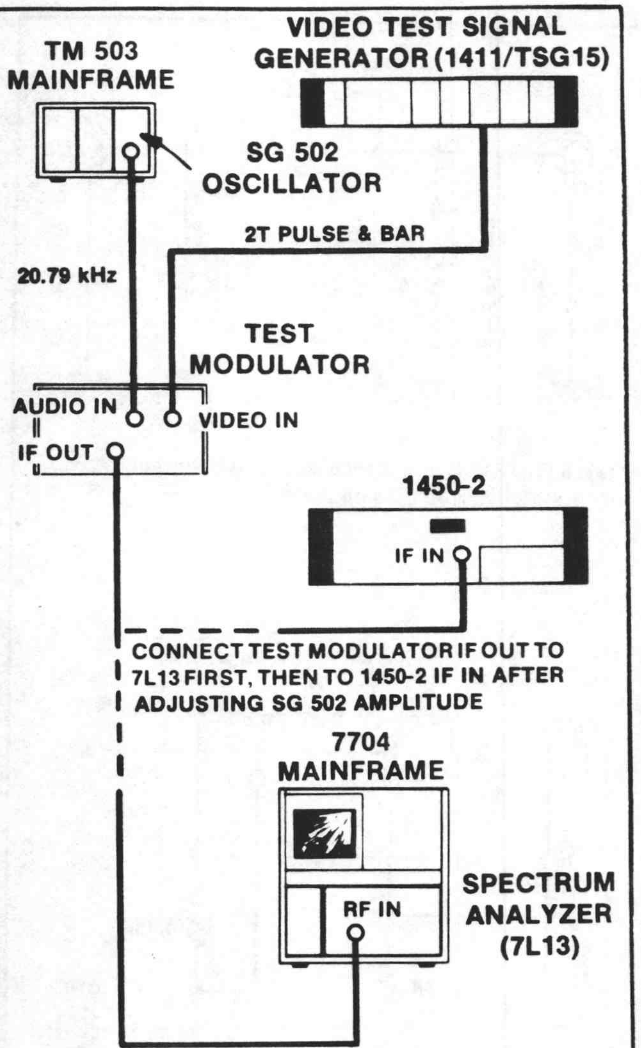
37. Adjust 28 MHz and Aural Alarm Bandpass Filters

(L62, L66, and L92 on A40 1st Audio Mixer board)

(a) Connect the test equipment as shown in Fig. 4-67. Set the aural carrier level control on the test modulator such that the aural carrier level is 10 dB less than the visual carrier level as viewed on the spectrum analyzer. Now reset the spectrum analyzer resolution to 3 kHz and the frequency span/division to 20 kHz. Set the audio generator output amplitude for minimum 20.790 kHz on the spectrum analyzer (at the center frequency). This sets the modulation to 50 kHz peak. See Fig. 4-68.

(b) Connect the test modulator **if** output to the IF IN connector and connect the INTERCARRIER OUT to a frequency counter. Set the aural **if** center frequency on the test modulator such that the counter indicates 6 MHz.

(c) Monitor the INTERCARRIER OUTput with a test oscilloscope. Push in SPLIT, and BACK PORCH (**agc**) buttons on the 1450-2 front panel.



Television Demodulator (1450-2)

SYNCHRONOUS DETECTION MODE . BACK PORCH
SOUND TRAP .... IN
AGC .... MANUAL GAIN

Test Modulator

AURAL CARRIER .... ON
VISUAL CARRIER .... ON
AURAL CARRIER LEVEL .... SET 10 dB BELOW VISUAL CARRIER LEVEL

Spectrum Analyzer (7L13)

CENTER FREQUENCY .... (IF −5.5 MHz)
SPAN/DIV .... 2 MHz
RESOLUTION .... 300 kHz
TIME/DIV .... 20 ms
VERT MODE .... 10 dB/DIV
REFERENCE LEVEL .... −20 dBm

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Fig. 4-67. Test Equipment Setup for Adjusting the 27.5 MHz and Aural Alarm Bandpass Filters (L62, L66, and L92 on A40).

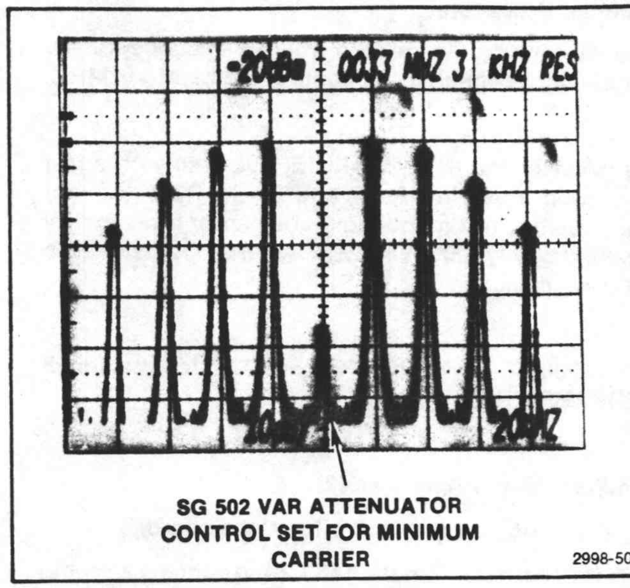


Fig. 4-68. Waveform for Setting 50 kHz Peak Deviation.

(d) Mount A40 in the 1450-2 using an extender card. This circuit board is included in the accessories package.

(e) ADJUST—L62 and L66 on A40 for maximum INTERCARRIER OUT signal on the test oscilloscope.

(f) Monitor pin 12 on the extender board with the test oscilloscope in **dc** mode. Decrease aural carrier level on the test modulator until the AURAL CARRIER LOSS LED lights; then slowly turn the test modulator aural carrier level control clockwise until the AURAL CARRIER LOSS LED goes out.

(g) ADJUST—L92 on A40 for positive maximum **dc** level at pin 12 on the extender board.

38. Adjust 6 MHz Input and Output Bandpass Filters

(T17 and T31 on A41 2nd Audio Mixer board)

(a) Omit Step 38 parts a and b if proceeding from Step 37. Connect the test equipment as shown in Fig. 4-67. Set the aural carrier level control on the test modulator such that the aural level is 10 dB less than the visual carrier level as viewed on the spectrum analyzer. Now reset the spectrum analyzer resolution to 3 kHz and the frequency span/division to 20 kHz. Set the audio generator output amplitude for minimum 20.790 kHz on the spectrum analyzer (at the center frequency). This sets the modulation to 50 kHz peak. See Fig. 4-68.

(b) Connect the test modulator **if** output to the IF IN connector and connect the INTERCARRIER OUT to a frequency counter. Set the aural if center frequency on the test modulator such that the counter indicates 6 MHz.

(c) Monitor the INTERCARRIER OUTput with a test oscilloscope. Push in SPLIT, and BACK PORCH (agc) buttons. Set the test modulator aural carrier level control for approximately 300 mV INTERCARRIER OUT signal on the test oscilloscope.

(d) ADJUST—T17 and T31 on A41 for maximum INTERCARRIER OUT signal.

39. Adjust Output Amp Bias (2)

(R56 and R53 on A44 Audio Interface board)

(a) Remove A43 from the 1450-2 and connect an audio generator to pin 12 (pin 11 = Ground) in A43 location using a bnc-to-square-pin adapter cable.

(b) Monitor TP29 on A44 with a test oscilloscope. Set the audio generator output control for 5.0 V p-p signal at TP29.

(c) Monitor J12 (8 Ω Output) with an audio spectrum analyzer using the 8 Ω-to-600 Ω pad shown in Fig. 4-69 (30 dB pad switched in). Set the audio analyzer vertical reference to −10 dB.

(d) Set the AUDIO LEVEL control for a +20 dBm (−10 dBm on the analyzer) level at the 8 Ω SPEAKER output. Now change the reference on the audio analyzer to −20 dB.

(e) ADJUST—R56 (labeled Bias) on A44 for minimum 3rd harmonic on the audio analyzer. See Fig. 4-70. Note that this adjustment may have very little effect on the 3rd harmonic. Harmonics should be down at least 70 dB from the fundamental.

(f) Monitor J13 (600 Ω BALanced LINE OUTput) with the audio spectrum analyzer using the 600 Ω pad shown in Fig. 4-69. Set the vertical reference on the audio analyzer at −10 dBm and set the 1450-2 600 Ω audio gain (labeled GAIN R05) for a +10 dBm level (−20 dBm on the analyzer) at the 600 Ω BALanced LINE AUDIO OUTput. Now change the audio analyzer vertical reference to −20 dBm.

(g) ADJUST—R53 (labeled Bias) on A44 for minimum 3rd harmonic on the audio analyzer. See Fig. 4-70. Note that this adjustment may have very little effect on the 3rd harmonic. Harmonics should be down at least 70 dB from the fundamental.

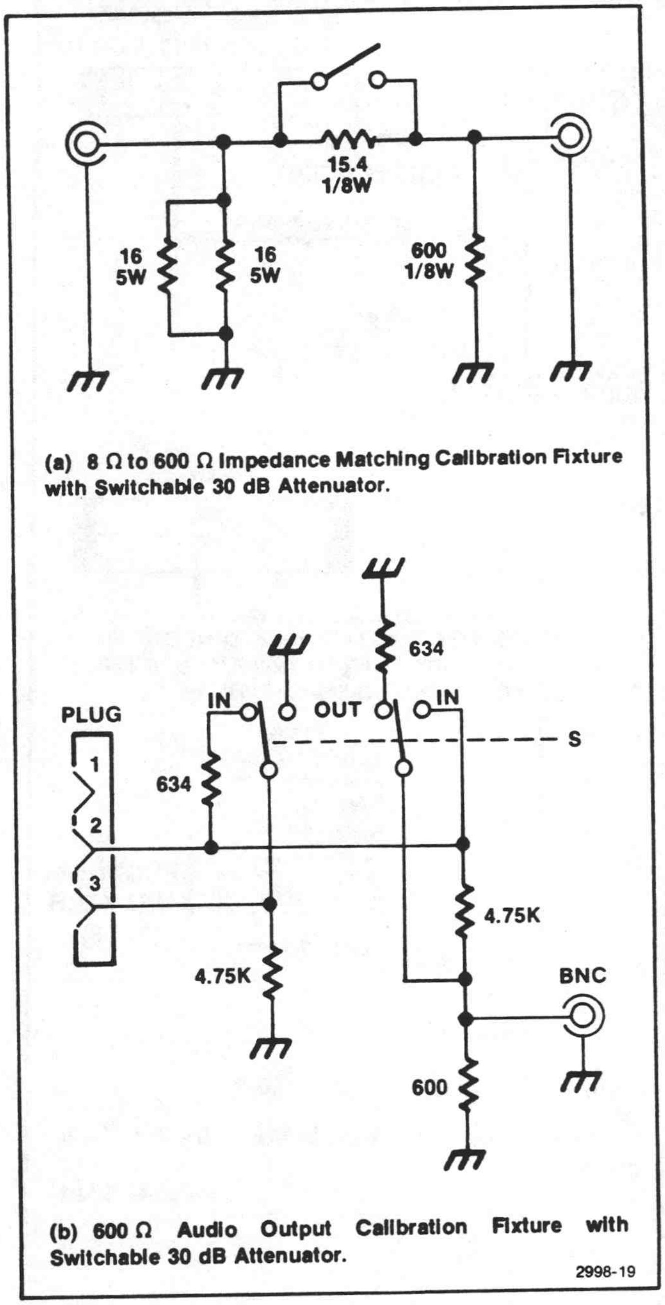


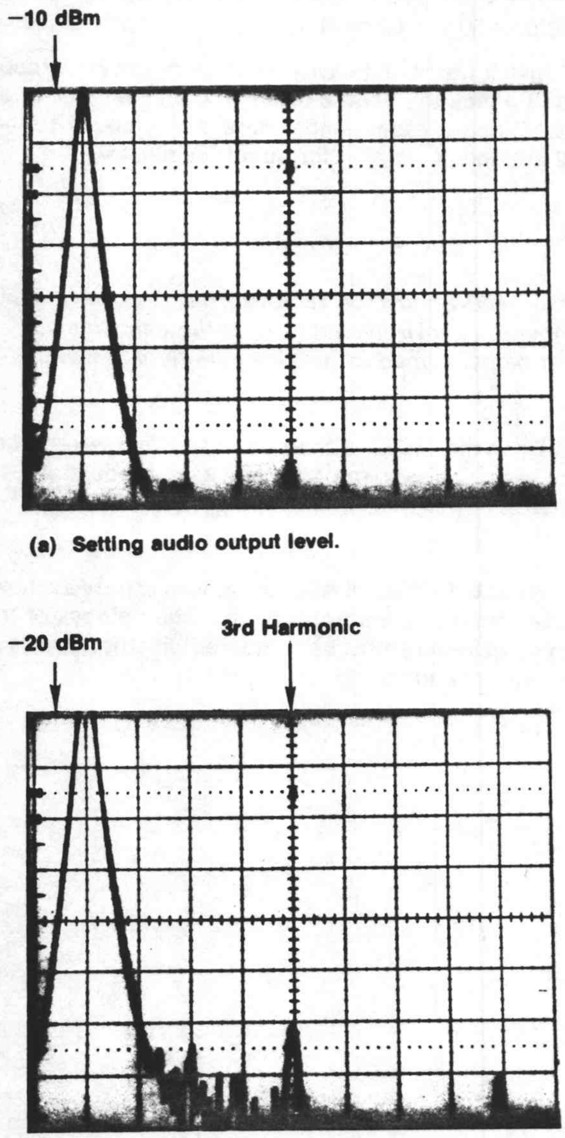
Fig. 4-69. Audio Output Calibration Fixtures.

(h) Replace A43 in the 1450-2.

40. Adjust DEVIATION OUT and Aural Mode Center Frequency

(R76 and R30 on A43 Audio Discriminator board)

(a) Connect the test equipment as shown in Fig. 4-67. Now reset the spectrum analyzer resolution to 3 kHz and the frequency span/division to 20 kHz. Set the audio generator output for minimum 20.790 kHz on the spectrum analyzer (at the center frequency). This sets the modulation to 50 kHz peak. See Fig. 4-68.



(a) Setting audio output level.

(b) Adjustment waveform.

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Fig. 4-70. Waveforms for Adjusting R56 and R53 on A44.

(b) Connect the test modulator If output to the IF IN connector and connect the INTERCARRIER OUT to a frequency counter. Set the aural If center frequency on the test modulator such that the counter indicates 6 MHz.

(c) Monitor the DEVIATION OUTput with a voltmeter set to read at least 1.0 Vac.

(d) ADJUST—~~R76~~ R80 on A43 for 1.768 Vrms DEVIATION OUTput level. This is 5.0 V p-p when measured with an oscilloscope.

(e) Monitor TP41 on A53 (Converter Phase Lock board) with a test oscilloscope. Push in AURAL ONLY and SPLIT buttons.

(f) ADJUST—R30 on A43 for the lowest frequency sine wave at TP51. Ideal condition is no periodic signal at TP51 (dc). However, any signal less than 10 kHz is acceptable.

41. Adjust 600 Ω BALanced LINE OUTput Level

(R05 on A44 Audio Interface board)

(a) Omit parts a and b of this step if proceeding from Step 40. Connect the test equipment as shown in Fig. 4-67. Now reset the spectrum analyzer resolution to 3 kHz and the frequency span/division to 20 kHz. Set the audio generator output for minimum 20.790 kHz on the spectrum analyzer (at the center frequency). This sets the modulation to 50 kHz peak. See Fig. 4-68.

(b) Connect the test modulator If output to the IF IN connector and connect the INTERCARRIER OUT to a frequency counter. Set the aural If center frequency on the test modulator such that the counter indicates 6 MHz.

(c) Monitor J13 with a voltmeter using the test fixture shown in Fig. 4-69b. Switch out the 30 dB pad in the test fixture and set the voltmeter at 20 Vac. Push in SPLIT (AUDIO SOURCE) and BACK PORCH (agc) buttons.

(d) ADJUST—R05 on A44 for a 2.45 Vrms (+ 10 dB) output level with the manual GAIN control fully clockwise.

(e) Disconnect all test equipment from the 1450-2.

42. Adjust 1 MHz Bandpass Filter

(L45, L55, L75, and L95 on A42 Audio Limiter board)

(a) Omit parts a and b of this step if proceeding from Step 42. Connect the test equipment as shown in Fig. 4-67. Now reset the spectrum analyzer resolution to 3 kHz and the frequency span/division to 20 kHz. Set the audio generator output amplitude for minimum 20.790 kHz on the spectrum analyzer (at the center frequency). This sets the modulation to 50 kHz peak. See Fig. 4-68.

(b) Connect the test modulator If output to the IF IN connector and connect the INTERCARRIER OUT to a frequency counter. Set the aural If center frequency on the test modulator such that the counter indicates 6 MHz. Push in SPLIT and AURAL ONLY buttons.

(c) Monitor J13 (600 Ω BALanced LINE) with an audio analyzer using the impedance-matching network (with switchable 30 dB pad) shown in Fig. 4-69b.

(d) Set the audio analyzer front panel controls for a vertical reference level of −20 dBm, vertical mode at 10 dB/div, triggering to Internal Auto, time/div to auto, resolution to Coupled, and horizontal mode (frequency and frequency span/div) to display the fundamental and the 3rd harmonic.

(e) Monitor TP22 on A42 with a test oscilloscope.

(f) ADJUST—L45, L55, L75, and L95 for maximum amplitude at TP22.

(g) ADJUST—L45, L55, L75, and L95 for minimum third harmonics. See Fig. 4-70 for comparative waveforms.

43. Adjust Temperature Tracking Gain (Range)

(R60 on A50 Ref Control board)

(a) Install the shield-cavity (extrusion) covers except over A50. Place the 1450-2 in an environment that is at least 20° C above room temperature. Apply power to the 1450-2 and let sit running for about 30 minutes.

NOTE

If the 1450-2 must be removed from an elevated temperature environment to make this adjustment, it must be performed within one minute of removal.

(b) Drive the 1450-2 with a composite field sweep from a video test signal generator through a test modulator. See Fig. 4-55.

(c) ADJUST—R60 on A50 for flatness of the waveform displayed on the waveform monitor. The flatness of the displayed waveform must be compared with the flatness of the sweep generator.

MAINTENANCE

Introduction

This section describes the procedure for reducing or preventing instrument malfunctions, plus troubleshooting and corrective maintenance. Preventive maintenance improves instrument reliability. Should the instrument fail to function properly, corrective measures should be taken immediately; otherwise, additional problems may develop within the instrument.

PREVENTIVE MAINTENANCE

Preventive maintenance consists of cleaning, visual inspection, performance check, and if needed, readjustment. The preventive maintenance schedule that is established for the instrument should be based on the environment in which the instrument is operated and the amount of use. Under average conditions, a preventive maintenance check should be performed every 3000 hours of instrument operation.

Cleaning

Clean the instrument often enough to prevent dust or dirt from accumulating in or on it. Dirt acts as a thermal insulating blanket and prevents efficient heat dissipation. It also provides high-resistance electrical leakage paths between conductors or components in a humid environment.

Exterior. Clean the dust from the outside of the instrument by wiping or brushing the surface with a soft cloth or small brush. The brush will remove dust from around the front-panel controls and connectors. Hardened dirt may be removed with a cloth dampened in water that contains a mild detergent. Abrasive cleaners should not be used.

Interior. Clean the interior by loosening accumulated dust with a dry soft brush, then remove the loosened dirt with low-pressure air to blow the dust clear. (High-velocity air can damage some components.) Hardened dirt or grease may be removed with a cotton-tipped applicator dampened with a solution of mild detergent in water. Abrasive cleaners should not be used. If the circuit-board assemblies need cleaning, remove the circuit board by referring to the instructions under Corrective Maintenance in this section.

After cleaning, allow the interior to thoroughly dry before applying power to the instrument.

CAUTION

Do not allow water to get inside any enclosed assembly or components. Do not clean any plastic materials with organic cleaning solvents such as benzene, toluene, xylene, acetone, or similar compounds because they may damage the plastics.

Visual Inspection

After cleaning, carefully check the instrument for such defects as defective connections, damaged parts, and improperly-seated transistors and integrated circuits. The remedy for most visible defects is obvious; however, if heat-damaged parts are discovered, try to determine the cause of overheading before the damaged part is replaced; otherwise the damage may be repeated.

Transistor and Integrated Circuit Checks

Periodic checks of the transistors and integrated circuits are not recommended. The best measure of performance is the actual operation of the component in the circuit. Performance of these components is thoroughly checked during the performance check or adjustment procedures, and any substandard transistors or integrated circuits will usually be detected at that time.

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 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.)

Performance Checks and Readjustment

The instrument performance should be checked after each 3000 hours of operation or every six months if the instrument is used intermittently, to ensure maximum performance and assist in locating defects that may not be apparent during regular operation. Instructions for conducting a performance check are provided in the Calibration section.

TROUBLESHOOTING

The following are a few aids and suggestions that may assist in locating a problem. After the defective assembly or component has been located, refer to the Corrective Maintenance part of this section for removal and replacement instructions.

NOTE

No repair should be attempted during the warranty period or by unqualified personnel.

Troubleshooting Aids

Foldout Pages. The foldout pages at the back of the manual contain significant information useful for troubleshooting the instrument. Block and schematic diagrams, waveforms, circuit-board illustrations, parts locating charts, and IC diagrams are located on foldout pages. See Fig. 5-1.

Diagrams. Block and circuit diagrams are the most often used aids to troubleshooting. The circuit number and electrical value of each component is shown on the diagrams (see the first page in the Diagrams section for definition of the reference symbology used to identify components in each circuit). Refer to the Replaceable Electrical Parts list for a complete description of each component. Those portions of the circuit that are mounted on circuit boards or assemblies are enclosed in a black border, with the name and assembly number shown on the border.

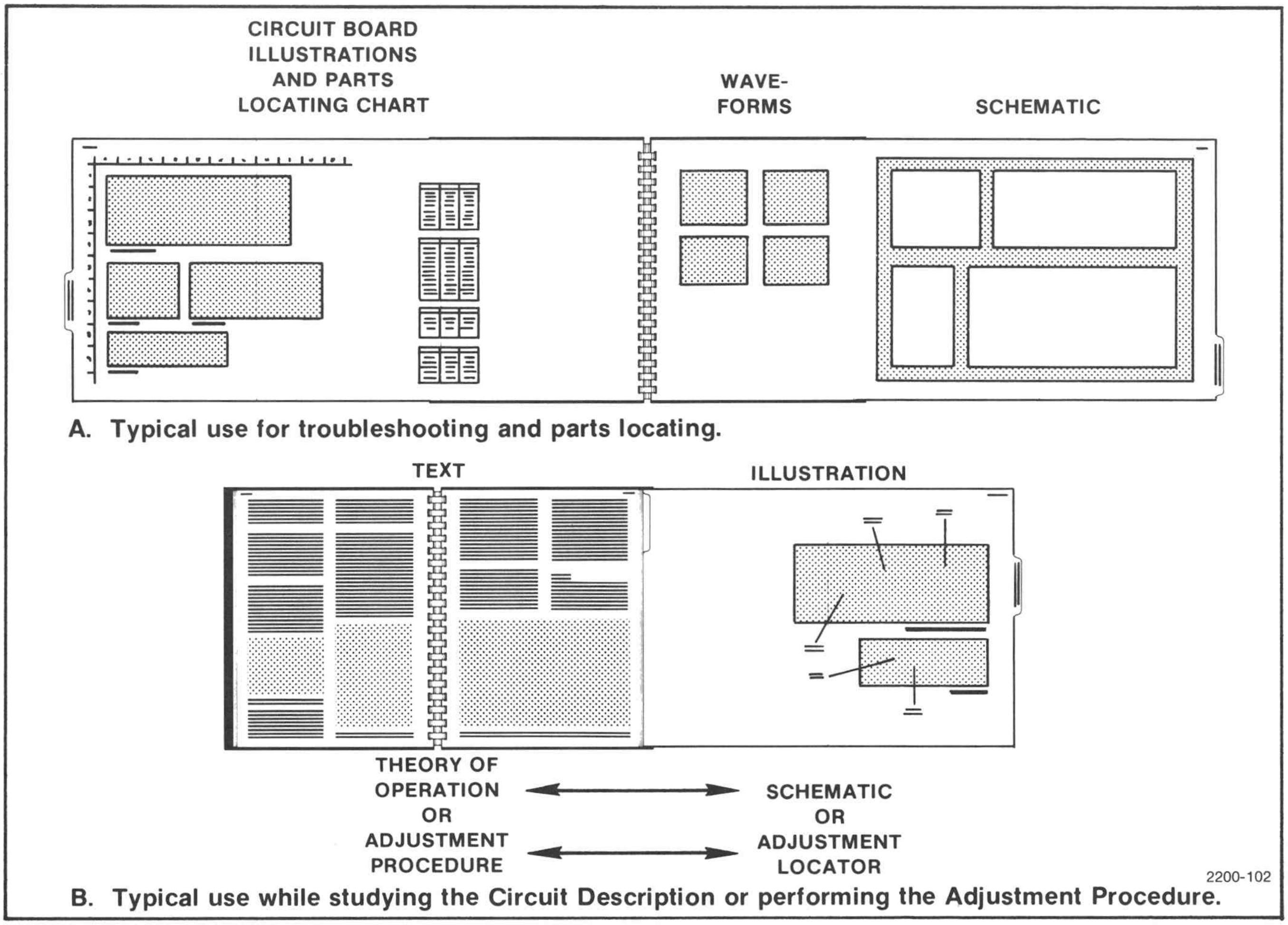


Fig. 5-1. Using the Foldout Pages.

NOTE

Check the Change Information section at the rear of the manual for inserts describing corrections and modifications to the instrument and manual.

Circuit Board Illustrations. Electrical components, connectors, and test points are identified on circuit board illustrations located on the inside fold of the corresponding circuit diagram, or the back of the preceding diagram.

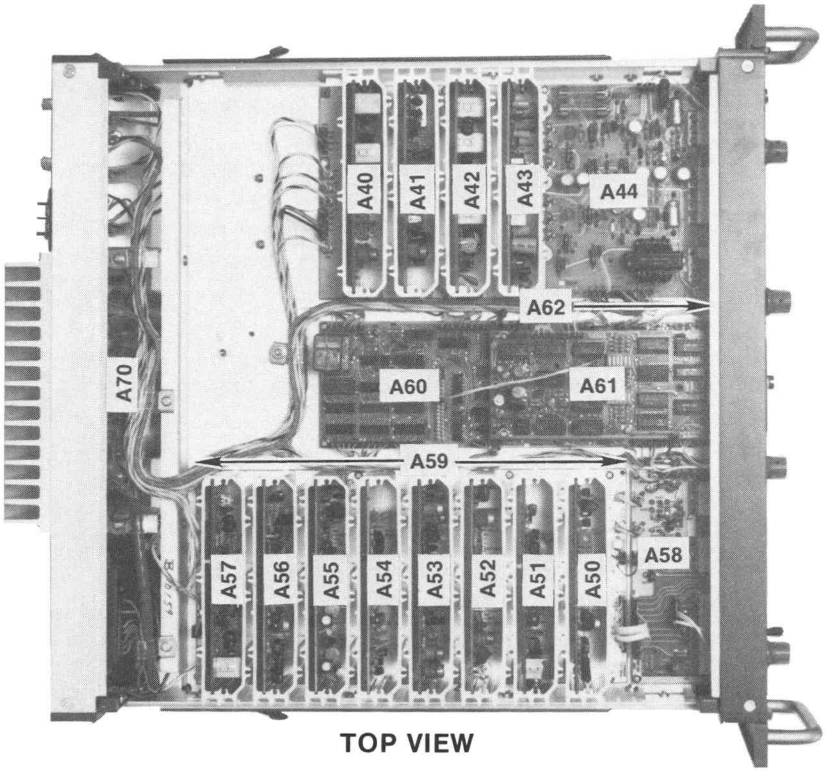
Parts Locating Charts. The schematic diagrams and the circuit board illustrations are assigned location grids. A parts locating chart for each assembly gives grid locations of components on both the circuit board and the schematic.

Assembly and Circuit Numbering. The circuit boards and other assemblies (except for the chassis and the front- and rear-panel components) are assigned assembly numbers that generally follow the signal path through the instrument. See Fig. 5-2.

Each component is assigned a circuit number according to its geographic location within an assembly.

The Replaceable Electrical Parts list is arranged in assembly-by-assembly order, as designated by ANSI Standard Y32.16-1975. The circuit number in the parts list is made up by combining the assembly number and the circuit number.

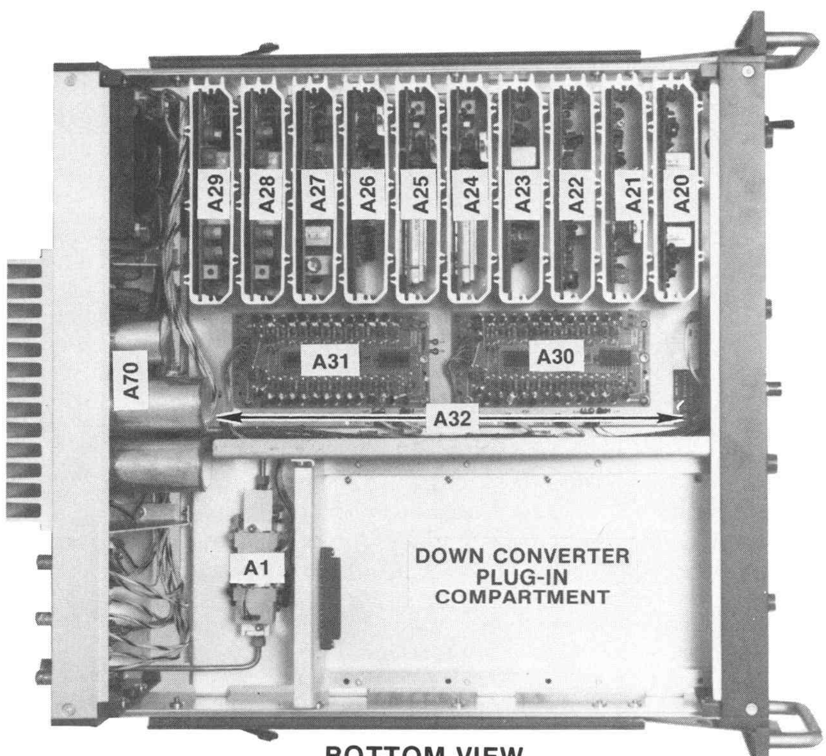
EXAMPLE: R25 on A61 would be listed in the parts list as A61R25.



TOP VIEW

A40 First Audio Mixer Board
A41 Second Audio Mixer Board
A42 Audio Limiter Board
A43 Audio Discriminator Board
A44 Audio Interface Board
A50 Reference Control Board
A51 Reference Oscillator Board
A52 Phase Shifter Board
A53 Converter Phase Lock Board
A54 Detector-LO Switch Board
A55 Limiter Board
A56 Converter Control Board
A57 Converter Oscillator Board
A58 Phase Lock Switch Board
A59 Phase Lock Interface Board
A60 AGC Control Board
A61 Readout Driver Board
A62 Readout Board
A70 Power Supply

A1 RF Attenuator
A20 IF Filter-Amplifier Board
A21 IF Attenuator-Amplifier Board
A22 IF Attenuator-Mixer-Filter Board
A23 IF Switch-Aural Drive Board
A24 IF SAW Amplifier (Narrow Band) Board
A25 IF SAW Amplifier (Wide Band) Board
A26 IF Post Amplifier Board
A27 IF Zero Carrier-Phase Shifter Board
A28 IF Detector-Video Amplifier (Quadrature) Board
A29 IF Detector-Video Amplifier (Video) Board
A30 PIN Driver Board (drives A21)
A31 PIN Driver Board (drives A22)
A32 IF Interface Board
A70 Power Supply



BOTTOM VIEW

2200-103

Fig. 5-2. Assembly Locations.

In the case of chassis, the front- and rear-panel mounted parts, which have no assembly number, the parts list number is the same as shown on the schematic. Any one- or two-digit circuit number in the parts list refers to a part mounted on the front or rear panel, or the chassis.

NOTE

The parts list number should be used when ordering replacement parts.

Components

Wire Color Codes. Insulated wires are color-coded to facilitate circuit tracing. Table 5-2 summarizes the coding system used in this instrument.

Table 5-2

Color Code	Significance
Black	Chassis Ground
White on Black	Floating Ground
Yellow on Green	Safety Ground
Gray[a]	AC Line
White[a]	Signal
Red[b]	$+V_{cc}$
Violet[b]	$-V_{cc}$

[a] **Color stripes are used on these wires as an aid to circuit tracing.**

[b] **Color stripe on wire indicates position of supply with respect to 0 V (e.g., a black stripe on a red wire would be the first voltage in the positive direction). If a second stripe is used (white only), this indicates a non-regulated supply.**

Connectors. Intercircuit connections are made by various connector types. Pin connectors are used for board-to-board connections on a common interface board. Multiple-terminal connectors in harmonica-type plastic holders are used for wire-cable interconnection of boards. The terminals in the holder are identified by numbers that appear on the holder and the circuit diagrams. Connector orientation to the circuit board is keyed by triangles on the holder and the circuit board (see Fig. 5-3). Coaxial connectors for board-to-board and board-to-panel mounted **bnc** connectors are the Peltola type.

NOTE

When reconnecting a Peltola connector, be careful to avoid bending the coaxial center conductor.

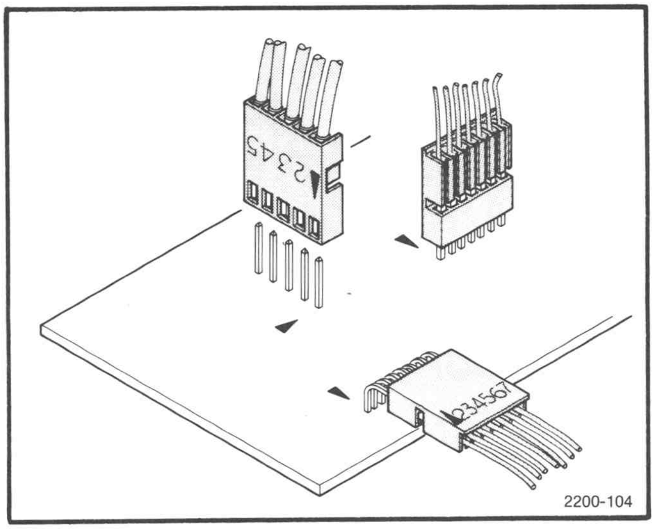


Fig. 5-3. Multipin Intercircuit Connectors.

All connectors are identified on the schematic and board with "P" numbers.

Resistors. Composition (brown body), metal-film (gray or light blue body, power, and chip resistors are used in this instrument. The resistance values of composition and metal-film resistors are color coded on the component with EIA color code (some metal-film resistors may have the value printed on the body). Chip resistors are generally too small to be marked, and therefore should be handled cautiously to avoid mixing resistors of different values if replacing more than one.

Capacitors. The capacitance value of common disc capacitors or small electrolytics are marked in microfarads or picofarads on the side of the component body. The white ceramic capacitors and tantalum electrolytics are color coded. Chip capacitors are generally too small to be marked, and so again, care should be taken against mixing more than one value of chip component at a time.

Diodes. The cathode of each glass-encased diode is indicated by a stripe, a series of stripes, or a dot. Some diodes have a diode symbol printed on one side.

Most diodes can be checked in the circuit by taking measurements across the diode and comparing these with voltages listed on the diagram. Forward-to-back resistance ratios can usually be taken by referring to the schematic and pulling appropriate transistors and pin connectors to remove low-resistance loops around the diode.

CAUTION

Do not use an ohmmeter scale with a high external current to check the diode junction.

Transistors. Lead identification for the transistors and ICs is shown in Fig. 5-4.

Semiconductor failures account for the majority of electronic equipment failures. Substitution is often the most practical means for checking their performance. The following guidelines should be followed when substituting these components:

1. First determine that circuit voltages are safe for the substituted component, so the replacement will not be damaged.

2. Use only good components for substitution.

3. Turn the power off before a component is substituted.

4. Be sure the component is inserted properly in its socket (see Fig. 5-4 or the manufacturer's data sheet).

5. After the operational check, return the good components to their original sockets to reduce calibration time and burn-in period.

NOTE

When replacing transistors mounted with heat sinks, check that they have adequate heat-conducting grease (Tektronix Part No. 006-0625-00) for proper thermal conduction.

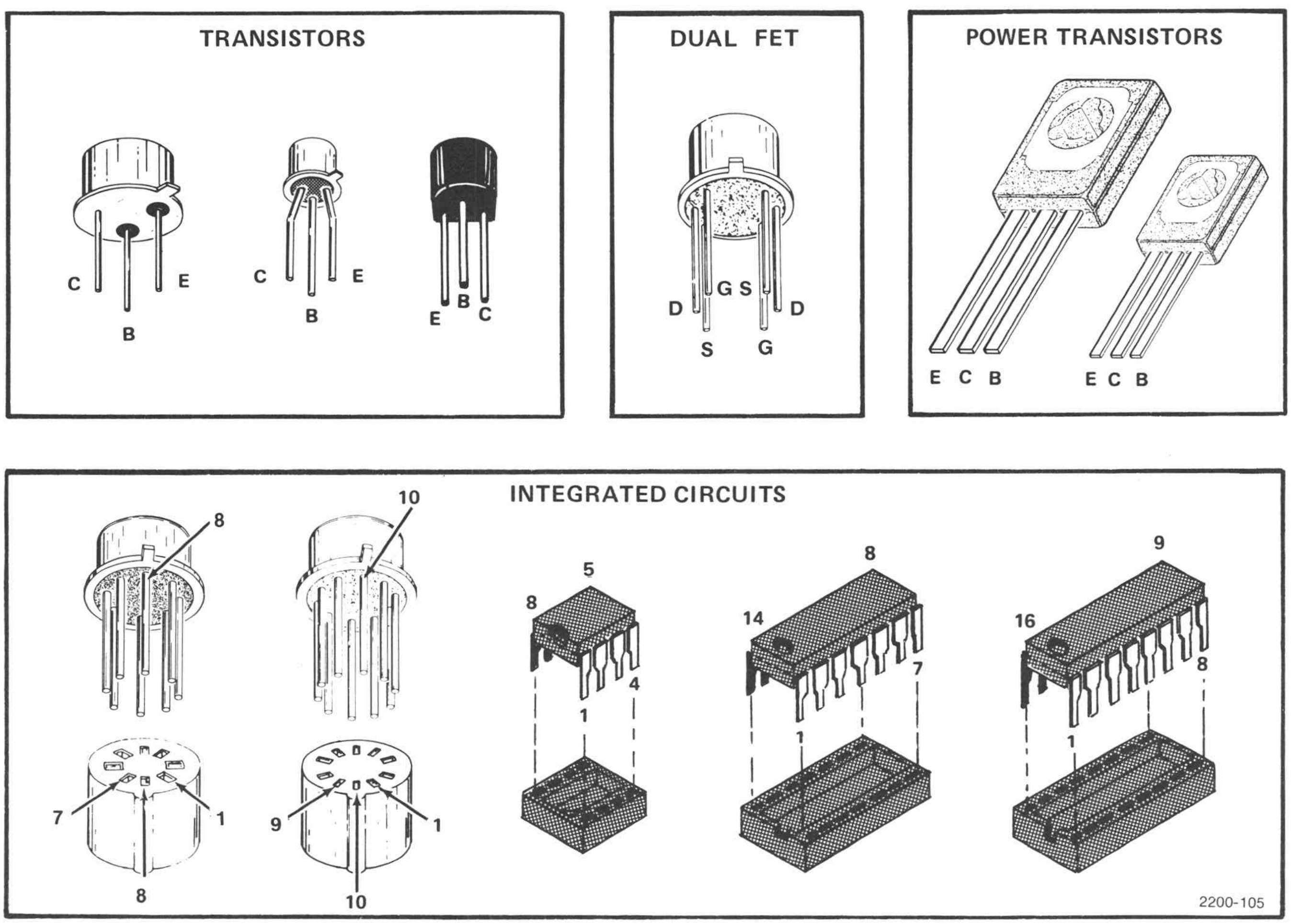


Fig. 5-4. Semiconductor Lead Identification.

WARNING

Handle thermal-conducting grease with care. Avoid getting the grease in eyes. Wash hands thoroughly after use.

NOTE

If a substitute is not available, check the transistor with a dynamic tester such as the TEKTRONIX 577 Curve Tracer. Static-type testers, such as an ohmmeter, can be used to check the resistance ratio across some semiconductor junctions if no other method is available. Use the high-resistance ranges (R X 1 kΩ or higher) so the external test current is limited to less than 6 mA. If uncertain, measure the external test current with an ammeter. Resistance ratios across base-to-emitter or base-to-collector junctions usually run 100:1 or higher. The ratio is measured by connecting the meter leads across the terminals, noting the reading, then reversing the leads and noting the second reading.

Integrated Circuits (IC). Integrated circuits are most easily checked by direct replacement. When substitution is impossible, check input- and output-signal states as described in the circuit description and on the diagram. Lead configurations for the ICs used in this instrument are provided on the inside fold of the schematic or the back of the previous schematic.

Check calibration and performance after a faulty component has been replaced.

If the above procedure fails to locate the trouble, a more detailed analysis must be performed. The Circuit Description section describes the operational theory of each circuit, and may aid to further evaluate the problem.

General Troubleshooting Technique

The following procedure is recommended to isolate a problem and expedite repairs.

1. Ensure that the malfunction exists in the instrument. Check the operation of associated equipment and the operating procedure of the instrument (see Operating Instructions).

2. Determine and evaluate all trouble symptoms. Isolate the problem to a circuit or assembly. The block diagram in the Diagrams section can aid in signal tracing and circuit isolation. The circuit boards are generally connected by coaxial cables, so the stages can be checked stage by stage. A spectrum analyzer and tracking generator are convenient tools for these checks.

CAUTION

When measuring voltages and waveforms, use extreme care in placing meter leads or probes. Because of high component density and limited access within the instrument, an inadvertent movement of the leads or probe could cause a short circuit. This may produce transient voltages that can destroy many components.

3. Make an educated guess as to the nature of the problem, such as component failure or calibration, and the functional area most likely at fault.

4. Visually inspect the area or the assembly for such defects as broken or loose connections, improperly-seated components, overheated or burned components, chafed insulation, etc. Use a magnifying glass or a jewelers eye loupe to inspect chip parts. Repair or replace all obvious defects. In the case of overheated components, try to determine the cause of the overheated condition and correct before reapplying power.

5. By successive electrical checks, locate the problem. At this time, an oscilloscope and spectrum analyzer are valuable test items for evaluating circuit performance. If applicable, check the calibration adjustments. Before changing an adjustment, note its position so it can be returned to the original setting. This will facilitate recalibration after the trouble has been located and repaired.

6. Determine the extent of the repair needed; if complex, we recommend contacting your local Tektronix Field Office or representative. If minor, such as a simple component replacement, see the Replaceable Electrical Parts list for replacement information. Removal and replacement procedure of the assemblies is described under Corrective Maintenance.

Troubleshooting Shield-Mounted Boards (see Fig. 5-5). An extender board (included in the standard accessories kit) allows the shield-mounted boards to be extended out of the shield for troubleshooting or calibration. Extra pins are added to the interface boards where necessary to provide grounds for signal connections. To look at the output of a stage, remove the following board and connect a **bnc**-to-square pin adapter cable to the input pins. This will give the output of the stage under test. To isolate a board or stage, remove both the input and output stages. A signal can be fed to this board (stage) and the output measured for this stage only.

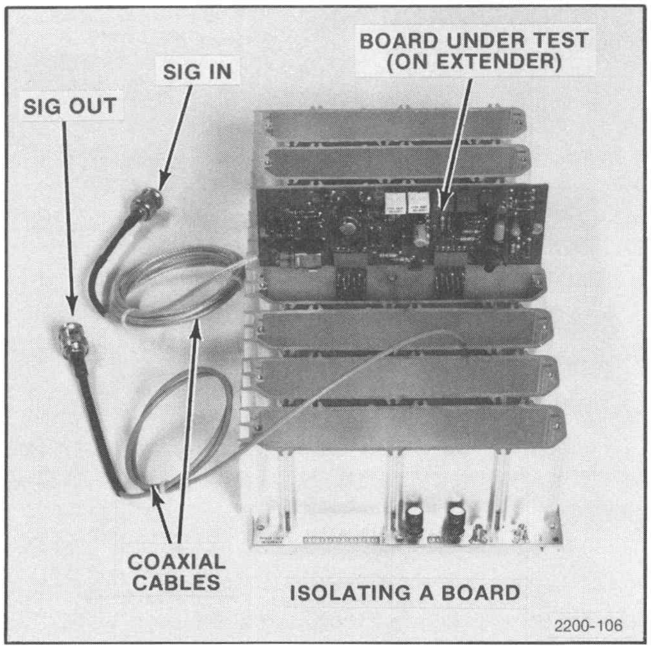


Fig. 5-5. Troubleshooting Shield-Mounted Boards.

Refer to the Corrective Maintenance portion of this section for instructions on removing the shield-mounted boards.

Troubleshooting the Power Supply. Access to the power-supply board may be gained by removing the board and heat sink from the rear panel as an assembly. A procedure for this is detailed in the Corrective Maintenance portion of this section.

NOTE

Be sure to connect a ground strap between the power-supply board and chassis ground when operating the instrument with the power supply detached.

CORRECTIVE MAINTENANCE

Corrective maintenance consists of component replacement and instrument repair. Special techniques and procedures, required to replace components in this instrument, are described here.

Obtaining Replacement Parts

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 Field Office or representative will contact you concerning any change in the part number. After repair, the circuits may need recalibration.

Nonreplaceable Parts

There are several components and circuits in the 1450-2 that are not directly replaceable. We recommend that you contact your local Tektronix Field Office or representative concerning servicing of these parts.

PIN Driver and PIN Attenuators. New Programmable Read Only Memories (PROMs) must be programmed if one of the old PROMs or precision resistors on the PIN Driver board, or a pin diode in the PIN Attenuator circuit needs to be replaced. Because each PROM program is unique, the PROMs and **p.i.n.** diodes are not directly replaceable. The affected boards are A30/A21 and A31/A22. Each pair of boards is listed under one assembly number in the Replaceable Electrical Parts list, namely 672-0638-00 and 672-0639-02 respectively. See the Replaceable Electrical Parts list for replacement information.

Parts Repair and Return Program

New Programmable Read Only Memories (PROM) must be programmed if one of the old PROMs or precision resistors on the PIN Driver board, or a **p.i.n.** diode in the PIN Attenuator circuit needs to be replaced. Because each PROM program is unique, the PROMs and pin diodes are not directly replaceable. The affected boards are A30/A21 and A31/A22. The board-pair A30/A21 must be replaced if a **p.i.n.** diode on A21, or a PROM and/or a precision resistor on A30 needs to be replaced. The same applies to A31/A22 board-pair. Each pair of boards is listed under one assembly number in the Replaceable Electrical Parts list, namely:

1. A80 Tektronix Part No. 672-0638-00 for A30/A21 pair

2. A82 Tektronix Part No. 672-0639-02 for A31/A22 pair

These boards can be exchanged under the Tektronix, Inc., Repair and Return Program. Contact your nearest Tektronix, Inc., Field Office.

Tektronix Inc., service centers provide repair service or replacement on these circuit boards as well as the entire mainframe. Return the instrument or board-pairs to your local Tektronix Field Office.

See the Replaceable Electrical Parts list for other replacement information.

Selected Components

During calibration at the factory, some components are selected, if necessary, to help the instrument meet the performance requirements. Table 5-3 lists these components, their nominal values, and the criteria for selection.

Table 5-3

SELECTED COMPONENTS

Component Number	Nominal Value	Selection Criteria
A20R07	39.2 Ω	50 Ω IF Input Impedance
A21C85	Open	Return Loss
A22R52	10 Ω or open	Mixer Balance
A22R53	10 Ω or open	Mixer Balance
A24C90	10—30 pF	SAW filter and amplitude compensation
A24R90	430 Ω or greater	SAW filter tilt and amplitude compensation
A25C90	10—30 pF	SAW filter tilt and amplitude
A25R90	430 Ω or greater	SAW filter tilt and amplitude
A28R40	100 kΩ or greater	DC unbalance with temperature
A28R43	100 kΩ or greater	DC unbalance with temperature
A29R40	100 kΩ or greater	DC unbalance with temperature
A29R43	100 kΩ or greater	DC unbalance with temperature
A55R04	187 Ω	Limiter phase shift

Soldering Chip Components (See Fig. 5-6)

Many circuit boards in this instrument have chip components. The contacts on chip resistors and capacitors are usually plated with silver. These components should be soldered with a 3% silver-bearing solder (Tektronix Part No. 006-0664-00).

Remove excess solder from the circuit-board pads before soldering so the component will lie flat. If the first solder joint is made with the component at an angle, soldering the second joint will cause pressure to be applied to the first, possibly breaking it. Use solder wick or other solder removers to remove the excess solder and clean the surface.

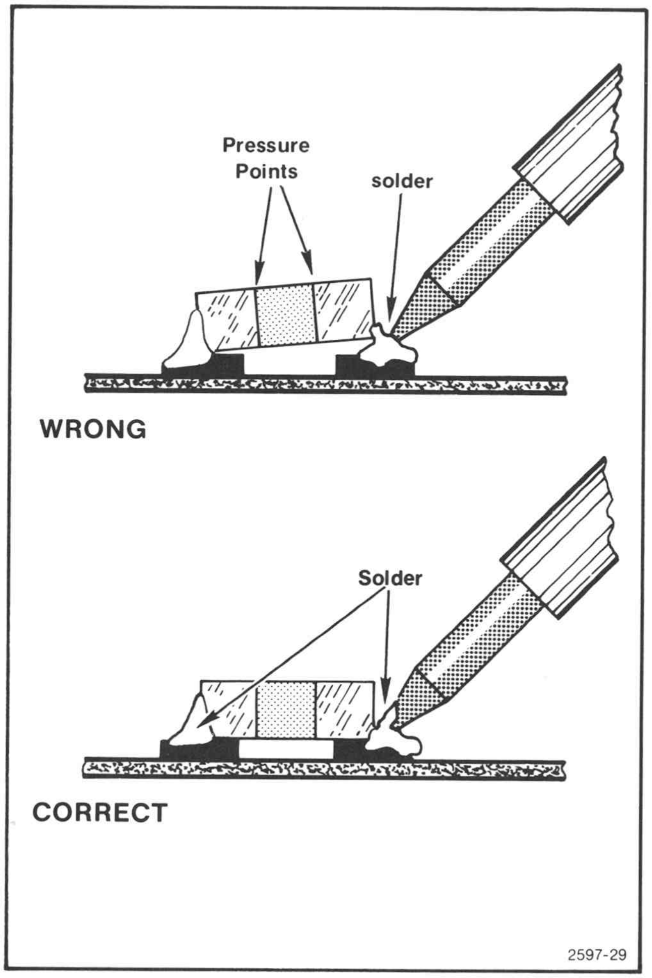


Fig. 5-6. Soldering Chip Components.

CAUTION

Do not apply a soldering iron directly to the ship component contacts. This will burn the silver plating.

TORX Screws

This instrument uses TORX head screws. A TORX screwdriver is supplied in the accessories kit for the 1450-2. Also, a tip for magnetic-tip or air-driven screwdrivers is available (Tektronix Part No. 003-0814-00).

Do not use more than about 8 to 10 inch-pounds of torque when tightening the TORX screws. If a screw head breaks off, leaving the screw body in the metal, the screw should be replaced using the following procedure:

1. Remove any other screws holding down the shield cover, and lift the cover off. This will expose part of the screw stud.

2. Use a pair of pliers to remove the screw.

3. Replace the shield cover, and insert a 3 mm X 20 mm TORX screw (Tektronix Part No. 211-0294-00).

Fuse Replacement

Three fuses are used in this instrument. The line fuse is located in the rear-panel line-voltage selector, the +5 V fuse is located on the Power Supply board (A70), and the Audio Output fuse is located on the Audio Interface board (A44). Use only correct value fuses when replacing.

NOTE

There is a spare audio fuse on the Audio Interface board, A44.

Power Transformer Replacement

If the power transformer becomes defective, contact your local Tektronix Field Office or representative for replacement. Replace only with a direct replacement Tektronix transformer.

Power Switch Replacement

If the power switch becomes defective, replace only with a direct replacement, safety-approved switch. Use the following replacement procedure.

1. Remove the left side panel and the left front-corner piece.

NOTE

An alternate method is to remove the IF Interface board (A32).

2. Remove the twelve-sided nut and washer from the front panel.

3. Pull the power switch back from the front panel, and remove the screws holding the power cable. (Note the locations of the wires on the switch for replacement.)

To replace, reverse the procedure.

Push Button Switch Replacement

Before removing a push button switch, disengage the push button actuating arm so that it does not project beyond the rear of the switch. Next, carefully pry back the plastic retainer clip at the rear of the switch with the tip of a small screwdriver. See Fig. 5-7. Remove by lifting the switch body up and back from the front retainer clip.

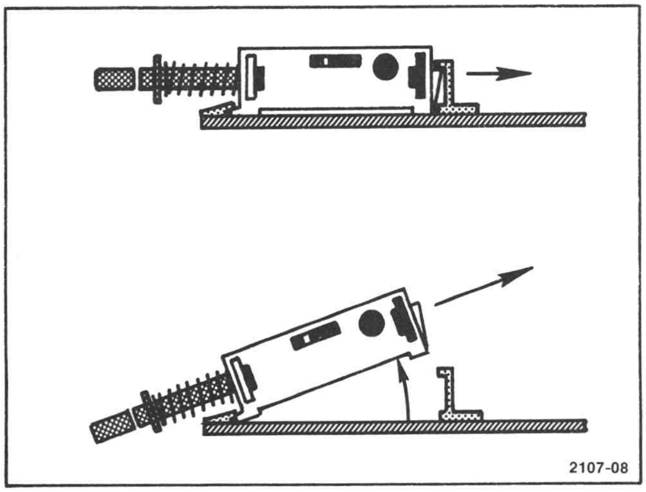


Fig. 5-7. Replacing Pushbutton Switches.

Indicator Lamp Replacement

Use the following procedure to remove LED indicator lights:

1. Pull the harmonica connector from the LED leads.

2. Grasp the outer ring at the rear of the light with needle-nose pliers, and remove.

3. Grasp both leads with the pliers and pull the LED out of the front-panel assembly.

To replace, reverse the procedure. Figure 5-8 illustrates the polarity of connections to be observed.

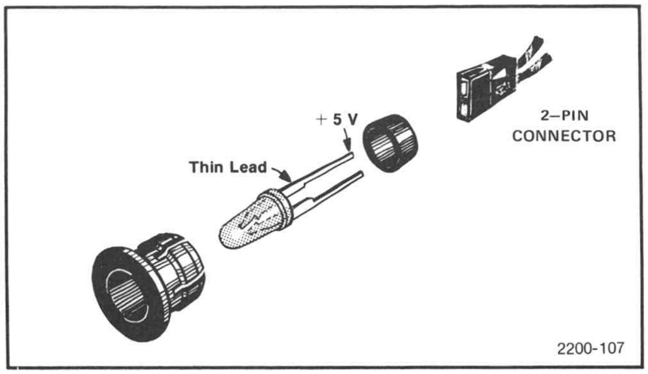


Fig. 5-8. Indicator Lamp Replacement.

Square Pin Replacement

A pin replacement kit including necessary tools, instructions, and replacement pins is available from Tektronix, Inc. Order Tektronix Part No. 040-0542-00.

Replacing Assemblies

Replacing the Attenuator Assembly (A1)

CAUTION

Do not disassemble the attenuator. Replace as a unit.

1. Remove the harmonica connectors at P10 and P20 of A1 (note their positions and orientation for replacement).

2. Loosen the semi-rigid coaxial-lead connectors, using a 5/16-inch open-end wrench.

3. Loosen and remove the attenuator mounting screws located on the opposite side of the chassis.

4. Remove the atteunator.

To replace, reverse the procedure.

CAUTION

When reconnecting the semi-rigid cables, be sure that the connectors fit smoothly into the attenuator connectors.

Replacing Shield-Mounted Boards

Each shield-mounted board has a tooling hole for extracting the board from the shield. A small screwdriver or the tip of a pair of needle-nose pliers may be used as levers against the shield to get the board loose.

To remove the boards:

1. Remove the shield cover from the desired board location.

2. Use a small screwdriver or needle-nose pliers to remove the board.

CAUTION

When replacing the board into the shield, keep the board to the outside rail (fin side) of the shield to align on the proper interface-board pins. Avoid forcing the board, as pins may be easily bent.

Replacing the IF Interface Board (A32) (See Fig. 5-9)

1. Remove all wire connectors from the board.

2. Remove the eleven screws holding the board down.

To replace, reverse the procedure. Be careful not to bend the square pins or the center conductor of the Peltola cable connectors.

Replacing the Phase Lock Interface Board (A59) (See Fig. 5-10)

1. Remove the wire connectors from both ends of the board.

2. Remove the eight screws (four on each side) from the sides of the board.

3. Remove the board.

To replace, reverse the procedure. Be careful when replacing the wire connectors. See that the square pins and Peltola center conductors are not bent.

Replacing the Phase Lock Switch Board (A58) (See Fig. 5-11)

1. Remove the wire connectors to P02, P05, P07, and P08 on the Phase Lock Interface board (A59).

2. Remove the wire connectors to P53, P59, and P98 on the Phase Lock Switch board (A58).

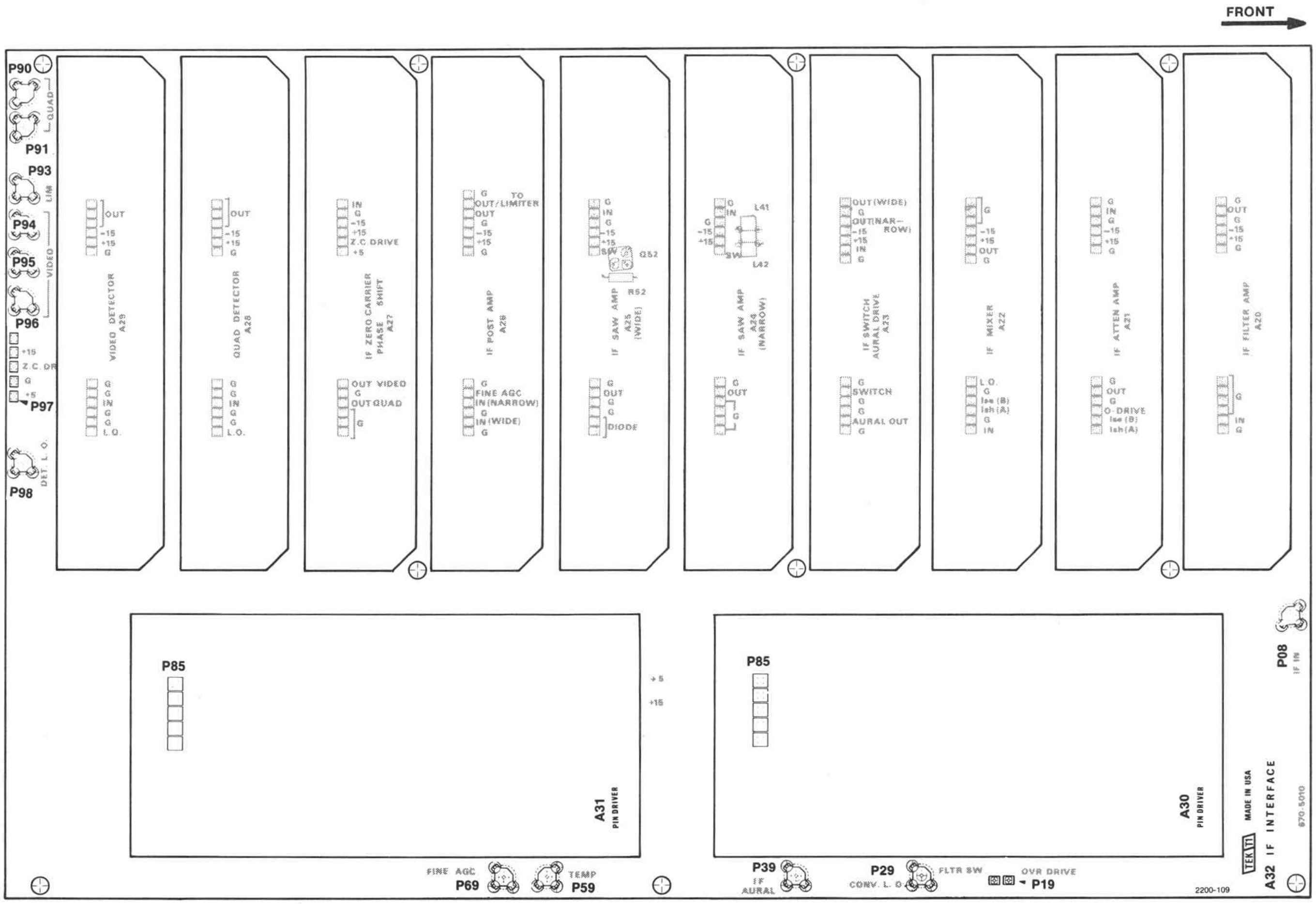


Fig. 5-9. Replacing the IF Interface Board, A32.

3. Remove the four screws holding the board.

4. Remove the board.

To replace, reverse the procedure. Be careful when replacing the wire connectors. See that the square pins and Peltola center conductors are not bent.

Replacing the Readout Driver Board (A61) (See Fig. 5-12)

1. Remove all harmonica connectors from the Readout Driver board (A61).

2. Remove the two screws from the rear corners.

3. Pull back from the Readout board (A62) to remove.

To replace, reverse the procedure. Be careful not to bend any pins on the Readout board (A62).

Replacing the Readout Board (A62) (See Fig. 5-13)

1. Remove the Readout Driver board (A61).

2. Remove the two spacer posts, using a 3/16-inch Hex driver.

3. Remove the Readout board.

To replace, reverse the procedure.

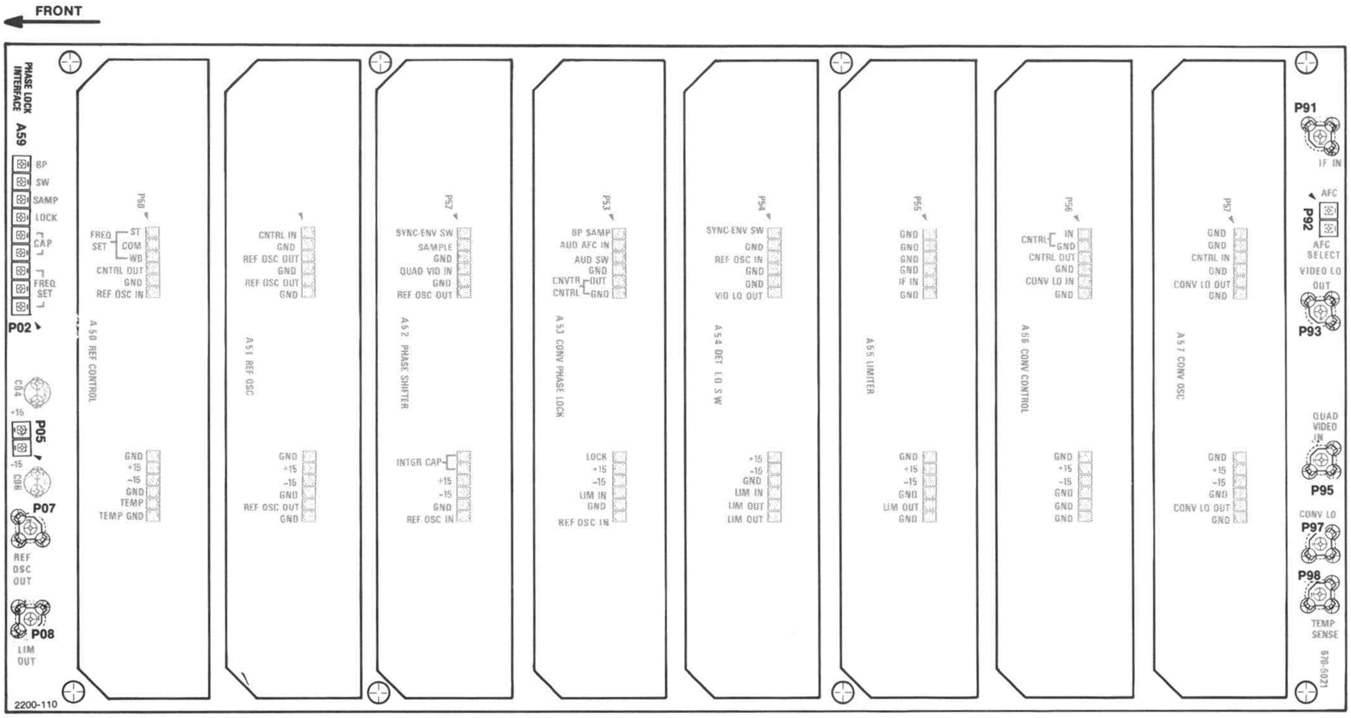


Fig. 5-10. Replacing the Phase Lock Interface Board, A59.

Replacing the AGC Control Board (A60) (See Fig. 5-14)

1. Remove the Readout Driver board (A61).

2. Remove all harmonica connectors on A60, except P01, P31, and P75, which are already disconnected from A61.

3. Remove the screws from the four corners, and the spacer posts from the center sides, using a 3/16-inch Hex driver.

4. Pull back until the switch push buttons clear the front panel, and remove the board.

To replace, reverse the procedure.

Replacing the Audio Interface board (A44) (See Fig. 5-15)

1. Remove all connectors.

2. Remove the eight screws holding the board.

3. Remove the board by pulling it back from the front panel to clear the switches.

To replace, reverse the procedure.

Replacing the Power Supply Board (A70) (See Fig. 5-16)

1. Remove all harmonica connectors.

2. Remove the four Allen screws (7/64-inch head) from the heat sink on the rear panel.

3. Remove the heat sink and power supply assembly from the rear panel.

NOTE

If troubleshooting the Power Supply, connect a ground strap between P50 or the heat sink and chassis ground on the 1450-2; reconnect P08, the power transformer secondaries, to the board.

4. Remove the screws from Q05, Q34, and Q95.

5. Remove the seven screws holding the Power Supply board.

6. Remove the board from the heat sink.

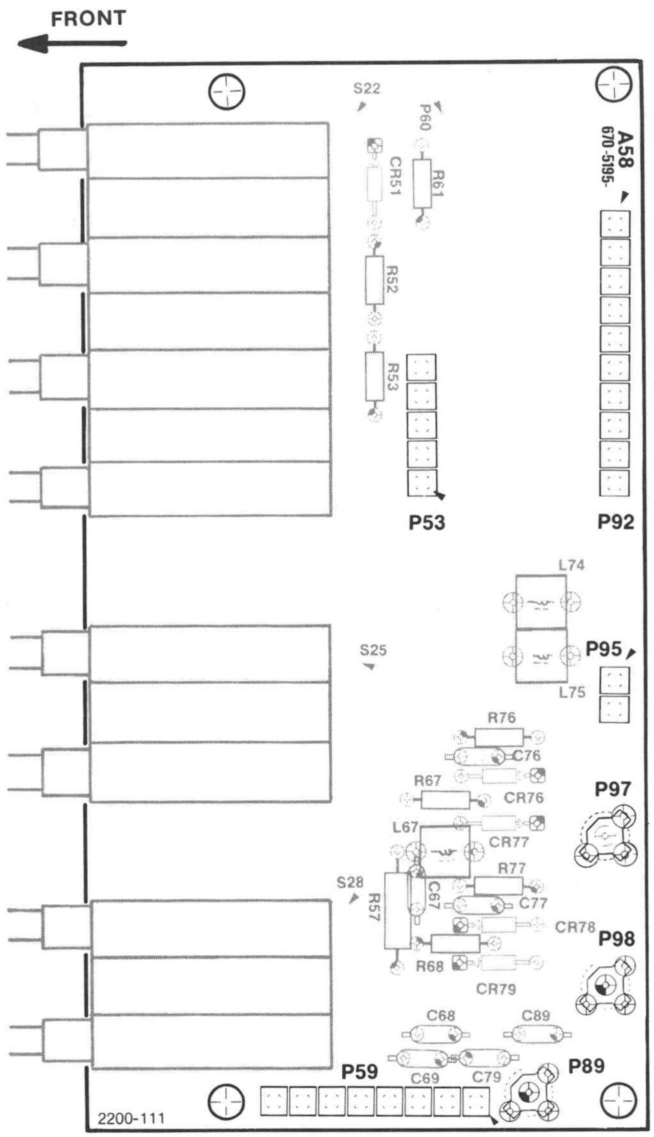


Fig. 5-11. Replacing the Phase Lock Switch Board, A58.

When replacing the Power Supply board, be sure to replace the mica insulating washers between the power transistors and the heat sink. Check that the transistors and heat sink have adequate thermal-conducting grease for proper thermal conduction.

WARNING

Handle grease with care. Avoid getting grease in the eyes. Wash hands thoroughly after use.

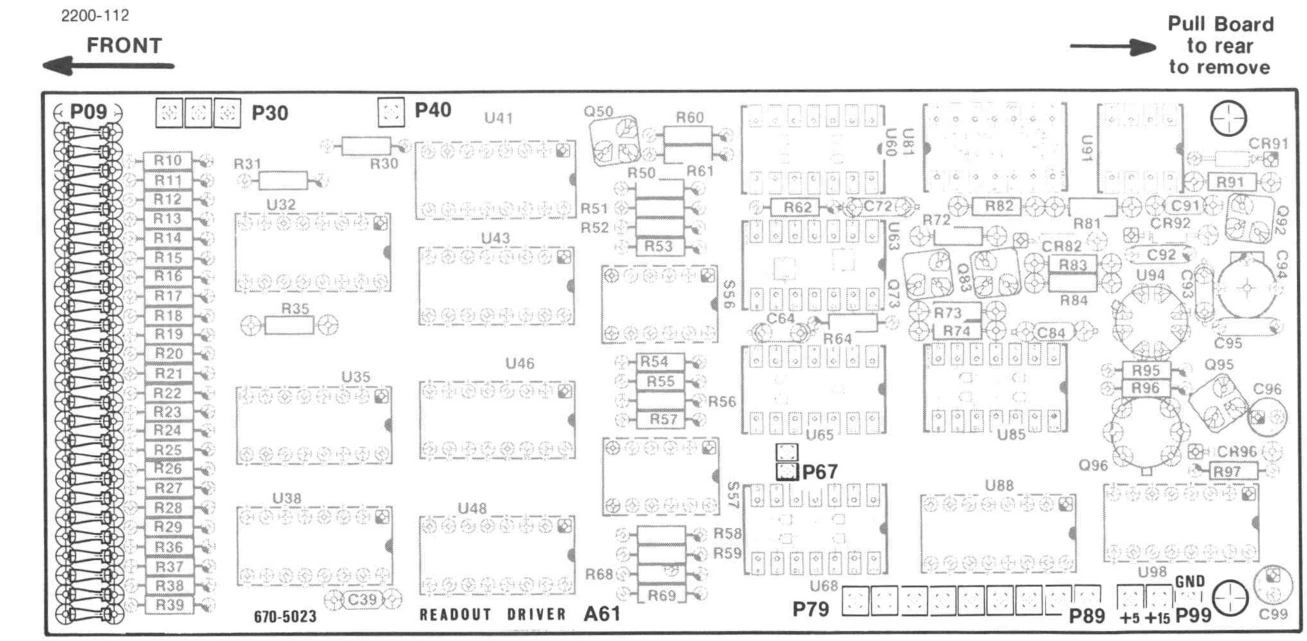


Fig. 5-12. Replacing the Readout Driver Board, A61.

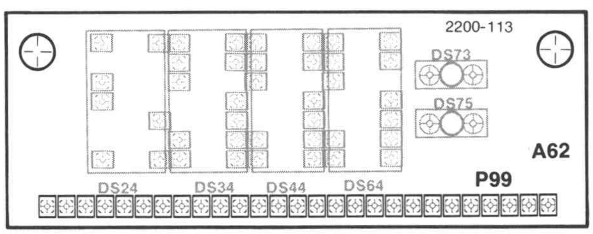


Fig. 5-13. Replacing the Readout Board, A62.

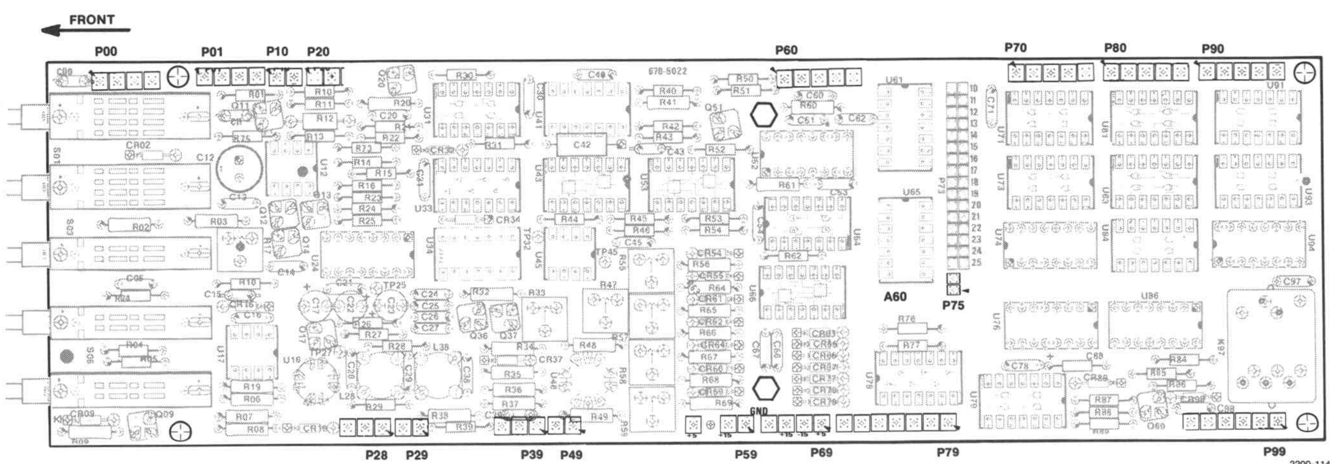


Fig. 5-14. Replacing the AGC Control Board, A60.

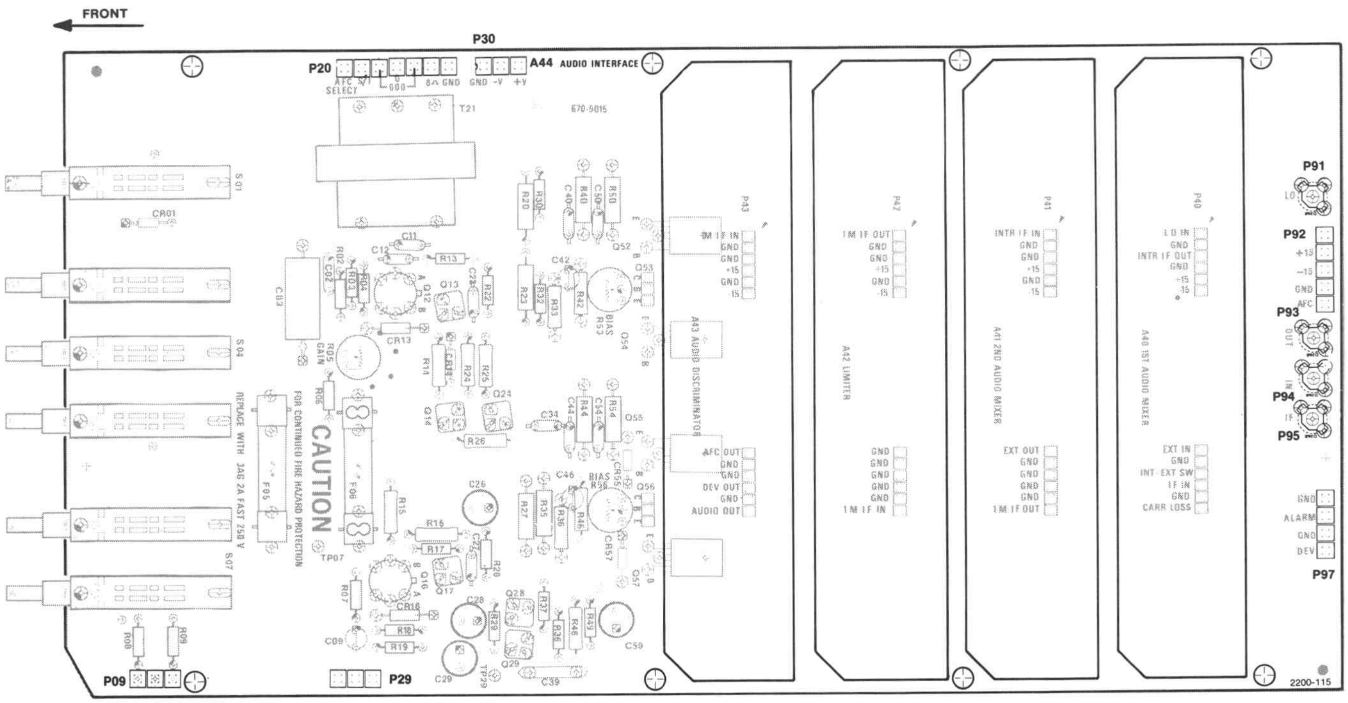
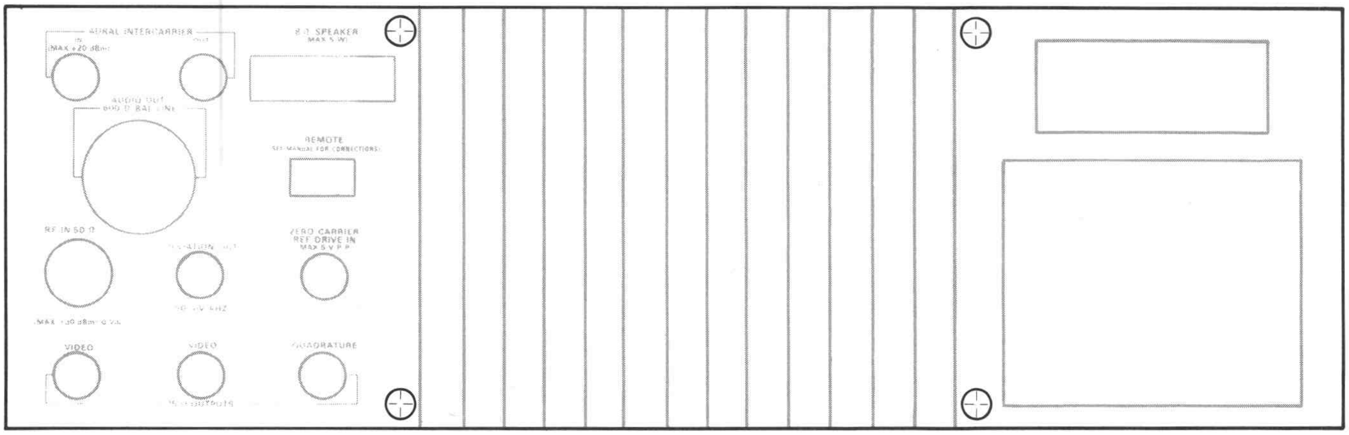
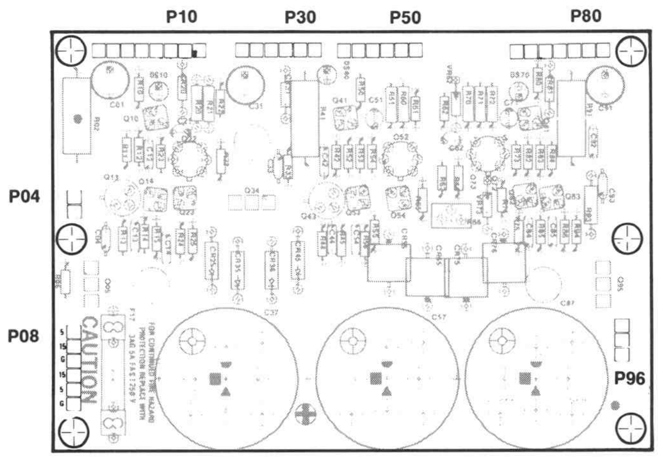


Fig. 5-15. Replacing the Audio Interface Board, A44.

@



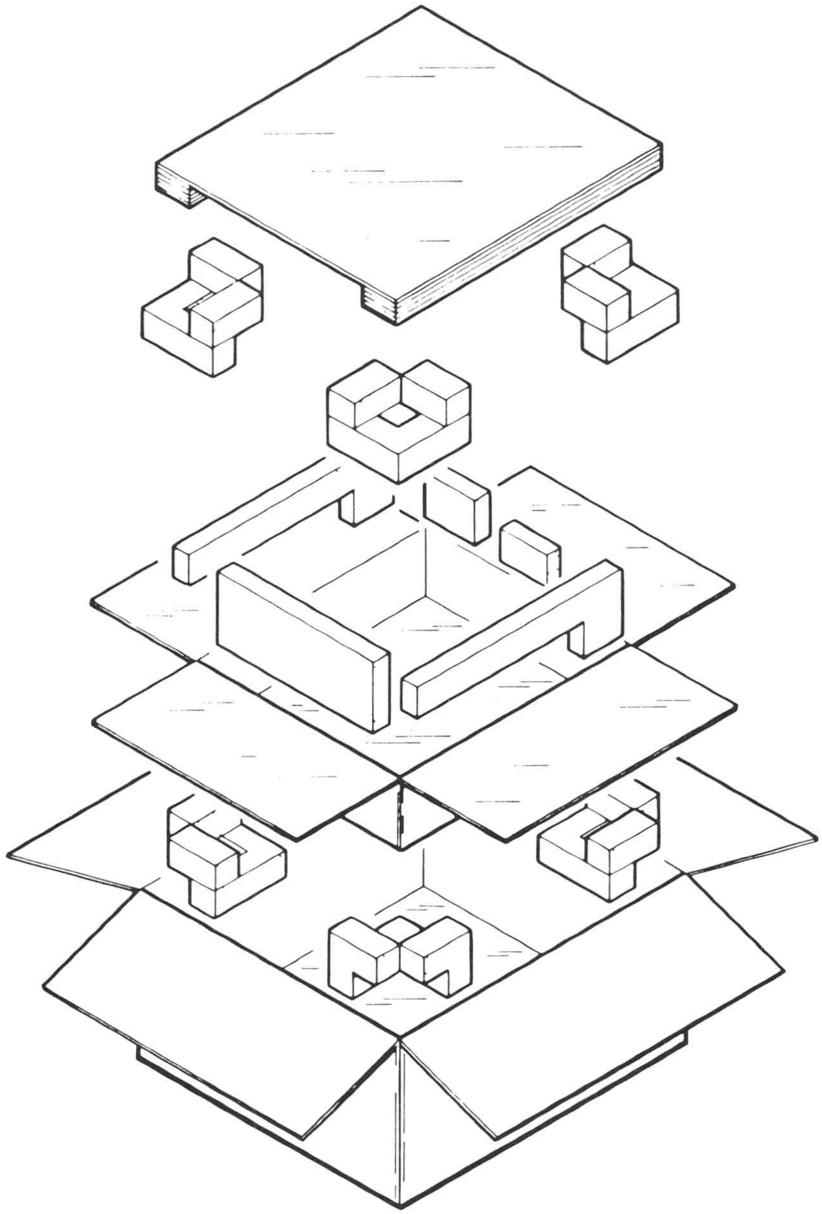
(a) Rear view of instrument.



(b)

2200-116

Fig. 5-16. Replacing the Power Supply Board, A70.



Repackaging for Shipment:

If the Tektronix instrument is to be shipped to a Tektronix Service Center for service or repair, attach a tag showing: owner (with address) and the name of an individual at your firm that can be contacted, complete instrument serial number and a description of the service required.

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

1. Obtain a carton of corrugated cardboard having inside dimensions of no less than six inches more than the instrument dimensions; this will allow for cushioning. Refer to Table 1 for carton test strength requirements.
2. Surround the instrument with polyethylene sheeting to protect the finish of the instrument.
3. Cushion the instrument on all sides by tightly packing dunnage or urethane foam between carton and instrument, allowing three inches on all sides.
4. Seal carton with shipping tape or industrial stapler.

Table 1

Shipping Carton Test Strength

Gross Weight (lb.)	Carton Test Strength (lb.)
0 — 10	200
10 — 30	275
30 — 120	375
120 — 140	500
140 — 160	600

2200-117

Fig. 5-17. Repackaging.

REPLACEABLE ELECTRICAL PARTS

PARTS ORDERING INFORMATION

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

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

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

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

LIST OF ASSEMBLIES

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

CROSS INDEX-MFR. CODE NUMBER TO MANUFACTURER

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

ABBREVIATIONS

Abbreviations conform to American National Standard Y1.1.

COMPONENT NUMBER (column one of the Electrical Parts List)

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

Example a.

component number

A23R1234 — A23 R1234

Assembly number — Circuit number

Read: Resistor 1234 of Assembly 23

Example b.

component number

A23A2R1234 — A23 A2 R1234

Assembly number — Subassembly number — Circuit number

Read: Resistor 1234 of Subassembly 2 of Assembly 23

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

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

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

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

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

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

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

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

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

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

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

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

Indicates actual manufacturers part number.

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
00779	AMP, INC.	P O BOX 3608	HARRISBURG, PA 17105
00853	SANGAMO ELECTRIC CO., S. CAROLINA DIV.	P O BOX 128	PICKENS, SC 29671
01002	GENERAL ELECTRIC COMPANY, INDUSTRIAL AND POWER CAPACITOR PRODUCTS DEPARTMENT	JOHN STREET	HUDSON FALLS, NY 12839
01121	ALLEN-BRADLEY COMPANY	1201 2ND STREET SOUTH	MILWAUKEE, WI 53204
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P O BOX 5012, 13500 N CENTRAL EXPRESSWAY	DALLAS, TX 75222
01686	RCL ELECTRONICS, INC.	195 MC GREGOR STREET	MANCHESTER, NH 03102
02111	SPECTROL ELECTRONICS CORPORATION	17070 EAST GALE AVENUE	CITY OF INDUSTRY, CA 91745
02735	RCA CORPORATION, SOLID STATE DIVISION	ROUTE 202	SOMERVILLE, NY 08876
02777	HOPKINS ENGINEERING COMPANY	12900 FOOTHILL BLVD.	SAN FERNANDO, CA 91342
03508	GENERAL ELECTRIC COMPANY, SEMI-CONDUCTOR PRODUCTS DEPARTMENT	ELECTRONICS PARK	SYRACUSE, NY 13201
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD,PO BOX 20923	PHOENIX, AZ 85036
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS STREET	MOUNTAIN VIEW, CA 94042
09023	CORNELL-DUBILIER ELECTRONIC DIVISION FEDERAL PACIFIC ELECTRIC CO.	2652 DALRYMPLE ST.	SANFORD, NC 27330
12089	BEAV MOTOR DIVISION UMC ELECTRONICS CO.	460 SACKETT POINT RD.	NORTH HAVEN, CT 06473
12969	UNITRODE CORPORATION	580 PLEASANT STREET	WATERTOWN, MA 02172
14433	ITT SEMICONDUCTORS	3301 ELECTRONICS WAY P O BOX 3049	WEST PALM BEACH, FL 33402
14552	MICRO SEMICONDUCTOR CORP.	2830 F FAIRVIEW ST.	SANTA ANA, CA 92704
15454	RODAN INDUSTRIES, INC.	2905 BLUE STAR ST.	ANAHEIM, CA 92806
18324	SIGNETICS CORP.	811 E. ARQUES	SUNNYVALE, CA 94086
19396	ILLINOIS TOOL WORKS, INC. PAKTRON DIV.	900 FOLLIN LANE, SE	VIENNA, VA 22180
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
24546	CORNING GLASS WORKS, ELECTRONIC COMPONENTS DIVISION	550 HIGH STREET	BRADFORD, PA 16701
24931	SPECIALITY CONNECTOR CO., INC.	2620 ENDRESS PLACE	GREENWOOD, IN 46142
27014	NATIONAL SEMICONDUCTOR CORP.	2900 SEMICONDUCTOR DR.	SANTA CLARA, CA 95051
27193	CUTLER-HAMMER, INC. SPECIALTY PRODUCTS DIVISION	4201 N. 27TH ST.	MILWAUKEE, WI 53216
32997	BOURNS, INC., TRIMPOT PRODUCTS DIV.	1200 COLUMBIA AVE.	RIVERSIDE, CA 92507
33095	SPECTRUM CONTROL, INC.	152 E MAIN STREET	FAIRVIEW, PA 16415
33096	COLORADO CRYSTAL CORPORATION	2303 W 8TH STREET	LOVELAND, CO 80537
34335	ADVANCED MICRO DEVICES	901 THOMPSON PL.	SUNNYVALE, CA 94086
34430	MONSANTO COMMERCIAL PRODUCT, CO. FABRICATOR PRODUCTS DIV.	BOX 3790, 611 EAST CERRITOS AVE.	ANAHEIM, CA 92803
50437	RELIANCE STEEL PRODUCTS COMPANY	3700 WALNUT STREET	MCKEESPORT, PA 15132
50522	MONSANTO CO., ELECTRONIC SPECIAL PRODUCTS	3400 HILLVIEW AVENUE	PALO ALTO, CA 94304
50579	LITRONIX INC.	19000 HOMESTEAD RD.	CUPERTINO, CA 95014
54473	MATSUSHITA ELECTRIC, CORP. OF AMERICA	1 PANASONIC WAY	SECAUCUS, NJ 07094
54937	DEYOUNG MFG., INC.	PO BOX 1806, 1517 130TH AVE.	BELLEVUE, WA 98009
55210	GETTIG ENG. AND MFG. COMPANY	PO BOX 85, OFF ROUTE 45	SPRING MILLS, PA 16875
55680	NICHICON/AMERICA/CORP.	6435 N PROESEL AVENUE	CHICAGO, IL 60645
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247
71400	BUSSMAN MFG., DIVISION OF MCGRAW-EDISON CO.	2536 W. UNIVERSITY ST.	ST. LOUIS, MO 63107
71468	ITT CANNON ELECTRIC	666 E. DYER RD.	SANTA ANA, CA 92702
72136	ELECTRO MOTIVE CORPORATION, SUB OF INTERNATIONAL ELECTRONICS CORPORATION	LAUTER AVE, P O BOX 7600	FLORENCE, SC 29501
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
73138	BECKMAN INSTRUMENTS, INC., HELIPOT DIV.	2500 HARBOR BLVD.	FULLERTON, CA 92634
74970	JOHNSON, E. F., CO.	299 10TH AVE. S. W.	WASECA, MN 56093
75042	TRW ELECTRONIC COMPONENTS, IRC FIXED RESISTORS, PHILADELPHIA DIVISION	401 N. BROAD ST.	PHILADELPHIA, PA 19108
76493	BELL INDUSTRIES, INC., MILLER, J. W., DIV.	19070 REYES AVE., P O BOX 5825	COMPTON, CA 90224
77342	AMF INC., POTTER AND BRUMFIELD DIV.	200 RICHLAND CREEK DRIVE	PRINCETON, IN 47670
78488	STACKPOLE CARBON CO.		ST. MARYS, PA 15857
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
80031	ELECTRA-MIDLAND CORP., MEPCO DIV.	22 COLUMBIA ROAD	MORRISTOWN, NJ 07960
82389	SWITCHCRAFT, INC.	5555 N. ELSTON AVE.	CHICAGO, IL 60630
90201	MALLORY CAPACITOR CO., DIV. OF P. R. MALLORY AND CO., INC.	3029 E. WASHINGTON STREET P. O. BOX 372	INDIANAPOLIS, IN 46206
91637	DALE ELECTRONICS, INC.	P. O. BOX 609	COLUMBUS, NE 68601
95275	VITRAMON, INC.	P O BOX 544	BRIDGEPORT, CT 06601
95354	METHODE MANUFACTURING CORP.	1700 SO. HICKS RD.	ROLLING MEADOWS, IL 60008

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A1	119-0948-00			ATTENUATOR,VAR:0-30DB IN 10DB STEPS	80009	119-0948-00
A10	120-1145-00			XFMR,PWR,STPDN:	80009	120-1145-00
A20	670-5001-00			CKT BOARD ASSY:I.F. FILTER AMP	80009	670-5001-00
A21	----- -----			CKT BOARD ASSY:I.F. ATTENUATOR AMP		
	----- -----			(REPLACEABLE AS A UNIT WITH A80)		
A22	----- -----			CKT BOARD ASSY:I.F. MIXER		
	----- -----			(REPLACEABLE AS A UNIT WITH A82)		
A23	670-5003-02			CKT BOARD ASSY:I.F. AURAL SWITCH	80009	670-5003-02
A24	670-5004-03			CKT BOARD ASSY:I.F. S.W.F. PREAMP	80009	670-5004-03
A25	670-5004-02			CKT BOARD ASSY:I.F. S.W.F. PREAMP	80009	670-5004-02
A26	670-6667-00			CKT BOARD ASSY:I.F. S.W.R. POSTAMP	80009	670-6667-00
A27	670-5008-00			CKT BOARD ASSY:I.F. ZERO CARRIER	80009	670-5008-00
A28	670-5009-01			CKT BOARD ASSY:DET-VIDEO AMP	80009	670-5009-01
A29	670-5009-01			CKT BOARD ASSY:DET-VIDEO AMP	80009	670-5009-01
A30	----- -----			CKT BOARD ASSY:PIN DRIVER		
	----- -----			(REPLACEABLE UNDER A80)		
A31	----- -----			CKT BOARD ASSY:PIN DRIVER		
	----- -----			(REPLACEABLE UNDER A82)		
A32	670-5010-00			CKT BOARD ASSY:I.F. INTERFACE	80009	670-5010-00
A40	670-5011-01			CKT BOARD ASSY:1ST AUDIO MIXER	80009	670-5011-01
A41	670-5012-01			CKT BOARD ASSY:2ND AUDIO MIXER	80009	670-5012-01
A42	670-5013-01			CKT BOARD ASSY:AUDIO LIMITER	80009	670-5013-01
A43	670-6727-00			CKT BOARD ASSY:AUDIO DISCRIMINATOR	80009	670-6727-00
A44	670-5015-03			CKT BOARD ASSY:AUDIO INTERFACE	80009	670-5015-03
A50	670-5016-01			CKT BOARD ASSY:REF CONTROL	80009	670-5016-01
A51	670-5018-01			CKT BOARD ASSY:REF OSCILLATOR	80009	670-5018-01
A52	670-5017-01			CKT BOARD ASSY:PHASE SHIFTER	80009	670-5017-01
A53	670-5019-01			CKT BOARD ASSY:CONVERTER PHASE LOCK	80009	670-5019-01
A54	670-5020-00			CKT BOARD ASSY:DET-L.O. SWITCH	80009	670-5020-00
A55	670-5007-00			CKT BOARD ASSY:LIMITER	80009	670-5007-00
A56	670-5194-03			CKT BOARD ASSY:CONVERTER CONTROL	80009	670-5194-03
A57	670-5196-03			CKT BOARD ASSY:CONVERTER OSCILLATOR	80009	670-5196-03
A58	670-5195-00			CKT BOARD ASSY:PHASE LOCK SWITCH	80009	670-5195-00
A59	670-5021-00			CKT BOARD ASSY:PHASE LOCK INTERFACE	80009	670-5021-00
A60	670-5022-02			CKT BOARD ASSY:A.G.C.,LOGIC	80009	670-5022-02
A61	670-5023-00			CKT BOARD ASSY:A.G.C.,READOUT DRIVER	80009	670-5023-00
A62	670-5024-00			CKT BOARD ASSY:A.G.C.,READOUT DRIVER	80009	670-5024-00
A70	670-4987-00			CKT BOARD ASSY:POWER SUPPLY	80009	670-4987-00
A80	672-0638-00			CKT BOARD ASSY:PIN DRIVER/IFATTEN AMP	80009	672-0638-00
A82	672-0639-02			CKT BD ASSY:PIN DRIVER/IF ATTEN/MIXER/FLTR	80009	672-0639-02
A20	670-5001-06			CKT BOARD ASSY:I.F. FILTER AMP	80009	670-5001-06
A20C05	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A20C13	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A20C14	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A20C15	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A20C19	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A20C20	283-0639-00			CAP.,FXD,MICA D:56PF,1%,100V	00853	D151E560F0
A20C25	283-0639-00			CAP.,FXD,MICA D:56PF,1%,100V	00853	D151E560F0
A20C26	281-0562-00			CAP.,FXD,CER DI:39PF,10%,500V	72982	301-000U2J0390K
A20C28	283-0407-00			CAP.,FXD,CER DI:27PF,5%,50V	72982	A01A2C0G270J
A20C29	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A20C35	281-0167-00			CAP.,VAR,CER DI:9-45PF,200V	72982	538-011-D 9-45
A20C36	283-0663-00			CAP.,FXD,MICA D:16.8PF,+/-0.5PF,500V	00853	D155C16.8D0
A20C37	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A20C38	281-0562-00			CAP.,FXD,CER DI:39PF,10%,500V	72982	301-000U2J0390K
A20C45	283-0640-00			CAP.,FXD,MICA D:160PF,1%,100V	00853	D151E161F0
A20C53	281-0562-00			CAP.,FXD,CER DI:39PF,10%,500V	72982	301-000U2J0390K
A20C54	283-0663-00			CAP.,FXD,MICA D:16.8PF,+/-0.5PF,500V	00853	D155C16.8D0
A20C55	281-0167-00			CAP.,VAR,CER DI:9-45PF,200V	72982	538-011-D 9-45
A20C58	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A20C59	290-0804-00			CAP.,FXD,ELCTLT:10UF,+50-10%,25V	55680	25ULA10V-T
A20C65	283-0638-00			CAP.,FXD,MICA D:130PF,1%,100V	00853	D151F131F0
A20C66	283-0639-00			CAP.,FXD,MICA D:56PF,1%,100V	00853	D151E560F0
A20C72	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A20C79	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A20C82	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A20C83	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A20C84	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A20C86	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A20C87	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A20L02	108-0509-00			COIL,RF:2.45UH	80009	108-0509-00
A20L22	114-0266-00			COIL,RF:VARIABLE,400-800NH	80009	114-0266-00
A20L26	108-0260-00			COIL,RF:98NH	80009	108-0260-00
A20L32	114-0333-00			COIL,RF:310-600NH	80009	114-0333-00
A20L45	114-0352-00			COIL,RF:VARIABLE,220 TO 400NH	80009	114-0352-00
A20L52	114-0333-00			COIL,RF:310-600NH	80009	114-0333-00
A20L62	114-0266-00			COIL,RF:VARIABLE,400-800NH	80009	114-0266-00
A20L99	108-0509-00			COIL,RF:2.45UH	80009	108-0509-00
A20LR13	108-0212-00			COIL,RF:FIXED,495NH	80009	108-0212-00
A20LR86	108-0212-00			COIL,RF:FIXED,495NH	80009	108-0212-00
A20Q04	151-0451-00			TRANSISTOR:SILICON,NPN	02735	65128
A20Q16	151-0650-00			TRANSISTOR:SILICON,NPN	80009	151-0650-00
A20Q47	151-0195-00			TRANSISTOR:SILICON,NPN	80009	151-0195-00
A20Q72	151-0650-00			TRANSISTOR:SILICON,NPN	80009	151-0650-00
A20Q85	151-0451-00			TRANSISTOR:SILICON,NPN	02735	65128
A20R02	321-0136-00			RES.,FXD,FILM:255 OHM,1%,0.125W	91637	MFF1816G255R0F
A20R03	321-0155-00			RES.,FXD,FILM:402 OHM,1%,0.125W	91637	MFF1816G402R0F
A20R06	321-0080-00			RES.,FXD,FILM:66.5 OHM,1%,0.125W	91637	MFF1816G66R50F
A20R07	321-0058-00			RES.,FXD,FILM:39.2 OHM,1%,0.125W	91637	MFF1816G39R20F
A20R08	315-0241-00			RES.,FXD,CMPSN:240 OHM,5%,0.25W	01121	CB2415
A20R14	315-0200-00			RES.,FXD,CMPSN:20 OHM,5%,0.25W	01121	CB2005
A20R15	315-0200-00			RES.,FXD,CMPSN:20 OHM,5%,0.25W	01121	CB2005
A20R26	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
A20R28	317-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.125W	01121	BB5105
A20R36	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
A20R48	321-0308-00			RES.,FXD,FILM:15.8K OHM,1%,0.125W	91637	MFF1816G15801F
A20R49	321-0358-00			RES.,FXD,FILM:52.3K OHM,1%,0.125W	91637	MFF1816G52301F
A20R57	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A20R66	321-0170-00			RES.,FXD,FILM:576 OHM,1%,0.125W	91637	MFF1816G576R0F
A20R71	321-0170-00			RES.,FXD,FILM:576 OHM,1%,0.125W	91637	MFF1816G576R0F
A20R72	321-0024-00			RES.,FXD,FILM:17.4 OHM,1%,0.125W	91637	MFF1816G17R40F
A20R73	321-0024-00			RES.,FXD,FILM:17.4 OHM,1%,0.125W	91637	MFF1816G17R40F
A20R74	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
A20R75	315-0200-00			RES.,FXD,CMPSN:20 OHM,5%,0.25W	01121	CB2005
A20R76	315-0200-00			RES.,FXD,CMPSN:20 OHM,5%,0.25W	01121	CB2005
A20R83	321-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.125W	91637	MFF1816G49R90F
A20R85	321-0080-00			RES.,FXD,FILM:66.5 OHM,1%,0.125W	91637	MFF1816G66R50F
A20R92	315-0241-00			RES.,FXD,CMPSN:240 OHM,5%,0.25W	01121	CB2415
A20R98	321-0155-00			RES.,FXD,FILM:402 OHM,1%,0.125W	91637	MFF1816G402R0F
A20R99	321-0136-00			RES.,FXD,FILM:255 OHM,1%,0.125W	91637	MFF1816G255R0F
A20RT12	307-0250-00			RES.,THERMAL:390 OHM,10%	15454	DG125390K

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A20RT97	307-0250-00			RES.,THERMAL:390 OHM,10%	15454	DG125390K
A20T11	120-1159-00			XFMR,RF:TOROID,7 T,TRIFILAR	80009	120-1159-00
A20T18	120-1158-00			XFMR,RF:BALUN	80009	120-1158-00
A20T72	120-1158-00			XFMR,RF:BALUN	80009	120-1158-00
A20T89	120-1159-00			XFMR,RF:TOROID,7 T,TRIFILAR	80009	120-1159-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A21	----- -----			CKT BOARD ASSY:I.F. ATTENUATOR AMP		
	----- -----			(REPLACEABLE AS A UNIT WITH A80)		
A21C10	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A21C28	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A21C29	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A21C31	281-0613-00			CAP.,FXD,CER DI:10PF,+/-1PF,200V	72982	374001C0G100F
A21C37	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A21C43	283-0067-00			CAP.,FXD,CER DI:0.001UF,10%,200V	72982	835-515B102K
A21C44	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A21C51	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A21C52	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A21C57	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A21C58	290-0782-00			CAP.,FXD,ELCTLT:4.7UF,+75-10%,35V	56289	503D475G035AS
A21C59	290-0782-00			CAP.,FXD,ELCTLT:4.7UF,+75-10%,35V	56289	503D475G035AS
A21C65	281-0658-00			CAP.,FXD,CER DI:6.2PF,+/-0.25PF,500V	72982	301-000C0H0629C
A21C66	283-0032-00			CAP.,FXD,CER DI:470PF,5%,500V	72982	0831085Z5E00471J
A21C67	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A21C68	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	72982	8131N075 E474M
A21C72	283-0663-00			CAP.,FXD,MICA D:16.8PF,+/-0.5PF,500V	00853	D155C16.8D0
A21C73	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	72982	8131N075 E474M
A21C74	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A21C76	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A21C85	281-0577-00			CAP.,FXD,CER DI:14PF,5%,500V	72982	301-050C0G0140J
	----- -----			(TEST,SELECTABLE)		
A21C86	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A21C87	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A21C89	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A21C95	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A21C97	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A21C98	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A21CR86	----- -----			SEMICOND DEVICE:SILICON,100V,25A		
	----- -----			(REPLACEABLE AS A UNIT WITH A80)		
A21CR96	----- -----			SEMICOND DEVICE:SILICON,100V,25A		
	----- -----			(REPLACEABLE AS A UNIT WITH A80)		
A21CR98	----- -----			SEMICOND DEVICE:SILICON,100V,25A		
	----- -----			(REPLACEABLE AS A UNIT WITH A80)		
A21E42	276-0543-00			SHLD BEAD,ELEK:FERRITE	80009	276-0543-00
A21L75	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A21L76	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A21L98	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A21Q31	151-0451-00			TRANSISTOR:SILICON,NPN	02735	65128
A21Q42	151-0438-00			TRANSISTOR:SILICON,PNP,SEL FROM SPS6927	80009	151-0438-00
A21Q62	151-0223-00			TRANSISTOR:SILICON,NPN	04713	SPS8026
A21Q75	151-0472-00			TRANSISTOR:SILICON,NPN	80009	151-0472-00
A21R12	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A21R21	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A21R26	305-0271-00			RES.,FXD,CMPSN:270 OHM,5%,2W	01121	HB2715
A21R27	321-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.125W	91637	MFF1816G49R90F
A21R31	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A21R34	315-0180-00			RES.,FXD,CMPSN:18 OHM,5%,0.25W	01121	CB1805
A21R35	315-0181-00			RES.,FXD,CMPSN:180 OHM,5%,0.25W	01121	CB1815
A21R41	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A21R43	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A21R44	315-0622-00			RES.,FXD,CMPSN:6.2K OHM,5%,0.25W	01121	CB6225
A21R45	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A21R46	311-1501-00			RES.,VAR,NONWIR:20 OHM,10%,0.50W	73138	72-37-0
A21R52	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
A21R53	315-0200-00			RES.,FXD,CMPSN:20 OHM,5%,0.25W	01121	CB2005

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A21R54	321-0047-00			RES.,FXD,FILM:30.1 OHM,1%,0.125W	91637	MFF1816G30R10F
A21R55	321-0051-00			RES.,FXD,FILM:33.2 OHM,1%,0.125W	91637	MFF1816G33R20F
A21R57	315-0430-00			RES.,FXD,CMPSN:43 OHM,5%,0.25W	01121	CB4305
A21R61	321-0134-00			RES.,FXD,FILM:243 OHM,1%,0.125W	91637	MFF1816G243R0F
A21R62	311-1936-00			RES.,VAR,NONWIR:CKT BD,50 OHM,20%,0.5W	73138	MODEL 72X
A21R63	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
A21R65	315-0162-00			RES.,FXD,CMPSN:1.6K OHM,5%,0.25W	01121	CB1625
A21R72	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A21R73	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A21R84	321-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.125W	91637	MFF1816G49R90F
A21R87	321-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.125W	91637	MFF1816G49R90F
A21R97	321-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.125W	91637	MFF1816G49R90F

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A22	----- -----			CKT BOARD ASSY:I.F. MIXER		
	----- -----			(REPLACEABLE AS A UNIT WITH A82)		
A22C01	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A22C02	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A22C04	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A22C05	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A22C06	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A22C07	283-0637-00			CAP.,FXD,MICA D:20PF,2.5%,100V	00853	D151E200D0
A22C08	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A22C15	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A22C18	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A22C19	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A22C25	283-0674-00			CAP.,FXD,MICA D:85PF,1%,500V	00853	D115F850F0
A22C26	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A22C27	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A22C28	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A22C30	283-0637-00			CAP.,FXD,MICA D:20PF,2.5%,100V	00853	D151E200D0
A22C46	283-0600-00			CAP.,FXD,MICA D:43PF,5%,500V	00853	D105E430J0
A22C48	281-0167-00			CAP.,VAR,CER DI:9-45PF,200V	72982	538-011-D 9-45
A22C53	283-0066-00			CAP.,FXD,CER DI:2.5PF,20%,200V	72982	8101-047C0J259D
A22C60	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A22C63	281-0170-00			CAP.,VAR,CER DI:1.25-3PF,100V	33095	53721003A125-3
A22C67	290-0782-00			CAP.,FXD,ELCTLT:4.7UF,+75-10%,35V	56289	503D475G035AS
A22C72	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A22C73	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A22C75	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A22C76	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A22C78	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A22C83	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A22C91	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A22C95	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A22C96	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A22CR08	----- -----			SEMICOND DEVICE:SILICON,100V,25A		
	----- -----			(REPLACEABLE AS A UNIT WITH A82)		
A22CR09	----- -----			SEMICOND DEVICE:SILICON,100V,25A		
	----- -----			(REPLACEABLE AS A UNIT WITH A82)		
A22CR17	----- -----			SEMICOND DEVICE:SILICON,100V,25A		
	----- -----			(REPLACEABLE AS A UNIT WITH A82)		
A22CR56	152-0715-00			SEMICOND DEVICE:SCHOTTKY,SI,RING QUAD	80009	152-0715-00
A22L04	108-0733-00			COIL,RF:113NH	80009	108-0733-00
A22L08	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A22L15	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A22L17	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A22L31	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A22L36	114-0352-00			COIL,RF:VARIABLE,220 TO 400NH	80009	114-0352-00
A22L43	114-0246-00			COIL,RF:VARIABLE,700-1100NH	80009	114-0246-00
A22L70	108-0311-00			COIL,RF:0.18UH	80009	108-0311-00
A22L97	108-0057-00			COIL,RF:8.8UH	80009	108-0057-00
A22LR22	108-0212-00			COIL,RF:FIXED,495NH	80009	108-0212-00
A22LR86	108-0212-00			COIL,RF:FIXED,495NH	80009	108-0212-00
A22Q02	151-0650-00			TRANSISTOR:SILICON,NPN	80009	151-0650-00
A22Q23	151-0451-00			TRANSISTOR:SILICON,NPN	02735	65128
A22Q81	151-0650-00			TRANSISTOR:SILICON,NPN	80009	151-0650-00
A22Q85	151-0451-00			TRANSISTOR:SILICON,NPN	02735	65128
A22Q93	151-0195-00			TRANSISTOR:SILICON,NPN	80009	151-0195-00
A22R00	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
A22R07	321-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.125W	91637	MFF1816G49R90F

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A22R11	321-0080-00			RES.,FXD,FILM:66.5 OHM,1%,0.125W	91637	MFF1816G66R50F
A22R12	321-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.125W	91637	MFF1816G49R90F
A22R14	315-0200-00			RES.,FXD,CMPSN:20 OHM,5%,0.25W	01121	CB2005
A22R15	315-0241-00			RES.,FXD,CMPSN:240 OHM,5%,0.25W	01121	CB2415
A22R16	315-0200-00			RES.,FXD,CMPSN:20 OHM,5%,0.25W	01121	CB2005
A22R19	321-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.125W	91637	MFF1816G49R90F
A22R20	321-0122-00			RES.,FXD,FILM:182 OHM,1%,0.125W	91637	MFF1816G182R0F
A22R21	321-0210-00			RES.,FXD,FILM:1.5K OHM,1%,0.125W	91637	MFF1816G15000F
A22R42	321-0001-00			RES.,FXD,FILM:10 OHM,1%,0.125W	75042	CEAT0-10R00F
A22R43	321-0105-00			RES.,FXD,FILM:121 OHM,1%,0.125W	91637	MFF1816G121R0F
A22R46	321-0001-00			RES.,FXD,FILM:10 OHM,1%,0.125W	75042	CEAT0-10R00F
A22R51	311-1501-00			RES.,VAR,NONWIR:20 OHM,10%,0.50W	73138	72-37-0
A22R52	317-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.125W	01121	BB1005
A22R53	317-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.125W	01121	BB1005
A22R62	321-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.125W	91637	MFF1816G49R90F
A22R74	321-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.125W	91637	MFF1816G49R90F
A22R75	315-0241-00			RES.,FXD,CMPSN:240 OHM,5%,0.25W	01121	CB2415
A22R76	321-0080-00			RES.,FXD,FILM:66.5 OHM,1%,0.125W	91637	MFF1816G66R50F
A22R81	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
A22R82	321-0308-00			RES.,FXD,FILM:15.8K OHM,1%,0.125W	91637	MFF1816G15801F
A22R83	315-0200-00			RES.,FXD,CMPSN:20 OHM,5%,0.25W	01121	CB2005
A22R84	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
A22R85	315-0200-00			RES.,FXD,CMPSN:20 OHM,5%,0.25W	01121	CB2005
A22R87	321-0184-00			RES.,FXD,FILM:806 OHM,1%,0.125W	91637	MFF1816G806R0F
A22R90	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A22R92	321-0358-00			RES.,FXD,FILM:52.3K OHM,1%,0.125W	91637	MFF1816G52301F
A22R97	321-0124-00			RES.,FXD,FILM:191 OHM,1%,0.125W	91637	MFF1816G191R0F
A22RT22	307-0250-00			RES.,THERMAL:390 OHM,10%	15454	DG125390K
A22RT86	307-0250-00			RES.,THERMAL:390 OHM,10%	15454	DG125390K
A22T04	120-1158-00			XFMR,RF:BALUN	80009	120-1158-00
A22T54	120-1157-00			XFMR,RF:TOROID,4 T QUADFILAR	80009	120-1157-00
A22T58	120-1157-00			XFMR,RF:TOROID,4 T QUADFILAR	80009	120-1157-00
A22T71	120-1159-00			XFMR,RF:TOROID,7 T,TRIFILAR	80009	120-1159-00
A22T78	120-1158-00			XFMR,RF:BALUN	80009	120-1158-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A23	670-5003-02			CKT BOARD ASSY:AURAL SWITCH	80009	670-5003-02
A23C11	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A23C15	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A23C22	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	72982	8131N075 E474M
A23C27	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A23C35	290-0782-00			CAP.,FXD,ELCTLT:4.7UF,+75-10%,35V	56289	503D475G035AS
A23C40	283-0603-00			CAP.,FXD,MICA D:113PF,2%,300V	00853	D153F1130G0
A23C41	281-0167-00			CAP.,VAR,CER DI:9-45PF,200V	72982	538-011-D 9-45
A23C42	283-0785-00			CAP.,FXD,MICA D:250PF,1%,500V	09023	CD15FD251F03
A23C43	283-0618-00			CAP.,FXD,MICA D:130PF,2%,400V	00853	D155E131G0
A23C44	281-0167-00			CAP.,VAR,CER DI:9-45PF,200V	72982	538-011-D 9-45
A23C46	283-0785-00			CAP.,FXD,MICA D:250PF,1%,500V	09023	CD15FD251F03
A23C47	283-0618-00			CAP.,FXD,MICA D:130PF,2%,400V	00853	D155E131G0
A23C48	281-0167-00			CAP.,VAR,CER DI:9-45PF,200V	72982	538-011-D 9-45
A23C64	283-0725-00			CAP.,FXD,MICA D:214PF,1%,500V	00853	D15-5E2140F0
A23C65	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A23C66	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A23C71	283-0725-00			CAP.,FXD,MICA D:214PF,1%,500V	00853	D15-5E2140F0
A23C75	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A23C84	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A23C89	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A23C93	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A23C99	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A23CR83	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A23CR84	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A23CR88	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A23CR94	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A23CR95	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A23CR97	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A23L36	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A23L51	114-0266-00			COIL,RF:VARIABLE,400-800NH	80009	114-0266-00
A23L54	114-0266-00			COIL,RF:VARIABLE,400-800NH	80009	114-0266-00
A23L58	114-0266-00			COIL,RF:VARIABLE,400-800NH	80009	114-0266-00
A23L61	114-0333-00			COIL,RF:310-600NH,ON CORE 276-0560-00	80009	114-0333-00
A23L82	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A23Q13	151-0472-00			TRANSISTOR:SILICON,NPN	80009	151-0472-00
A23Q17	151-0333-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	04713	SPS1752
A23R13	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A23R15	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A23R23	315-0622-00			RES.,FXD,CMPSN:6.2K OHM,5%,0.25W	01121	CB6225
A23R24	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A23R25	315-0430-00			RES.,FXD,CMPSN:43 OHM,5%,0.25W	01121	CB4305
A23R27	315-0121-00			RES.,FXD,CMPSN:120 OHM,5%,0.25W	01121	CB1215
A23R33	315-0430-00			RES.,FXD,CMPSN:43 OHM,5%,0.25W	01121	CB4305
A23R36	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A23R53	315-0182-00			RES.,FXD,CMPSN:1.8K OHM,5%,0.25W	01121	CB1825
A23R56	315-0182-00			RES.,FXD,CMPSN:1.8K OHM,5%,0.25W	01121	CB1825
A23R64	321-0134-00			RES.,FXD,FILM:243 OHM,1%,0.125W	91637	MFF1816G243R0F
A23R65	321-0024-00			RES.,FXD,FILM:17.4 OHM,1%,0.125W	91637	MFF1816G17R40F
A23R66	321-0134-00			RES.,FXD,FILM:243 OHM,1%,0.125W	91637	MFF1816G243R0F
A23R71	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A23R78	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A23R81	321-0099-00			RES.,FXD,FILM:105 OHM,1%,0.125W	91637	MFF1816G105R0F
A23R82	321-0006-00			RES.,FXD,FILM:11.3 OHM,1%,0.125W	24546	NA55D11R3F
A23R83	321-0006-00			RES.,FXD,FILM:11.3 OHM,1%,0.125W	24546	NA55D11R3F
A23R86	301-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.50W	01121	EB5115
A23R87	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A23R96	301-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.50W	01121	EB5115
A23R97	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A23T29	120-1155-00			XFMR,RF:TOROID,4 T TRIFILAR	80009	120-1155-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A24	670-5004-03			CKT BOARD ASSY:I.F. S.W.F. PREAMP	80009	670-5004-03
A24C54	283-0598-00			CAP.,FXD,MICA D:253PF,5%,300V	09023	CD15EC(253)J03
A24C57	290-0804-00			CAP.,FXD,ELCTLT:10UF,+50-10%,25V	55680	25ULA10V-T
A24C65	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A24C66	290-0804-00			CAP.,FXD,ELCTLT:10UF,+50-10%,25V	55680	25ULA10V-T
A24C73	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A24C74	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A24C76	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A24C78	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A24C83	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A24C85	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	72982	8131N075 E474M
A24C90	----- -----			(SELECTED)		
A24C95	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	72982	8131N075 E474M
A24C96	283-0636-00			CAP.,FXD,MICA D:36PF,1.4%,100V	00853	D155F360G0
A24C98	283-0635-00			CAP.,FXD,MICA D:51PF,1%,100V	00853	D151E510F0
A24C99	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A24CR18	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A24CR78	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A24FL23	155-0223-00			MICROCIRCUIT,LI:NARROW BAND FILTER	80009	155-0223-00
A24L52	114-0288-00			COIL,RF:VAR,450-850NH	80009	114-0288-00
A24L58	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A24L66	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A24L83	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A24Q71	151-0451-00			TRANSISTOR:SILICON,NPN	02735	65128
A24Q82	151-0438-00			TRANSISTOR:SILICON,PNP,SEL FROM SPS6927	80009	151-0438-00
A24Q85	151-0223-00			TRANSISTOR:SILICON,NPN	04713	SPS8026
A24Q97	151-0472-00			TRANSISTOR:SILICON,NPN	80009	151-0472-00
A24R63	305-0271-00			RES.,FXD,CMPSN:270 OHM,5%,2W	01121	HB2715
A24R65	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A24R70	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A24R71	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A24R72	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A24R73	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A24R75	315-0622-00			RES.,FXD,CMPSN:6.2K OHM,5%,0.25W	01121	CB6225
A24R76	311-1501-00			RES.,VAR,NONWIR:20 OHM,10%,0.50W	73138	72-37-0
A24R77	315-0200-00			RES.,FXD,CMPSN:20 OHM,5%,0.25W	01121	CB2005
A24R79	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A24R81	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A24R83	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A24R85	321-0030-00			RES.,FXD,FILM:20 OHM,1%,0.125W	91637	MFF1816G20R00F
A24R87	321-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.125W	91637	MFF1816G49R90F
A24R88	315-0162-00			RES.,FXD,CMPSN:1.6K OHM,5%,0.25W	01121	CB1625
A24R90	----- -----			(TEST SELECTABLE)		
A24R93	311-1936-00			RES.,VAR,NONWIR:CKT BD,50 OHM,20%,0.5W	73138	MODEL 72X
A24R96	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A24R97	321-0092-00			RES.,FXD,FILM:88.7 OHM,1%,0.125W	91637	MFF1816G88R70F
A24R98	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A24T55	120-0487-00			XFMR,TOROID:5 TURNS BIFILAR	80009	120-0487-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A25	670-5004-02			CKT BOARD ASSY:I.F. S.W.F. PREAMP	80009	670-5004-02
A25C54	283-0598-00			CAP.,FXD,MICA D:253PF,5%,300V	09023	CD15EC(253)J03
A25C57	290-0804-00			CAP.,FXD,ELCTLT:10UF,+50-10%,25V	55680	25ULA10V-T
A25C65	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A25C66	290-0804-00			CAP.,FXD,ELCTLT:10UF,+50-10%,25V	55680	25ULA10V-T
A25C73	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A25C74	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A25C76	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A25C78	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A25C83	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A25C85	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	72982	8131N075 E474M
A25C90	----- -----			(SELECTED)		
A25C95	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	72982	8131N075 E474M
A25C96	283-0636-00			CAP.,FXD,MICA D:36PF,1.4%,100V	00853	D155F360G0
A25C98	283-0635-00			CAP.,FXD,MICA D:51PF,1%,100V	00853	D151E510F0
A25C99	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A25CR18	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A25CR78	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A25FL23	155-0224-00			MICROCIRCUIT,LI:WIDE BAND FILTER	80009	155-0224-00
A25L52	114-0288-00			COIL,RF:VAR,450-850NH	80009	114-0288-00
A25L58	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A25L66	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A25L83	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A25Q71	151-0451-00			TRANSISTOR:SILICON,NPN	02735	65128
A25Q82	151-0438-00			TRANSISTOR:SILICON,PNP,SEL FROM SPS6927	80009	151-0438-00
A25Q85	151-0223-00			TRANSISTOR:SILICON,NPN	04713	SPS8026
A25Q97	151-0472-00			TRANSISTOR:SILICON,NPN	80009	151-0472-00
A25R63	305-0271-00			RES.,FXD,CMPSN:270 OHM,5%,2W	01121	HB2715
A25R65	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A25R70	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A25R71	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A25R72	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A25R73	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A25R75	315-0622-00			RES.,FXD,CMPSN:6.2K OHM,5%,0.25W	01121	CB6225
A25R76	311-1501-00			RES.,VAR,NONWIR:20 OHM,10%,0.50W	73138	72-37-0
A25R77	315-0200-00			RES.,FXD,CMPSN:20 OHM,5%,0.25W	01121	CB2005
A25R79	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A25R81	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A25R83	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A25R85	321-0030-00			RES.,FXD,FILM:20 OHM,1%,0.125W	91637	MFF1816G20R00F
A25R87	321-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.125W	91637	MFF1816G49R90F
A25R88	315-0162-00			RES.,FXD,CMPSN:1.6K OHM,5%,0.25W	01121	CB1625
A25R90	----- -----			SELECTED(NOMINL VALUE,1K)		
A25R93	311-1936-00			RES.,VAR,NONWW:TRMR,50 OHM,20%,0.5W	32997	3386C-T07-500
A25R96	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A25R97	321-0101-00			RES.,FXD,FILM:110 OHM,1%,0.125W	91637	MFF1816G110R0F
A25R98	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A25T55	120-0487-00			XFMR,TOROID:5 TURNS BIFILAR	80009	120-0487-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A26	670-6667-00			CKT BOARD ASSY:I.F. S.W.R. POSTAMP	80009	670-6667-00
A26C22	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A26C24	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A26C25	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A26C26	283-0594-00			CAP.,FXD,MICA D:0.001UF,1%,100V	00853	D151F102F0
A26C27	283-0648-00			CAP.,FXD,MICA D:10PF,5%,100V	00853	D151C100D0
A26C28	283-0666-00			CAP.,FXD,MICA D:890PF,2%,100V	00853	D151F891G0
A26C31	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A26C35	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	72982	8131N075 E474M
A26C37	283-0648-00			CAP.,FXD,MICA D:10PF,5%,100V	00853	D151C100D0
A26C43	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	72982	8131N075 E474M
A26C45	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A26C46	283-0635-00			CAP.,FXD,MICA D:51PF,1%,100V	00853	D151E510F0
A26C52	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A26C55	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A26C56	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A26C57	290-0782-00			CAP.,FXD,ELCTLT:4.7UF,+75-10%,35V	56289	503D475G035AS
A26C58	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A26C62	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A26C64	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A26C70	281-0097-00			CAP.,VAR,CER DI:9-35PF,200V	72982	538-006-D9-35
A26C72	281-0611-00			CAP.,FXD,CER DI:2.7PF,+/-0.25PF,200V	72982	374001C0J279C
A26C76	290-0782-00			CAP.,FXD,ELCTLT:4.7UF,+75-10%,35V	56289	503D475G035AS
A26C80	283-0636-00			CAP.,FXD,MICA D:36PF,1.4%,100V	00853	D155F360G0
A26C84	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A26C85	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A26C94	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A26CR56	152-0579-00			SEMICOND DEVICE:SILICON,100V,2.5A	12969	UM6601B
A26E13	276-0543-02			SHIELDING BEAD,:	78488	57-3096
A26E23	276-0543-02			SHIELDING BEAD,:	78488	57-3096
A26E33	276-0543-02			SHIELDING BEAD,:	78488	57-3096
A26E71	276-0543-02			SHIELDING BEAD,:	78488	57-3096
A26L56	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A26L58	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A26L72	108-0345-00			COIL,RF:FIXED,1.89UH	80009	108-0345-00
A26L78	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A26LR81	108-0212-00			COIL,RF:FIXED,495NH	80009	108-0212-00
A26Q13	151-0333-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	04713	SPS1752
A26Q23	151-0333-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	04713	SPS1752
A26Q33	151-0472-00			TRANSISTOR:SILICON,NPN	80009	151-0472-00
A26Q53	151-0223-00			TRANSISTOR:SILICON,NPN	04713	SPS8026
A26Q71	151-0438-00			TRANSISTOR:SILICON,PNP,SEL FROM SPS6927	80009	151-0438-00
A26Q81	151-0451-00			TRANSISTOR:SILICON,NPN	02735	65128
A26R10	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
A26R11	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
A26R12	315-0132-00			RES.,FXD,CMPSN:1.3K OHM,5%,0.25W	01121	CB1325
A26R15	307-0103-00			RES.,FXD,CMPSN:2.7 OHM,5%,0.25W	01121	CB27G5
A26R21	315-0181-00			RES.,FXD,CMPSN:180 OHM,5%,0.25W	01121	CB1815
A26R22	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
A26R30	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
A26R31	315-0132-00			RES.,FXD,CMPSN:1.3K OHM,5%,0.25W	01121	CB1325
A26R32	321-0089-00			RES.,FXD,FILM:82.5 OHM,1%,0.125W	91637	MFF1816G82R50F
A26R34	307-0103-00			RES.,FXD,CMPSN:2.7 OHM,5%,0.25W	01121	CB27G5
A26R41	311-1936-00			RES.,VAR,NONWIR:CKT BD,50 OHM,20%,0.5W	73138	MODEL 72X
A26R42	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A26R44	315-0162-00			RES.,FXD,CMPSN:1.6K OHM,5%,0.25W	01121	CB1625
A26R45	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A26R46	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A26R48	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A26R53	321-0030-00			RES.,FXD,FILM:20 OHM,1%,0.125W	91637	MFF1816G20R00F
A26R54	315-0330-00			RES.,FXD,CMPSN:33 OHM,5%,0.25W	01121	CB3305
A26R58	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
A26R63	321-0147-00			RES.,FXD,FILM:332 OHM,1%,0.125W	91637	MFF1816G332R0F
A26R64	311-1501-00			RES.,VAR,NONWIR:20 OHM,10%,0.50W	73138	72-37-0
A26R65	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A26R66	315-0430-00			RES.,FXD,CMPSN:43 OHM,5%,0.25W	01121	CB4305
A26R71	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A26R73	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A26R74	315-0622-00			RES.,FXD,CMPSN:6.2K OHM,5%,0.25W	01121	CB6225
A26R75	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A26R80	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A26R85	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A26R87	321-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.125W	91637	MFF1816G49R90F
A26R96	321-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.125W	91637	MFF1816G49R90F
A26R97	305-0271-00			RES.,FXD,CMPSN:270 OHM,5%,2W	01121	HB2715

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A27	670-5008-00			CKT BOARD ASSY:I.F. ZERO CARRIER	80009	670-5008-00
A27C03	283-0633-00			CAP.,FXD,MICA D:77PF,1%,100V	00853	D151E770F0
A27C10	281-0096-00			CAP.,VAR,AIR DI:5.5-18PF,350V	72982	538-006-A5.5-18
A27C27	283-0598-00			CAP.,FXD,MICA D:253PF,5%,300V	09023	CD15EC(253)J03
A27C31	283-0598-00			CAP.,FXD,MICA D:253PF,5%,300V	09023	CD15EC(253)J03
A27C56	283-0644-00			CAP.,FXD,MICA D:150PF,1%,500V	00853	D155E151F0
A27C57	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A27C88	283-0668-00			CAP.,FXD,MICA D:184PF,1%,500V	00853	D155F1840F0
A27C95	283-0706-00			CAP.,FXD,MICA D:91PF,+/-1PF,500V	00853	D15-5E910F0
A27CR53	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A27CR66	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A27CR74	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A27CR75	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A27CR84	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A27CR85	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A27L13	114-0220-00			COIL,RF:1-3UH	80009	114-0220-00
A27L21	114-0333-00			COIL,RF:310-600NH	80009	114-0333-00
A27L25	114-0333-00			COIL,RF:310-600NH	80009	114-0333-00
A27L48	120-1143-00			XFMR,RF:VARIABLE	80009	120-1143-00
A27L89	108-0733-00			COIL,RF:113NH	80009	108-0733-00
A27L98	120-1146-00			XFMR,RF:VARIABLE	80009	120-1146-00
A27Q58	151-0325-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
A27R33	321-0085-00			RES.,FXD,FILM:75 OHM,1%,0.125W	91637	MFF1816G75R00F
A27R43	321-0071-00			RES.,FXD,FILM:53.6 OHM,1%,0.125W	91637	MFF1816G53R60F
A27R44	321-0085-00			RES.,FXD,FILM:75 OHM,1%,0.125W	91637	MFF1816G75R00F
A27R45	321-0022-00			RES.,FXD,FILM:16.5 OHM,1%,0.125W	91637	MFF1816G16R50F
A27R55	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
A27R58	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A27R62	315-0330-00			RES.,FXD,CMPSN:33 OHM,5%,0.25W	01121	CB3305
A27R66	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
A27R68	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A27R72	311-1423-00			RES.,VAR,NONWIR:20 OHM,20%,0.50W	73138	72PM-01-0-200
A27R73	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
A27R75	315-0330-00			RES.,FXD,CMPSN:33 OHM,5%,0.25W	01121	CB3305
A27R82	321-0007-00			RES.,FXD,FILM:11.5 OHM,1%,0.125W	91637	MFF1816G11R50F
A27R83	321-0158-00			RES.,FXD,FILM:432 OHM,1%,0.125W	91637	MFF1816G432R0F
A27R84	315-0330-00			RES.,FXD,CMPSN:33 OHM,5%,0.25W	01121	CB3305
A27R94	321-0158-00			RES.,FXD,FILM:432 OHM,1%,0.125W	91637	MFF1816G432R0F
A27T55	120-1156-00			XFMR,RF:TOROID,11 T,TRIFILAR	80009	120-1156-00
A27T65	120-0571-00			XFMR,TOROID:11 TURNS QUADFILAR	80009	120-0571-00
A27T94	120-1156-00			XFMR,RF:TOROID,11 T,TRIFILAR	80009	120-1156-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A28	670-5009-01			CKT BOARD ASSY:DET-VIDEO AMP	80009	670-5009-01
A28C05	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A28C07	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A28C17	283-0635-00			CAP.,FXD,MICA D:51PF,1%,100V	00853	D151E510F0
A28C34	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A28C41	283-0634-00			CAP.,FXD,MICA D:65PF,1%,100V	00853	D151E650F0
A28C47	283-0632-00			CAP.,FXD,MICA D:87PF,1%,100V	00853	D151E870F0
A28C51	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A28C57	283-0663-00			CAP.,FXD,MICA D:16.8PF,+/-0.5PF,500V	00853	D155C16.8D0
A28C58	290-0804-00			CAP.,FXD,ELCTLT:10UF,+50-10%,25V	55680	25ULA10V-T
A28C59	290-0804-00			CAP.,FXD,ELCTLT:10UF,+50-10%,25V	55680	25ULA10V-T
A28C66	283-0620-00			CAP.,FXD,MICA D:470PF,1%,300V	00853	D153F471F0
A28C76	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A28C78	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A28C86	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M020FL
A28C98	283-0084-00			CAP.,FXD,CER DI:270PF,5%,1000V	72982	838-533B271J
A28E83	276-0543-00			SHLD BEAD,ELEK:FERRITE	80009	276-0543-00
A28L38	108-0262-00			COIL,RF:FIXED,50MH	80009	108-0262-00
A28L44	114-0325-00			COIL,RF:VAR,2.4-6.7UH	80009	114-0325-00
A28L54	114-0222-00			COIL,RF:2-6UH	80009	114-0222-00
A28L64	120-1144-00			XFMR,RF:VARIABLE	80009	120-1144-00
A28L88	108-0733-00			COIL,RF:113NH	80009	108-0733-00
A28L89	108-0733-00			COIL,RF:113NH	80009	108-0733-00
A28LR14	108-0212-00			COIL,RF:FIXED,495NH	80009	108-0212-00
A28LR24	108-0212-00			COIL,RF:FIXED,495NH	80009	108-0212-00
A28Q11	151-0195-00			TRANSISTOR:SILICON,NPN	80009	151-0195-00
A28Q20	151-0195-00			TRANSISTOR:SILICON,NPN	80009	151-0195-00
A28Q21	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
A28Q31	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
A28Q71	151-0195-00			TRANSISTOR:SILICON,NPN	80009	151-0195-00
A28Q81	151-0195-00			TRANSISTOR:SILICON,NPN	80009	151-0195-00
A28Q83	151-0195-00			TRANSISTOR:SILICON,NPN,SEL FROM SPS6927	80009	151-0195-00
A28Q86	151-0103-00			TRANSISTOR:SILICON,NPN	80009	151-0103-00
A28R01	321-0085-00			RES.,FXD,FILM:75 OHM,1%,0.125W	91637	MFF1816G75R00F
A28R02	321-0085-00			RES.,FXD,FILM:75 OHM,1%,0.125W	91637	MFF1816G75R00F
A28R11	311-1239-00			RES.,VAR,NONWIR:2.5K OHM,10%,0.50W	73138	72X-76-0-252K
A28R12	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
A28R14	321-0142-00			RES.,FXD,FILM:294 OHM,1%,0.125W	91637	MFF1816G294R0F
A28R16	321-0091-00			RES.,FXD,FILM:86.6 OHM,1%,0.125W	91637	MFF1816G86R60F
A28R19	321-0088-00			RES.,FXD,FILM:80.6 OHM,1%,0.125W	91637	MFF1816G80R60F
A28R23	321-0211-00			RES.,FXD,FILM:1.54K OHM,1%,0.125W	91637	MFF1816G15400F
A28R24	321-0195-00			RES.,FXD,FILM:1.05K OHM,1%,0.125W	91637	MFF1816G10500F
A28R25	321-0195-00			RES.,FXD,FILM:1.05K OHM,1%,0.125W	91637	MFF1816G10500F
A28R31	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A28R37	315-0560-00			RES.,FXD,CMPSN:56 OHM,5%,0.25W	01121	CB5605
A28R40	----- -----			(SELECTED)		
A28R41	321-0193-07			RES.,FXD,FILM:1K OHM,0.1%,0.125W	91637	MFF1816C10000B
A28R42	321-0193-07			RES.,FXD,FILM:1K OHM,0.1%,0.125W	91637	MFF1816C10000B
A28R43	----- -----			(SELECTED)		
A28R60	311-1241-00			RES.,VAR,NONWIR:100K OHM,10%,0.5W	32997	3386X-T07-104
A28R61	321-0306-00			RES.,FXD,FILM:15K OHM,1%,0.125W	91637	MFF1816G15001F
A28R62	321-0312-00			RES.,FXD,FILM:17.4K OHM,1%,0.125W	91637	MFF1816G17401F
A28R64	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
A28R72	321-0093-00			RES.,FXD,FILM:90.9 OHM,1%,0.125W	91637	MFF1816G90R90F
A28R77	301-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.50W	01121	EB1015
A28R83	321-0222-00			RES.,FXD,FILM:2K OHM,1%,0.125W	91637	MFF1816G20000F
A28R85	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A28R86	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
A28R87	321-0066-00			RES.,FXD,FILM:47.5 OHM,1%,0.125W	91637	MFF1816G47R50F
A28R88	321-0085-00			RES.,FXD,FILM:75 OHM,1%,0.125W	91637	MFF1816G75R00F
A28R89	321-0085-00			RES.,FXD,FILM:75 OHM,1%,0.125W	91637	MFF1816G75R00F
A28R90	321-0302-00			RES.,FXD,FILM:13.7K OHM,1%,0.125W	91637	MFF1816G13701F
A28R91	321-0273-00			RES.,FXD,FILM:6.81K OHM,1%,0.125W	91637	MFF1816G68100F
A28R92	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A28R93	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A28R95	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
A28R97	308-0299-00			RES.,FXD,WW:300 OHM,1%,3W	01686	T2A-300R-F-10
A28T09	120-1149-00			XFMR,RF:TOROID,5 T QUADFILAR	80009	120-1149-00
A28R27	120-1148-00			XFMR,RF:TOROID,5 T,TRIFILAR	80009	120-1148-00
A28U14	156-0130-01			MICROCIRCUIT,LI:MODULATOR/DEMODULATOR	04713	MC1496
A28VR94	152-0166-00			SEMICOND DEVICE:ZENER,0.4W,6.2V,5%	04713	SZ11738

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A29	670-5009-01			CKT BOARD ASSY:DET-VIDEO AMP	80009	670-5009-01
A29C05	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A29C07	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A29C17	283-0635-00			CAP.,FXD,MICA D:51PF,1%,100V	00853	D151E510F0
A29C34	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A29C41	283-0634-00			CAP.,FXD,MICA D:65PF,1%,100V	00853	D151E650F0
A29C47	283-0632-00			CAP.,FXD,MICA D:87PF,1%,100V	00853	D151E870F0
A29C51	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A29C57	283-0663-00			CAP.,FXD,MICA D:16.8PF,+/-0.5PF,500V	00853	D155C16.8D0
A29C58	290-0804-00			CAP.,FXD,ELCTLT:10UF,+50-10%,25V	55680	25ULA10V-T
A29C59	290-0804-00			CAP.,FXD,ELCTLT:10UF,+50-10%,25V	55680	25ULA10V-T
A29C66	283-0620-00			CAP.,FXD,MICA D:470PF,1%,300V	00853	D153F471F0
A29C76	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A29C78	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A29C86	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M020FL
A29C98	283-0084-00			CAP.,FXD,CER DI:270PF,5%,1000V	72982	838-533B271J
A29E83	276-0543-00			SHLD BEAD,ELEK:FERRITE	80009	276-0543-00
A29L38	108-0262-00			COIL,RF:FIXED,50MH	80009	108-0262-00
A29L44	114-0325-00			COIL,RF:VAR,2.4-7.6UH	80009	114-0325-00
A29L54	114-0222-00			COIL,RF:2-6UH	80009	114-0222-00
A29L64	120-1144-00			XFMR,RF:VARIABLE	80009	120-1144-00
A29L88	108-0733-00			COIL,RF:113NH	80009	108-0733-00
A29L89	108-0733-00			COIL,RF:113NH	80009	108-0733-00
A29LR14	108-0212-00			COIL,RF:FIXED,495NH	80009	108-0212-00
A29LR24	108-0212-00			COIL,RF:FIXED,495NH	80009	108-0212-00
A29Q11	151-0195-00			TRANSISTOR:SILICON,NPN	80009	151-0195-00
A29Q20	151-0195-00			TRANSISTOR:SILICON,NPN	80009	151-0195-00
A29Q21	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
A29Q31	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
A29Q71	151-0195-00			TRANSISTOR:SILICON,NPN	80009	151-0195-00
A29Q81	151-0195-00			TRANSISTOR:SILICON,NPN	80009	151-0195-00
A29Q83	151-0438-00			TRANSISTOR:SILICON,PNP,SEL FROM SPS6927	80009	151-0438-00
A29Q86	151-0103-00			TRANSISTOR:SILICON,NPN	80009	151-0103-00
A29R01	321-0085-00			RES.,FXD,FILM:75 OHM,1%,0.125W	91637	MFF1816G75R00F
A29R02	321-0085-00			RES.,FXD,FILM:75 OHM,1%,0.125W	91637	MFF1816G75R00F
A29R11	311-1239-00			RES.,VAR,NONWIR:2.5K OHM,10%,0.50W	73138	72X-76-0-252K
A29R12	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
A29R14	321-0142-00			RES.,FXD,FILM:294 OHM,1%,0.125W	91637	MFF1816G294R0F
A29R16	321-0091-00			RES.,FXD,FILM:86.6 OHM,1%,0.125W	91637	MFF1816G86R60F
A29R19	321-0088-00			RES.,FXD,FILM:80.6 OHM,1%,0.125W	91637	MFF1816G80R60F
A29R23	321-0211-00			RES.,FXD,FILM:1.54K OHM,1%,0.125W	91637	MFF1816G15400F
A29R24	321-0195-00			RES.,FXD,FILM:1.05K OHM,1%,0.125W	91637	MFF1816G10500F
A29R25	321-0195-00			RES.,FXD,FILM:1.05K OHM,1%,0.125W	91637	MFF1816G10500F
A29R31	321-0202-00			RES.,FXD,FILM:1.24K OHM,1%,0.125W	91637	MFF1816G12400F
A29R37	315-0560-00			RES.,FXD,CMPSN:56 OHM,5%,0.25W	01121	CB5605
A29R40	----- -----			(SELECTED)		
A29R41	321-0193-07			RES.,FXD,FILM:1K OHM,0.1%,0.125W	91637	MFF1816C10000B
A29R42	321-0193-07			RES.,FXD,FILM:1K OHM,0.1%,0.125W	91637	MFF1816C10000B
A29R43	----- -----			(SELECTED)		
A29R60	311-1241-00			RES.,VAR,NONWIR:100K OHM,10%,0.5W	32997	3386X-T07-104
A29R61	321-0306-00			RES.,FXD,FILM:15K OHM,1%,0.125W	91637	MFF1816G15001F
A29R62	321-0312-00			RES.,FXD,FILM:17.4K OHM,1%,0.125W	91637	MFF1816G17401F
A29R64	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
A29R72	321-0093-00			RES.,FXD,FILM:90.9 OHM,1%,0.125W	91637	MFF1816G90R90F
A29R77	301-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.50W	01121	EB1015
A29R83	321-0222-00			RES.,FXD,FILM:2K OHM,1%,0.125W	91637	MFF1816G20000F
A29R85	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A29R86	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
A29R87	321-0066-00			RES.,FXD,FILM:47.5 OHM,1%,0.125W	91637	MFF1816G47R50F
A29R88	321-0085-00			RES.,FXD,FILM:75 OHM,1%,0.125W	91637	MFF1816G75R00F
A29R89	321-0085-00			RES.,FXD,FILM:75 OHM,1%,0.125W	91637	MFF1816G75R00F
A29R90	321-0302-00			RES.,FXD,FILM:13.7K OHM,1%,0.125W	91637	MFF1816G13701F
A29R91	321-0273-00			RES.,FXD,FILM:6.81K OHM,1%,0.125W	91637	MFF1816G68100F
A29R92	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A29R93	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A29R95	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
A29R97	308-0299-00			RES.,FXD,WW:300 OHM,1%,3W	01686	T2A-300R-F-10
A29T09	120-1149-00			XFMR,RF:TOROID,5 T QUADFILAR	80009	120-1149-00
A29R27	120-1148-00			XFMR,RF:TOROID,5 T,TRIFILAR	80009	120-1148-00
A29U14	156-0130-01			MICROCIRCUIT,LI:MODULATOR/DEMODULATOR	04713	MC1496
A29VR94	152-0066-01			SEMICOND DEVICE:ZENER,0.4W,6.2V,5%	04713	SZ11738

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A30	----- -----			CKT BOARD ASSY:PIN DRIVER		
	----- -----			(REPLACEABLE AS A UNIT WITH A80)		
A30C87	290-0573-00			CAP.,FXD,ELCTLT:2.7UF,20%,50V	56289	196D275X0050JA1
A30C88	290-0512-00			CAP.,FXD,ELCTLT:22UF,20%,15V	56289	196D226X0015KA1
A30CR17	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A30CR21	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A30CR22	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A30CR27	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A30CR28	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A30CR31	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A30CR32	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A30CR37	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A30CR38	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A30CR41	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A30CR47	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A30CR51	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A30CR52	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A30CR57	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A30CR58	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A30CR61	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A30CR62	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A30CR67	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A30CR68	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A30CR71	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A30CR77	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A30CR81	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A30Q00	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A30Q10	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A30Q19	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A30Q20	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A30Q21	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A30Q28	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A30Q29	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A30Q30	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A30Q31	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A30Q38	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A30Q39	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A30Q40	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A30Q48	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A30Q50	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A30Q51	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A30Q58	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A30Q59	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A30Q60	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A30Q61	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A30Q68	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A30Q69	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A30Q70	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A30Q79	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A30Q80	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A30Q81	151-0195-00			TRANSISTOR:SILICON,NPN	80009	151-0195-00
A30Q88	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A30Q89	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A30R02	321-0932-03			RES.,FXD,FILM:2.5K OHM,0.25%,0.125W	91637	MFF1816D25000C
A30R12	321-0932-03			RES.,FXD,FILM:2.5K OHM,0.25%,0.125W	91637	MFF1816D25000C
A30R17	315-0275-00			RES.,FXD,CMPSN:2.7M OHM,5%,0.25W	01121	CB2755
A30R21	321-0932-03			RES.,FXD,FILM:2.5K OHM,0.25%,0.125W	91637	MFF1816D25000C

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A30R22	321-0816-07			RES.,FXD,FILM:5K OHM,0.1%,0.125W	91637	MFF1816C50000B
A30R27	315-0135-00			RES.,FXD,CMPSN:1.3M OHM,5%,0.25W	01121	CB1355
A30R28	321-0463-00			RES.,FXD,FILM:649K OHM,1%,0.125W	91637	MFF1816G64902F
A30R31	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A30R32	321-0318-00			RES.,FXD,FILM:20K OHM,1%,0.125W	91637	MFF1816G20001F
A30R37	321-0434-00			RES.,FXD,FILM:324K OHM,1%,0.125W	91637	MFF1816G32402F
A30R38	321-0405-00			RES.,FXD,FILM:162K OHM,1%,0.125W	91637	MFF1816G16202F
A30R41	321-0924-07			RES.,FXD,FILM:40K OHM,0.1%,0.125W	91637	MFF1816C40001B
A30R47	321-0376-00			RES.,FXD,FILM:80.6K OHM,1%,0.125W	91637	MFF1816G80601F
A30R51	321-0376-00			RES.,FXD,FILM:80.6K OHM,1%,0.125W	91637	MFF1816G80601F
A30R52	321-0405-00			RES.,FXD,FILM:162K OHM,1%,0.125W	91637	MFF1816G16202F
A30R57	321-0924-07			RES.,FXD,FILM:40K OHM,0.1%,0.125W	91637	MFF1816C40001B
A30R58	321-0318-00			RES.,FXD,FILM:20K OHM,1%,0.125W	91637	MFF1816G20001F
A30R61	321-0434-00			RES.,FXD,FILM:324K OHM,1%,0.125W	91637	MFF1816G32402F
A30R62	321-0463-00			RES.,FXD,FILM:649K OHM,1%,0.125W	91637	MFF1816G64902F
A30R67	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A30R68	321-0816-07			RES.,FXD,FILM:5K OHM,0.1%,0.125W	91637	MFF1816C50000B
A30R71	315-0135-00			RES.,FXD,CMPSN:1.3M OHM,5%,0.25W	01121	CB1355
A30R77	321-0932-03			RES.,FXD,FILM:2.5K OHM,0.25%,0.125W	91637	MFF1816D25000C
A30R81	315-0275-00			RES.,FXD,CMPSN:2.7M OHM,5%,0.25W	01121	CB2755
A30R82	315-0161-00			RES.,FXD,CMPSN:160 OHM,5%,0.25W	01121	CB1615
A30R87	321-0932-03			RES.,FXD,FILM:2.5K OHM,0.25%,0.125W	91637	MFF1816D25000C
A30R88	321-0932-03			RES.,FXD,FILM:2.5K OHM,0.25%,0.125W	91637	MFF1816D25000C
A30R92	321-0227-00			RES.,FXD,FILM:2.26K OHM,1%,0.125W	91637	MFF1816G22600F
A30R93	321-0299-00			RES.,FXD,FILM:12.7K OHM,1%,0.125W	91637	MFF1816G12701F
A30U14	----- -----			(REPLACEABLE AS A UNIT WITH A80)		
A30U44	----- -----			(REPLACEABLE AS A UNIT WITH A80)		
A30U64	----- -----			(REPLACEABLE AS A UNIT WITH A80)		

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A31	----- -----			CKT BOARD ASSY:PIN DRIVER		
	----- -----			(REPLACEABLE AS A UNIT WITH A82)		
A31C87	290-0573-00			CAP.,FXD,ELCTLT:2.7UF,20%,50V	56289	196D275X0050JA1
A31C88	290-0512-00			CAP.,FXD,ELCTLT:22UF,20%,15V	56289	196D226X0015KA1
A31CR17	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A31CR21	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A31CR22	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A31CR27	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A31CR28	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A31CR31	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A31CR32	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A31CR37	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A31CR38	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A31CR41	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A31CR47	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A31CR51	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A31CR52	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A31CR57	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A31CR58	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A31CR61	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A31CR62	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A31CR67	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A31CR68	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A31CR71	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A31CR77	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A31CR81	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A31Q00	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A31Q10	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A31Q19	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A31Q20	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A31Q21	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A31Q28	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A31Q29	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A31Q30	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A31Q31	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A31Q38	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A31Q39	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A31Q40	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A31Q48	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A31Q50	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A31Q51	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A31Q58	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A31Q59	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A31Q60	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A31Q61	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A31Q68	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A31Q69	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A31Q70	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A31Q79	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A31Q80	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A31Q81	151-0195-00			TRANSISTOR:SILICON,NPN	80009	151-0195-00
A31Q88	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A31Q89	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A31R02	321-0932-03			RES.,FXD,FILM:2.5K OHM,0.25%,0.125W	91637	MFF1816D25000C
A31R12	321-0932-03			RES.,FXD,FILM:2.5K OHM,0.25%,0.125W	91637	MFF1816D25000C
A31R17	315-0275-00			RES.,FXD,CMPSN:2.7M OHM,5%,0.25W	01121	CB2755
A31R21	321-0932-03			RES.,FXD,FILM:2.5K OHM,0.25%,0.125W	91637	MFF1816D25000C

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A31R22	321-0816-07			RES.,FXD,FILM:5K OHM,0.1%,0.125W	91637	MFF1816C50000B
A31R27	315-0135-00			RES.,FXD,CMPSN:1.3M OHM,5%,0.25W	01121	CB1355
A31R28	321-0463-00			RES.,FXD,FILM:649K OHM,1%,0.125W	91637	MFF1816G64902F
A31R31	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A31R32	321-0318-00			RES.,FXD,FILM:20K OHM,1%,0.125W	91637	MFF1816G20001F
A31R37	321-0434-00			RES.,FXD,FILM:324K OHM,1%,0.125W	91637	MFF1816G32402F
A31R38	321-0405-00			RES.,FXD,FILM:162K OHM,1%,0.125W	91637	MFF1816G16202F
A31R41	321-0924-07			RES.,FXD,FILM:40K OHM,0.1%,0.125W	91637	MFF1816C40001B
A31R47	321-0376-00			RES.,FXD,FILM:80.6K OHM,1%,0.125W	91637	MFF1816G80601F
A31R51	321-0376-00			RES.,FXD,FILM:80.6K OHM,1%,0.125W	91637	MFF1816G80601F
A31R52	321-0405-00			RES.,FXD,FILM:162K OHM,1%,0.125W	91637	MFF1816G16202F
A31R57	321-0924-07			RES.,FXD,FILM:40K OHM,0.1%,0.125W	91637	MFF1816C40001B
A31R58	321-0318-00			RES.,FXD,FILM:20K OHM,1%,0.125W	91637	MFF1816G20001F
A31R61	321-0434-00			RES.,FXD,FILM:324K OHM,1%,0.125W	91637	MFF1816G32402F
A31R62	321-0463-00			RES.,FXD,FILM:649K OHM,1%,0.125W	91637	MFF1816G64902F
A31R67	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A31R68	321-0816-07			RES.,FXD,FILM:5K OHM,0.1%,0.125W	91637	MFF1816C50000B
A31R71	315-0135-00			RES.,FXD,CMPSN:1.3M OHM,5%,0.25W	01121	CB1355
A31R77	321-0932-03			RES.,FXD,FILM:2.5K OHM,0.25%,0.125W	91637	MFF1816D25000C
A31R81	315-0275-00			RES.,FXD,CMPSN:2.7M OHM,5%,0.25W	01121	CB2755
A31R82	315-0161-00			RES.,FXD,CMPSN:160 OHM,5%,0.25W	01121	CB1615
A31R87	321-0932-03			RES.,FXD,FILM:2.5K OHM,0.25%,0.125W	91637	MFF1816D25000C
A31R88	321-0932-03			RES.,FXD,FILM:2.5K OHM,0.25%,0.125W	91637	MFF1816D25000C
A31R92	321-0227-00			RES.,FXD,FILM:2.26K OHM,1%,0.125W	91637	MFF1816G22600F
A31R93	321-0299-00			RES.,FXD,FILM:12.7K OHM,1%,0.125W	91637	MFF1816G12701F
A31U14	----- -----			(REPLACEABLE AS A UNIT WITH A80)		
A31U44	----- -----			(REPLACEABLE AS A UNIT WITH A80)		
A31U64	----- -----			(REPLACEABLE AS A UNIT WITH A80)		

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A32	670-5010-00			CKT BOARDA ASSY:I.F. INTERFACE	80009	670-5010-00
A32C23	283-0353-00			CAP.,FXD,CER DI:0.1UF,10%,50V	95275	VJ1210Y104K-H
A32C24	283-0353-00			CAP.,FXD,CER DI:0.1UF,10%,50V	95275	VJ1210Y104K-H
A32C29	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A32C59	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A32C69	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A32L41	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A32L42	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A32Q52	151-0207-00			TRANSISTOR:SILICON,NPN	80009	151-0207-00
A32R52	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
A32W20	175-2069-00			CABLE ASSY,RF:50 OHM COAX,2.25 L	80009	175-2069-00
A32W21	175-2066-00			CABLE ASSY,RF:50 OHM COAX,1.25 L	80009	175-2066-00
A32W22	175-2067-00			CABLE ASSY,RF:50 OHM COAX,1.375 L	80009	175-2067-00
A32W23	175-2073-00			CABLE ASSY,RF:50 OHM COAX,5.125 L	80009	175-2073-00
A32W24	175-2066-00			CABLE ASSY,RF:50 OHM COAX,1.25 L	80009	175-2066-00
A32W25	175-2074-00			CABLE ASSY,RF:50 OHM COAX,5.128 L	80009	175-2074-00
A32W26	175-2066-00			CABLE ASSY,RF:50 OHM COAX,1.25 L	80009	175-2066-00
A32W27	175-2070-00			CABLE ASSY,RF:50 OHM COAX,2.75 L	80009	175-2070-00
A32W28	175-2067-00			CABLE ASSY,RF:50 OHM COAX,1.375 L	80009	175-2067-00
A32W29	175-2070-00			CABLE ASSY,RF:50 OHM COAX,2.75 L	80009	175-2070-00
A32W30	175-2072-00			CABLE ASSY,RF:50 OHM COAX,4.625 L	80009	175-2072-00
A32W31	175-2068-00			CABLE ASSY,RF:50 OHM COAX,2.0 L	80009	175-2068-00
A32W32	175-2066-00			CABLE ASSY,RF:50 OHM COAX,1.25 L	80009	175-2066-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A40	670-5011-01			CKT BOARD ASSY:1ST AUDIO MIXER	80009	670-5011-01
A40C15	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,50V	72982	8121N083Z5U0104Z
A40C17	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,50V	72982	8121N083Z5U0104Z
A40C31	283-0005-00			CAP.,FXD,CER DI:0.01UF,+100-0%,250V	72982	8131N300Z5U0103P
A40C37	283-0005-00			CAP.,FXD,CER DI:0.01UF,+100-0%,250V	72982	8131N300Z5U0103P
A40C44	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,50V	72982	8121N083Z5U0104Z
A40C47	290-0782-00			CAP.,FXD,ELCTLT:4.7UF,+75-10%,35V	56289	503D475G035AS
A40C51	283-0618-00			CAP.,FXD,MICA D:130PF,2%,400V	00853	D155E131G0
A40C52	283-0669-00			CAP.,FXD,MICA D:360PF,1%,500V	00853	D155F361F0
A40C55	283-0005-00			CAP.,FXD,CER DI:0.01UF,+100-0%,250V	72982	8131N300Z5U0103P
A40C56	283-0669-00			CAP.,FXD,MICA D:360PF,1%,500V	00853	D155F361F0
A40C57	283-0005-00			CAP.,FXD,CER DI:0.01UF,+100-0%,250V	72982	8131N300Z5U0103P
A40C59	290-0782-00			CAP.,FXD,ELCTLT:4.7UF,+75-10%,35V	56289	503D475G035AS
A40C71	283-0615-00			CAP.,FXD,MICA D:33PF,5%,500V	00853	D155E330J0
A40C72	283-0005-00			CAP.,FXD,CER DI:0.01UF,+100-0%,250V	72982	8131N300Z5U0103P
A40C73	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	72982	8131N075 E474M
A40C75	283-0615-00			CAP.,FXD,MICA D:33PF,5%,500V	00853	D155E330J0
A40C78	283-0005-00			CAP.,FXD,CER DI:0.01UF,+100-0%,250V	72982	8131N300Z5U0103P
A40C82	283-0663-00			CAP.,FXD,MICA D:16.8PF,+/-0.5PF,500V	00853	D155C16.8D0
A40C95	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A40CR25	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A40CR26	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A40CR36	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A40CR45	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A40CR49	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A40CR85	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A40CR96	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A40L38	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A40L39	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A40L55	108-0606-00			COIL,RF:37NH	80009	108-0606-00
A40L62	114-0246-00			COIL,RF:VARIABLE,700-1100NH	80009	114-0246-00
A40L66	114-0246-00			COIL,RF:VARIABLE,700-1100NH	80009	114-0246-00
A40L92	114-0220-00			COIL,RF:1-3UH	80009	114-0220-00
A40LR05	108-0212-00			COIL,RF:FIXED,495NH	80009	108-0212-00
A40LR15	108-0212-00			COIL,RF:FIXED,495NH	80009	108-0212-00
A40LR19	108-0212-00			COIL,RF:FIXED,495NH	80009	108-0212-00
A40Q46	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
A40Q72	151-0472-00			TRANSISTOR:SILICON,NPN	80009	151-0472-00
A40Q84	151-0223-00			TRANSISTOR:SILICON,NPN	04713	SPS8026
A40R01	321-0218-00			RES.,FXD,FILM:1.82K OHM,1%,0.125W	91637	MFF1816G18200F
A40R02	321-0143-00			RES.,FXD,FILM:301 OHM,1%,0.125W	91637	MFF1816G301R0F
A40R16	321-0218-00			RES.,FXD,FILM:1.82K OHM,1%,0.125W	91637	MFF1816G18200F
A40R21	321-0088-00			RES.,FXD,FILM:80.6 OHM,1%,0.125W	91637	MFF1816G80R60F
A40R22	321-0088-00			RES.,FXD,FILM:80.6 OHM,1%,0.125W	91637	MFF1816G80R60F
A40R34	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A40R35	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A40R42	315-0270-00			RES.,FXD,CMPSN:27 OHM,5%,0.25W	01121	CB2705
A40R43	315-0432-00			RES.,FXD,CMPSN:4.3K OHM,5%,0.25W	01121	CB4325
A40R44	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A40R47	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A40R48	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A40R54	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A40R55	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A40R57	315-0330-00			RES.,FXD,CMPSN:33 OHM,5%,0.25W	01121	CB3305
A40R58	315-0392-00			RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
A40R73	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A40R75	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A40R76	315-0200-00			RES.,FXD,CMPSN:20 OHM,5%,0.25W	01121	CB2005
A40R77	315-0121-00			RES.,FXD,CMPSN:120 OHM,5%,0.25W	01121	CB1215
A40R78	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A40R79	315-0240-00			RES.,FXD,CMPSN:24 OHM,5%,0.25W	01121	CB2405
A40R82	315-0432-00			RES.,FXD,CMPSN:4.3K OHM,5%,0.25W	01121	CB4325
A40R85	315-0474-00			RES.,FXD,CMPSN:470K OHM,5%,0.25W	01121	CB4745
A40R86	315-0474-00			RES.,FXD,CMPSN:470K OHM,5%,0.25W	01121	CB4745
A40R96	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
A40T19	120-1148-00			XFMR,RF:TOROID,5 T,TRIFILAR	80009	120-1148-00
A40T31	120-1149-00			XFMR,RF:TOROID,5 T QUADFILAR	80009	120-1149-00
A40U12	156-0130-00			MICROCIRCUIT,LI:BALANCED MODEM	80009	156-0130-00
A40U88	156-0067-12			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	04713	MC1741CU
A40VR98	152-0395-00			SEMICOND DEVICE:ZENER,0.4W,4.3V,5%	14552	TD332317

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A41	670-5012-01			CKT BOARD ASSY:2ND AUDIO MIXER	80009	670-5012-01
A41C13	283-~~0655~~-00 0641			CAP.,FXD,MICA D:~~0.0033UF~~ 180PF,1%,500V	00853	D195F332F0
A41C17	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,50V	72982	8121N083Z5U0104Z
A41C21	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,50V	72982	8121N083Z5U0104Z
A41C25	290-0782-00			CAP.,FXD,ELCTLT:4.7UF,+75-10%,35V	56289	503D475G035AS
A41C26	290-0782-00			CAP.,FXD,ELCTLT:4.7UF,+75-10%,35V	56289	503D475G035AS
A41C31	283-~~0655~~ 0641-00			CAP.,FXD,MICA D:~~0.0033UF~~ 180PF,1%,500V	00853	D195F332F0
A41C43	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,50V	72982	8121N083Z5U0104Z
A41C44	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A41C56	283-0142-00			CAP.,FXD,CER DI:0.0027UF,5%,200V	72982	875-571-Y5E0272J
A41C66	290-0782-00			CAP.,FXD,ELCTLT:4.7UF,+75-10%,35V	56289	503D475G035AS
A41C74	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A41C75	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,50V	72982	8121N083Z5U0104Z
A41C80	283-0670-00			CAP.,FXD,MICA D:375PF,1%,500V	00853	D155F3750F0
A41C81	283-0596-00			CAP.,FXD,MICA D:528PF,1%,300V	00853	D153F5280F0
A41C91	283-0642-00			CAP.,FXD,MICA D:33PF,+/-0.5PF,300V	00853	D10-5E330G
A41C92	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,50V	72982	8121N083Z5U0104Z
A41CR75	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A41L24	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A41L26	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A41Q36	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A41Q44	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A41Q70	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
A41R12	321-0202-00			RES.,FXD,FILM:1.24K OHM,1%,0.125W	91637	MFF1816G12400F
A41R13	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A41R14	321-0196-00			RES.,FXD,FILM:1.07K OHM,1%,0.125W	91637	MFF1816G10700F
A41R22	321-0201-00			RES.,FXD,FILM:1.21K OHM,1%,0.125W	91637	MFF1816G12100F
A41R24	315-0621-00			RES.,FXD,CMPSN:620 OHM,5%,0.25W	01121	CB6215
A41R34	315-0621-00			RES.,FXD,CMPSN:620 OHM,5%,0.25W	01121	CB6215
A41R35	315-0162-00			RES.,FXD,CMPSN:1.6K OHM,5%,0.25W	01121	CB1625
A41R41	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A41R42	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A41R44	315-0182-00			RES.,FXD,CMPSN:1.8K OHM,5%,0.25W	01121	CB1825
A41R45	315-0123-00			RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
A41R46	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A41R51	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A41R54	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A41R56	315-0681-00			RES.,FXD,CMPSN:680 OHM,5%,0.25W	01121	CB6815
A41R58	315-0330-00			RES.,FXD,CMPSN:33 OHM,5%,0.25W	01121	CB3305
A41R61	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A41R62	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A41R64	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A41R65	321-0222-00			RES.,FXD,FILM:2K OHM,1%,0.125W	91637	MFF1816G20000F
A41R71	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A41R73	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A41R76	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A41R81	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A41R82	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A41R86	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A41R91	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A41T17	120-1142-00			XFMR,RF:INTERCARRIER,POT CORE	80009	120-1142-00
A41T31	120-1142-00			XFMR,RF:INTERCARRIER,POT CORE	80009	120-1142-00
A41U11	156-0033-00			MICROCIRCUIT,LI:RF/IF AMPLIFIER	80009	156-0033-00
A41U51	156-0130-00			MICROCIRCUIT,LI:BALANCED MODEM	80009	156-0130-00
A41Y86	158-~~0196~~ 0241-00			XTAL UNIT,QTZ:~~6.6929~~ 7.0184MHZ,0.01% PARALLEL	33096	OBD

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A42	670-5013-01			CKT BOARD ASSY:AUDIO LIMITER	80009	670-5013-01
A42C03	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A42C05	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A42C13	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A42C15	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A42C44	283-~~0728~~-00 0644			CAP.,FXD,MICA D:~~120PF~~,1%,500V 150PF	00853	D155F121F03
A42C45	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A42C46	290-0782-00			CAP.,FXD,ELCTLT:4.7UF,+75-10%,35V	56289	503D475G035AS
A42C47	290-0782-00			CAP.,FXD,ELCTLT:4.7UF,+75-10%,35V	56289	503D475G035AS
A42C54	283-~~0624~~-00 0626			CAP.,FXD,MICA D:~~1300~~PF,2%,500V 180	00853	D195E132G0
A42C63	283-~~0635~~-00 0629			CAP.,FXD,MICA D:~~51~~PF,1%,100V 62	00853	D151E510F0
A42C83	283-~~0691~~-00 0645			CAP.,FXD,MICA D:~~650~~PF,1%,300V 790	00853	D153F651F0
A42L45	114-0259-00			COIL,RF:150-240UH	80009	114-0359-00
A42L48	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A42L55	114-0280-00			COIL,RF:12-43UH	80009	114-0280-00
A42L75	114-0238-00			COIL,RF:300-470UH	80009	114-0238-00
A42L95	114-0310-00			COIL,RF:VARIABLE,22-80UH	80009	114-0310-00
A42R12	321-0135-00			RES.,FXD,FILM:249 OHM,1%,0.125W	91637	MFF1816G249R0F
A42R44	321-0135-00			RES.,FXD,FILM:249 OHM,1%,0.125W	91637	MFF1816G249R0F
A42R45	315-0821-00			RES.,FXD,CMPSN:820 OHM,5%,0.25W	01121	CB8215
A42R47	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A42R86	321-0164-00			RES.,FXD,FILM:499 OHM,1%,0.125W	91637	MFF1816G499R0F
A42T18	120-1151-00			XFMR,RF:TOROID,6 T QUADFILAR	80009	120-1151-00
A42TP22	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
A42U15	156-0902-00			MICROCIRCUIT,DI:FM IF AMPL	80009	156-0902-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A43	670-6727-00			CKT BOARD ASSY:AUDIO DISCRIMINATOR	80009	670-6727-00
A43C00	290-0776-00			CAP.,FXD,ELCTLT:22UF,+50-10%,10V	54473	ECE-A10V22L
A43C05	283-0596-00			CAP.,FXD,MICA D:528PF,1%,300V	00853	D153F5280F0
A43C07	290-0782-00			CAP.,FXD,ELCTLT:4.7UF,+75-10%,35V	56289	503D475G035AS
A43C12	290-0770-00			CAP.,FXD,ELCTLT:100UF,+50-10%,25V	56289	502D230
A43C20	290-0776-00			CAP.,FXD,ELCTLT:22UF,+50-10%,10V	54473	ECE-A10V22L
A43C24	290-0755-00			CAP.,FXD,ELCTLT:100UF,+50-10%,10V	56289	502D223
A43C26	290-0782-00			CAP.,FXD,ELCTLT:4.7UF,+75-10%,35V	56289	503D475G035AS
A43C28	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A43C43	283-0695-00			CAP.,FXD,MICA D:4440PF,1%,300V	72136	DM19FC4441F0
A43C48	290-0782-00			CAP.,FXD,ELCTLT:4.7UF,+75-10%,35V	56289	503D475G035AS
A43C53	285-0698-00			CAP.,FXD,PLSTC:0.0082UF,5%,100V	56289	410P82251
A43C55	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A43C56	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	72982	8131N075 E474M
A43C65	283-0655-00			CAP.,FXD,MICA D:0.0033UF,1%,500V	00853	D195F332F0
A43C83	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,50V	72982	8121N083Z5U0104Z
A43C84	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,50V	72982	8121N083Z5U0104Z
A43CR02	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A43CR16	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A43L36	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A43L39	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A43L41	108-0894-00			COIL,RF:FIXED,6.68MH,POT CORE	80009	108-0894-00
A43L61	108-0971-00			COIL,RF:FIXED,5.24MH	80009	108-0971-00
A43Q08	151-0127-00			TRANSISTOR:SILICON,NPN	07263	S006075
A43Q13	151-0127-00			TRANSISTOR:SILICON,NPN	07263	S006075
A43Q14	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
A43Q18	151-0301-00			TRANSISTOR:SILICON,PNP	04713	2N2907A
A43Q19	151-0301-00			TRANSISTOR:SILICON,PNP	04713	2N2907A
A43R01	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A43R02	321-0182-00			RES.,FXD,FILM:768 OHM,1%,0.125W	91637	MFF1816G768R0F
A43R03	301-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.50W	01121	EB4715
A43R05	301-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.50W	01121	EB1025
A43R08	315-0751-00			RES.,FXD,CMPSN:750 OHM,5%,0.25W	01121	CB7515
A43R10	315-0751-00			RES.,FXD,CMPSN:750 OHM,5%,0.25W	01121	CB7515
A43R11	321-0226-00			RES.,FXD,FILM:2.21K OHM,1%,0.125W	91637	MFF1816G22100F
A43R16	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A43R17	315-0432-00			RES.,FXD,CMPSN:4.3K OHM,5%,0.25W	01121	CB4325
A43R18	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A43R21	321-0298-00			RES.,FXD,FILM:12.4K OHM,1%,0.125W	91637	MFF1816G12401F
A43R22	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A43R26	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A43R30	311-1241-00			RES.,VAR,NONWIR:100K OHM,10%,0.5W	32997	3386X-T07-104
A43R32	315-~~0104~~-00 0513			RES.,FXD,CMPSN:~~100~~K OHM,5%,0.25W 51	01121	CB1045
A43R33	321-0256-00			RES.,FXD,FILM:4.53K OHM,1%,0.125W	91637	MFF1816G45300F
A43R36	321-0201-00			RES.,FXD,FILM:1.21K OHM,1%,0.125W	91637	MFF1816G12100F
A43R44	321-0241-00			RES.,FXD,FILM:3.16K OHM,1%,0.125W	91637	MFF1816G31600F
A43R45	321-~~0326~~-00 0331			RES.,FXD,FILM:~~24.9~~K OHM,1%,0.125W 27.4	91637	MFF1816G24301F
A43R46	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
A43R47	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
A43R55	315-0205-00			RES.,FXD,CMPSN:2M OHM,5%,0.25W	01121	CB2055
A43R72	321-0184-00			RES.,FXD,FILM:806 OHM,1%,0.125W	91637	MFF1816G806R0F
A43R73	321-0277-00			RES.,FXD,FILM:7.5K OHM,1%,0.125W	91637	MFF1816G75000F
A43R74	321-0184-00			RES.,FXD,FILM:806 OHM,1%,0.125W	91637	MFF1816G806R0F
A43R80	311-1239-00			RES.,VAR,NONWIR:2.5K OHM,10%,0.50W	73138	72X-76-0-252K
A43R92	321-0184-00			RES.,FXD,FILM:806 OHM,1%,0.125W	91637	MFF1816G806R0F
A43R93	321-0264-00			RES.,FXD,FILM:5.49K OHM,1%,0.125W	91637	MFF1816G54900F
A43R97	321-0172-00			RES.,FXD,FILM:604 OHM,1%,0.125W	91637	MFF1816G604R0F

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A43TP12	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
A43U58	156-1267-12			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	04713	MC1741C4
A43U84	156-1272-00			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	NE5532FE-11B
A43VR12	152-0195-00			SEMICOND DEVICE:ZENER,0.4W,5.1V,5%	04713	SZ11755
A43VR47	152-0168-00			SEMICOND DEVICE:ZENER,0.4W,12V,5%	80009	152-0168-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A44	670-5015-03			CKT BOARD ASSY:AUDIO INTERFACE	80009	670-5015-03
A44C02	283-0067-00			CAP.,FXD,CER DI:0.001UF,10%,200V	72982	835-515B102K
A44C03	290-0367-00			CAP.,FXD,ELCTLT:70UF,20%,6V NONPOLARIZED	56289	30D1802
A44C09	290-0525-00			CAP.,FXD,ELCTLT:4.7UF,20%,50V	56289	196D475X0050KA1
A44C11	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A44C12	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A44C22	283-0060-00			CAP.,FXD,CER DI:100PF,5%,200V	72982	855-535U2J101J
A44C26	290-0745-00			CAP.,FXD,ELCTLT:22UF,+50-10%,25V	56289	502D225
A44C27	283-0060-00			CAP.,FXD,CER DI:100PF,5%,200V	72982	855-535U2J101J
A44C28	290-0745-00			CAP.,FXD,ELCTLT:22UF,+50-10%,25V	56289	502D225
A44C29	290-0745-00			CAP.,FXD,ELCTLT:22UF,+50-10%,25V	56289	502D225
A44C34	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A44C39	283-0593-00			CAP.,FXD,MICA D:0.01UF,1%,100V	00853	D301F103F0
A44C40	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A44C42	290-0522-00			CAP.,FXD,ELCTLT:1UF,20%,50V	56289	196D105X0050HA1
A44C44	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A44C46	290-0522-00			CAP.,FXD,ELCTLT:1UF,20%,50V	56289	196D105X0050HA1
A44C50	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A44C54	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A44C59	290-0745-00			CAP.,FXD,ELCTLT:22UF,+50-10%,25V	56289	502D225
A44CR01	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A44CR13	152-0460-00			SEMICOND DEVICE:SILICON,25V,1MA	04713	1N5299
A44CR14	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A44CR18	152-0460-00			SEMICOND DEVICE:SILICON,25V,1MA	04713	1N5299
A44CR55	152-0040-00			SEMICOND DEVICE:SILICON,600V,1A	80009	152-0040-00
A44CR57	152-0040-00			SEMICOND DEVICE:SILICON,600V,1A	80009	152-0040-00
A44F05	159-0021-00			FUSE,CARTRIDGE:3AG,2A,250V,FAST-BLOW	71400	AGC 2
A44F06	159-0021-00			FUSE,CARTRIDGE:3AG,2A,250V,FAST-BLOW	71400	AGC 2
A44Q12	151-0232-00			TRANSISTOR:SILICON,NPN,DUAL	80009	151-0232-00
A44Q13	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A44Q14	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
A44Q16	151-0232-00			TRANSISTOR:SILICON,NPN,DUAL	80009	151-0232-00
A44Q17	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A44Q24	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
A44Q28	151-0301-00			TRANSISTOR:SILICON,PNP	04713	2N2907A
A44Q29	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
A44Q52	151-0405-00			TRANSISTOR:SILICON,NPN,SEL FROM MJE800	80009	151-0405-00
A44Q53	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
A44Q54	151-0429-00			TRANSISTOR:SILICON,PND	80009	151-0429-00
A44Q55	151-0405-00			TRANSISTOR:SILICON,NPN,SEL FROM MJE800	80009	151-0405-00
A44Q56	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
A44Q57	151-0429-00			TRANSISTOR:SILICON,PND	80009	151-0429-00
A44R02	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A44R03	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A44R04	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A44R05	311-1560-00			RES.,VAR,NONWIR:5K OHM,20%,0.50W	73138	91-82-0
A44R06	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
A44R07	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A44R08	315-0750-00			RES.,FXD,CMPSN:75 OHM,5%,0.25W	01121	CB7505
A44R09	315-0750-00			RES.,FXD,CMPSN:75 OHM,5%,0.25W	01121	CB7505
A44R13	315-0112-00			RES.,FXD,CMPSN:1.1K OHM,5%,0.25W	01121	CB1125
A44R14	321-0105-00			RES.,FXD,FILM:121 OHM,1%,0.125W	91637	MFF1816G121R0F
A44R15	321-0303-00			RES.,FXD,FILM:14K OHM,1%,0.125W	91637	MFF1816G14001F
A44R16	321-0222-00			RES.,FXD,FILM:2K OHM,1%,0.125W	91637	MFF1816G20000F
A44R17	315-0112-00			RES.,FXD,CMPSN:1.1K OHM,5%,0.25W	01121	CB1125
A44R18	315-0123-00			RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
A44R19	315-0242-00			RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	01121	CB2425

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A44R20	301-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.50W	01121	EB1005
A44R22	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
A44R23	301-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.50W	01121	EB1005
A44R24	321-0169-00			RES.,FXD,FILM:562 OHM,1%,0.125W	91637	MFF1816G562R0F
A44R25	321-0105-00			RES.,FXD,FILM:121 OHM,1%,0.125W	91637	MFF1816G121R0F
A44R26	321-0300-00			RES.,FXD,FILM:13K OHM,1%,0.125W	91637	MFF1816G13001F
A44R27	308-0685-00			RES.,FXD,WW:1.5 OHM,5%,1W	75042	BW20-1R500J
A44R28	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
A44R29	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
A44R30	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
A44R32	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
A44R33	321-0210-00			RES.,FXD,FILM:1.5K OHM,1%,0.125W	91637	MFF1816G15000F
A44R35	308-0685-00			RES.,FXD,WW:1.5 OHM,5%,1W	75042	BW20-1R500J
A44R36	321-0210-00			RES.,FXD,FILM:1.5K OHM,1%,0.125W	91637	MFF1816G15000F
A44R37	315-0681-00			RES.,FXD,CMPSN:680 OHM,5%,0.25W	01121	CB6815
A44R38	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A44R40	308-0685-00			RES.,FXD,WW:1.5 OHM,5%,1W	75042	BW20-1R500J
A44R42	321-0251-00			RES.,FXD,FILM:4.02K OHM,1%,0.125W	91637	MFF1816G40200F
A44R44	308-0685-00			RES.,FXD,WW:1.5 OHM,5%,1W	75042	BW20-1R500J
A44R46	321-0251-00			RES.,FXD,FILM:4.02K OHM,1%,0.125W	91637	MFF1816G40200F
A44R48	321-0816-00			RES.,FXD,FILM:5K OHM,1%,0.125W	24546	NA55D5000F
A44R49	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A44R50	308-0685-00			RES.,FXD,WW:1.5 OHM,5%,1W	75042	BW20-1R500J
A44R53	311-1565-00			RES.,VAR,NONWIR:250 OHM,20%,0.50W	73138	91-87-0
A44R54	308-0685-00			RES.,FXD,WW:1.5 OHM,5%,1W	75042	BW20-1R500J
A44R56	311-1565-00			RES.,VAR,NONWIR:250 OHM,20%,0.50W	73138	91-87-0
A44S01	263-0010-00			SWITCH PB ASSY:1 PUSH,7.5MM,W/2 CONTACTS	80009	263-0010-00
A44S04	263-0023-03			SWITCH PB ASSY:3 LCH,7.5MM,6CONTACTS	80009	263-0023-03
A44S07	263-0015-03			SWITCH PB ASSY:2 LCH,7.5MM,4CONTACTS	80009	263-0015-03
A44T21	120-1131-01			TRANSFORMER,AF:	54937	OBD
A44TP07	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A50	670-5016-01			CKT BOARDSSY:REF CONTROL	80009	670-5016-01
A50C03	283-0631-00			CAP.,FXD,MICA D:95PF,1%,100V	00853	D151E950F0
A50C06	283-0649-00			CAP.,FXD,MICA D:105PF,1%,300V	00853	D153F1050F0
A50C14	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A50C16	283-0649-00			CAP.,FXD,MICA D:105PF,1%,300V	00853	D153F1050F0
A50C30	283-0706-00			CAP.,FXD,MICA D:91PF,+/-1PF,500V	00853	D15-5E910F0
A50C31	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A50C35	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A50C37	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A50C52	283-0644-00			CAP.,FXD,MICA D:150PF,1%,500V	00853	D155E151F0
A50C54	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
A50C59	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A50C63	283-0706-00			CAP.,FXD,MICA D:91PF,+/-1PF,500V	00853	D15-5E910F0
A50C67	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A50C71	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A50C78	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A50C83	290-0574-00			CAP.,FXD,ELCTLT:47UF,10%,20V	90201	TDC476K020CL
A50C85	283-0644-00			CAP.,FXD,MICA D:150PF,1%,500V	00853	D155E151F0
A50C87	283-0114-00			CAP.,FXD,CER DI:0.0015UF,5%,200V	72982	805-509B152J
A50C94	290-0535-00			CAP.,FXD,ELCTLT:33UF,20%,10V	56289	196D336X0010KA1
A50C95	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A50CR85	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A50CR91	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A50L13	108-0735-00			COIL,RF:FIXED,560NH	80009	108-0735-00
A50L15	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A50L52	108-0443-00			COIL,RF:25UH	80009	108-0443-00
A50L62	108-0443-00			COIL,RF:25UH	80009	108-0443-00
A50LR12	108-0543-00			COIL,RF:FIXED,1.1UH	80009	108-0543-00
A50P29	131-1771-00			CONNECTOR,RCPT,:CIRCUIT BOARD,6 FEMALE	22526	65001-111
A50Q02	151-0333-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	04713	SPS1752
A50Q35	151-0333-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	04713	SPS1752
A50Q70	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
A50Q80	151-0127-00			TRANSISTOR:SILICON,NPN	07263	S006075
A50Q87	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
A50Q88	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
A50Q92	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A50R04	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A50R05	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A50R06	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A50R10	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A50R11	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A50R16	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A50R21	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A50R25	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A50R31	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A50R33	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A50R34	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
A50R35	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A50R36	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
A50R40	311-1245-00			RES.,VAR,NONWIR:10K OHM,10%,0.50W	73138	72-28-0
A50R43	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
A50R45	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
A50R48	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
A50R49	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A50R50	311-1245-00			RES.,VAR,NONWIR:10K OHM,10%,0.50W	73138	72-28-0
A50R53	321-0301-00			RES.,FXD,FILM:13.3K OHM,1%,0.125W	91637	MFF1816G13301F
A50R56	321-0352-00			RES.,FXD,FILM:45.3K OHM,1%,0.125W	91637	MFF1816G45301F

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A50R57	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A50R60	311-1246-00			RES.,VAR,NONWIR:50K OHM,10%,0.50W	02111	63X-503-T602
A50R63	321-0225-00			RES.,FXD,FILM:2.15K OHM,1%,0.125W	91637	MFF1816G21500F
A50R64	321-0359-00			RES.,FXD,FILM:53.6K OHM,1%,0.125W	91637	MFF1816G53601F
A50R66	315-0623-00			RES.,FXD,CMPSN:62K OHM,5%,0.25W	01121	CB6235
A50R70	311-1246-00			RES.,VAR,NONWIR:50K OHM,10%,0.50W	02111	63X-503-T602
A50R72	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A50R73	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A50R74	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A50R75	321-0419-00			RES.,FXD,FILM:226K OHM,1%,0.125W	91637	MFF1816G22602F
A50R76	321-0302-00			RES.,FXD,FILM:13.7K OHM,1%,0.125W	91637	MFF1816G13701F
A50R78	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
A50R81	315-0183-00			RES.,FXD,CMPSN:18K OHM,5%,0.25W	01121	CB1835
A50R83	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A50R84	315-0272-00			RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	01121	CB2725
A50R89	321-0268-00			RES.,FXD,FILM:6.04K OHM,1%,0.125W	91637	MFF1816G60400F
A50R90	315-0270-00			RES.,FXD,CMPSN:27 OHM,5%,0.25W	01121	CB2705
A50R91	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A50R96	321-0262-00			RES.,FXD,FILM:5.23K OHM,1%,0.125W	91637	MFF1816G52300F
A50R97	321-0287-00			RES.,FXD,FILM:9.53K OHM,1%,0.125W	91637	MFF1816G95300F
A50R98	315-0182-00			RES.,FXD,CMPSN:1.8K OHM,5%,0.25W	01121	CB1825
A50R99	321-0073-00			RES.,FXD,FILM:56.2 OHM,1%,0.125W	91637	MFF1816G56R20F
A50U23	156-0130-00			MICROCIRCUIT,LI:BALANCED MODEM	80009	156-0130-00
A50U56	156-0156-04			MICROCIRCUIT,LI:DUAL OPERTIONAL AMPLIFIER	01295	MC1458JG
A50Y18	158-0205-00			XTAL UNIT,QTZ:22.25MHZ,0.01%,SER	33096	PB3069

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A51	670-5018-01			CKT BOARD ASSY:REF OSCILLATOR	80009	670-5018-01
A51C07	281-0552-00			CAP.,FXD,CER DI:25PF,5%,500V	72982	301-000P2G0250J
A51C08	283-0636-00			CAP.,FXD,MICA D:36PF,1.4%,100V	00853	D155F360G0
A51C13	283-0730-00			CAP.,FXD,MICA D:274PF,1%,500V	00853	D155E2740F0
A51C16	283-0730-00			CAP.,FXD,MICA D:274PF,1%,500V	00853	D155E2740F0
A51C20	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A51C24	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A51C28	283-0067-00			CAP.,FXD,CER DI:0.001UF,10%,200V	72982	835-515B102K
A51C30	283-0671-00			CAP.,FXD,MICA D:164PF,1%,500V	00853	D155F1640F0
A51C35	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A51C36	283-0114-00			CAP.,FXD,CER DI:0.0015UF,5%,200V	72982	805-509B152J
A51C45	290-0745-00			CAP.,FXD,ELCTLT:22UF,+50-10%,25V	56289	502D225
A51C51	283-0638-00			CAP.,FXD,MICA D:130PF,1%,100V	00853	D151F131F0
A51C56	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A51C60	283-0598-00			CAP.,FXD,MICA D:253PF,5%,300V	09023	CD15EC(253)J03
A51C62	283-0004-00			CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855-558Z5V0203Z
A51C63	283-0004-00			CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855-558Z5V0203Z
A51C64	283-0004-00			CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855-558Z5V0203Z
A51C66	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A51C84	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A51CR09	152-0665-00			SEMICOND DEVICE:SILICON,VVC,30V	04713	SMV1344
A51CR47	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A51CR48	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A51L03	114-0376-00			COIL,RF:VAR,1.70MH TO 3.0MH	80009	114-0376-00
A51L18	108-0897-00			COIL,RF:FIXED,220UH	80009	108-0897-00
A51L31	108-0215-00			COIL,RF:1.1UH	80009	108-0215-00
A51L41	114-0246-00			COIL,RF:VARIABLE,700-1100NH	80009	114-0246-00
A51LR12	108-0328-00			COIL,RF:0.3UH	80009	108-0328-00
A51LR56	108-0520-00			COIL,RF:2.2UH (WOUND ON A 10 OHM RES)	80009	108-0520-00
A51LR71	108-0212-00			COIL,RF:FIXED,495NH	80009	108-0212-00
A51Q16	151-0198-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	80009	151-0198-00
A51Q22	151-0333-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	04713	SPS1752
A51Q32	151-0333-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	04713	SPS1752
A51Q35	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A51Q72	151-0325-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
A51Q74	151-0472-00			TRANSISTOR:SILICON,NPN	80009	151-0472-00
A51R10	315-0272-00			RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	01121	CB2725
A51R11	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
A51R13	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
A51R15	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A51R21	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A51R23	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
A51R26	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A51R27	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
A51R46	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A51R52	315-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
A51R53	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A51R54	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A51R57	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A51R58	301-0122-00			RES.,FXD,CMPSN:1.2K OHM,5%,0.50W	01121	EB1225
A51R62	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A51R65	315-0360-00			RES.,FXD,CMPSN:36 OHM,5%,0.25W	01121	CB3605
A51R81	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A51R83	315-0151-00			RES.,FXD,CMPSN:150 OHM,5%,0.25W	01121	CB1515
A51R84	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A51R85	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A52	670-5017-01			CKT BOARD ASSY:PHASE SHIFTER	80009	670-5017-01
A52C01	281-0209-00			CAP.,VAR,AIR DI:1.3-5.4PF,250V	74970	187-0303-105
A52C03	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A52C08	283-0511-00			CAP.,FXD,MICA D:200PF,5%,500V	72136	CM19D201J
A52C10	293-0596-00			CAP.,FXD,MICA D:528PF,1%300V	00853	D15EF5280F0
A52C11	283-0060-00			CAP.,FXD,CER DI:100PF,5%,200V	72982	855-535U2J101J
A52C16	281-0504-00			CAP.,FXD,CER DI:10PF,+/-1PF,500V	72982	301-055C0G0100F
A52C21	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A52C22	283-0672-00			CAP.,FXD,MICA D:200PF,1%,500V	00853	D155F2010F0
A52C45	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A52C46	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A52C47	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A52C48	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A52C66	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A52C78	281-0504-00			CAP.,FXD,CER DI:10PF,+/-1PF,500V	72982	301-055C0G0100F
A52C83	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A52C88	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A52C89	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A52C90	283-0647-00			CAP.,FXD,MICA D:70PF,1%,100V	00853	D151E700F0
A52C94	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A52C95	283-0647-00			CAP.,FXD,MICA D:70PF,1%,100V	00853	D151E700F0
A52CR10	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A52CR32	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A52CR33	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A52CR41	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A52CR42	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A52CR43	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A52CR44	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A52CR45	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A52CR50	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A52CR51	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A52CR52	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A52CR54	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A52CR55	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A52CR63	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A52CR64	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A52CR65	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A52E37	276-0543-00			SHLD BEAD,ELEK:FERRITE	80009	276-0543-00
A52L20	108-0103-00			SHLD BEAD,ELEK:2.45UH	80009	108-0103-00
A52L98	114-0246-00			COIL,RF:VARIABLE,700-1100NH	80009	114-0246-00
A52LR47	108-0212-00			COIL,RF:FIXED,495NH	80009	108-0212-00
A52Q03	151-1005-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	80009	151-1005-00
A52Q15	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
A52Q17	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
A52Q18	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A52Q37	151-0472-00			TRANSISTOR:SILICON,NPN	80009	151-0472-00
A52Q38	151-0325-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
A52Q59	151-0325-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
A52R03	315-0396-00			RES.,FXD,CMPSN:39M OHM,5%,0.25W	01121	CB3965
A52R05	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A52R06	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
A52R07	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
A52R09	315-0154-00			RES.,FXD,CMPSN:150K OHM,5%,0.25W	01121	CB1545
A52R13	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A52R14	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A52R15	315-0183-00			RES.,FXD,CMPSN:18K OHM,5%,0.25W	01121	CB1835
A52R18	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A52R19	315-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
A52R25	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
A52R26	301-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.50W	01121	EB3015
A52R34	315-0123-00			RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
A52R36	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A52R49	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A52R52	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A52R53	321-0220-00			RES.,FXD,FILM:1.91K OHM,1%,0.125W	91637	MFF1816G19100F
A52R55	321-0243-00			RES.,FXD,FILM:3.32K OHM,1%,0.125W	91637	MFF1816G33200F
A52R56	321-0262-00			RES.,FXD,FILM:5.23K OHM,1%,0.125W	91637	MFF1816G52300F
A52R57	315-0681-00			RES.,FXD,CMPSN:680 OHM,5%,0.25W	01121	CB6815
A52R58	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
A52R61	321-0266-00			RES.,FXD,FILM:5.76K OHM,1%,0.125W	91637	MFF1816G57600F
A52R62	321-0291-00			RES.,FXD,FILM:10.5K OHM,1%,0.125W	91637	MFF1816G10501F
A52R63	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
A52R70	321-0211-00			RES.,FXD,FILM:1.54K OHM,1%,0.125W	91637	MFF1816G15400F
A52R71	321-0266-00			RES.,FXD,FILM:5.76K OHM,1%,0.125W	91637	MFF1816G57600F
A52R72	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A52R73	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A52R74	321-0210-00			RES.,FXD,FILM:1.5K OHM,1%,0.125W	91637	MFF1816G15000F
A52R76	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A52R77	321-0269-00			RES.,FXD,FILM:6.19K OHM,1%,0.125W	91637	MFF1816G61900F
A52R82	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A52R84	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A52R91	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A52R92	315-0910-00			RES.,FXD,CMPSN:91 OHM,5%,0.25W	01121	CB9105
A52R93	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
A52R94	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A52R96	315-0910-00			RES.,FXD,CMPSN:91 OHM,5%,0.25W	01121	CB9105
A52T58	120-1150-00			XFMR,RF:TOROID,7 T TRIFILAR	80009	120-1150-00
A52TP33	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
A52U22	156-0770-00			MICROCIRCUIT,DI:OPERATIONAL AMPLIFIER	27014	LF356H
A52U81	156-0130-00			MICROCIRCUIT,LI:BALANCED MODEM	80009	156-0130-00
A52U84	156-0130-00			MICROCIRCUIT,LI:BALANCED MODEM	80009	156-0130-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A53	670-5019-01			CKT BOARD ASSY:CONVERTER PHASE LOCK	80009	670-5019-01
A53C09	283-0114-00			CAP.,FXD,CER DI:0.0015UF,5%,200V	72982	805-509B152J
A53C15	283-0210-00			CAP.,FXD,CER DI:5600PF,10%,100V	72982	8131N145W5R562M
A53C33	290-0525-00			CAP.,FXD,ELCTLT:4.7UF,20%,50V	56289	196D475X0050KA1
A53C34	283-0210-00			CAP.,FXD,CER DI:5600PF,10%,100V	72982	8131N145W5R562M
A53C44	283-0142-00			CAP.,FXD,CER DI:0.0027UF,5%,200V	72982	875-571-Y5E0272J
A53C45	283-0142-00			CAP.,FXD,CER DI:0.0027UF,5%,200V	72982	875-571-Y5E0272J
A53C46	283-0616-00			CAP.,FXD,MICA D:75PF,5%,500V	00853	D155E750J0
A53C51	283-0616-00			CAP.,FXD,MICA D:75PF,5%,500V	00853	D155E750J0
A53C57	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A53C64	283-0598-00			CAP.,FXD,MICA D:253PF,5%,300V	09023	CD15EC(253)J03
A53C66	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A53C70	283-0644-00			CAP.,FXD,MICA D:150PF,1%,500V	00853	D155E151F0
A53C71	283-0598-00			CAP.,FXD,MICA D:253PF,5%,300V	09023	CD15EC(253)J03
A53C72	283-0644-00			CAP.,FXD,MICA D:150PF,1%,500V	00853	D155E151F0
A53C75	283-0644-00			CAP.,FXD,MICA D:150PF,1%,500V	00853	D155E151F0
A53C76	283-0644-00			CAP.,FXD,MICA D:150PF,1%,500V	00853	D155E151F0
A53C79	283-0639-00			CAP.,FXD,MICA D:56PF,1%,100V	00853	D151E560F0
A53C84	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A53C88	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A53C92	283-0004-00			CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855-558Z5V0203Z
A53C94	283-0004-00			CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855-558Z5V0203Z
A53C99	283-0639-00			CAP.,FXD,MICA D:56PF,1%,100V	00853	D151E560F0
A53CR19	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A53CR23	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A53CR24	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A53CR26	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A53CR42	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A53CR47	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A53L54	108-0226-00			COIL,RF:100UH	76493	DWG B4257
A53L55	108-0226-00			COIL,RF:100UH	76493	DWG B4257
A53L61	108-0226-00			COIL,RF:100UH	76493	DWG B4257
A53L62	108-0226-00			COIL,RF:100UH	76493	DWG B4257
A53L63	108-0226-00			COIL,RF:100UH	76493	DWG B4257
A53L66	108-0226-00			COIL,RF:100UH	76493	DWG B4257
A53L70	108-0226-00			COIL,RF:100UH	76493	DWG B4257
A53L72	108-0226-00			COIL,RF:100UH	76493	DWG B4257
A53L89	108-0683-00			COIL,RF:900MH	80009	108-0683-00
A53Q08	151-0216-00			TRANSISTOR:SILICON,PNP	04713	SPS8803
A53Q18	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
A53Q32	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
A53Q42	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
A53Q43	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
A53Q45	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
A53Q46	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
A53Q50	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
A53Q53	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
A53Q94	151-0333-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	04713	SPS1752
A53Q95	151-0333-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	04713	SPS1752
A53R00	321-0243-00			RES.,FXD,FILM:3.32K OHM,1%,0.125W	91637	MFF1816G33200F
A53R01	315-0204-00			RES.,FXD,CMPSN:200K OHM,5%,0.25W	01121	CB2045
A53R04	315-0204-00			RES.,FXD,CMPSN:200K OHM,5%,0.25W	01121	CB2045
A53R05	315-0122-00			RES.,FXD,CMPSN:1.2K OHM,5%,0.25W	01121	CB1225
A53R06	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A53R07	315-0123-00			RES.,FXD,CMPSN:12K OHM,5%,0.25W	01121	CB1235
A53R09	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
A53R10	321-0169-00			RES.,FXD,FILM:562 OHM,1%,0.125W	91637	MFF1816G562R0F

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A53R11	315-0680-00			RES.,FXD,CMPSN:68 OHM,5%,0.25W	01121	CB6805
A53R13	315-0563-00			RES.,FXD,CMPSN:56K OHM,5%,0.25W	01121	CB5635
A53R14	315-0563-00			RES.,FXD,CMPSN:56K OHM,5%,0.25W	01121	CB5635
A53R15	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A53R16	315-0333-00			RES.,FXD,CMPSN:33K OHM,5%,0.25W	01121	CB3335
A53R17	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A53R18	315-0335-00			RES.,FXD,CMPSN:3.3M OHM,5%,0.25W	01121	CB3355
A53R19	315-0392-00			RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
A53R20	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
A53R22	315-0751-00			RES.,FXD,CMPSN:750 OHM,5%,0.25W	01121	CB7515
A53R23	315-0680-00			RES.,FXD,CMPSN:68 OHM,5%,0.25W	01121	CB6805
A53R25	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A53R26	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
A53R27	315-0273-00			RES.,FXD,CMPSN:27K OHM,5%,0.25W	01121	CB2735
A53R31	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
A53R35	321-0239-00			RES.,FXD,FILM:3.01K OHM,1%,0.125W	91637	MFF1816G30100F
A53R36	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A53R37	321-0239-00			RES.,FXD,FILM:3.01K OHM,1%,0.125W	91637	MFF1816G30100F
A53R40	321-0243-00			RES.,FXD,FILM:3.32K OHM,1%,0.125W	91637	MFF1816G33200F
A53R41	321-0169-00			RES.,FXD,FILM:562 OHM,1%,0.125W	91637	MFF1816G562R0F
A53R42	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A53R46	315-0122-00			RES.,FXD,CMPSN:1.2K OHM,5%,0.25W	01121	CB1225
A53R47	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
A53R48	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
A53R49	315-0562-00			RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625
A53R51	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
A53R53	315-0122-00			RES.,FXD,CMPSN:1.2K OHM,5%,0.25W	01121	CB1225
A53R55	315-0625-00			RES.,FXD,CMPSN:6.2M OHM,5%,0.25W	01121	CB6255
A53R56	315-0205-00			RES.,FXD,CMPSN:2M OHM,5%,0.25W	01121	CB2055
A53R73	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A53R74	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
A53R76	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A53R81	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A53R83	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A53R84	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A53R85	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
A53R86	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A53R87	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A53R91	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A53R92	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
A53R96	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
A53R97	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A53R98	315-0151-00			RES.,FXD,CMPSN:150 OHM,5%,0.25W	01121	CB1515
A53TP44	214-0579-02			TERM,TEST POINT:BRASS	80009	214-0579-02
A53TP51	214-0579-02			TERM,TEST POINT:BRASS	80009	214-0579-02
A53TP55	214-0579-02			TERM,TEST POINT:BRASS	80009	214-0579-02
A53TP62	214-0579-02			TERM,TEST POINT:BRASS	80009	214-0579-02
A53U03	156-0356-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	80009	156-0356-00
A53U13	156-0356-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	80009	156-0356-00
A53U59	156-0158-04			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	01295	MC1458JG
A53U81	156-0130-00			MICROCIRCUIT,LI:BALANCED MODEM	80009	156-0130-00
A53U87	156-0130-00			MICROCIRCUIT,LI:BALANCED MODEM	80009	156-0130-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A54	670-5020-00			CKT BOARD ASSY:DET-L.O. SWITCH	80009	670-5020-00
A54C10	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A54C13	283-0004-00			CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855-558Z5V0203Z
A54C21	283-0004-00			CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855-558Z5V0203Z
A54C34	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A54C36	283-0004-00			CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855-558Z5V0203Z
A54C43	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A54C44	283-0065-00			CAP.,FXD,CER DI:0.001UF,5%,100V	72982	805-518-Z5D0102J
A54C51	283-0004-00			CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855-558Z5V0203Z
A54C56	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A54C58	281-0509-00			CAP.,FXD,CER DI:15PF,+/-1.5PF,500V	72982	301-000C0G0150K
A54C63	283-0615-00			CAP.,FXD,MICA D:33PF,5%,500V	00853	D155E330J0
A54C65	283-0004-00			CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855-558Z5V0203Z
A54C66	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A54C67	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A54C71	283-0004-00			CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855-558Z5V0203Z
A54C75	283-0004-00			CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855-558Z5V0203Z
A54C85	283-0004-00			CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855-558Z5V0203Z
A54CR14	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A54CR15	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A54CR22	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A54CR41	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A54CR59	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A54CR61	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A54CR63	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A54CR78	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A54L31	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A54LR63	108-0212-00			COIL,RF:FIXED,495NH	80009	108-0212-00
A54LR66	108-0520-00			COIL,RF:2.2UH (WOUND ON A 10 OHM RES)	80009	108-0520-00
A54Q03	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
A54Q04	151-0164-00			TRANSISTOR:SILICON,PNP	01295	SKB3334
A54Q17	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
A54Q19	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
A54Q34	151-0472-00			TRANSISTOR:SILICON,NPN	80009	151-0472-00
A54Q35	151-0472-00			TRANSISTOR:SILICON,NPN	80009	151-0472-00
A54Q62	151-0325-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4258	80009	151-0325-00
A54Q72	151-0472-00			TRANSISTOR:SILICON,NPN	80009	151-0472-00
A54R02	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A54R03	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A54R05	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A54R06	315-0753-00			RES.,FXD,CMPSN:75K OHM,5%,0.25W	01121	CB7535
A54R07	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A54R08	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A54R12	301-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.50W	01121	EB5115
A54R13	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
A54R19	315-0133-00			RES.,FXD,CMPSN:13K OHM,5%,0.25W	01121	CB1335
A54R23	315-0432-00			RES.,FXD,CMPSN:4.3K OHM,5%,0.25W	01121	CB4325
A54R24	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A54R25	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A54R31	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
A54R32	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A54R33	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A54R34	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A54R36	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A54R38	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
A54R43	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A54R48	301-0122-00			RES.,FXD,CMPSN:1.2K OHM,5%,0.50W	01121	EB1225

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Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A54R50	301-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.50W	01121	EB5115
A54R55	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A54R58	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A54R60	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A54R64	315-0680-00			RES.,FXD,CMPSN:68 OHM,5%,0.25W	01121	CB6805
A54R65	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A54R70	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A54R73	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A54R75	315-0151-00			RES.,FXD,CMPSN:150 OHM,5%,0.25W	01121	CB1515
A54R83	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A54R84	301-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.50W	01121	EB3015
A54R86	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A55	670-5007-00			CKT BOARD ASSY:LIMITER	80009	670-5007-00
A55C05	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A55C09	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A55C14	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A55C18	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A55C24	283-0688-00			CAP.,FXD,MICA D:464PF,1%,300V	00853	D153F4640F0
A55C34	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A55C44	283-0688-00			CAP.,FXD,MICA D:464PF,1%,300V	00853	D153F4640F0
A55C54	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A55C64	283-0688-00			CAP.,FXD,MICA D:464PF,1%,300V	00853	D153F4640F0
A55C69	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A55C74	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A55C84	283-0688-00			CAP.,FXD,MICA D:464PF,1%,300V	00853	D153F4640F0
A55C87	290-0745-00			CAP.,FXD,ELCTLT:22UF,+50-10%,25V	56289	502D225
A55C89	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	72982	8131N075 E474M
A55C94	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A55C98	290-0745-00			CAP.,FXD,ELCTLT:22UF,+50-10%,25V	56289	502D225
A55CR11	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A55CR31	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A55CR61	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A55CR81	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A55L05	108-0182-00			COIL,RF:0.3UH	80009	108-0182-00
A55L15	108-0736-00			COIL,RF:810NH	80009	108-0736-00
A55L17	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A55L35	108-0262-00			COIL,RF:FIXED,50MH	80009	108-0262-00
A55L37	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A55L45	108-0736-00			COIL,RF:810NH	80009	108-0736-00
A55L54	108-0262-00			COIL,RF:FIXED,50MH	80009	108-0262-00
A55L57	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A55L58	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A55L64	108-0736-00			COIL,RF:810NH	80009	108-0736-00
A55L75	108-0262-00			COIL,RF:FIXED,50MH	80009	108-0262-00
A55L76	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A55L84	108-0736-00			COIL,RF:810NH	80009	108-0736-00
A55Q02	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A55Q09	151-0472-00			TRANSISTOR:SILICON,NPN	80009	151-0472-00
A55Q15	151-0472-00			TRANSISTOR:SILICON,NPN	80009	151-0472-00
A55Q21	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A55Q22	151-0472-00			TRANSISTOR:SILICON,NPN	80009	151-0472-00
A55Q32	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A55Q35	151-0472-00			TRANSISTOR:SILICON,NPN	80009	151-0472-00
A55Q41	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A55Q43	151-0472-00			TRANSISTOR:SILICON,NPN	80009	151-0472-00
A55Q52	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A55Q55	151-0472-00			TRANSISTOR:SILICON,NPN	80009	151-0472-00
A55Q60	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A55Q62	151-0472-00			TRANSISTOR:SILICON,NPN	80009	151-0472-00
A55Q75	151-0472-00			TRANSISTOR:SILICON,NPN	80009	151-0472-00
A55Q81	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A55Q90	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A55Q92	151-0472-00			TRANSISTOR:SILICON,NPN	80009	151-0472-00
A55R00	311-1280-00			RES.,VAR,NONWIR:1K OHM,10%,0.50W	32997	3329W-L58-102
A55R01	315-0362-00			RES.,FXD,CMPSN:3.6K OHM,5%,0.25W	01121	CB3625
A55R02	321-0126-00			RES.,FXD,FILM:200 OHM,1%,0.125W	91637	MFF1816G200R0F
A55R04	321-0123-00			RES.,FXD,FILM:187 OHM,1%,0.125W	91637	MFF1816G187R0F
A55R05	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A55R08	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A55R11	321-0126-00			RES.,FXD,FILM:200 OHM,1%,0.125W	91637	MFF1816G200R0F
A55R12	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A55R15	321-0051-00			RES.,FXD,FILM:33.2 OHM,1%,0.125W	91637	MFF1816G33R20F
A55R18	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A55R19	321-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.125W	91637	MFF1816G49R90F
A55R21	315-0362-00			RES.,FXD,CMPSN:3.6K OHM,5%,0.25W	01121	CB3625
A55R22	321-0126-00			RES.,FXD,FILM:200 OHM,1%,0.125W	91637	MFF1816G200R0F
A55R24	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A55R25	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A55R26	321-0147-00			RES.,FXD,FILM:332 OHM,1%,0.125W	91637	MFF1816G332R0F
A55R30	311-1280-00			RES.,VAR,NONWIR:1K OHM,10%,0.50W	32997	3329W-L58-102
A55R31	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A55R34	321-0051-00			RES.,FXD,FILM:33.2 OHM,1%,0.125W	91637	MFF1816G33R20F
A55R35	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A55R41	321-0126-00			RES.,FXD,FILM:200 OHM,1%,0.125W	91637	MFF1816G200R0F
A55R45	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A55R46	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A55R47	321-0147-00			RES.,FXD,FILM:332 OHM,1%,0.125W	91637	MFF1816G332R0F
A55R50	311-1280-00			RES.,VAR,NONWIR:1K OHM,10%,0.50W	32997	3329W-L58-102
A55R51	315-0362-00			RES.,FXD,CMPSN:3.6K OHM,5%,0.25W	01121	CB3625
A55R52	321-0126-00			RES.,FXD,FILM:200 OHM,1%,0.125W	91637	MFF1816G200R0F
A55R57	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A55R61	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A55R62	321-0126-00			RES.,FXD,FILM:200 OHM,1%,0.125W	91637	MFF1816G200R0F
A55R64	321-0051-00			RES.,FXD,FILM:33.2 OHM,1%,0.125W	91637	MFF1816G33R20F
A55R65	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A55R70	321-0239-00			RES.,FXD,FILM:3.01K OHM,1%,0.125W	91637	MFF1816G30100F
A55R71	321-0126-00			RES.,FXD,FILM:200 OHM,1%,0.125W	91637	MFF1816G200R0F
A55R73	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A55R74	321-0147-00			RES.,FXD,FILM:332 OHM,1%,0.125W	91637	MFF1816G332R0F
A55R75	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A55R80	321-0164-00			RES.,FXD,FILM:499 OHM,1%,0.125W	91637	MFF1816G499R0F
A55R81	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A55R82	321-0126-00			RES.,FXD,FILM:200 OHM,1%,0.125W	91637	MFF1816G200R0F
A55R84	321-0051-00			RES.,FXD,FILM:33.2 OHM,1%,0.125W	91637	MFF1816G33R20F
A55R94	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
A55R95	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A56	670-5194-03			CKT BOARD ASSY:CONVERTER CONTROL	80009	670-5194-03
A56C03	283-0637-00			CAP.,FXD,MICA D:20PF,2.5%,100V	00853	D151E200D0
A56C05	283-0615-00			CAP.,FXD,MICA D:33PF,5%,500V	00853	D155E330J0
A56C13	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A56C15	283-0615-00			CAP.,FXD,MICA D:33PF,5%,500V	00853	D155E330J0
A56C30	283-0706-00			CAP.,FXD,MICA D:91PF,+/-1PF,500V	00853	D15-5E910F0
A56C31	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A56C35	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A56C37	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A56C46	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A56C51	283-0644-00			CAP.,FXD,MICA D:150PF,1%,500V	00853	D155E151F0
A56C61	283-0706-00			CAP.,FXD,MICA D:91PF,+/-1PF,500V	00853	D15-5E910F0
A56C70	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A56C73	283-0644-00			CAP.,FXD,MICA D:150PF,1%,500V	00853	D155E151F0
A56C76	283-0114-00			CAP.,FXD,CER DI:0.0015UF,5%,200V	72982	805-509B152J
A56C78	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A56C84	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A56C85	290-0535-00			CAP.,FXD,ELCTLT:33UF,20%,10V	56289	196D336X0010KA1
A56C88	290-0745-00			CAP.,FXD,ELCTLT:22UF,+50-10%,25V	56289	502D225
A56CR62	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A56CR94	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A56L13	108-0413-00			COIL,RF:FIXED,0.4UH	80009	108-0413-00
A56L14	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A56L50	108-0443-00			COIL,RF:25UH	80009	108-0443-00
A56L60	108-0443-00			COIL,RF:25UH	80009	108-0443-00
A56L76	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A56LR03	108-0408-00			COIL,RF:100NH	80009	108-0408-00
A56LR12	108-0543-00			COIL,RF:FIXED,1.1UH	80009	108-0543-00
A56P29	131-1771-00			CONNECTOR,RCPT,:CIRCUIT BOARD,6 FEMALE	22526	65001-111
A56Q02	151-0333-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	04713	SPS1752
A56Q35	151-0333-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	04713	SPS1752
A56Q55	151-1054-00			TRANSISTOR:SILICON,JFE,N-CHANNEL,DUAL	80009	151-1054-00
A56Q64	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A56Q74	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
A56Q91	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
A56Q92	151-0127-00			TRANSISTOR:SILICON,NPN	07263	S006075
A56Q95	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A56R04	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A56R06	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A56R10	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A56R11	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A56R16	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A56R21	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A56R25	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A56R31	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A56R32	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A56R34	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
A56R35	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A56R36	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
A56R43	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A56R45	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
A56R52	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A56R53	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A56R63	321-0322-00			RES.,FXD,FILM:22.1K OHM,1%,0.125W	91637	MFF1816G22101F
A56R71	315-0272-00			RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	01121	CB2725
A56R72	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A56R73	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A56R76	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
A56R80	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A56R81	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A56R82	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A56R83	315-0183-00			RES.,FXD,CMPSN:18K OHM,5%,0.25W	01121	CB1835
A56R84	315-0242-00			RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	01121	CB2425
A56R85	321-0073-00			RES.,FXD,FILM:56.2 OHM,1%,0.125W	91637	MFF1816G56R20F
A56R87	321-0287-00			RES.,FXD,FILM:9.53K OHM,1%,0.125W	91637	MFF1816G95300F
A56R88	321-0262-00			RES.,FXD,FILM:5.23K OHM,1%,0.125W	91637	MFF1816G52300F
A56TP70	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
A56U22	156-0130-00			MICROCIRCUIT,LI:BALANCED MODEM	80009	156-0130-00
A56Y18	158-0206-00			XTAL UNIT,QTZ:61.150MHZ,0.01%,SER	33096	PB5057

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A57	670-5196-03			CKT BOARD ASSY:CONVERT OSCILLATOR	80009	670-5196-03
A57C06	281-0651-00			CAP.,FXD,CER DI:47PF,5%,200V	72982	374001T2H0470J
A57C07	281-0552-00			CAP.,FXD,CER DI:25PF,5%,500V	72982	301-000P2G0250J
A57C08	283-0602-00			CAP.,FXD,MICA D:53PF,5%,300V	00853	D153E530J0
A57C14	283-0630-00			CAP.,FXD,MICA D:110PF,1%,100V	00853	D151E111F0
A57C15	283-0630-00			CAP.,FXD,MICA D:110PF,1%,100V	00853	D151E111F0
A57C21	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A57C25	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A57C28	283-0067-00			CAP.,FXD,CER DI:0.001UF,10%,200V	72982	835-515B102K
A57C30	283-0633-00			CAP.,FXD,MICA D:77PF,1%,100V	00853	D151E770F0
A57C36	283-0114-00			CAP.,FXD,CER DI:0.0015UF,5%,200V	72982	805-509B152J
A57C45	290-0745-00			CAP.,FXD,ELCTLT:22UF,+50-10%,25V	56289	502D225
A57C52	283-0629-00			CAP.,FXD,MICA D:62PF,1%,500V	00853	D105E620F0
A57C53	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A57C55	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A57C63	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A57C66	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A57C73	283-0646-00			CAP.,FXD,MICA D:170PF,1%,100V	00853	D151E171F0
A57C77	283-0635-00			CAP.,FXD,MICA D:51PF,1%,100V	00853	D151E510F0
A57C83	283-0706-00			CAP.,FXD,MICA D:91PF,+/-1PF,500V	00853	D15-5E910F0
A57C84	281-0092-00			CAP.,VAR,CER DI:9-35PF,200V	72982	538-011 D9-35
A57CR09	152-0665-00			SEMICOND DEVICE:SILICON,VVC,30V	04713	SMV1344
A57L03	114-0373-00			COIL,RF:VAR,290 TO 540NH	80009	114-0373-00
A57L18	108-0397-00			COIL,RF:1.3UF	80009	108-0397-00
A57L31	108-0262-00			COIL,RF:FIXED,50MH	80009	108-0262-00
A57L41	114-0302-00			COIL,RF:VAR,140-290MH	80009	114-0302-00
A57L82	108-0260-00			COIL,RF:98NH	80009	108-0260-00
A57L86	108-0413-00			COIL,RF:FIXED,0.4UH	80009	108-0413-00
A57LR13	108-0408-00			COIL,RF:100NH	80009	108-0408-00
A57LR56	108-0520-00			COIL,RF:2.2UH (WOUND ON A 10 OHM RES)	80009	108-0520-00
A57LR72	108-0328-00			COIL,RF:0.3UH	80009	108-0328-00
A57Q22	151-0333-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	04713	SPS1752
A57Q32	151-0333-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS918	04713	SPS1752
A57Q35	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A57Q62	151-0472-00			TRANSISTOR:SILICON,NPN	80009	151-0472-00
A57R11	315-0272-00			RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	01121	CB2725
A57R12	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
A57R21	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A57R23	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
A57R26	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A57R27	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
A57R46	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A57R53	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A57R61	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A57R65	315-0620-00			RES.,FXD,CMPSN:62 OHM,5%,0.25W	01121	CB6205
A57R71	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
A57R73	315-0180-00			RES.,FXD,CMPSN:18 OHM,5%,0.25W	01121	CB1805
A57R74	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A57R75	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A58	670-5195-00			CKT BOARD ASSY:PHASE LOCK SWITCH	80009	670-5195-00
A58C67	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,50V	72982	8121N083Z5U0104Z
A58C68	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,50V	72982	8121N083Z5U0104Z
A58C69	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,50V	72982	8121N083Z5U0104Z
A58C76	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,50V	72982	8121N083Z5U0104Z
A58C77	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,50V	72982	8121N083Z5U0104Z
A58C79	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,50V	72982	8121N083Z5U0104Z
A58C89	283-0024-00			CAP.,FXD,CER DI:0.1UF,+80-20%,50V	72982	8121N083Z5U0104Z
A58CR51	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A58CR76	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A58CR77	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A58CR78	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A58CR79	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A58L67	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A58L74	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A58L75	120-0382-00			XFMR,TOROID:14 TURNS,SINGLE	80009	120-0382-00
A58R52	315-0203-00			RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
A58R53	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A58R57	301-0681-00			RES.,FXD,CMPSN:680 OHM,5%,0.50W	01121	EB6815
A58R61	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
A58R67	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
A58R68	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
A58R76	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A58R77	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A58S22	263-0021-01			SWITCH PB ASSY:4 LCH,7.5MM,6 CONTACTS	80009	263-0021-01
A58S25	263-0015-04			SWITCH PB ASSY:2 LCH,7.5MM,2 CONTACTS	80009	263-0015-04
A58S28	263-0015-05			SWITCH PB ASSY:2 LCH,7.5MM,2 CONTACTS	80009	263-0015-05
A59	670-5021-00			CKT BOARD ASSY:PHASE LOCK INTERFACE	80009	670-5021-00
A59C04	290-0745-00			CAP.,FXD,ELCTLT:22UF,+50-10%,25V	56289	502D225
A59C06	290-0745-00			CAP.,FXD,ELCTLT:22UF,+50-10%,25V	56289	502D225
A59C55	283-0353-00			CAP.,FXD,CER DI:0.1UF,10%,50V	95275	VJ1210Y104K-H
A59C56	283-0353-00			CAP.,FXD,CER DI:0.1UF,10%,50V	95275	VJ1210Y104K-H
A59C57	283-0353-00			CAP.,FXD,CER DI:0.1UF,10%,50V	95275	VJ1210Y104K-H
A59W50	175-2076-00			CABLE ASSY,RF:50 OHM COAX,3.375 L	80009	175-2076-00
A59W52	175-2077-00			CABLE ASSY,RF:50 OHM COAX,6.5 L	80009	175-2077-00
A59W56	175-2075-00			CABLE ASSY,RF:50 OHM COAX,3.375 L	80009	175-2075-00
A59W57	175-2107-00			CABLE ASSY,RF:50 OHM COAX,3.3 L	80009	175-2107-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A60	670-5022-02			CKT BOARD ASSY:A.G.C.,LOGIC	80009	670-5022-02
A60C00	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A60C05	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A60C11	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A60C12	290-0770-00			CAP.,FXD,ELCTLT:100UF,+50-10%,25V	56289	502D230
A60C13	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A60C14	283-0028-00			CAP.,FXD,CER DI:0.0022UF,20%,50V	56289	19C606
A60C15	283-0103-00			CAP.,FXD,CER DI:180PF,5%,500V	56289	40C638
A60C16	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	72982	8131N075 E474M
A60C17	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
A60C20	283-0672-00			CAP.,FXD,MICA D:200PF,1%,500V	00853	D155F2010F0
A60C21	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A60C22	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
A60C23	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
A60C24	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A60C25	283-0167-00			CAP.,FXD,CER DI:0.1UF,10%,100V	72982	8131N145X5R0104K
A60C26	283-0785-00			CAP.,FXD,MICA D:250PF,1%,500V	09023	CD15FD251F03
A60C27	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A60C28	283-0598-00			CAP.,FXD,MICA D:253PF,5%,300V	09023	CD15EC(253)J03
A60C29	283-0728-00			CAP.,FXD,MICA D:120PF,1%,500V	00853	D155F121F03
A60C30	283-0114-00			CAP.,FXD,CER DI:0.0015UF,5%,200V	72982	805-509B152J
A60C31	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A60C38	283-0601-00			CAP.,FXD,MICA D:22PF,10%,300V	00853	D153C220K0
A60C39	283-0032-00			CAP.,FXD,CER DI:470PF,5%,500V	72982	0831085Z5E00471J
A60C40	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A60C42	285-0598-00			CAP.,FXD,PLSTC:0.01UF,5%,100V	01002	61F10AC103
A60C43	283-0032-00			CAP.,FXD,CER DI:470PF,5%,500V	72982	0831085Z5E00471J
A60C45	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A60C54	283-0142-00			CAP.,FXD,CER DI:0.0027UF,5%,200V	72982	875-571-Y5E0272J
A60C60	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A60C61	283-0659-00			CAP.,FXD,MICA D:1160PF,2%,500V	00853	D195C1161G0
A60C62	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A60C63	283-0689-00			CAP.,FXD,MICA D:550PF,0.5%,300V	00853	D153F551E0
A60C67	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A60C68	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A60C71	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A60C78	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A60C88	290-0526-00			CAP.,FXD,ELCTLT:6.8UF,20%,6V	90201	TDC685M00NLE
A60C97	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A60C98	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A60CR02	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A60CR09	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A60CR16	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A60CR19	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A60CR32	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A60CR34	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A60CR37	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A60CR54	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A60CR55	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A60CR61	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A60CR62	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A60CR63	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A60CR64	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A60CR65	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A60CR66	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A60CR67	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A60CR68	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A60CR69	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A60CR77	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A60CR78	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A60CR79	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A60CR88	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A60CR98	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A60K97	148-0081-00			RELAY,ARMATURE:28DC	77342	R10-E2434-1
A60L28	114-0311-00			COIL,RF:65-190UH	80009	114-0311-00
A60L38	114-0219-00			COIL,RF:VARIABLE,43-130UH	80009	114-0219-00
A60Q09	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A60Q11	151-0301-00			TRANSISTOR:SILICON,PNP	04713	2N2907A
A60Q12	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A60Q13	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A60Q14	151-1005-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	80009	151-1005-00
A60Q17	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A60Q20	151-0127-00			TRANSISTOR:SILICON,NPN	07263	S006075
A60Q36	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A60Q37	151-0219-00			TRANSISTOR:SILICON,PNP	07263	S022650
A60Q51	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A60Q89	151-0281-00			TRANSISTOR:SILICON,NPN	03508	X16P4039
A60R01	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A60R02	321-0321-00			RES.,FXD,FILM:21.5K OHM,1%,0.125W	91637	MFF1816G21501F
A60R03	321-0891-00			RES.,FXD,FILM:800K OHM,1%,0.125W	91637	MFF1816G80002F
A60R04	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A60R05	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A60R06	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A60R07	321-0172-00			RES.,FXD,FILM:604 OHM,1%,0.125W	91637	MFF1816G604R0F
A60R08	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
A60R09	321-0281-00			RES.,FXD,FILM:8.25K OHM,1%,0.125W	91637	MFF1816G82500F
A60R10	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
A60R11	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A60R12	301-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.50W	01121	EB2015
A60R13	315-0203-00			RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
A60R14	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
A60R15	315-0683-00			RES.,FXD,CMPSN:68K OHM,5%,0.25W	01121	CB6835
A60R16	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
A60R17	311-1226-00			RES.,VAR,NONWIR:2.5K OHM,20%,0.50W	32997	3386F-T04-252
A60R18	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A60R19	321-0260-00			RES.,FXD,FILM:4.99K OHM,1%,0.125W	91637	MFF1816G49900F
A60R20	321-0263-00			RES.,FXD,FILM:5.36K OHM,1%,0.125W	91637	MFF1816G53600F
A60R21	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
A60R22	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
A60R23	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A60R24	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A60R25	315-0684-00			RES.,FXD,CMPSN:680K OHM,5%,0.25W	01121	CB6845
A60R26	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
A60R27	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A60R28	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
A60R29	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A60R30	315-0205-00			RES.,FXD,CMPSN:2M OHM,5%,0.25W	01121	CB2055
A60R31	315-0392-00			RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
A60R32	321-0241-00			RES.,FXD,FILM:3.16K OHM,1%,0.125W	91637	MFF1816G31600F
A60R33	311-1228-00			RES.,VAR,NONWIR:10K OHM,20%,0.50W	32997	3386F-T04-103
A60R34	321-0335-00			RES.,FXD,FILM:30.1K OHM,1%,0.125W	91637	MFF1816G30101F
A60R35	321-0414-00			RES.,FXD,FILM:200K OHM,1%,0.125W	91637	MFF1816G20002F
A60R36	321-0239-00			RES.,FXD,FILM:3.01K OHM,1%,0.125W	91637	MFF1816G30100F
A60R37	321-0176-00			RES.,FXD,FILM:665 OHM,1%,0.125W	91637	MFF1816G665R0F

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A60R38	321-0191-00			RES.,FXD,FILM:953 OHM,1%,0.125W	91637	MFF1816G953R0F
A60R39	315-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
A60R40	315-0122-00			RES.,FXD,CMPSN:1.2K OHM,5%,0.25W	01121	CB1225
A60R41	321-0357-00			RES.,FXD,FILM:51.1K OHM,1%,0.125W	91637	MFF1816G51101F
A60R42	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
A60R43	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
A60R44	131-0566-00			BUS CONDUCTOR:DUMMY RES,2.375,22 AWG	55210	L-2007-1
A60R45	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
A60R46	315-0204-00			RES.,FXD,CMPSN:200K OHM,5%,0.25W	01121	CB2045
A60R47	311-1228-00			RES.,VAR,NONWIR:10K OHM,20%,0.50W	32997	3386F-T04-103
A60R48	321-0210-00			RES.,FXD,FILM:1.5K OHM,1%,0.125W	91637	MFF1816G15000F
A60R49	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
A60R50	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A60R51	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A60R52	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A60R53	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A60R54	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A60R55	311-1223-00			RES.,VAR,NONWIR:TRMR,250 OHM,0.5W	02111	63M251T602
A60R56	321-0276-00			RES.,FXD,FILM:7.32K OHM,1%,0.125W	91637	MFF1816G73200F
A60R57	311-1223-00			RES.,VAR,NONWIR:TRMR,250 OHM,0.5W	02111	63M251T602
A60R58	311-1224-00			RES.,VAR,NONWIR:500 OHM,20%,0.50W	32997	3386F-T04-501
A60R59	311-1224-00			RES.,VAR,NONWIR:500 OHM,20%,0.50W	32997	3386F-T04-501
A60R60	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	91637	MFF1816G37401F
A60R61	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	91637	MFF1816G37401F
A60R62	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
A60R63	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
A60R64	321-0603-07			RES.,FXD,FILM:15K OHM,0.1%,0.125W	91637	MFF1816C15001B
A60R65	321-0685-00			RES.,FXD,FILM:15K OHM,0.1%,0.125W	91637	MFF1816D300010
A60R66	321-0720-03			RES.,FXD,FILM:60K OHM,0.25%,0.125W	91637	MFF1816D60001C
A60R67	321-0393-00			RES.,FXD,FILM:121K OHM,1%,0.125W	91637	MFF1816G12102F
A60R68	321-0422-00			RES.,FXD,FILM:243K OHM,1%,0.125W	91637	MFF1816G24302F
A60R69	321-0451-00			RES.,FXD,FILM:487K OHM,1%,0.125W	91637	MFF1816G48702F
A60R73	315-0134-00			RES.,FXD,CMPSN:130K OHM,5%,0.25W	01121	CB1345
A60R74	315-0395-00			RES.,FXD,CMPSN:3.9M OHM,5%,0.25W	01121	CB3955
A60R75	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
A60R76	315-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
A60R77	315-0474-00			RES.,FXD,CMPSN:470K OHM,5%,0.25W	01121	CB4745
A60R83	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A60R84	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A60R85	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A60R86	315-0241-00			RES.,FXD,CMPSN:240 OHM,5%,0.25W	01121	CB2415
A60R87	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A60R88	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
A60R89	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
A60S01	263-0011-09			SWITCH PB ASSY:1 PUSH,10MM,3 CONTACTS	80009	263-0011-09
A60S03	263-0011-09			SWITCH PB ASSY:1 PUSH,10MM,3 CONTACTS	80009	263-0011-09
A60S06	263-0023-02			SWITCH,PB ASSY:3 LCH,7.5MM,6 CONTACTS	80009	263-0023-02
A60TP25	214-0579-02			TERM,TEST POINT:BRASS	80009	214-0579-02
A60TP27	214-0579-02			TERM,TEST POINT:BRASS	80009	214-0579-02
A60TP32	214-0579-02			TERM,TEST POINT:BRASS	80009	214-0579-02
A60TP45	214-0579-02			TERM,TEST POINT:BRASS	80009	214-0579-02
A60U12	156-0200-00			MICROCIRCUIT,LI:LOW INPUT/OFFSET CURRENT	04713	MC1456P1
A60U17	156-0158-04			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	01295	MC1458JG
A60U18	156-0356-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	80009	156-0356-00
A60U24	155-0144-00			MICROCIRCUIT,LI:DUAL IN-LINE,16 LEAD	80009	155-0144-00
A60U31	156-0382-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	80009	156-0382-00
A60U33	156-0385-00			MICROCIRCUIT,DI:HEX.INVERTER	80009	156-0385-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A60U34	156-0091-00			MICROCIRCUIT,DI:DIV BY 2 AND 5 RIPPLE CNTR	80009	156-0091-00
A60U41	156-0081-00			MICROCIRCUIT,LI:SGL RETRIGGERABLE MV	04713	MC9601(P OR L)
A60U43	156-0388-00			MICROCIRCUIT,DI:DUAL D-TYPE FLIP-FLOP	80009	156-0388-00
A60U45	156-0158-04			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	01295	MC1458JG
A60U48	156-0570-00			MICROCIRCUIT,LI:DUAL HIGH SPEED COMPARATOR	27014	LM319H
A60U53	156-0388-00			MICROCIRCUIT,DI:DUAL D-TYPE FLIP-FLOP	80009	156-0388-00
A60U61	156-0651-00			MICROCIRCUIT,DI:8-BIT PRL-OUT,SER SHF RGTR	01295	SN74LS164N
A60U62	156-0733-00			MICROCIRCUIT,DI:DUAL MONOSTABLE MV	80009	156-0733-00
A60U64	156-0721-00			MICROCIRCUIT,DI:ST POS-NAND GATES W/TP OUT	27014	DM74LS132N
A60U65	156-0651-00			MICROCIRCUIT,DI:8-BIT PRL-OUT,SER SHF RGTR	01295	SN74LS164N
A60U66	156-0388-00			MICROCIRCUIT,DI:DUAL D-TYPE FLIP-FLOP	80009	156-0388-00
A60U71	156-0479-00			MICROCIRCUIT,DI:QUAD 2-INPUT OR GATE	27014	DM74LS32N
A60U73	156-0479-00			MICROCIRCUIT,DI:QUAD 2-INPUT OR GATE	27014	DM74LS32N
A60U74	156-0905-11			MICROCIRCUIT,DI:256 X 4 PROM,PROGRAMMED	80009	156-0905-11
A60U76	156-0422-00			MICROCIRCUIT,DI:UP/DOWN SYNC BINARY COUNTER	07263	74LS191PC OR DC
A60U78	156-0058-00			MICROCIRCUIT,DI:HEX.INVERTER	80009	156-0058-00
A60U79	156-0030-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	01295	SN7400(N OR J)
A60U81	156-0381-00			MICROCIRCUIT,DI:QUAD 2-INPUT EXCL OR GATES	80009	156-0381-00
A60U83	156-0381-00			MICROCIRCUIT,DI:QUAD 2-INPUT EXCL OR GATES	80009	156-0381-00
A60U84	156-0480-00			MICROCIRCUIT,DI:QUAD 2-INPUT AND GATE	01295	SN74LS08(N OR J)
A60U86	156-0422-00			MICROCIRCUIT,DI:UP/DOWN SYNC BINARY COUNTER	07263	74LS191PC OR DC
A60U91	156-0480-00			MICROCIRCUIT,DI:QUAD 2-INPUT AND GATE	01295	SN74LS08(N OR J)
A60U93	156-0480-00			MICROCIRCUIT,DI:QUAD 2-INPUT AND GATE	01295	SN74LS08(N OR J)
A60U94	156-0905-12			MICROCIRCUIT,DI:256 X 4 PROM,PROGRAMMED	80009	156-0905-12

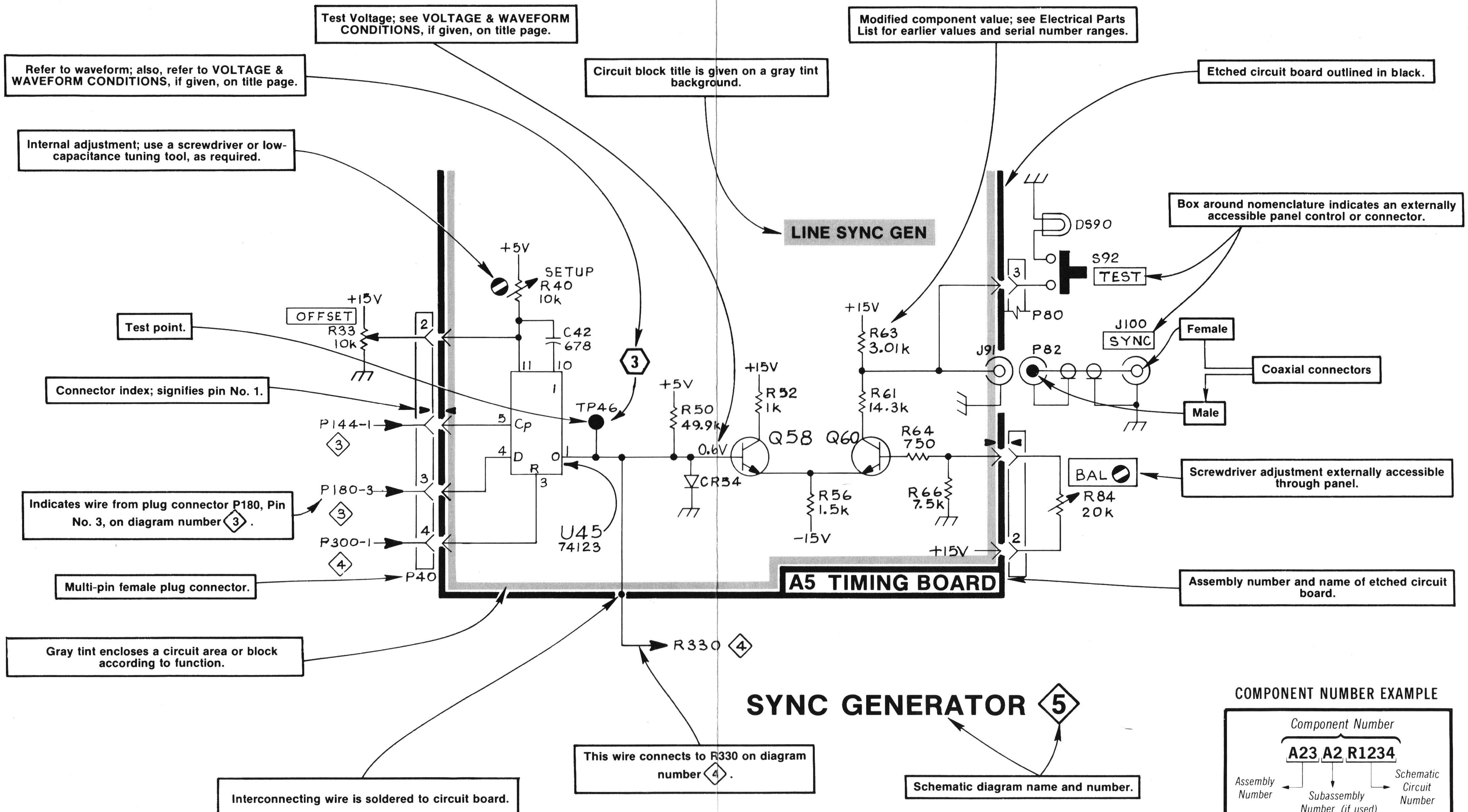
Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A61	670-5023-00			CKT BOARD ASSY:A.G.C.,READOUT DRIVER	80009	670-5023-00
A61C39	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A61C64	283-0067-00			CAP.,FXD,CER DI:0.001UF,10%,200V	72982	835-515B102K
A61C72	283-0032-00			CAP.,FXD,CER DI:470PF,5%,500V	72982	0831085Z5E00471J
A61C84	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A61C91	283-0339-00			CAP.,FXD,CER DI:0.22UF.10%,50V	72982	8131N075W5R224K
A61C92	283-0594-00			CAP.,FXD,MICA D:0.001UF,1%,100V	00853	D151F102F0
A61C93	283-0601-00			CAP.,FXD,MICA D:22PF,10%,300V	00853	D153C220K0
A61C94	281-0204-00			CAP.,VAR,PLSTC:2-22PF,100V	80031	287C00222MJ02
A61C95	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A61C96	290-0782-00			CAP.,FXD,ELCTLT:4.7UF,+75-10%,35V	56289	503D475G035AS
A61C99	290-0782-00			CAP.,FXD,ELCTLT:4.7UF,+75-10%,35V	56289	503D475G035AS
A61CR82	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A61CR91	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A61CR92	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A61CR96	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	01295	1N4152R
A61Q50	151-0301-00			TRANSISTOR:SILICON,PNP	04713	2N2907A
A61Q73	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A61Q83	151-0127-00			TRANSISTOR:SILICON,NPN	07263	S006075
A61Q92	151-0127-00			TRANSISTOR:SILICON,NPN	07263	S006075
A61Q95	151-0301-00			TRANSISTOR:SILICON,PNP	04713	2N2907A
A61Q96	151-0261-00			TRANSISTOR:SILICON,PNP,DUAL	80009	151-0261-00
A61R10	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A61R11	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A61R12	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A61R13	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A61R14	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A61R15	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A61R16	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A61R17	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A61R18	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A61R19	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A61R20	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A61R21	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A61R22	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A61R23	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A61R24	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A61R25	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A61R26	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A61R27	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A61R28	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A61R29	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A61R30	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A61R31	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A61R35	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A61R36	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A61R37	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A61R38	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A61R39	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A61R50	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A61R51	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A61R52	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A61R53	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A61R54	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A61R55	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A61R56	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A61R57	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A61R58	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A61R59	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A61R60	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
A61R61	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
A61R62	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A61R64	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A61R68	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A61R69	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A61R72	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A61R73	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A61R74	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A61R81	315-0304-00			RES.,FXD,CMPSN:300K OHM,5%,0.25W	01121	CB3045
A61R82	315-0155-00			RES.,FXD,CMPSN:1.5M OHM,5%,0.25W	01121	CB1555
A61R83	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A61R84	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A61R91	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A61R95	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A61R96	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A61R97	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A61S056	260-1589-00			SWITCH,PUSH:(6)SPST,0.1A,5V	00779	435166-4
A61S057	260-1589-00			SWITCH,PUSH:(6)SPST,0.1A,5V	00779	435166-4
A61TP67	214-0579-00			TERM,TEST POINT:BRS CD PL	80009	214-0579-00
A61U32	156-0128-00			MICROCIRCUIT,DI:SGL BCD TO 7-SEG DCDR/DRVR	80009	156-0128-00
A61U35	156-0128-00			MICROCIRCUIT,DI:SGL BCD TO 7-SEG DCDR/DRVR	80009	156-0128-00
A61U38	156-0128-00			MICROCIRCUIT,DI:SGL BCD TO 7-SEG DCDR/DRVR	80009	156-0128-00
A61U41	156-0087-00			MICROCIRCUIT,DI:4-BIT BINARY FULL ADDER	80009	156-0087-00
A61U43	156-0569-00			MICROCIRCUIT,DI:BCD COUNTER	34335	SN74LS190N OR J
A61U46	156-0569-00			MICROCIRCUIT,DI:BCD COUNTER	34335	SN74LS190N OR J
A61U48	156-0569-00			MICROCIRCUIT,DI:BCD COUNTER	34335	SN74LS190N OR J
A61U60	156-0382-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	80009	156-0382-00
A61U63	156-0388-00			MICROCIRCUIT,DI:DUAL D-TYPE FLIP-FLOP	80009	156-0388-00
A61U65	156-0386-00			MICROCIRCUIT,DI:TRIPLE 3-INPUT NAND GATE	04713	SN74LS10N OR J
A61U68	156-0480-00			MICROCIRCUIT,DI:QUAD 2-INPUT AND GATE	01295	SN74LS08(N OR J)
A61U81	156-0656-00			MICROCIRCUIT,DI:DECADE COUNTER	80009	156-0656-00
A61U85	156-0382-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	80009	156-0382-00
A61U88	156-0422-00			MICROCIRCUIT,DI:UP/DOWN SYNC BINARY COUNTER	07263	74LS191PC OR DC
A61U91	156-0402-00			MICROCIRCUIT,LI:TIMER	27014	SL34829
A61U94	156-0096-00			MICROCIRCUIT,LI:VOLTAGE COMPARATOR	27014	LM311H
A61U98	156-0422-00			MICROCIRCUIT,DI:UP/DOWN SYNC BINARY COUNTER	07263	74LS191PC OR DC

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A62	670-5024-00			CKT BOARD ASSY:A.G.C.,READOUT DRIVER	80009	670-5024-00
A62DS24	150-1038-00			LAMP,LED RDOUT:ORANGE 7SEG,POLARITY IND	50522	MAN 3630 A
A62DS34	150-1037-00			LAMP,LED,RDOUT:7 SEGMENT,LH DECIMAL,ORANGE	50522	MAN 3620A
A62DS44	150-1037-00			LAMP,LED,RDOUT:7 SEGMENT,LH DECIMAL,ORANGE	50522	MAN 3620A
A62DS64	150-1037-00			LAMP,LED,RDOUT:7 SEGMENT,LH DECIMAL,ORANGE	50522	MAN 3620A
A62DS73	150-1000-00			LT EMITTING DIO:RED,650NM,40MA MAX	34430	MV-50
A62DS75	150-1000-00			LT EMITTING DIO:RED,650NM,40MA MAX	34430	MV-50
A70	670-4987-00			CKT BOARD ASSY:POWER SUPPLY	80009	670-4987-00
A70C01	290-0770-00			CAP.,FXD,ELCTLT:100UF,+50-10%,25V	56289	502D230
A70C04	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A70C12	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A70C13	283-0060-00			CAP.,FXD,CER DI:100PF,5%,200V	72982	855-535U2J101J
A70C14	283-0067-00			CAP.,FXD,CER DI:0.001UF,10%,200V	72982	835-515B102K
A70C21	290-0517-00			CAP.,FXD,ELCTLT:6.8UF,20%,35V	56289	196D685X0035KA1
A70C31	290-0770-00			CAP.,FXD,ELCTLT:100UF,+50-10%,25V	56289	502D230
A70C33	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A70C37	290-0436-00			CAP.,FXD,ELCTLT:10,000UF,20%,10V	56289	68D10467
A70C42	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A70C44	283-0060-00			CAP.,FXD,CER DI:100PF,5%,200V	72982	855-535U2J101J
A70C51	290-0517-00			CAP.,FXD,ELCTLT:6.8UF,20%,35V	56289	196D685X0035KA1
A70C54	283-0067-00			CAP.,FXD,CER DI:0.001UF,10%,200V	72982	835-515B102K
A70C57	290-0506-00			CAP.,FXD,ELCTLT:9600UF,+100-10%,25V	56289	68D10471
A70C62	290-0517-00			CAP.,FXD,ELCTLT:6.8UF,20%,35V	56289	196D685X0035KA1
A70C71	290-0517-00			CAP.,FXD,ELCTLT:6.8UF,20%,35V	56289	196D685X0035KA1
A70C84	283-0067-00			CAP.,FXD,CER DI:0.001UF,10%,200V	72982	835-515B102K
A70C85	283-0060-00			CAP.,FXD,CER DI:100PF,5%,200V	72982	855-535U2J101J
A70C87	290-0506-00			CAP.,FXD,ELCTLT:9600UF,+100-10%,25V	56289	68D10471
A70C91	290-0770-00			CAP.,FXD,ELCTLT:100UF,+50-10%,25V	56289	502D230
A70C92	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A70C93	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A70CR20	152-0066-00			SEMICOND DEVICE:SILICON,400V,750MA	14433	LG4016
A70CR25	152-0198-00			SEMICOND DEVICE:SILICON,200V,3A	03508	1N5624
A70CR31	152-0066-00			SEMICOND DEVICE:SILICON,400V,750MA	14433	LG4016
A70CR35	152-0198-00			SEMICOND DEVICE:SILICON,200V,3A	03508	1N5624
A70CR36	152-0198-00			SEMICOND DEVICE:SILICON,200V,3A	03508	1N5624
A70CR45	152-0198-00			SEMICOND DEVICE:SILICON,200V,3A	03508	1N5624
A70CR55	152-0659-00			SEMICOND DEVICE:SILICON,100V,6A	04713	MR751
A70CR65	152-0659-00			SEMICOND DEVICE:SILICON,100V,6A	04713	MR751
A70CR75	152-0659-00			SEMICOND DEVICE:SILICON,100V,6A	04713	MR751
A70CR76	152-0659-00			SEMICOND DEVICE:SILICON,100V,6A	04713	MR751
A70CR81	152-0066-00			SEMICOND DEVICE:SILICON,400V,750MA	14433	LG4016
A70DS10	150-1001-00			LT EMITTING DIO:RED,660NM,100MA MAX	50522	MV5024
A70DS40	150-1001-00			LT EMITTING DIO:RED,660NM,100MA MAX	50522	MV5024
A70DS70	150-1001-00			LT EMITTING DIO:RED,660NM,100MA MAX	50522	MV5024
A70F17	159-0014-00			FUSE,CARTRIDGE:3AG,5A,250V,FAST-BLOW	71400	MTH5
A70Q10	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
A70Q13	151-0389-00			TRANSISTOR:SILICON,PNP	80009	151-0389-00
A70Q14	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
A70Q22	151-0232-00			TRANSISTOR:SILICON,NPN,DUAL	80009	151-0232-00
A70Q23	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A70Q41	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
A70Q43	151-0389-00			TRANSISTOR:SILICON,PNP	80009	151-0389-00
A70Q52	151-0232-00			TRANSISTOR:SILICON,NPN,DUAL	80009	151-0232-00
A70Q53	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A70Q54	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A70Q72	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
A70Q73	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
A70Q81	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
A70Q82	151-0192-00			TRANSISTOR:SILICON,NPN,SEL FROM MPS6521	04713	SPS8801
A70Q83	151-0207-00			TRANSISTOR:SILICON,NPN	80009	151-0207-00
A70R02	308-0590-00			RES.,FXD,WW:0.25 OHM,5%,3W	91637	RS2B-ER2500J
A70R06	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A70R10	315-0122-00			RES.,FXD,CMPSN:1.2K OHM,5%,0.25W	01121	CB1225
A70R11	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A70R12	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A70R13	315-0680-00			RES.,FXD,CMPSN:68 OHM,5%,0.25W	01121	CB6805
A70R14	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A70R15	315-0241-00			RES.,FXD,CMPSN:240 OHM,5%,0.25W	01121	CB2415
A70R20	321-0779-03			RES.,FXD,FILM:7.020K OHM,0.25%,0.125W	91637	MFF1816D70200C
A70R21	321-0779-03			RES.,FXD,FILM:7.020K OHM,0.25%,0.125W	91637	MFF1816D70200C
A70R22	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
A70R23	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A70R24	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
A70R25	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
A70R32	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A70R33	315-0680-00			RES.,FXD,CMPSN:68 OHM,5%,0.25W	01121	CB6805
A70R41	308-0590-00			RES.,FXD,WW:0.25 OHM,5%,3W	91637	RS2B-ER2500J
A70R42	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A70R44	315-0241-00			RES.,FXD,CMPSN:240 OHM,5%,0.25W	01121	CB2415
A70R45	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A70R50	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
A70R51	321-0816-03			RES.,FXD,FILM:5K OHM,0.25%,0.125W	91637	MFF1816D50000C
A70R52	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A70R53	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A70R54	315-0684-00			RES.,FXD,CMPSN:680K OHM,5%,0.25W	01121	CB6845
A70R55	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
A70R56	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
A70R60	321-0603-00			RES.,FXD,FILM:15K OHM,0.25%,0.125W	91637	MFF1816D15001C
A70R61	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
A70R62	315-0362-00			RES.,FXD,CMPSN:3.6K OHM,5%,0.25W	01121	CB3625
A70R63	315-0363-00			RES.,FXD,CMPSN:36K OHM,5%,0.25W	01121	CB3635
A70R64	315-0562-00			RES.,FXD,CMPSN:5.6K OHM,5%,0.25W	01121	CB5625
A70R65	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A70R66	311-1241-00			RES.,VAR,NONWIR:100K OHM,10%,0.5W	32997	3386X-T07-104
A70R70	321-0200-00			RES.,FXD,FILM:1.18K OHM,1%,0.125W	91637	MFF1816G11800F
A70R71	321-0669-00			RES.,FXD,FILM:6.08K OHM,0.5%,0.125W	91637	MFF1816D60800D
A70R72	321-0283-08			RES.,FXD,FILM:8.66K OHM,1%,0.125W	24546	NC55C8660F
A70R73	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
A70R74	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
A70R75	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
A70R80	315-0122-00			RES.,FXD,CMPSN:1.2K OHM,5%,0.25W	01121	CB1225
A70R82	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A70R83	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A70R84	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A70R85	315-0680-00			RES.,FXD,CMPSN:68 OHM,5%,0.25W	01121	CB6805
A70R86	315-0241-00			RES.,FXD,CMPSN:240 OHM,5%,0.25W	01121	CB2415
A70R91	308-0590-00			RES.,FXD,WW:0.25 OHM,5%,3W	91637	RS2B-ER2500J
A70R93	301-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.50W	01121	EB1025
A70R94	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A70VR62	152-0317-00			SEMICOND DEVICE:ZENER,0.25W,6.2V,5%	80009	152-0317-00
A70VR73	152-0127-00			SEMICOND DEVICE:ZENER,0.4W,7.5V,5%	04713	SZG35009K2

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
				CHASSIS PARTS		
C01	283-0672-00			CAP.,FXD,MICA D:200PF,1%,500V	00853	D155F2010F0
C02	285-0862-00			CAP.,FXD,PLSTC:0.001,10%,100V	56289	410P10291
C03	285-0598-00			CAP.,FXD,PLSTC:0.01UF,5%,100V	01002	61F10AC103
C04	285-1101-00			CAP.,FXD,PLSTC:0.022UF,10%,200V	19396	223K02PT485
C05	283-0179-00			CAP.,FXD,CER DI:0.68UF,10%,100V	72982	8151N150 C684K
C12	283-0065-00			CAP.,FXD,CER DI:0.001UF,5%,100V	72982	805-518-Z5D0102J
DS01	150-1017-00			LT EMITTING DIO:GREEN,550NM,55MA MAX	50437	LSM-16L-100
DS02	150-1077-00			LT EMITTING DIO:RED,650NM,40MA MAX	50579	RL4480-1
DS03	150-1077-00			LT EMITTING DIO:RED,650NM,40MA MAX	50579	RL4480-1
DS04	150-1077-00			LT EMITTING DIO:RED,650NM,40MA MAX	50579	RL4480-1
F10	159-0043-00			FUSE,CARTRIDGE:3AG,0.6A,250V,SLOW-BLOW	71400	MDL 6/10
J01	131-1315-01			CONN,RCPT,ELEC:BNC,FEMALE	24931	28JR 306-1
J03	131-0267-00			PLUG TELEPHONE:3 CONDUCTOR	82389	12B
J04	131-0934-00			CONN,RCPT,ELEC:CKT BOARD,12/24 CONT	95354	80-6024-1100-00
J10	131-1315-01			CONN,RCPT,ELEC:BNC,FEMALE	24931	28JR 306-1
J11	131-1315-01			CONN,RCPT,ELEC:BNC,FEMALE	24931	28JR 306-1
J12	124-0342-00			TERMINAL BOARD:2 CONTACTS	12089	72202
J13	131-0014-00			TERMINAL BOARD:MALE 3 CONTACT	82389	C3M
J14	131-1006-00			CONN,RCPT,ELEC:9 CONTACT,FEMALE	71468	DE 9S
J16	131-1315-01			CONN,RCPT,ELEC:BNC,FEMALE	24931	28JR 306-1
J17	131-1315-01			CONN,RCPT,ELEC:BNC,FEMALE	24931	28JR 306-1
J18	131-1315-01			CONN,RCPT,ELEC:BNC,FEMALE	24931	28JR 306-1
J19	131-1315-01			CONN,RCPT,ELEC:BNC,FEMALE	24931	28JR 306-1
J20	131-1315-01			CONN,RCPT,ELEC:BNC,FEMALE	24931	28JR 306-1
L12	108-0931-00			COIL,RF:FIXED,400NH	80009	108-0931-00
P10	119-0813-00			SELECTOR,VOLTS:W/LINE FLTR RCPT & FUSE	02777	F65003
Q05	151-0373-00			TRANSISTOR:SILICON,PNP	80009	151-0373-00
Q34	151-0373-00			TRANSISTOR:SILICON,PNP	80009	151-0373-00
Q95	151-0349-00			TRANSISTOR:SILICON,NPN,SEL FROM MJE2801	04713	SJE924
R01	311-1483-00			RES.,VAR,NONWIR:100K OHM,20%,1W	01121	73A1G040L104M
R02	311-1150-00			RES.,VAR,WW:10K OHM,5%	73138	7366-60-1
R03	311-0555-00			RES.,VAR,NONWIR:10K OHM,20%,0.50W	01121	10M985
S01	260-1874-00			SWITCH,ROTARY:TIME CONSTANT	80009	260-1874-00
S02	260-1901-00			SWITCH,TOGGLE:DPST,8A,250V	27193	7320K55
W02	175-2079-00			CABLE ASSY,RF:50 OHM COAX,16.0 L	80009	175-2079-00
W03	012-0751-00			CABLE,INTERCON:7.375 L	80009	012-0751-00
W04	012-0752-00			CABLE,INTERCON:7.5 L	80009	012-0752-00
W15	175-2078-00			CABLE ASSY,RF:50 OHM COAX,6.0 L	80009	175-2078-00



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

SCHEMATIC EXAMPLE

2597-37

DIAGRAMS & CIRCUIT BOARD ILLUSTRATIONS

This section of the manual contains block and schematic diagrams with waveforms, and etched circuit board illustrations.

Symbols

Symbols used on the diagrams are based on ANSI Y32.2-1970 and IEEE No. 315 March 1971. Logic symbology is based on ANSI Y32.14-1973 (IEEE Std. 91-1973). Logic symbols depict the logic function performed and may differ from the manufacturer's data.

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 micofarads (μF).

Resistors = Ohms (Ω).

Semiconductor Types

Refer to the Electrical Parts List.

Reference Designators

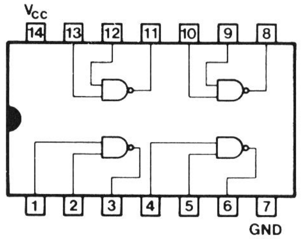
The following letters are used as reference designators to identify components or assemblies on Tektronix, Inc. schematic diagrams.

A	Assembly, separable or repairable (circuit board, etc.)
AT	Attenuator, fixed or variable
B	Motor
BT	Battery
C	Capacitor, fixed or variable
CR	Diode, signal or rectifier
DH	Decoupling Hybrid
DL	Delay Line
DS	Indicating device (lamp)
E	Spark Gap
F	Fuse
FL	Filter
H	Heat dissipating device (heat sink, heat radiator, etc.)
HR	Heater
J	Connector, stationary portion
K	Relay
L	Inductor, fixed or variable
LR	Inductor/resistor combination
M	Meter
P	Connector, movable portion
Q	Transistor, silicon-controlled rectifier, or programmable unijunction transistor
R	Resistor, fixed or variable
RT	Thermistors
S	Switch
T	Transformer
TC	Thermocouple
TP	Test Point
U	Assembly, inseparable or non-repairable (integrated circuit, etc.)
V	Electron tube
VR	Voltage regulator (zener diode, etc.)
Y	Crystal

Partial Schematic Diagram With Explanations

The partial diagram at the left is an example of the various symbols and other information provided on Tektronix, Inc. diagrams.

IC LOGIC DIAGRAMS



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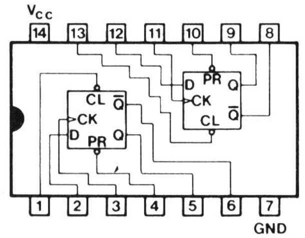

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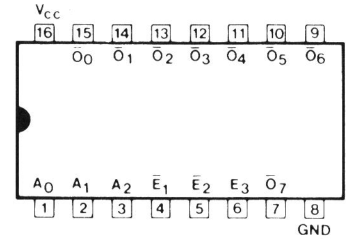

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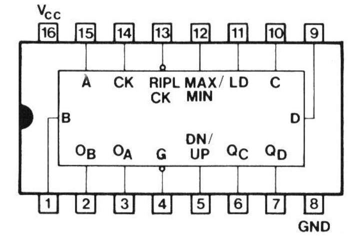

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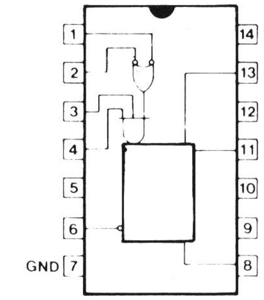

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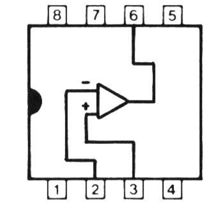

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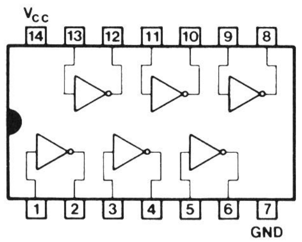

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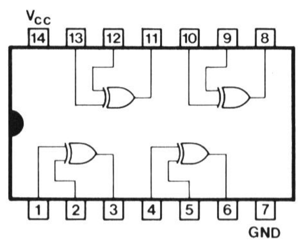

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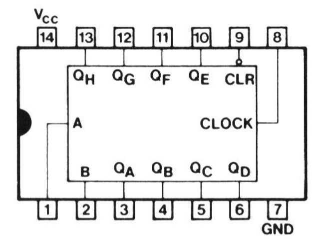

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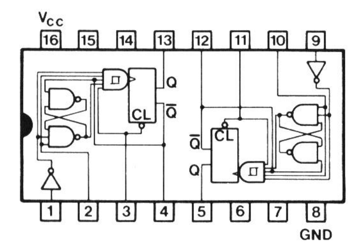

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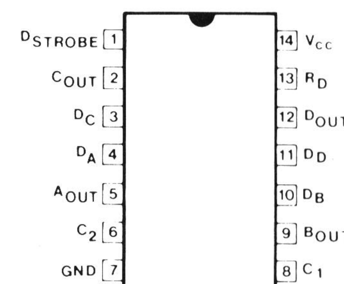

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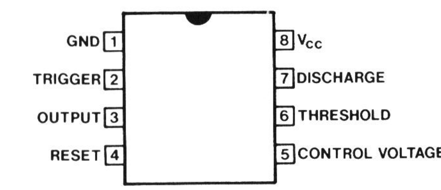

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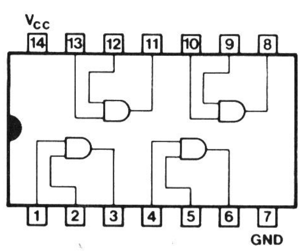

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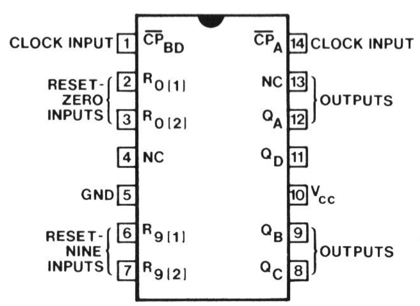

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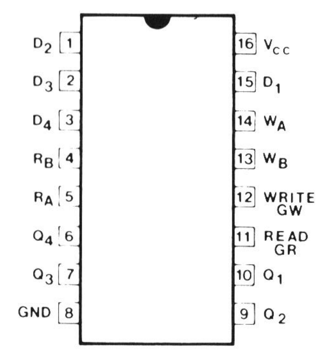

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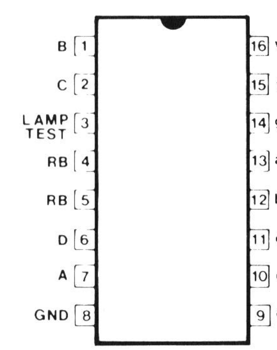

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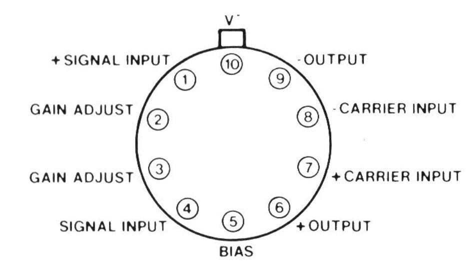

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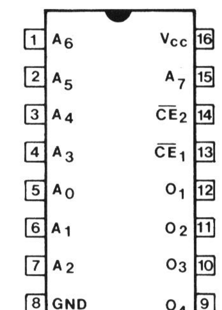

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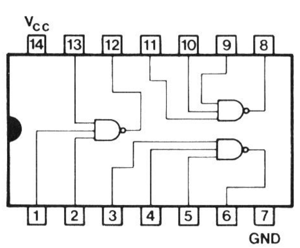

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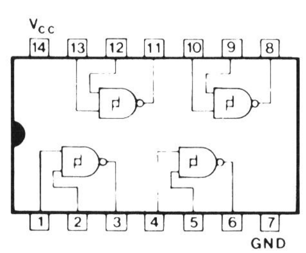

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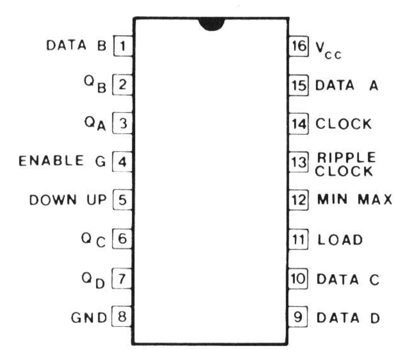

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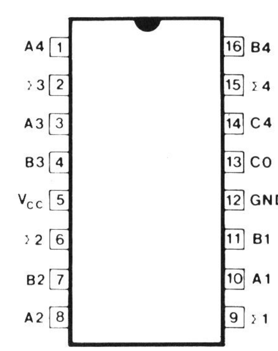

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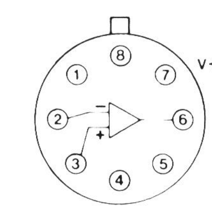

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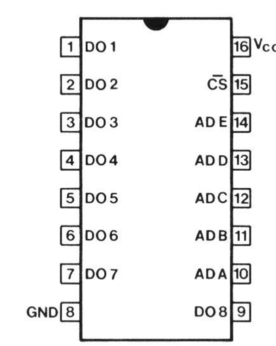

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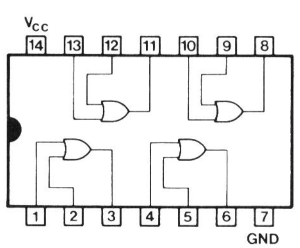

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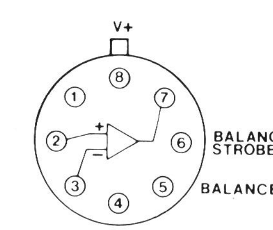

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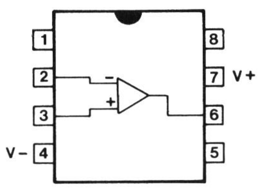

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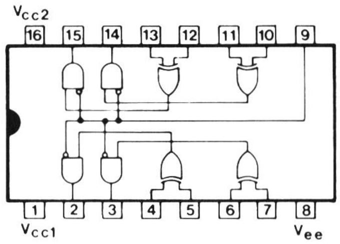

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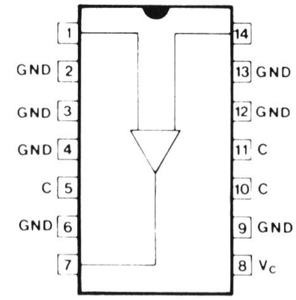

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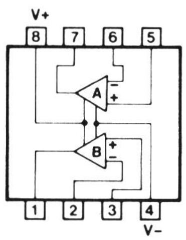

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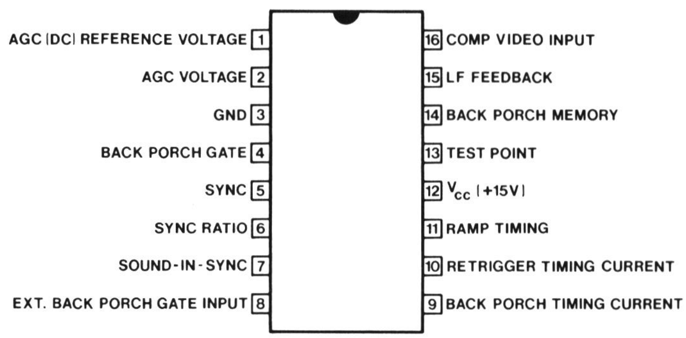

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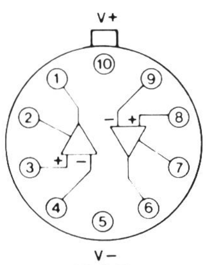
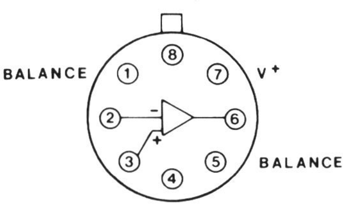


319

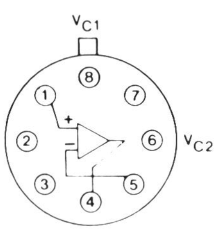
WAVEFORM CONDITIONS

SYNCHRONOUS DETECTION MODE	BACK PORCH
SOUND TRAP	IN
ZERO CARRIER	ON
AUTO AGC	BACK PORCH
AUDIO SOURCE	



356

Diagram ⟨9⟩ waveforms ⟨1⟩ ⟨2⟩ ⟨3⟩ & ⟨4⟩ taken with pins 5 and 6 on A53 shorted together.



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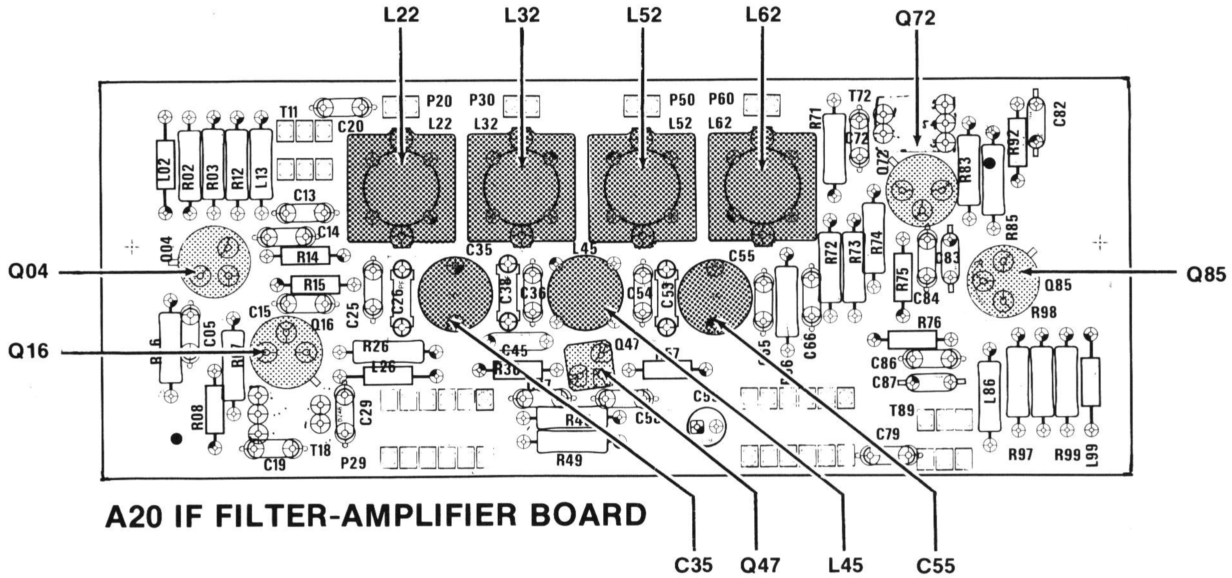
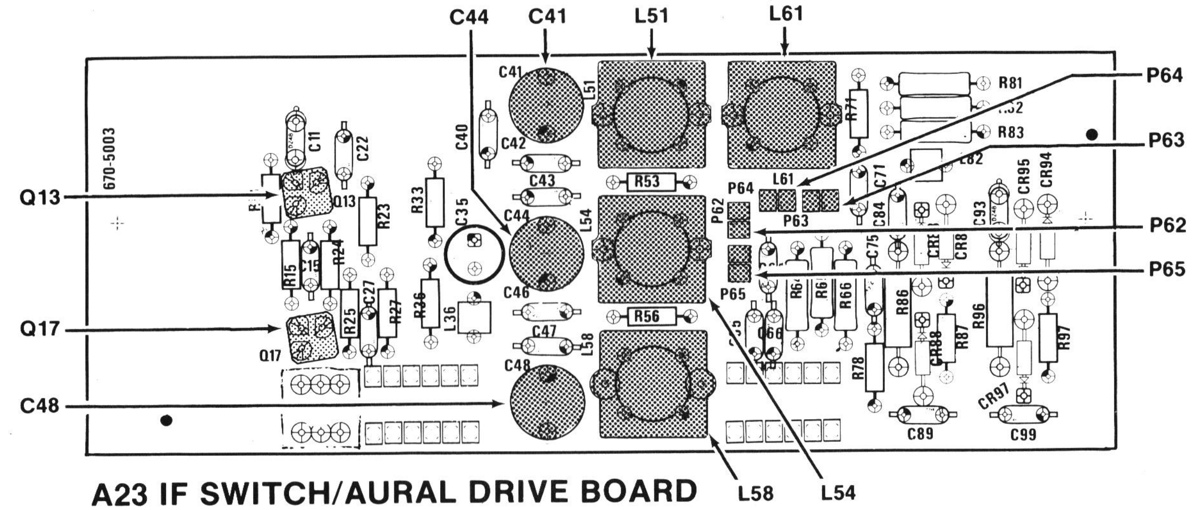
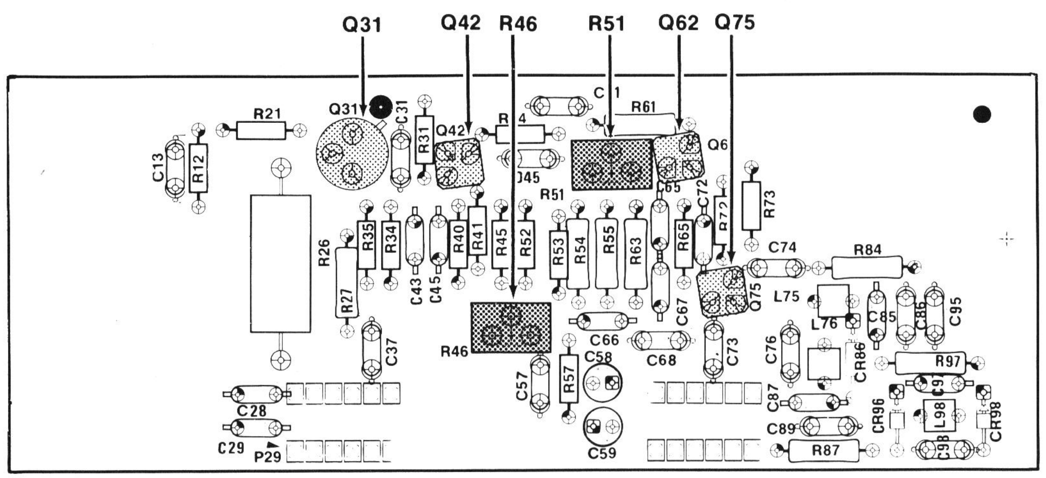


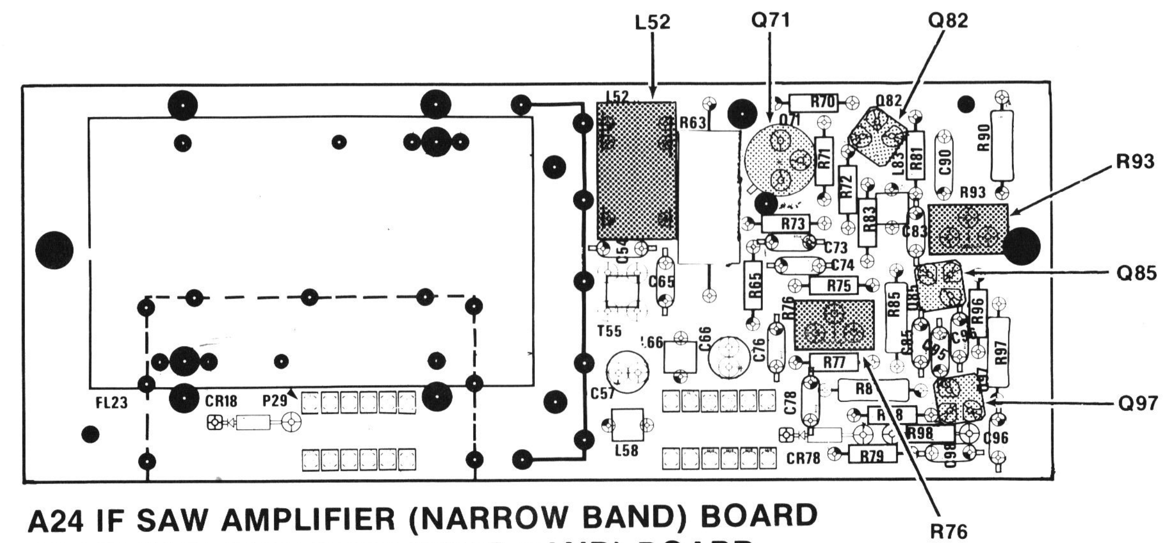
A20 IF FILTER-AMPLIFIER BOARD



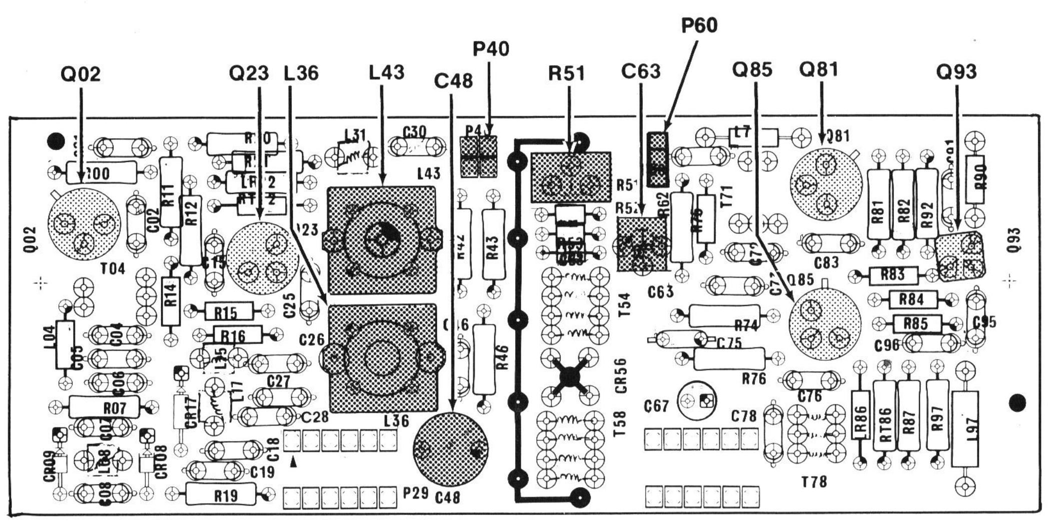
A23 IF SWITCH/AURAL DRIVE BOARD



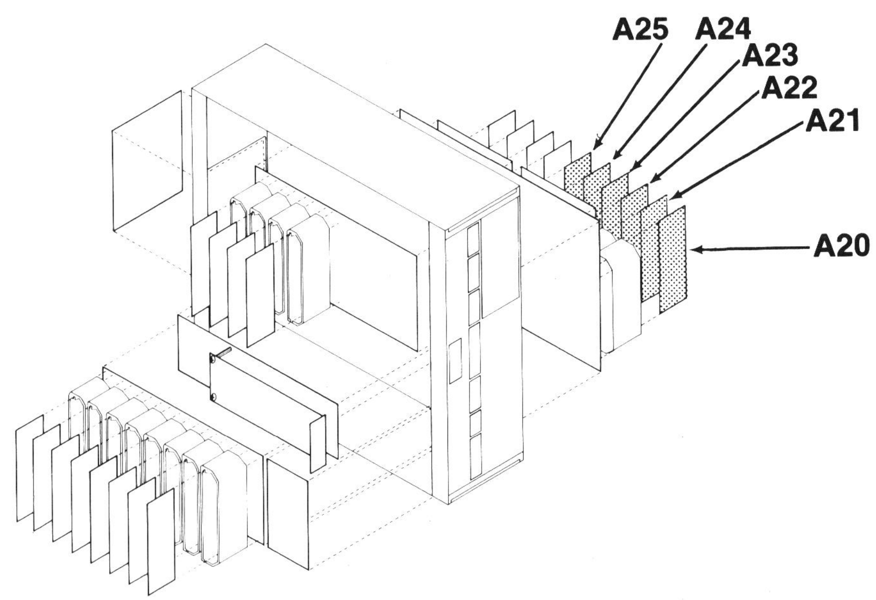
A21 IF ATTENUATOR-AMPLIFIER BOARD



A24 IF SAW AMPLIFIER (NARROW BAND) BOARD
A25 IF SAW AMPLIFIER (WIDE BAND) BOARD



A22 IF ATTENUATOR-MIXER-FILTER BOARD



2998-83

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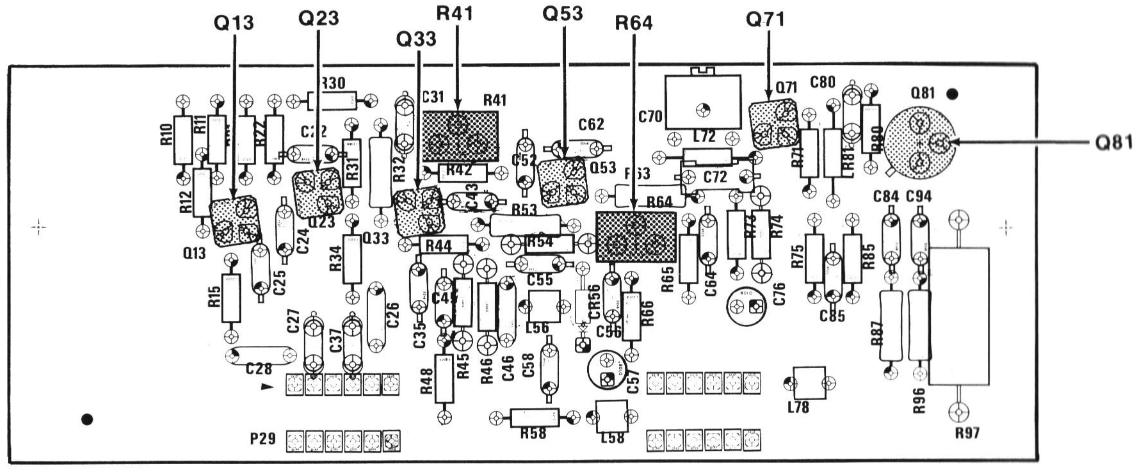
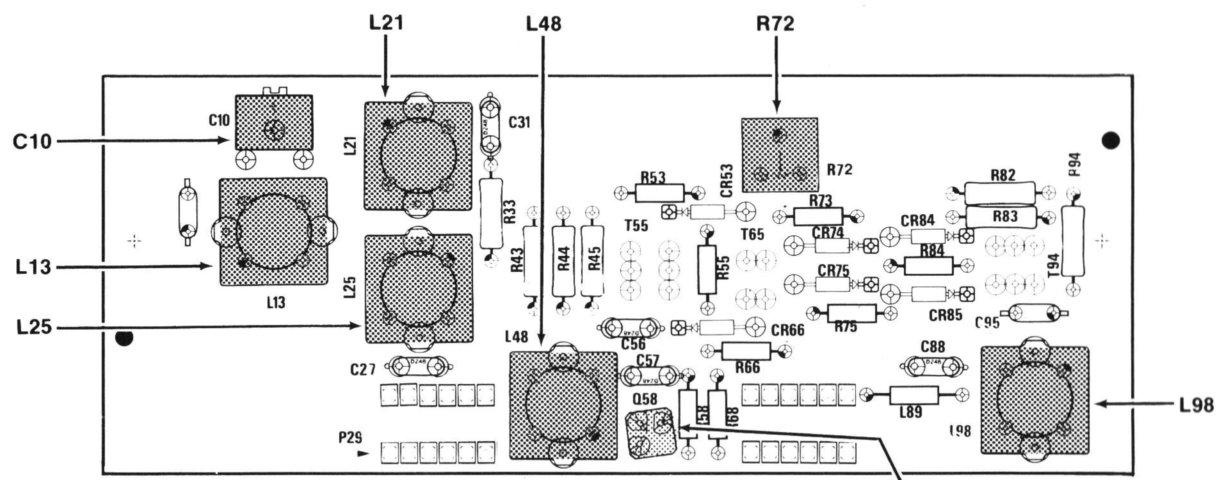
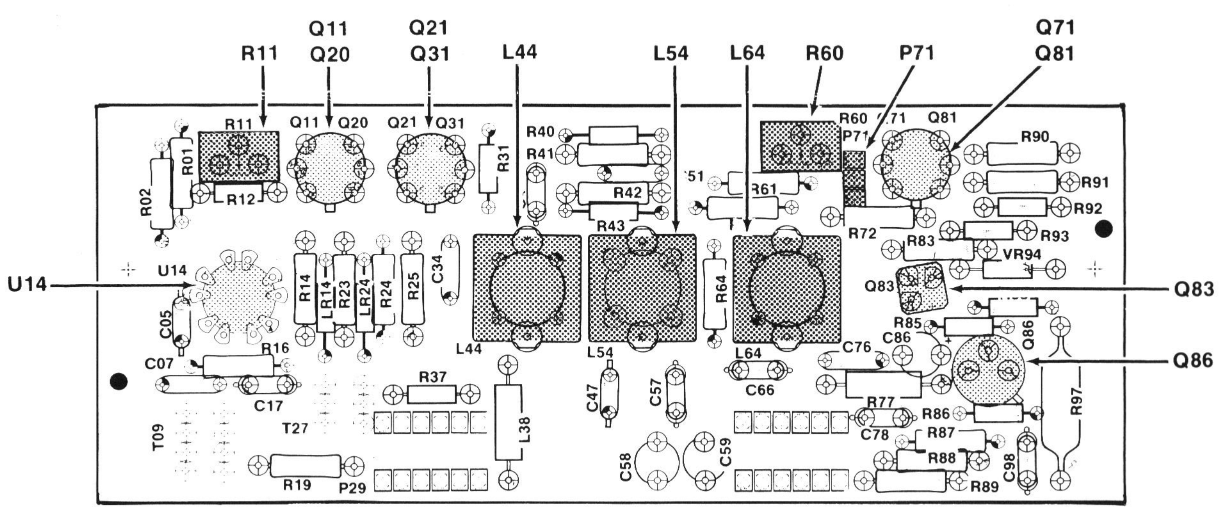
Fig. 8-1. CIRCUIT BOARD ADJUSTMENT AND JUMPER LOCATIONS.



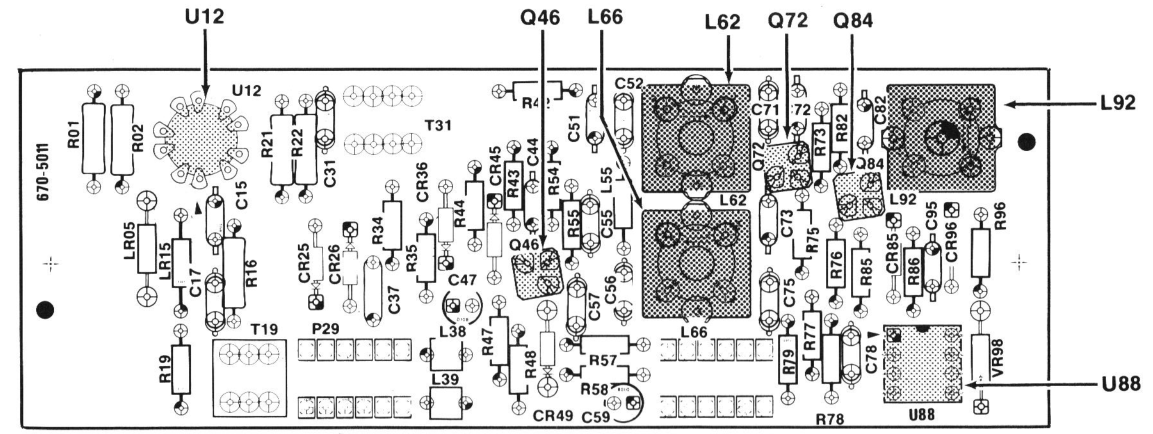
A26 IF POST AMPLIFIER BOARD



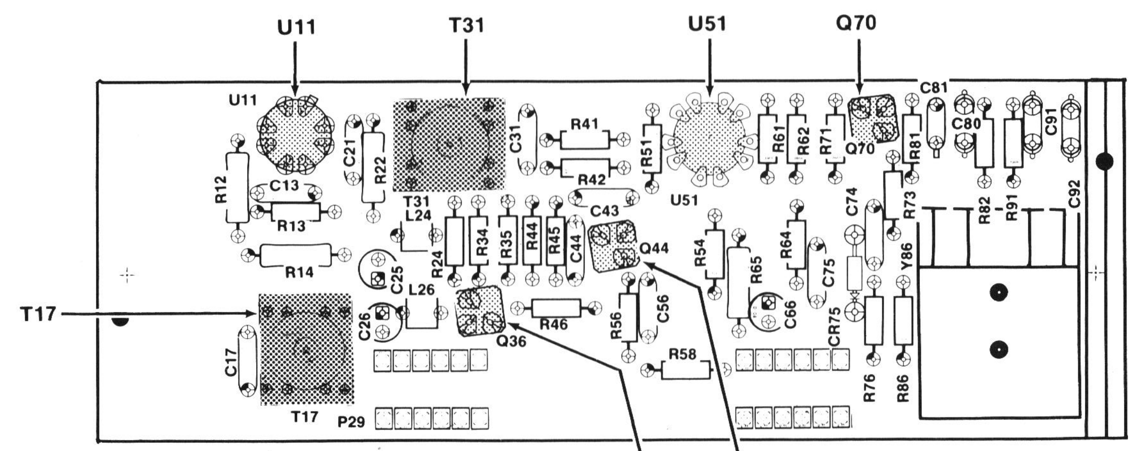
A27 IF ZERO CARRIER/PHASE SHIFTER BOARD



A28 IF DETECTOR-VIDEO AMPLIFIER (QUADRATURE) BOARD
A29 IF DETECTOR-VIDEO AMPLIFIER (VIDEO) BOARD



A40 1st AUDIO MIXER BOARD



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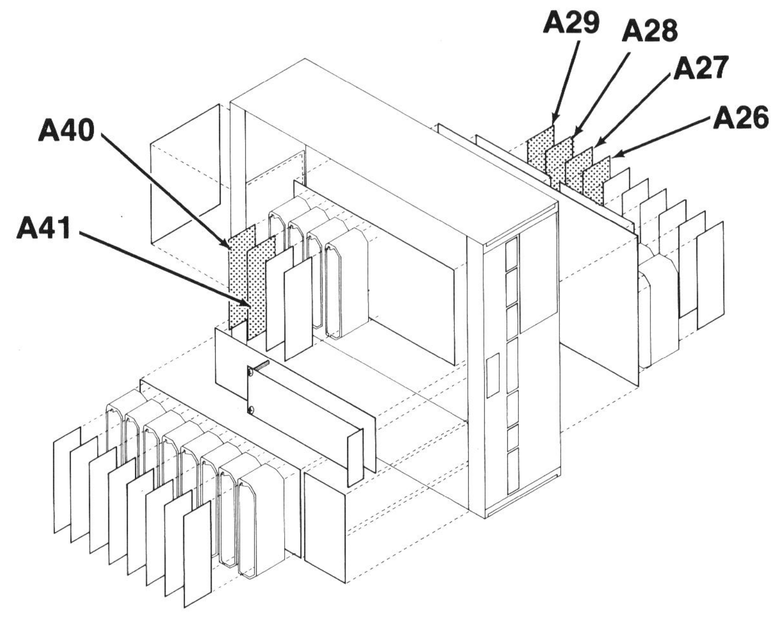
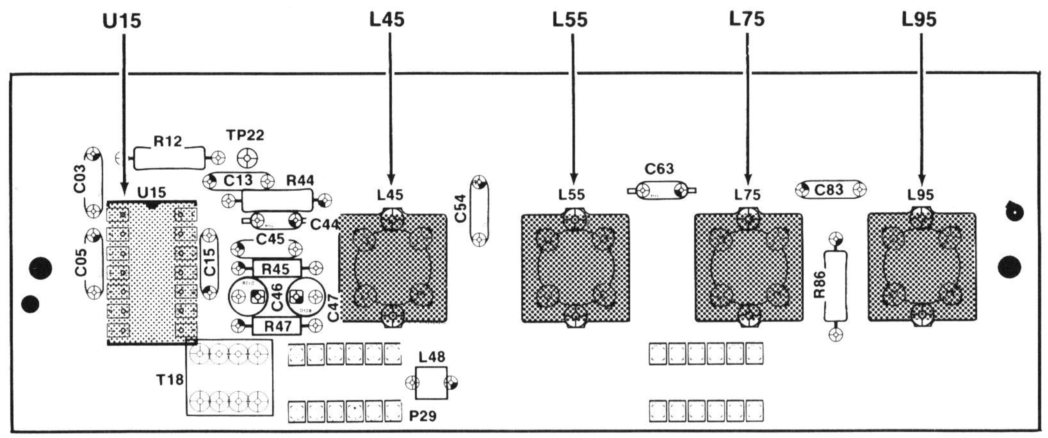
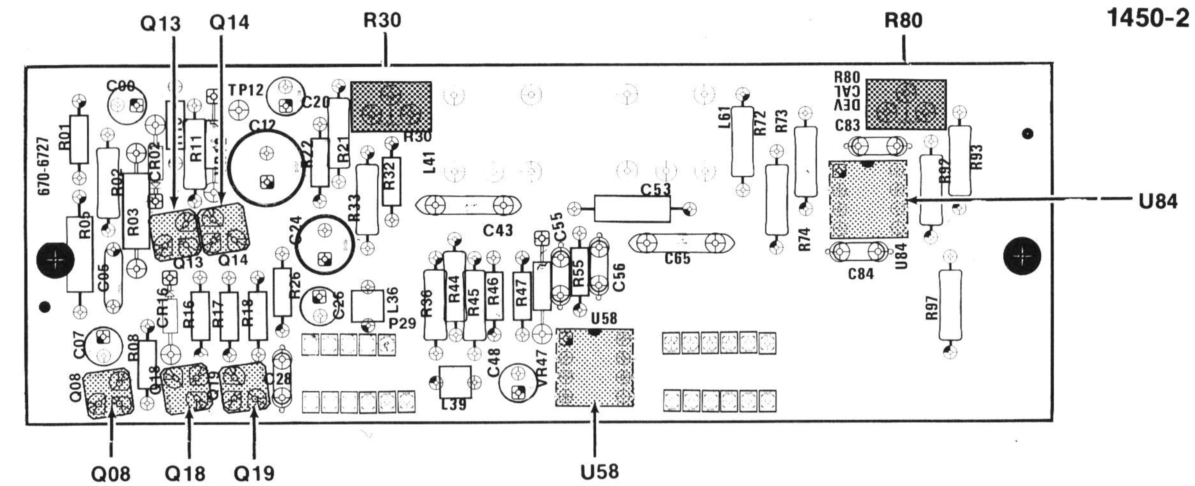


Fig. 8-2. CIRCUIT BOARD ADJUSTMENT LOCATIONS.

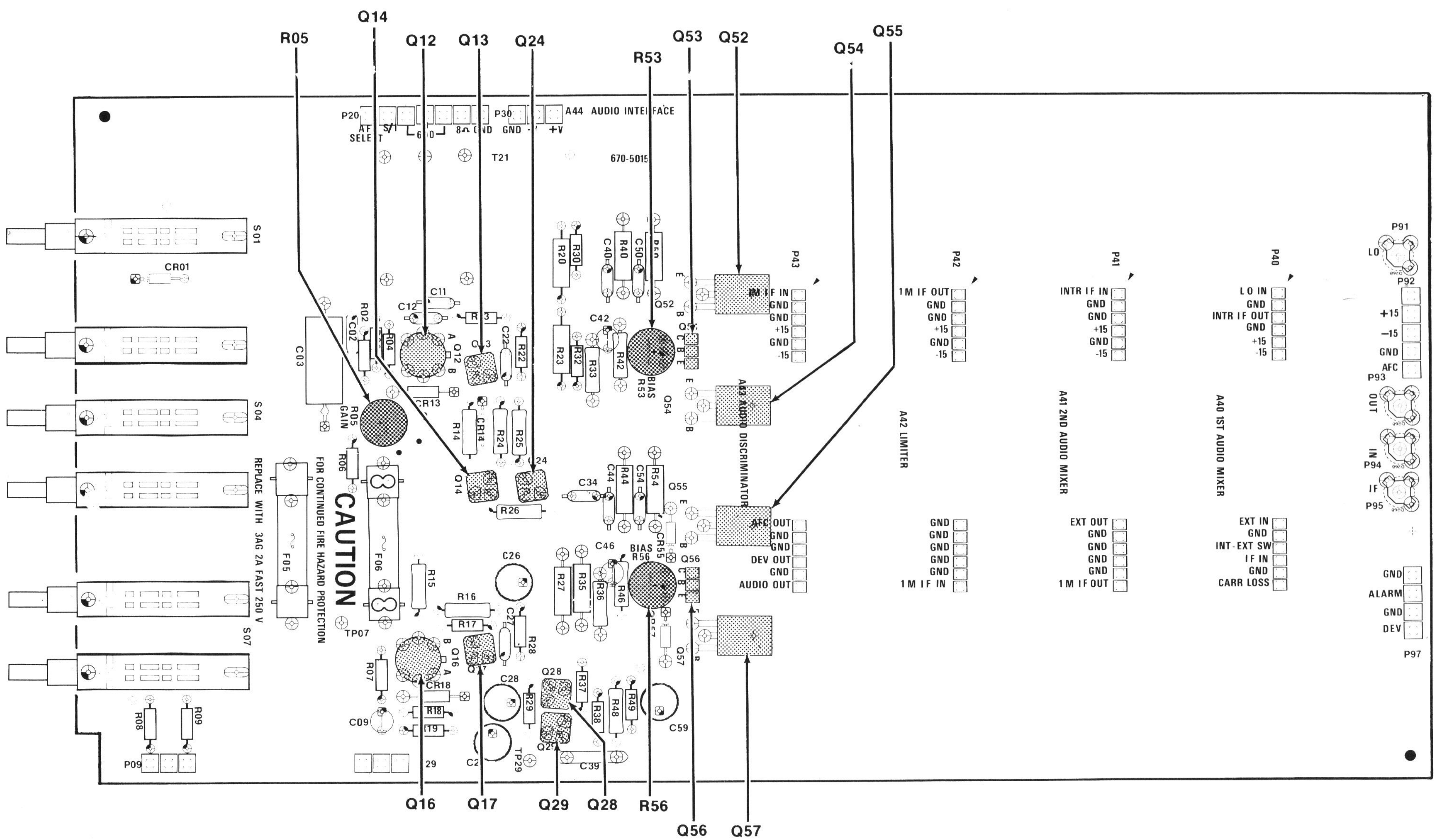
2998-84



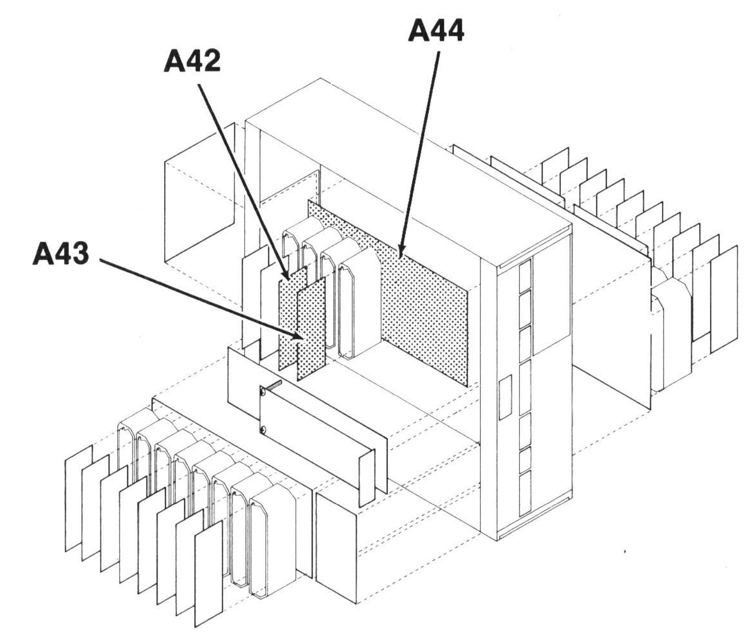
A42 AUDIO LIMITER BOARD



A43 AUDIO DISCRIMINATOR BOARD

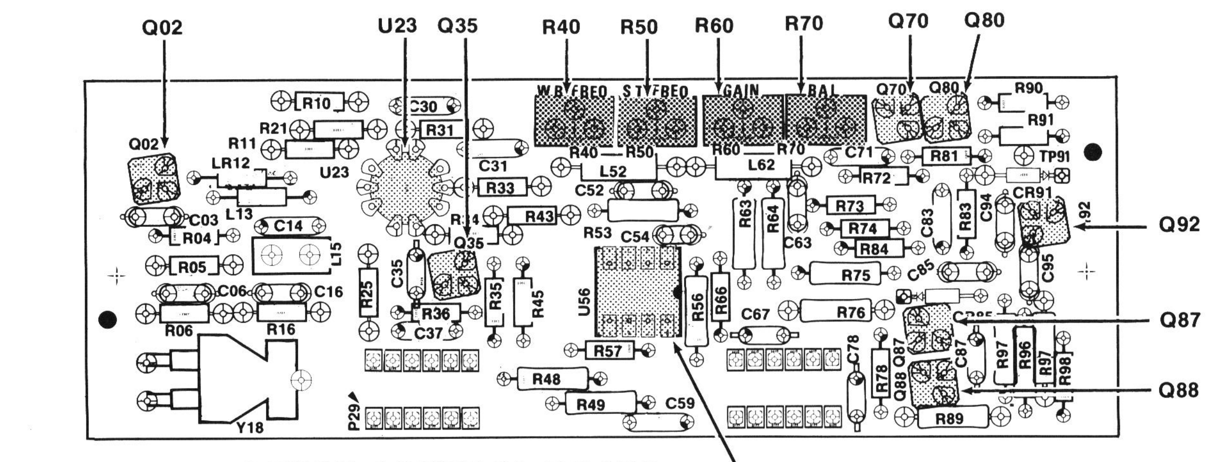


A44 AUDIO INTERFACE BOARD

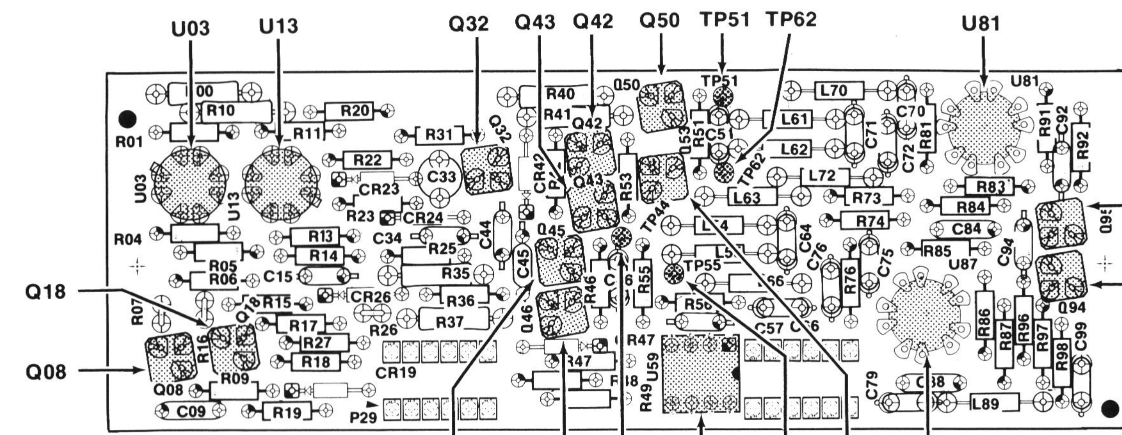


@ **Fig. 8-3. CIRCUIT BOARD ADJUSTMENT LOCATIONS.**

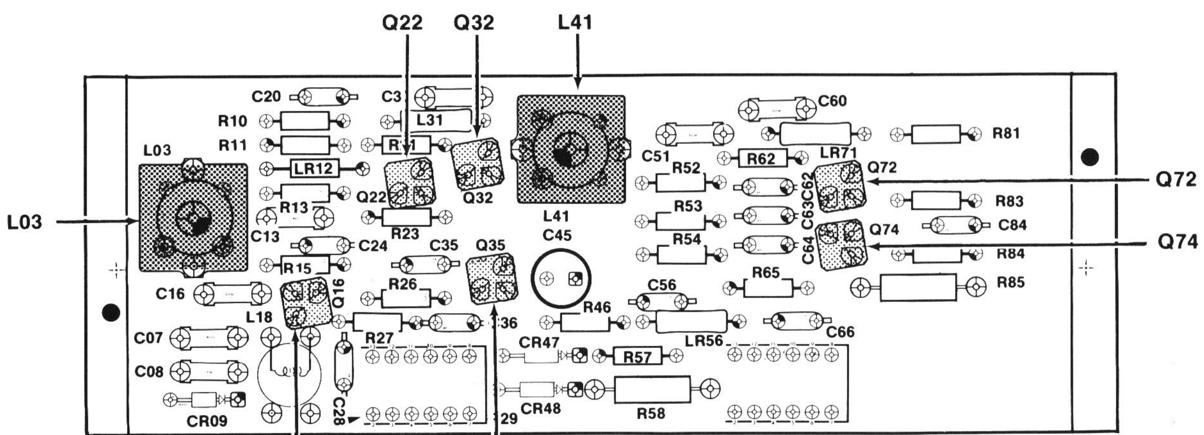
2998-85



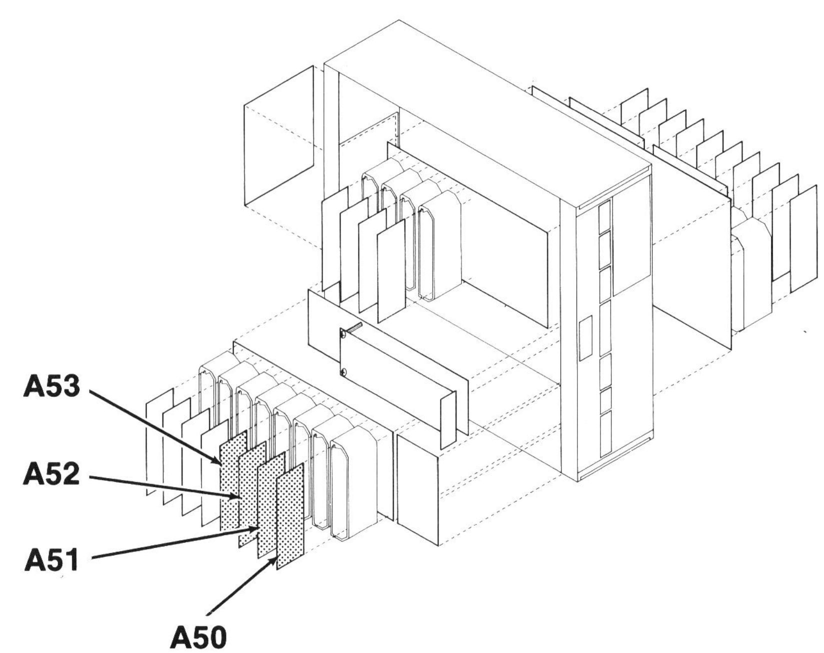
A50 REFERENCE CONTROL BOARD

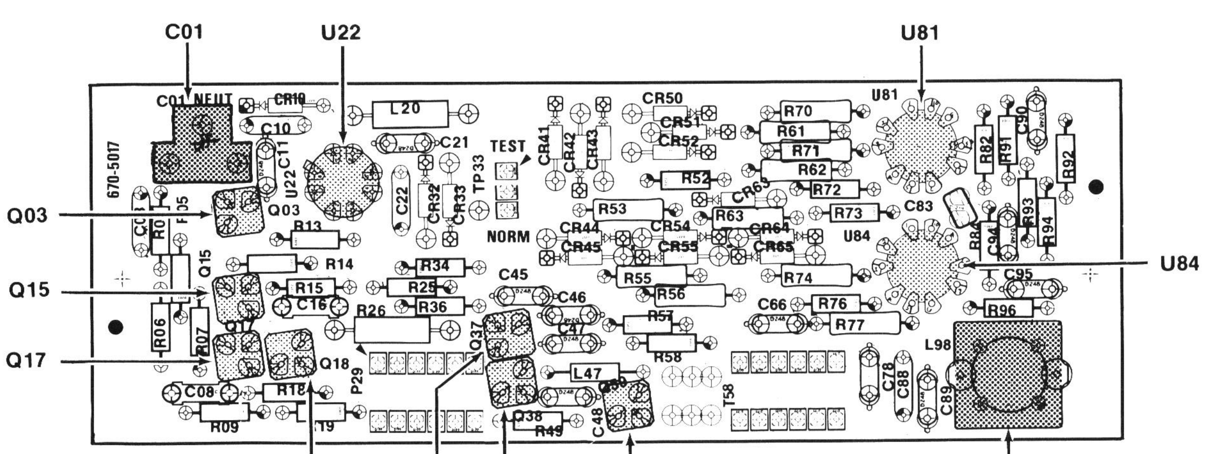


A53 CONVERTER PHASE LOCK BOARD



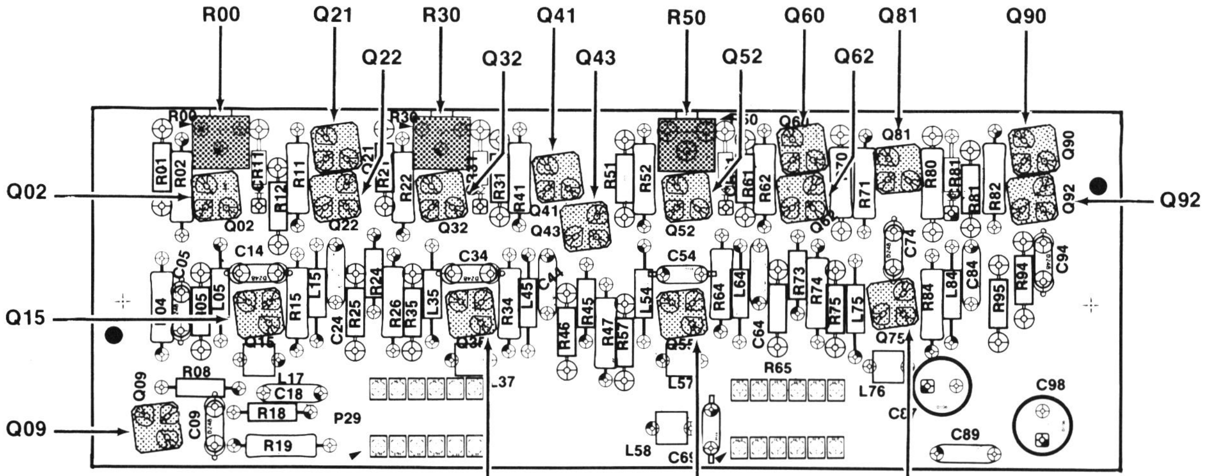
A51 REFERENCE OSCILLATOR BOARD



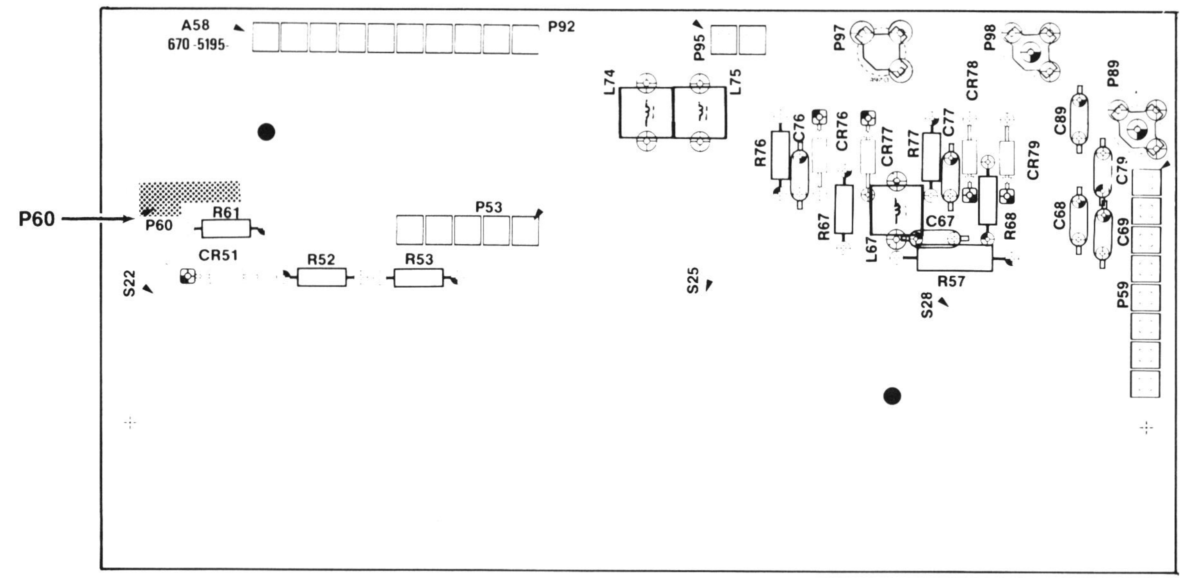


A52 PHASE SHIFTER BOARD

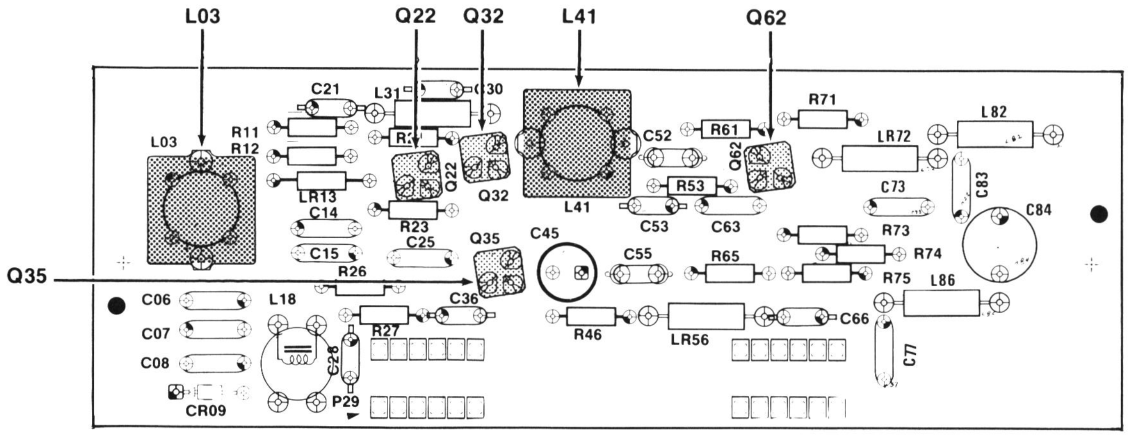
Fig. 8-4. CIRCUIT BOARD ADJUSTMENT LOCATIONS.



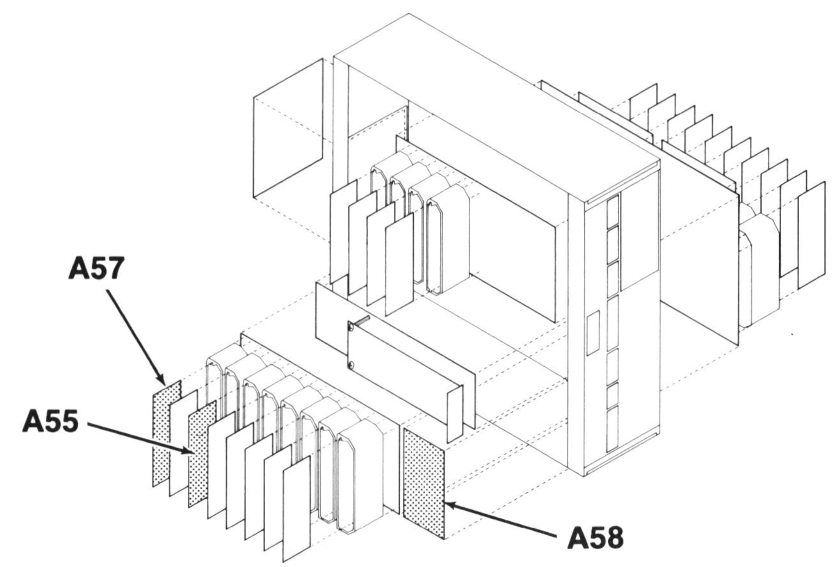
A55 LIMITER BOARD



A58 PHASE LOCK SWITCH BOARD

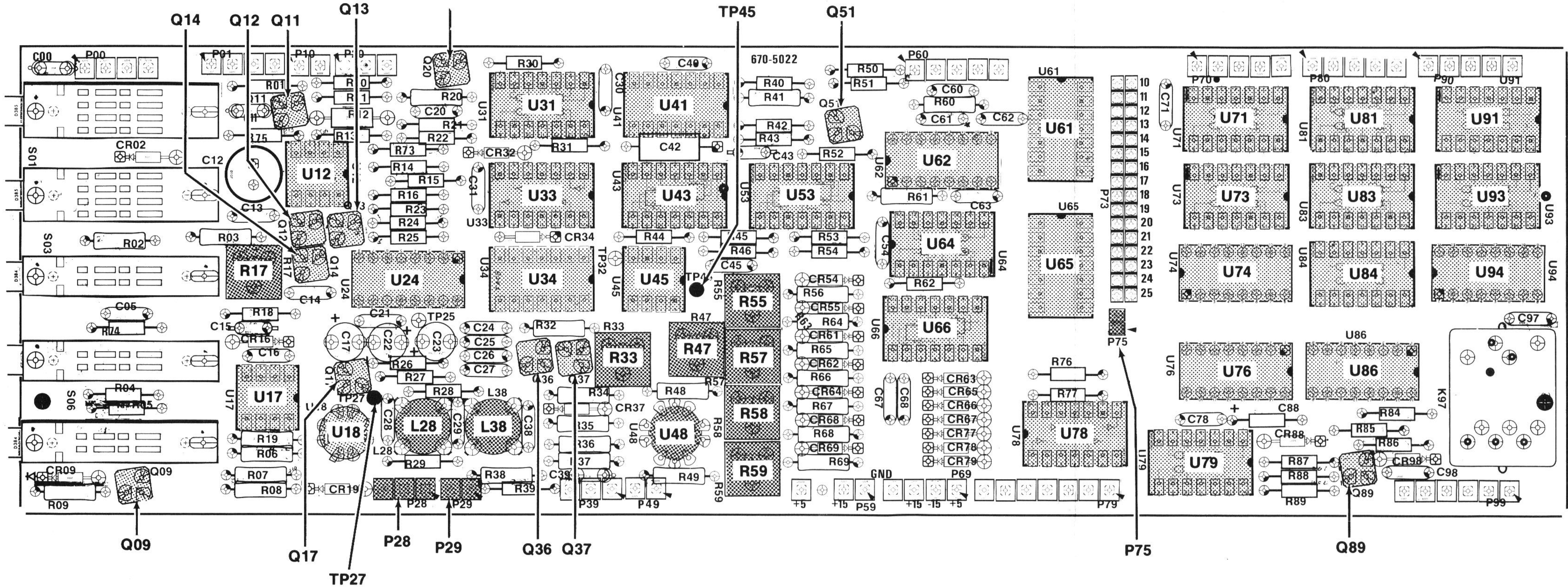


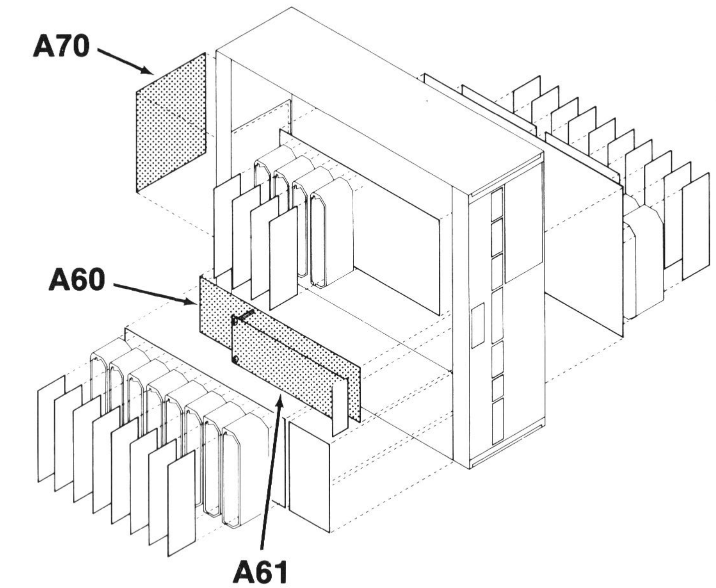
A57 CONVERTER OSCILLATOR BOARD



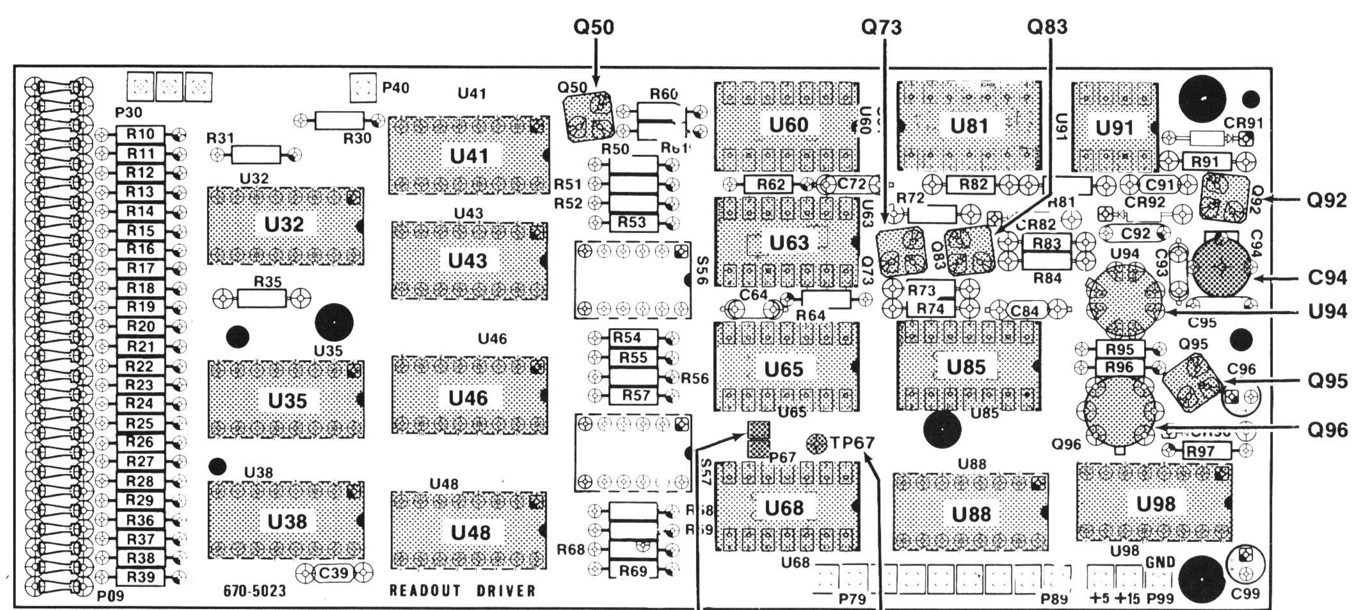
2998-87

Fig. 8-5. CIRCUIT BOARD ADJUSTMENT AND JUMPER LOCATIONS.

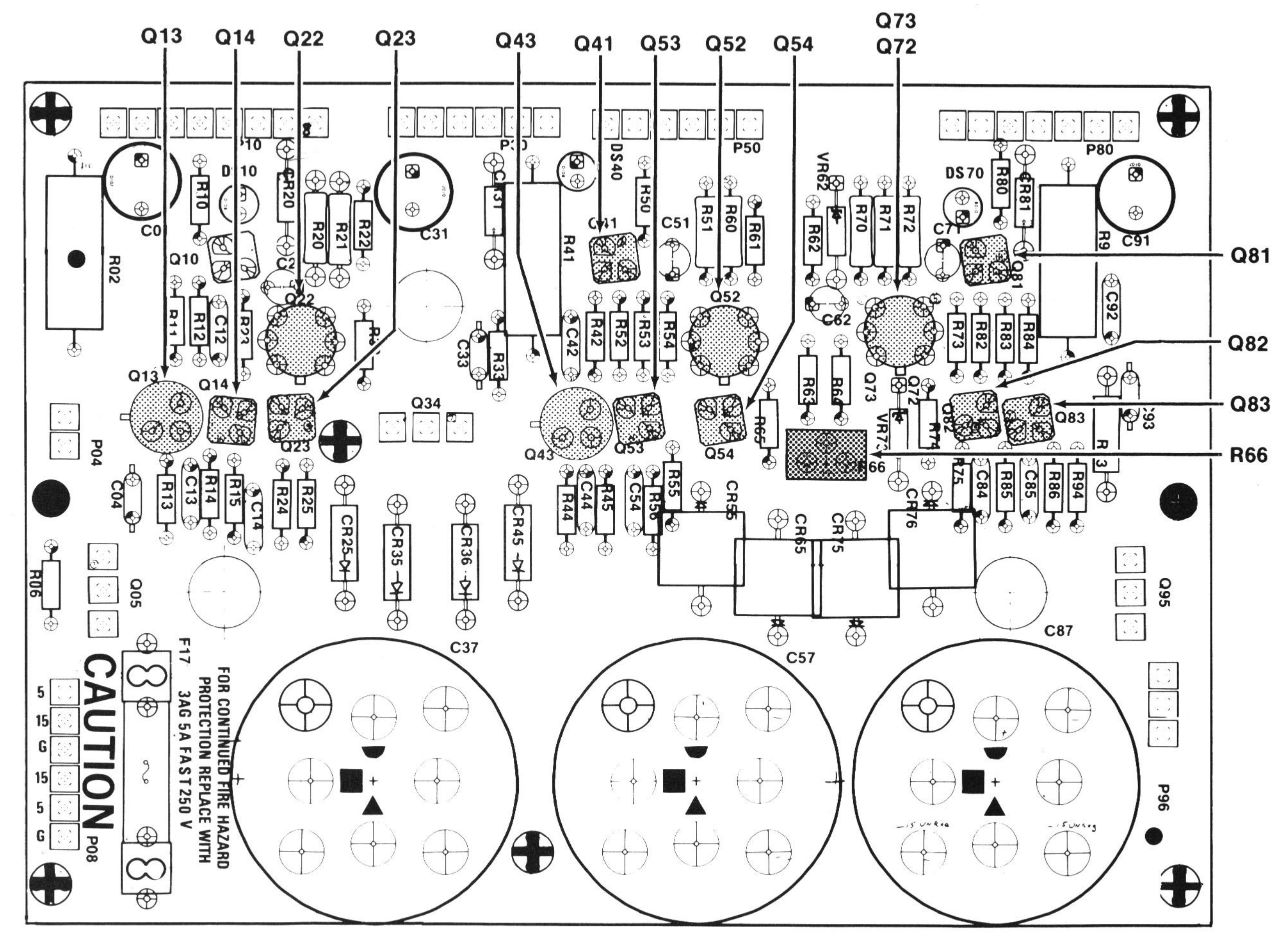




A60 AGC CONTROL BOARD



A61 READOUT DRIVER BOARD

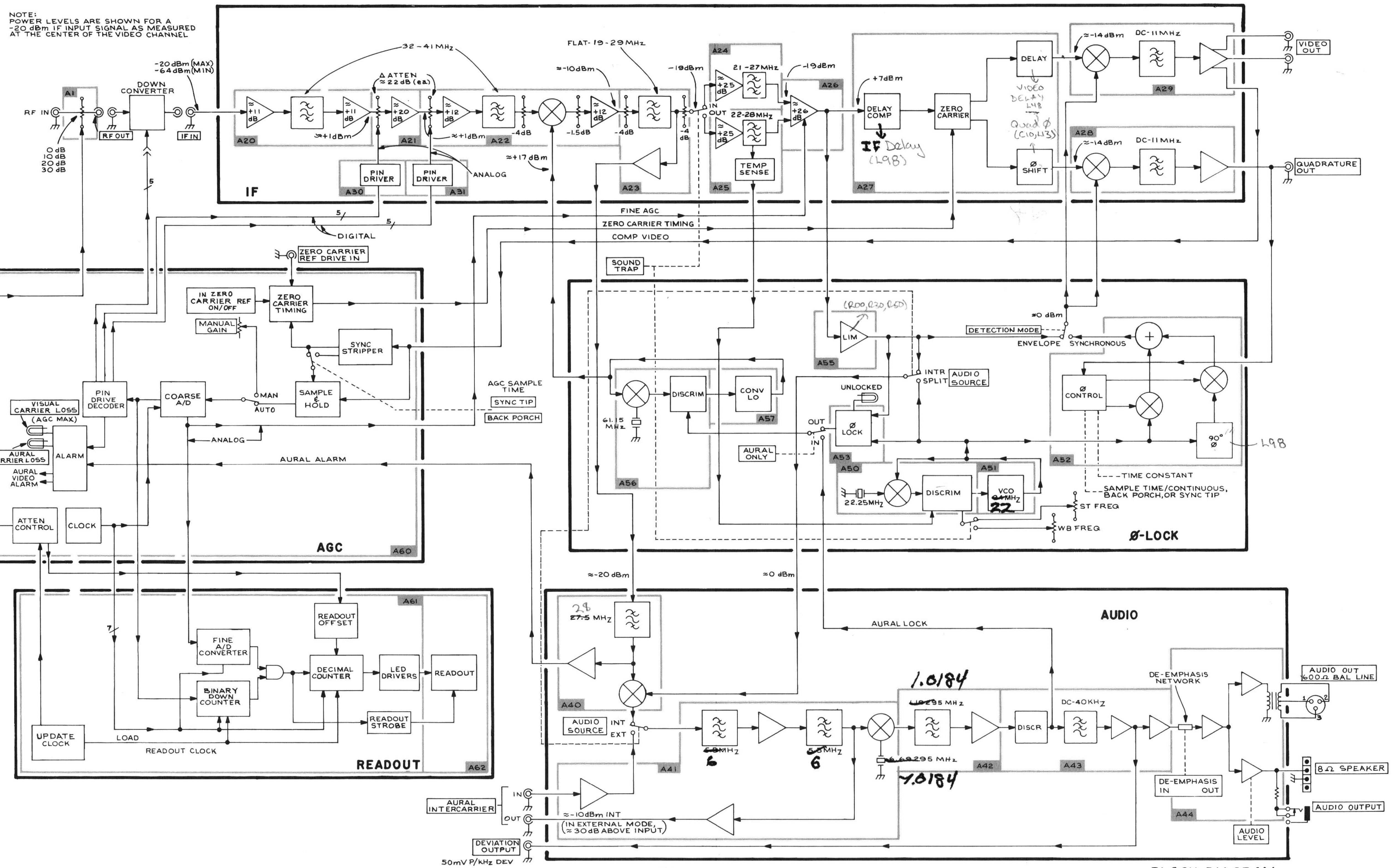


A70 POWER SUPPLY BOARD

2998-88

@

Fig. 8-6. CIRCUIT BOARD ADJUSTMENT AND JUMPER LOCATIONS.

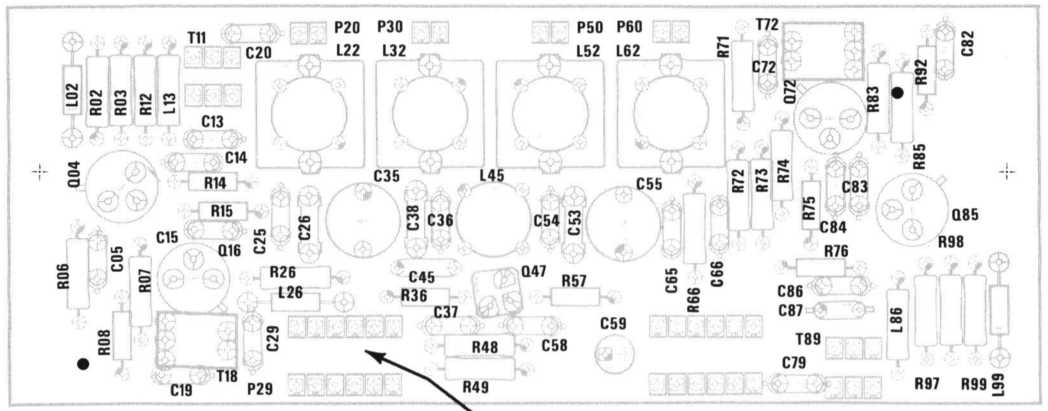


1450-2

@ 2998-105 (2200-148)

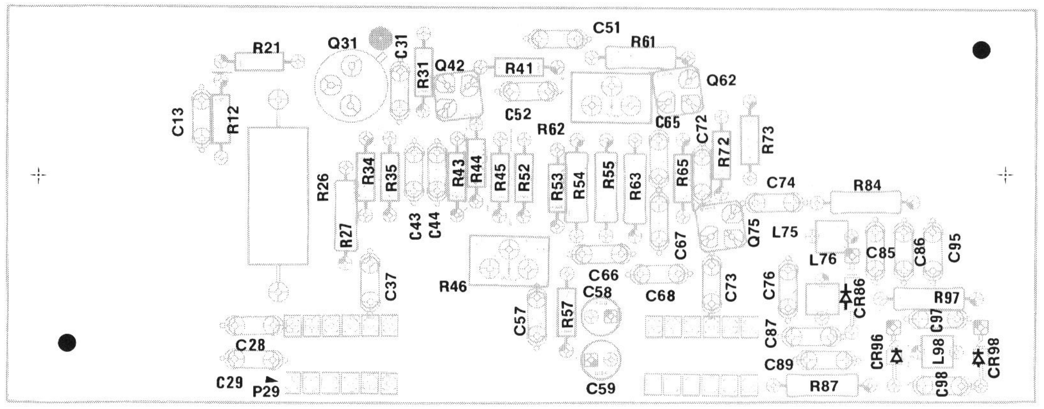
BLOCK DIAGRAM

A	B	C	D	E	F	G	H	I	J	K	L	M

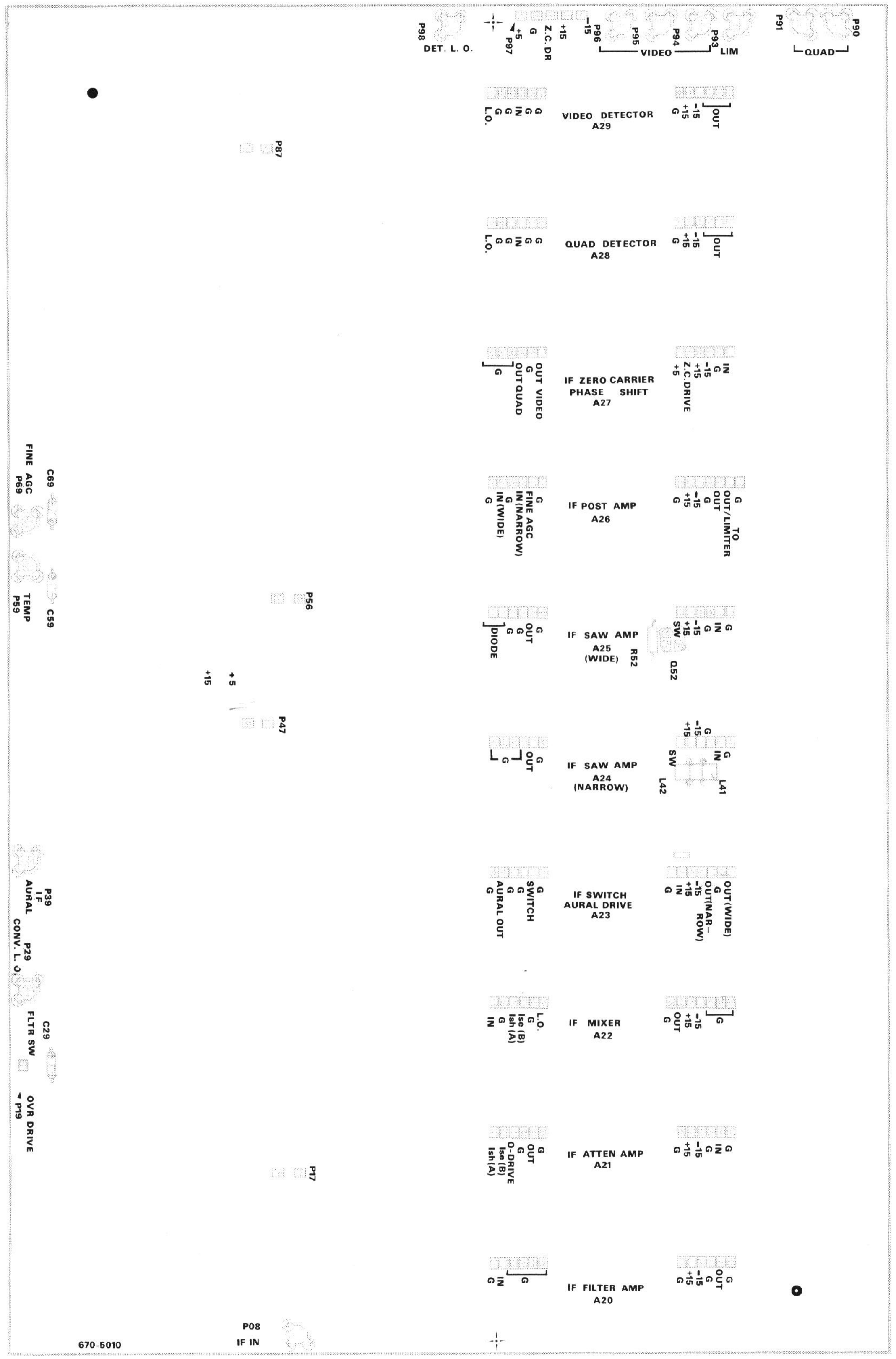


A20 IF FILTER AMP BOARD

C28B
R28B
(On back



A21 IF ATTENUATOR-AMPLIFIER BOARD

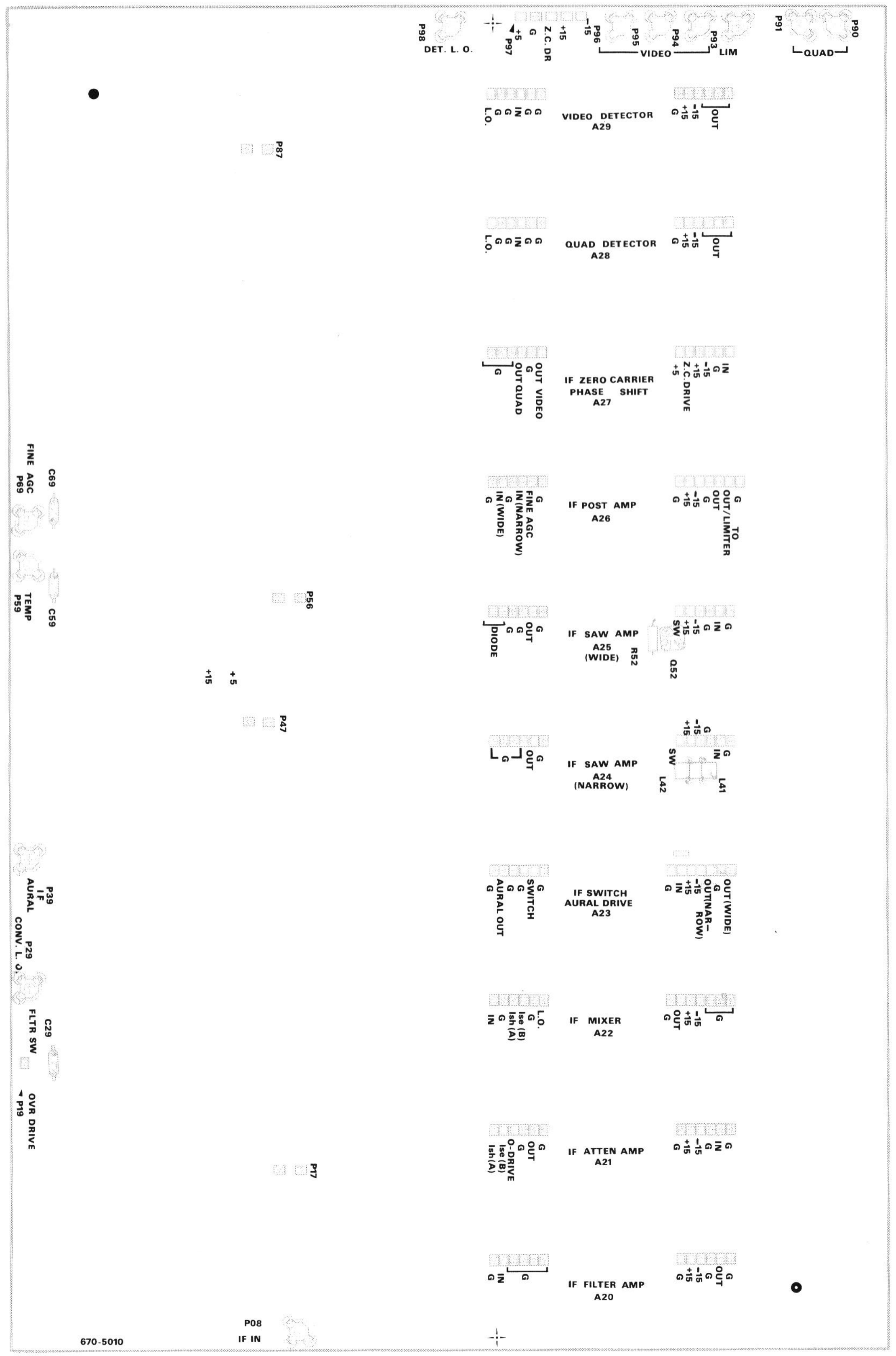


A32 IF INTERFACE BOARD

C23, C24
(On back
of board)

Circuit Number
ASSY A
C05
C13
C14
C15
C19
C20
C25
C26
C28B
C29
C35
C36
C37
C38
C45
C53
C54
C55
C58
C59
C65
C66
C72
C79
C82
C83
C84
C86
C87
L02
L22
L26
L32
L45
L52
L62
L99
LR13
LR86
Q04
Q16
Q47
Q72
Q85
R02
R03
R06
R07
R08
R14
R15

G	H	I	J	K	L	M

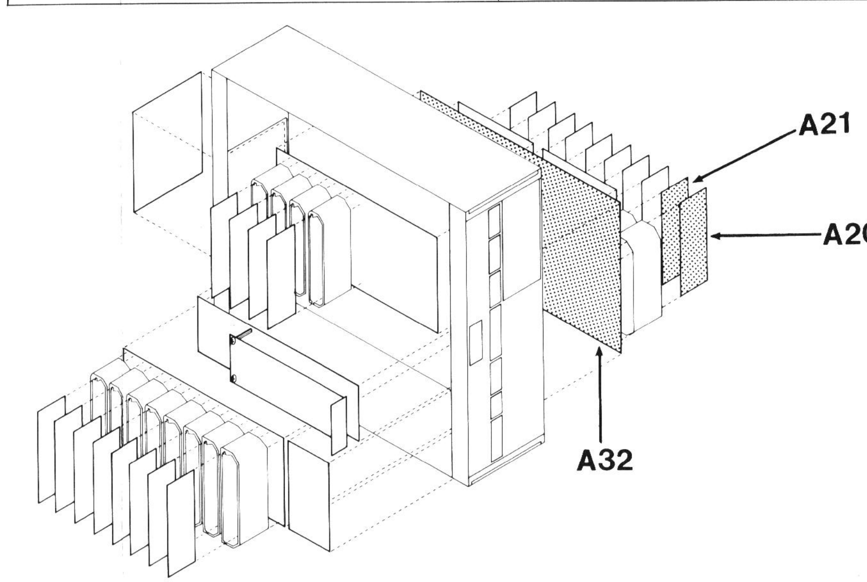


A32 IF INTERFACE BOARD

C23, C24
(On back
of board)

IF Input 1

Circuit Number	Schematic Location	Board Location
ASSY A20		
C05	B2	A2
C13	A2	B1
C14	A2	B2
C15	A1	B2
C19	A2	B3
C20	A3	B1
C25	B3	B2
C26	B3	B2
C28B	B1	B3
C29	B1	B3
C35	B3	C2
C36	A3	C2
C37	A1	C2
C38	A3	C2
C45	B3	C2
C53	A3	D2
C54	A3	C2
C55	B3	D2
C58	A1	C3
C59	A4	D2
C65	B3	D2
C66	A4	D2
C72	A4	E1
C79	A5	E3
C82	A4	F1
C83	A4	E2
C84	A4	E2
C86	A5	E2
C87	A5	E2
L02	A2	A1
L22	A3	B1
L26	B1	B2
L32	A3	C1
L45	B3	C2
L52	A3	D1
L62	A3	D1
L99	A5	F3
LR13	B2	A1
LR86	A5	E2
Q04	B1	A2
Q16	B1	B2
Q47	A1	C2
Q72	A4	E1
Q85	A5	F2
R02	A2	A1
R03	A2	A1
R06	B2	A2
R07	B2	A2
R08	A2	A3
R14	A2	B2
R15	A1	B2
R26	B1	B2
R28B	B1	B3
R36	A1	C2
R48	A1	C3
R49	A1	C3
R57	A1	D2
R66	A4	D2
R71	A4	D1
R72	A4	D2
R73	A4	E2
R74	A4	E2
R75	A4	E2
R76	A5	E2
R83	A4	E1
R85	A4	E2
R92	A4	E1
R98	A5	F2
R99	A5	F3
RT12	A2	A1
RT97	A5	E3
T11	B1	B1
T18	B2	B3
T72	A4	E1
T89	A5	E3
ASSY A21		
C13	D4	B8
C28	D1	B9
C29	C1	B9
C31	C3	C7
C37	C4	C9
C43	D4	C8
C44	D3	C8
C51	C3	D7
C52	C3	C8
C57	D3	C9
C58	D3	D9
C59	C5	D9
C65	C3	D8
C66	D3	D8
C67	D3	D8
C68	C3	D9
C72	C3	D8
C73	C3	D9
C74	C2	E8
C76	C2	E9
C85	C2	E8
C86	C2	E8
C87	C2	E9
C89	C2	E9
C95	C2	F8
C97	D2	F9
C98	C2	F9
CR86	C2	E9
CR96	C2	E9
CR98	C2	F9
E42	C3	
L75	C2	E8
L76	C2	E8
L98	C2	F9
Q31	C4	B7
Q42	C3	C7
Q62	C3	D7
Q75	C2	E8
R12	D4	B8
R21	D4	B7
R26	C4	B8
R27	C4	B8
R31	C3	C7
R34	C4	C8
R35	C4	C8
R43	D3	C8
R41	C3	C8
R44	C3	C7
R45	C3	C8
R46	D3	C9
R52	C3	C8
R53	D3	D8
R54	D3	D8
R55	D3	D8
R57	D3	D9
R61	C3	D7
R62	C3	D8
R63	D3	D8
R65	D2	D8
R72	C3	D8
R73	C3	E8
R84	C2	E8
R87	C2	E9
R97	C2	F9
P/O ASSY A32		
J1	B1	CHASSIS
P08	B1	I9



COMPONENT NUMBER EXAMPLE

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

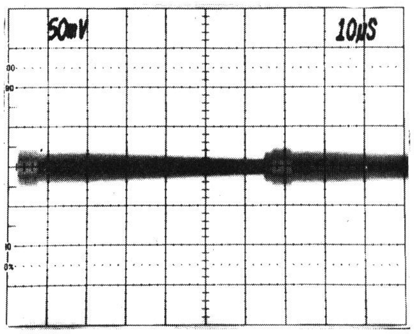
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

Static Sensitive Devices
See Maintenance Section

2998-89

1

1



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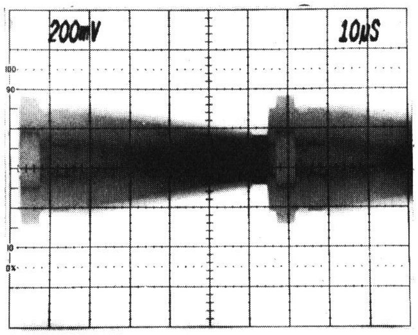

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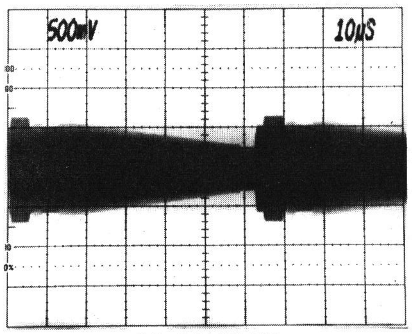
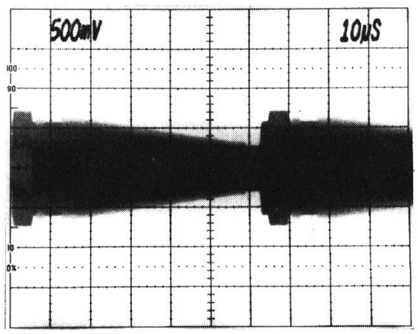


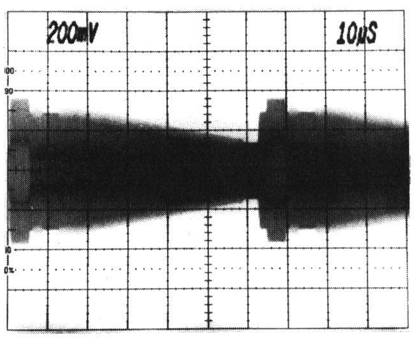
AC COUPLED

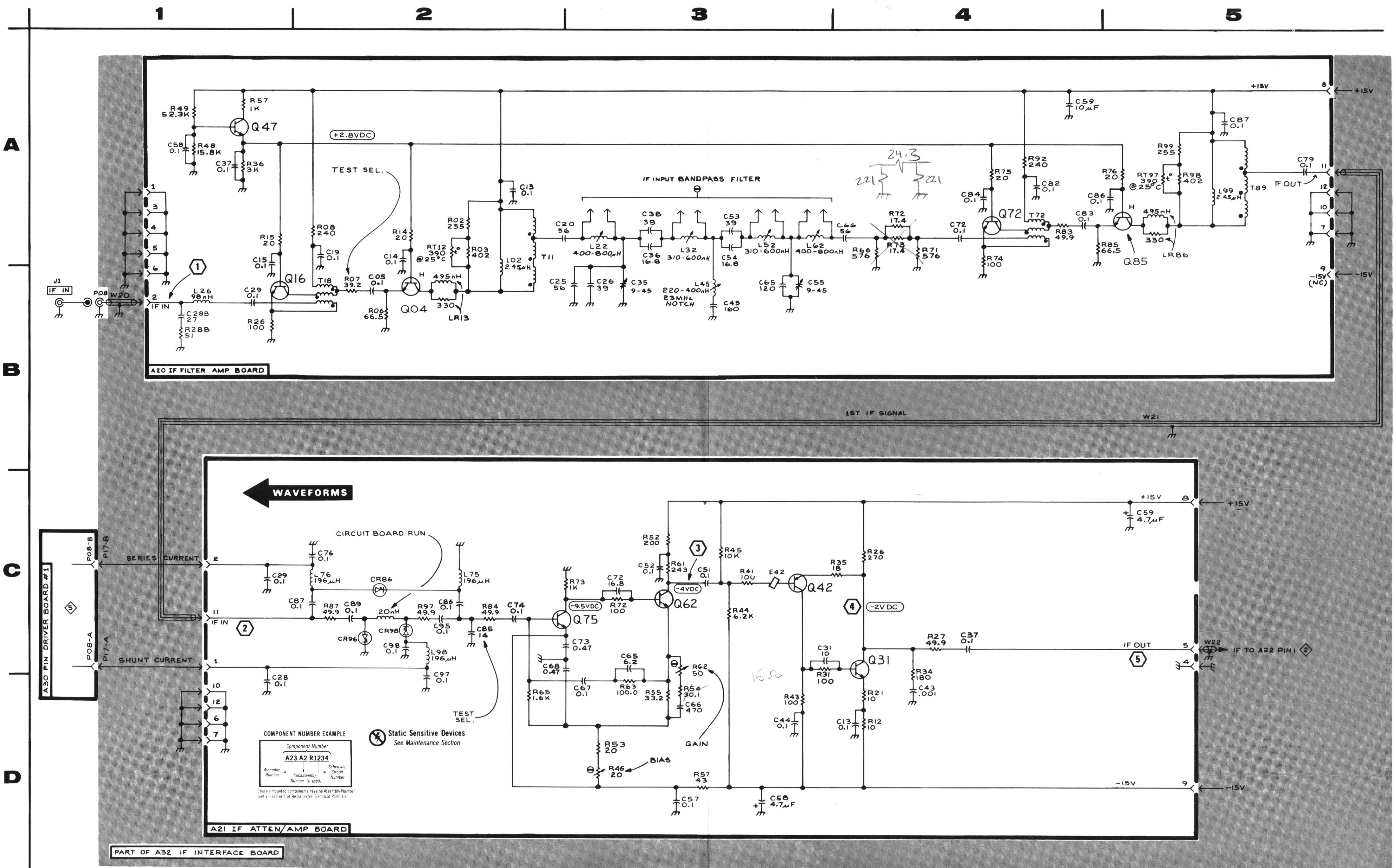
4



AC COUPLED

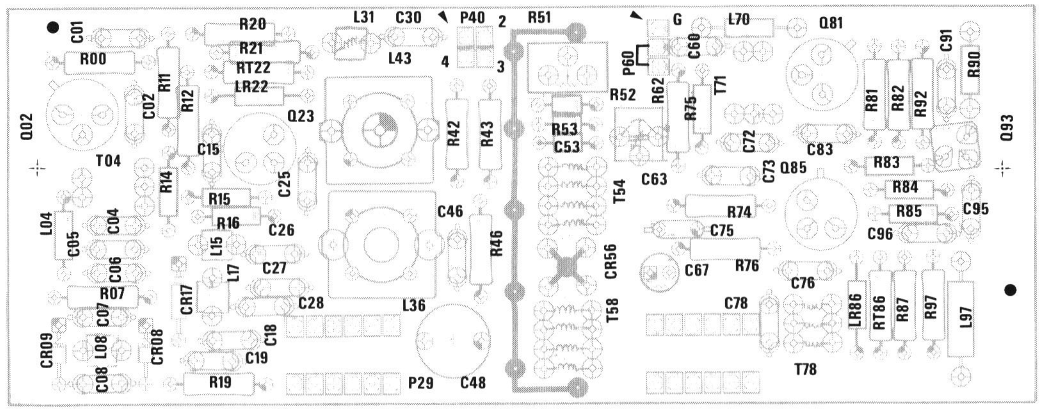
5




1
2
3
4
5
A
B
C
D
A20 IF FILTER AMP BOARD
IF INPUT BANDPASS FILTER
TEST SEL.
+2.8VDC
J1
IF IN
P08
W20
Q47
Q16
Q04
Q72
Q85
L22 400-800μH
L32 310-600nH
L52 310-600nH
L62 400-800nH
L45 220-400nH 23MHz NOTCH
T11
T18
T72
T89
LR13
LR86
IF OUT
+15V
-15V (NC)
24.3
221
221
1ST IF SIGNAL
W21
WAVEFORMS
A21 IF ATTEN/AMP BOARD
CIRCUIT BOARD RUN
SERIES CURRENT
SHUNT CURRENT
IF IN
P08-B
P17-B
P08-A
P17-A
A30 PIN DRIVER BOARD #1
Q75
Q62
Q42
Q31
-9.5VDC
-4VDC
-2VDC
GAIN
BIAS
TEST SEL.
IF OUT
W22
IF TO A22 PIN 1
COMPONENT NUMBER EXAMPLE
A23 A2 R1234
Static Sensitive Devices
See Maintenance Section
PART OF A32 IF INTERFACE BOARD

	A	B	C	D	E	F

1

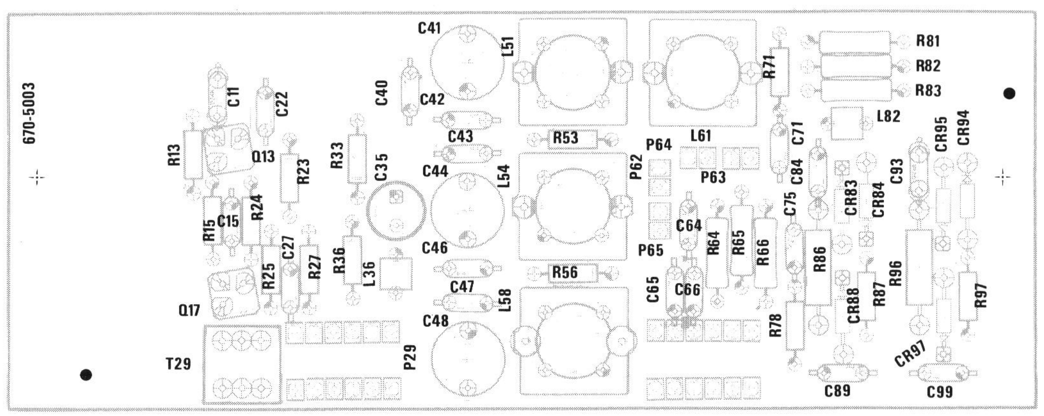


2

3

A22 IF ATTENUATOR-MIXER-FILTER BOARD

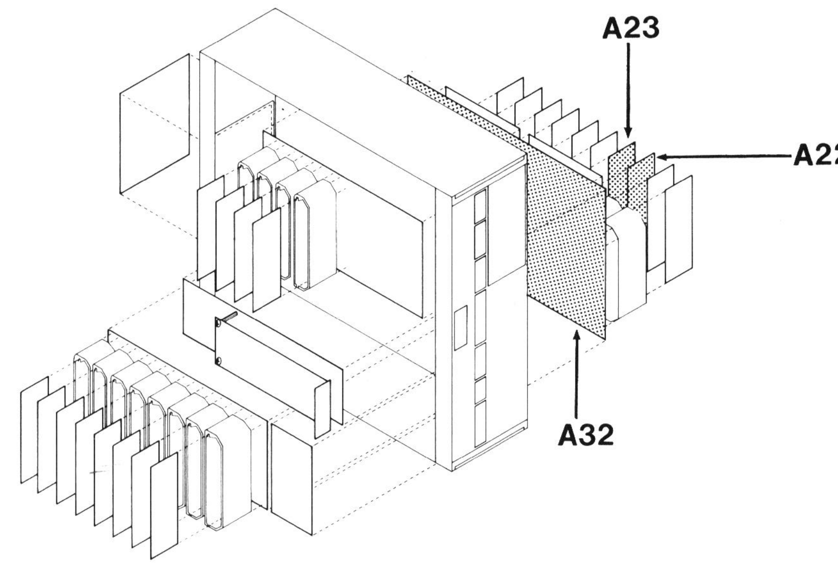
4



5

6

A23 IF SWITCH/AURAL DRIVE BOARD



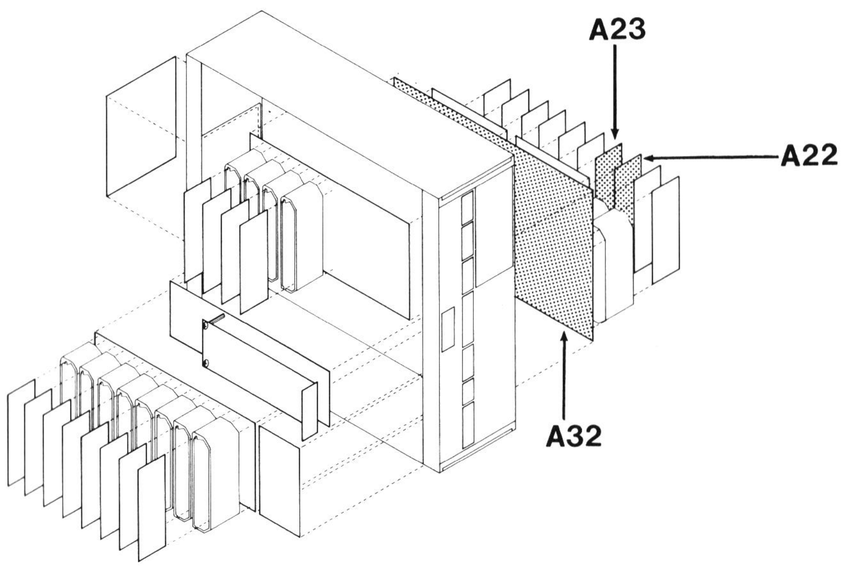
Static Sensitive Devices
See Maintenance Section

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.

Circuit Number	Schematic Location
ASSY A22	
C01	B2
C02	A2
C04	A2
C05	A1
C06	A1
C07	A1
C08	B1
C15	A2
C18	A1
C19	A1
C25	B3
C26	A2
C27	A1
C28	B1
C30	B3
C46	B3
C48	B3
C53	A4
C60	B4
C63	B4
C67	B5
C72	A4
C73	B4
C75	B4
C76	A5
C78	A5
C83	A4
C91	B3
C95	A1
C96	A2
CR08	B1
CR09	B1
CR17	A1
CR56	B3
L04	A2
L08	B1
L15	A1
L17	A1
L31	A3
L36	A3
L43	A3
L70	B4
L97	A5
LR22	A2
LR86	B5
P40	A3
P60	A4
Q02	A2
Q23	A2
Q81	B4
Q85	B5
Q93	A2
R00	A2
R07	A1
R11	A2
R12	A2
R14	A2
R15	A2
R16	A2
R19	A1
R20	A2
R21	A2
R42	A3
R43	A3
R46	A3
R51	B3
R52	B3



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.

IF Mixer & Aural Drive ⟨2⟩

Circuit Number	Schematic Location	Board Location
ASSY A22		
C01	B2	A1
C02	A2	A1
C04	A2	A2
C05	A1	A2
C06	A1	A2
C07	A1	A2
C08	B1	A3
C15	A2	B1
C18	A1	B2
C19	A1	B3
C25	B3	B2
C26	A2	B2
C27	A1	B2
C28	B1	B2
C30	B3	C1
C46	B3	C2
C48	B3	C3
C53	A4	D1
C60	B4	D1
C63	B4	D2
C67	B5	D2
C72	A4	E1
C73	B4	E2
C75	B4	D2
C76	A5	E2
C78	A5	E2
C83	A4	E1
C91	B3	F1
C95	A1	F2
C96	A2	E2
CR08	B1	A3
CR09	B1	A3
CR17	A1	B2
CR56	B3	D2
L04	A2	A2
L08	B1	A3
L15	A1	B2
L17	A1	B2
L31	A3	B1
L36	A3	C2
L43	A3	C1
L70	B4	E1
L97	A5	F2
LR22	A2	B1
LR86	B5	E2
P40	A3	C1
P60	A4	D1
Q02	A2	A1
Q23	A2	B1
Q81	B4	E1
Q85	B5	E2
Q93	A2	F1
R00	A2	A1
R07	A1	A2
R11	A2	B1
R12	A2	B1
R14	A2	B2
R15	A2	B2
R16	A2	B2
R19	A1	B3
R20	A2	B1
R21	A2	B1
R42	A3	C1
R43	A3	C1
R46	A3	C2
R51	B3	D1
R52	B3	D1
R53	B3	D1
R62	B4	D1
R74	B4	E2
R75	A4	D1
R76	B5	E2
R81	B4	E1
R82	A1	E1
R83	A4	E2
R84	A2	E2
R85	A5	E2
R87	A5	E2
R90	A2	F1
R92	A1	E1
R97	A5	F2
RT22	A2	B1
RT86	A5	E2
T04	A2	A2
T54	B3	D2
T58	B3	D2
T71	B4	D1
T78	A5	E3
ASSY A23		
C11	D4	B4
C15	D5	B5
C22	D4	B4
C27	D4	B5
C35	D5	C5
C40	C3	C4
C41	C3	C4
C42	C3	C4
C43	C3	C4
C44	C3	C5
C46	C3	C5
C47	C3	C5
C48	C3	C5
C64	C3	D5
C65	C2	D5
C66	D5	D5
C71	C4	E4
C75	C5	E5
C84	C4	E5
C89	C5	E6
C93	C4	E5
C99	C5	F6
CR83	C5	E5
CR84	C4	E5
CR88	C5	E5
CR94	C4	F5
CR95	C5	F5
CR97	C5	E6
L36	D5	C5
L51	C3	C4
L54	C3	C5
L58	C3	C5
L61	C4	D4
L82	C4	E4
P62	C3	D5
P63	C4	D5
P64	C3	D5
P65	C3	D5
Q13	D4	B5
Q17	D5	B5
R13	D4	B5,B8
R15	D5	B5,B8
R23	D4	B5,B8
R24	D5	B5,B8
R25	D5	B5,B8
R27	D4	B5,B8
R33	D5	B5,B8
R36	C5	B5,B8
R53	C3	D5
R56	C3	D5
R64	C2	D5,D8
R65	C2	D5,D8
R66	C2	E5,E8
R71	D4	E4,E7
R78	C5	E5,E9
R81	C4	E4,E7
R82	C4	E4,E7
R83	C4	E4,E7
R86	C5	E5,E8
R87	C5	E5,E8
R96	C5	E5,E8
R97	C5	F5,F8
T29	D5	B6,B9
P/O ASSY A32		
C23	C2	L6
C24	D5	L6
C29	C5	H7
P29	B1	H7
P39	D5	H6

Component locations for A32 are shown on the reverse side of the block diagram.

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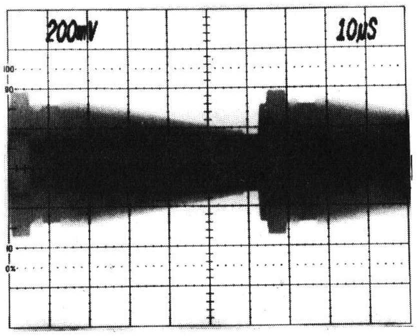
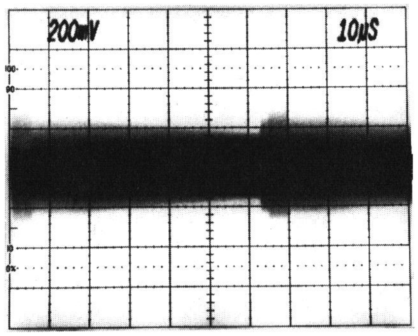
2

1



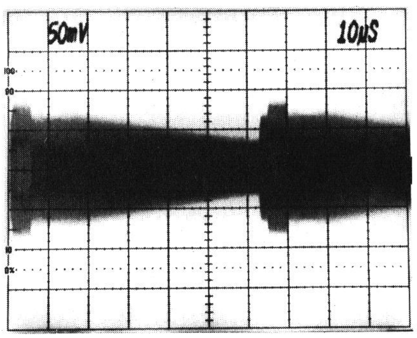
0 V

2



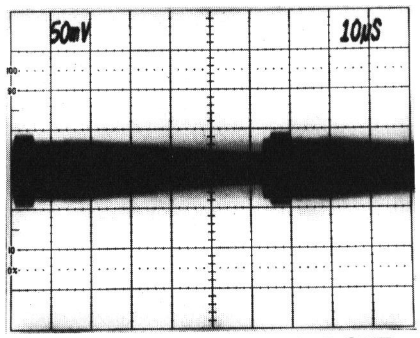
0 V

3



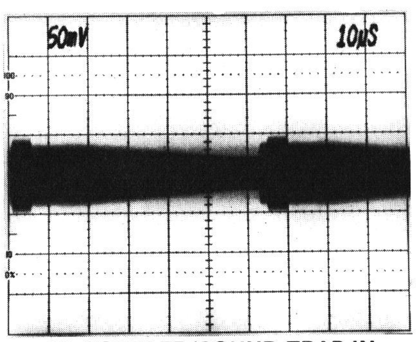
0 V

4



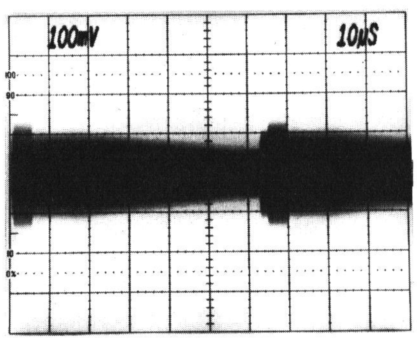
AC COUPLED/SOUND TRAP OUT

5

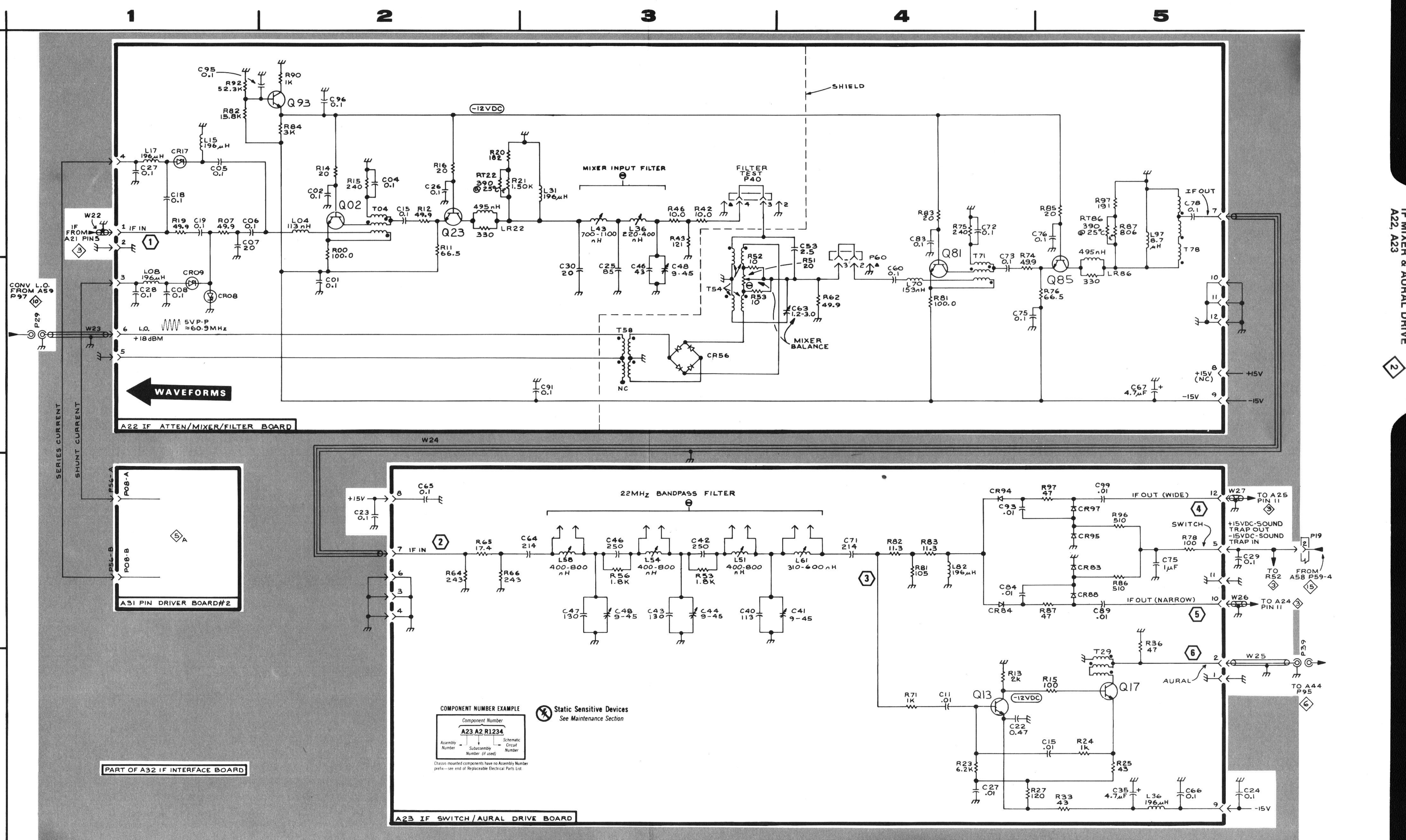


AC COUPLED/SOUND TRAP IN

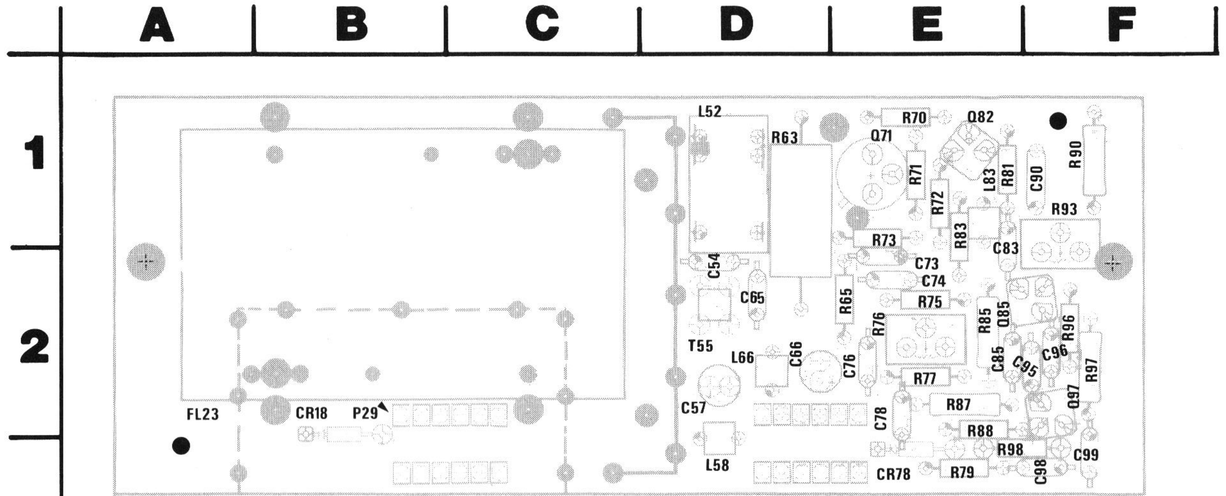
6



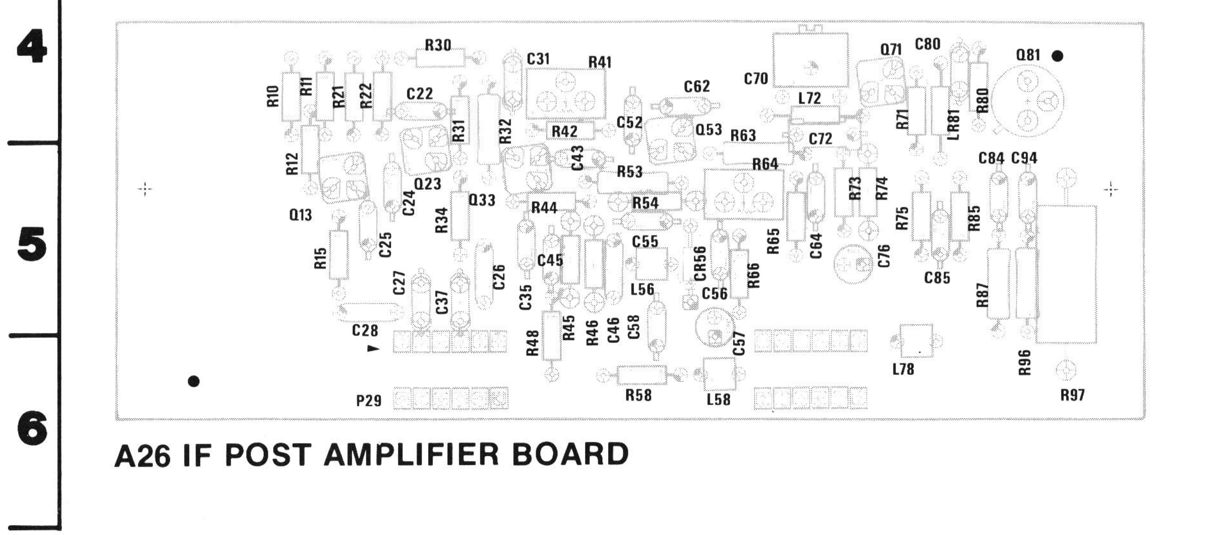
0 V



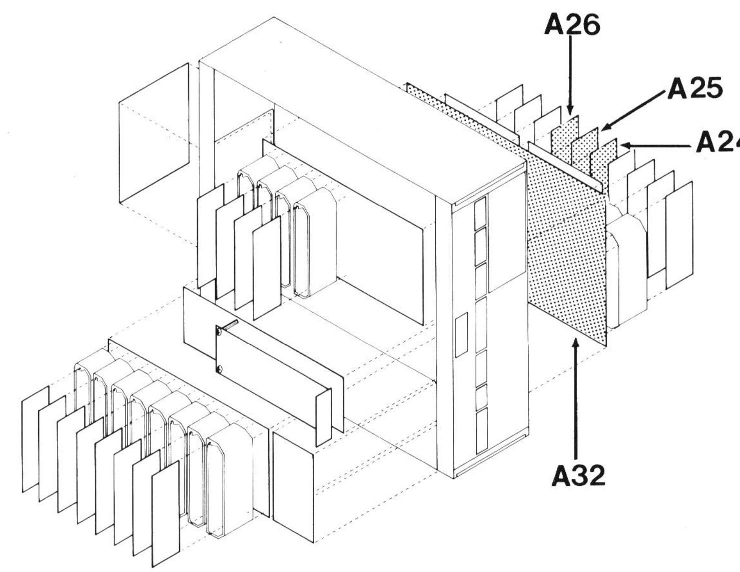
IF MIXER & AURAL DRIVE
A22, A23
A22 IF ATTEN/MIXER/FILTER BOARD
A23 IF SWITCH/AURAL DRIVE BOARD
A31 PIN DRIVER BOARD#2
PART OF A32 IF INTERFACE BOARD
MIXER INPUT FILTER
22MHz BANDPASS FILTER
WAVEFORMS
SHIELD
FILTER TEST P40
MIXER BALANCE
IF OUT (WIDE)
IF OUT (NARROW)
SERIES CURRENT
SHUNT CURRENT
CONV L.O. FROM A59 P97
COMPONENT NUMBER EXAMPLE
A23 A2 R1234
Static Sensitive Devices
See Maintenance Section



A24 IF SAW AMPLIFIER (NARROW BAND) BOARD
A25 IF SAW AMPLIFIER (WIDE BAND) BOARD



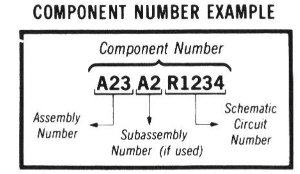
A26 IF POST AMPLIFIER BOARD



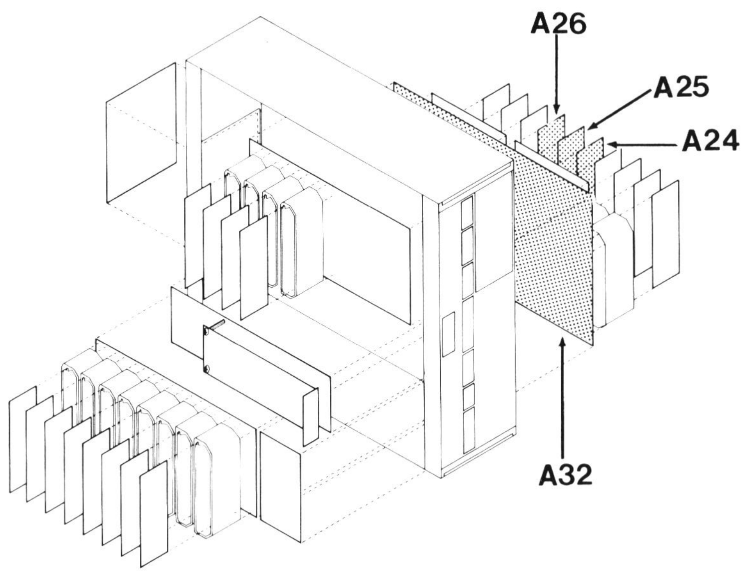
Circuit Number	Schematic Lo ation
ASSY A24, 25	
C54	A3,B3
C57	A2,B2
C65	A2,C2
C66	B3,C3
C73	B2,C2
C74	B2,C2
C76	B1,C1
C78	A1,C1
C83	A2,C2
C85	B1,C1
C90	A2,B2
C95	B1,C1
C96	A1,C1
C96'	B1,C1
C98	A1,C1
C99	B1,C1
CR18	A3,C3
CR78	B1,C1
FL23	A3,B3
L52	A3,C3
L58	A3,B3
L66	B3,C3
L83	A1,B1
Q71	B2,C2
Q82	A2,C2
Q85	A2,C2
Q97	B1,C1
R63	A2,B2
R65	B2,C2
R70	A2,C2
R71	B2,C2
R72	B2,C2
R73	B2,C2
R75	A2,C2
R76	B1,C1
R77	B1,C1
R79	A1,C1
R81	A2,C2
R83	A2,B2
R85	B2,C2
R87	A1,C1
R88	B1,C1
R90	A2,B2
R93	B2,C1
R96	A1,C1
R97	B1,C1
R98	A1,C1
T55	A2,C2

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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



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.

IF Nyquist Filtering 3

Circuit Number	Schematic Lo ation	Board Location
ASSY A24, 25		
C54	A3,B3	D2
C57	A2,B2	D2
C65	A2,C2	D2
C66	B3,C3	D2
C73	B2,C2	E2
C74	B2,C2	E2
C76	B1,C1	E2
C78	A1,C1	E2
C83	A2,C2	E1
C85	B1,C1	E2
C90	A2,B2	F1
C95	B1,C1	F2
C96	A1,C1	F2
C96*	B1,C1	F3
C98	A1,C1	F3
C99	B1,C1	G3
CR18	A3,C3	B2
CR78	B1,C1	E3
FL23	A3,B3	A2
L52	A3,C3	D1
L58	A3,B3	D3
L66	B3,C3	D2
L83	A1,B1	E1
Q71	B2,C2	E1
Q82	A2,C2	E1
Q85	A2,C2	E2
Q97	B1,C1	F2
R63	A2,B2	D1
R65	B2,C2	E2
R70	A2,C2	E1
R71	B2,C2	E1
R72	B2,C2	E1
R73	B2,C2	E1
R75	A2,C2	E2
R76	B1,C1	E2
R77	B1,C1	E2
R79	A1,C1	E3
R81	A2,C2	E1
R83	A2,B2	E1
R85	B2,C2	E2
R87	A1,C1	E2
R88	B1,C1	E2
R90	A2,B2	F1
R93	B2,C1	F1
R96	A1,C1	F2
R97	B1,C1	F2
R98	A1,C1	E3
T55	A2,C2	D2

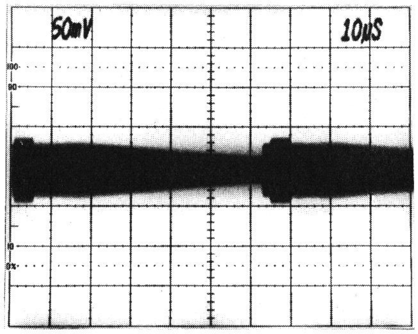
Circuit Number	Schematic Location	Board Location
ASSY A26		
C22	B4	B4
C24	B4	B5
C25	B4	B5
C26	B3	C5
C27	C3	B5
C28	B3	B5
C31	C4	C4
C35	B4	C5
C37	B3	B5
C43	C4	C5
C45	B4	C5
C46	B4	C5
C52	C5	C4
C55	C5	C5
C56	C4	D5
C57	C5	D5
C58	C5	C5
C62	B5	D4
C64	B4	D5
C70	B5	D4
C72	B5	D4
C76	B5	E5
C80	B5	E4
C84	C5	E5
C85	C5	E5
C94	B5	E5
CR56	C5	D5
E13	B4	B5
E23	B4	B5
E33	B4	C5
E71	B5	E4
L56	C5	C5
L58	C5	D6
L72	B5	D4
L78	B5	E6
LR81	B5	E4
Q13	C4	B5
Q23	B4	B5
Q33	B4	C5
Q53	B5	D4
Q71	B5	E4
Q81	B5	E4
R10	B4	B4
R11	B4	B4
R12	C4	B5
R15	B3	B5
R21	B4	B4
R22	B4	B4

Circuit Number	Schematic Location	Board Location
R30	B4	B4
R31	B4	C4
R32	C4	C4
R34	B3	B5
R41	C4	C4
R42	B4	C4
R44	C4	C5
R45	B4	C5
R46	B4	C5
R48	B4	C5
R53	C5	C5
R54	C4	C5
R58	C5	C6
R63	B5	D4
R64	C4	D5
R65	B5	D5
R66	C5	D5
R71	B5	E4
R73	B5	E5
R74	B5	E5
R75	C5	E5
R80	B5	E4
R85	B5	E5
R87	B5	E5
R96	B5	E5
R97	B5	F6
P/O ASSY A32		
C59	D5	H4
C69	C5	H4
L41	D2	L6
L42	D2	L6
P59	D5	H4
P69	C5	H4
P93	B5	L1
Q52	C1	L5
R52	C1	L5

Component locations for A32 are shown on the reverse side of the block diagram.

2998-91

1



0 V

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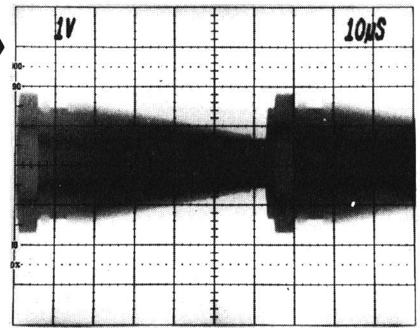

0 V

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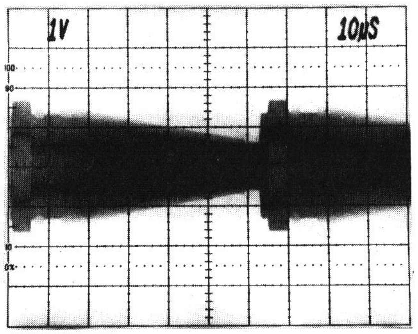
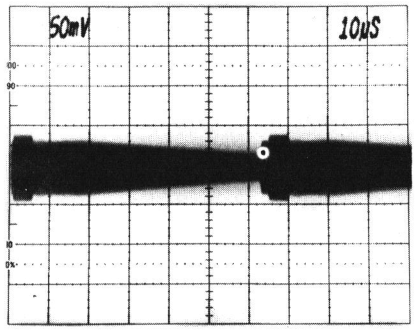


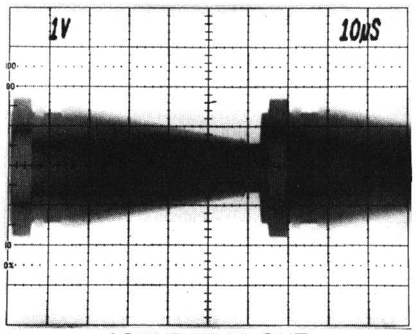
AC COUPLED

4



SOUND TRAP OUT

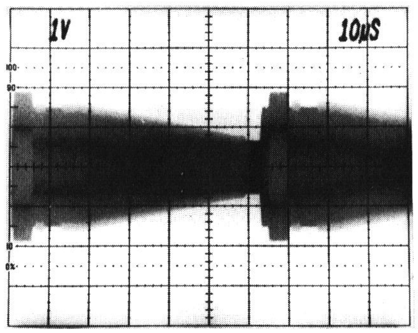
5



0 V

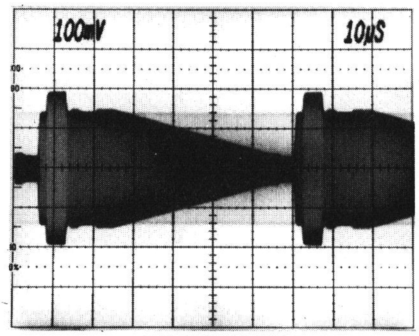
SOUND TRAP OUT

6



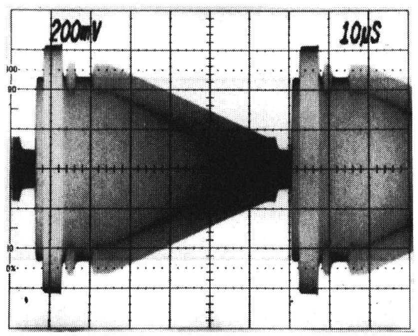
AC COUPLED/SOUND TRAP OUT

7



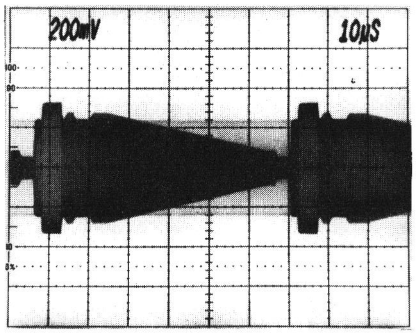
AC COUPLED

8



AC COUPLED

9



0 V

1 2 3 4 5

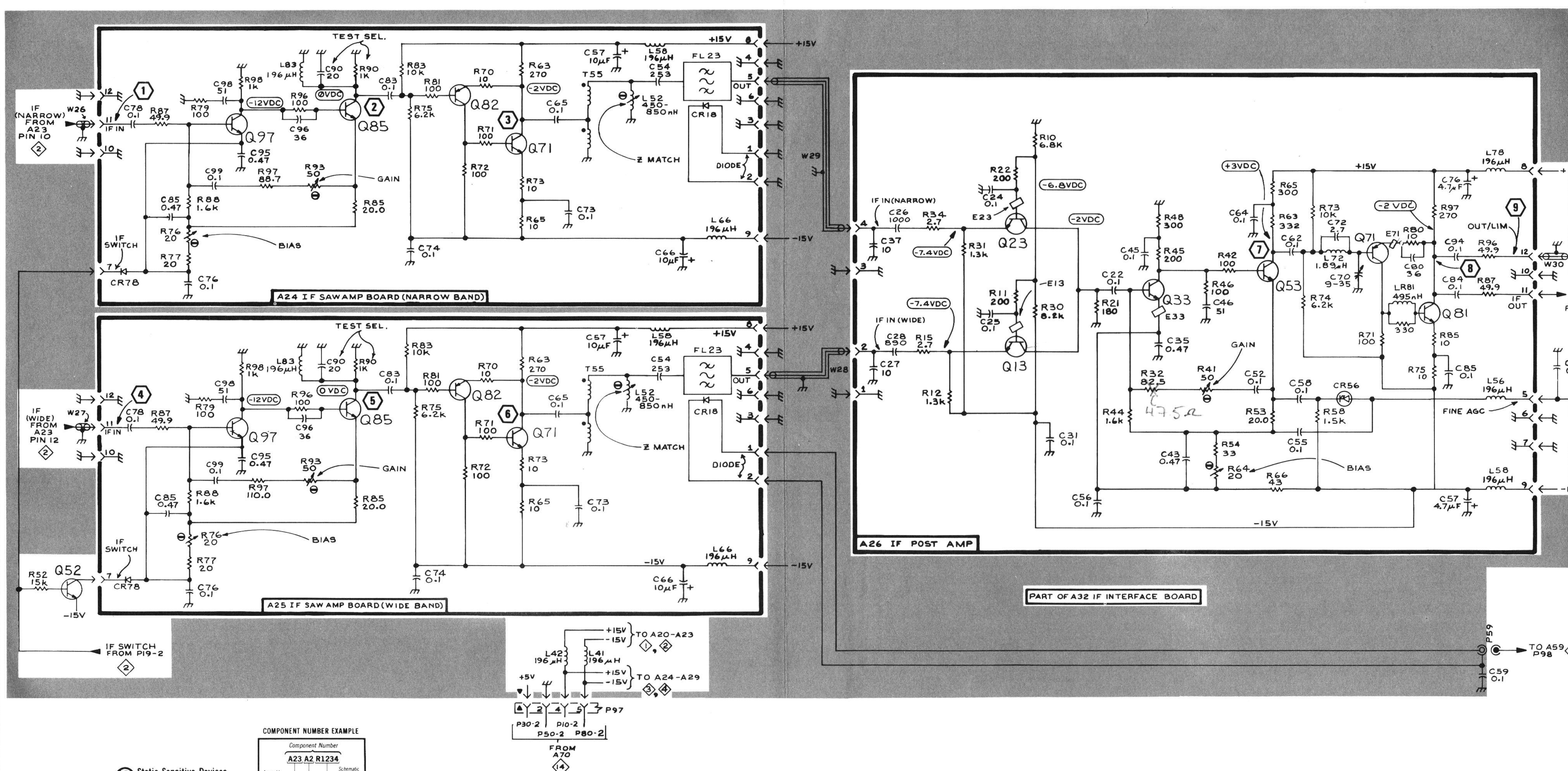
A

WAVEFORMS

B

C

D



COMPONENT NUMBER EXAMPLE

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

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

Static Sensitive Devices
See Maintenance Section

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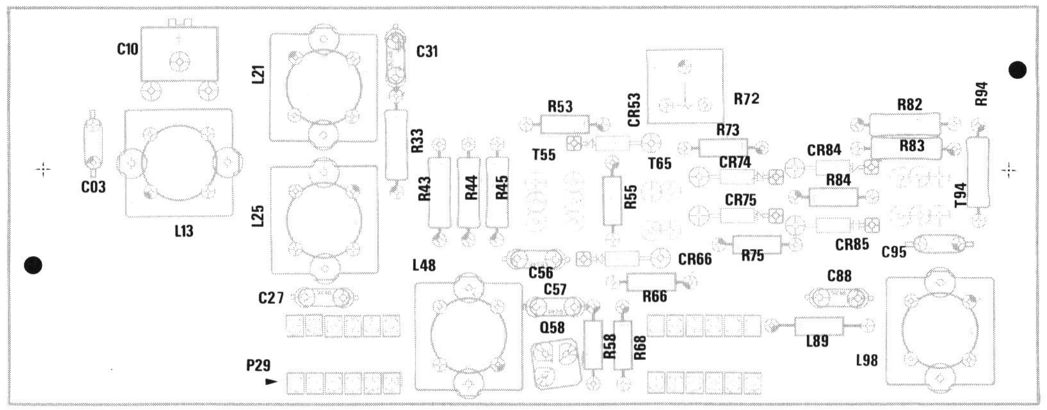
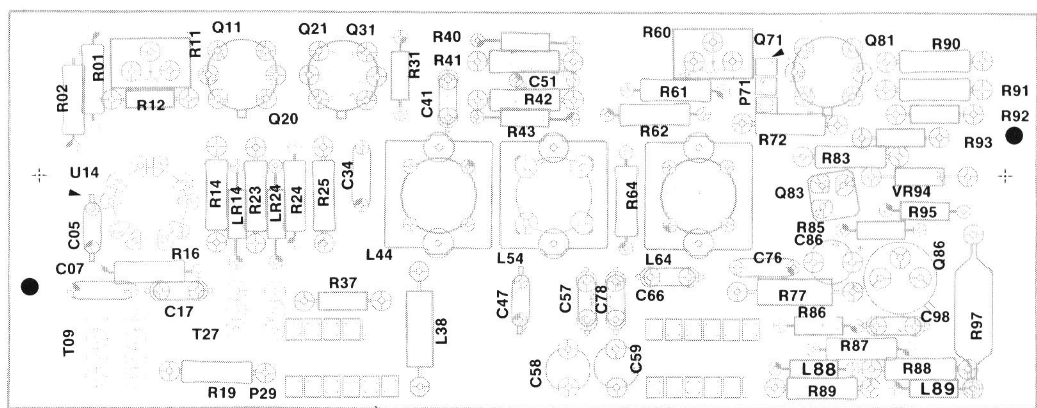
@ 2998-108 (2200-153)

IF NYQUIST FILTERING ③

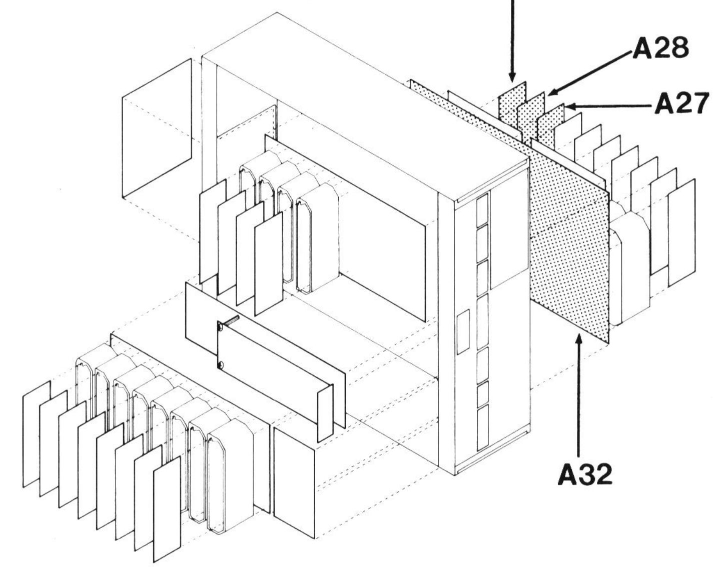
	A	B	C	D	E	F



A27 IF ZERO CARRIER/PHASE SHIFTER BOARD



A28 IF DETECTOR-VIDEO AMPLIFIER (QUADRATURE) BOARD
A29 IF DETECTOR-VIDEO AMPLIFIER (VIDEO) BOARD



Static Sensitive Devices
See Maintenance Section

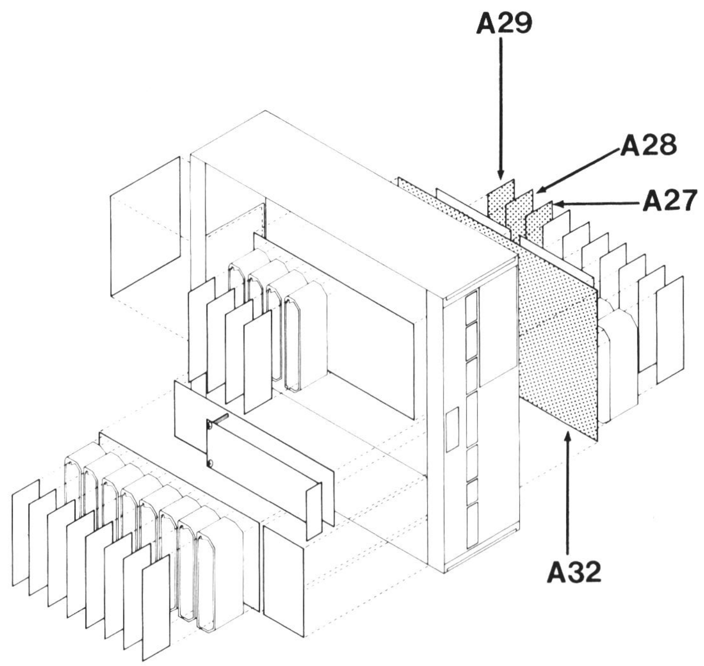
COMPONENT NUMBER EXAMPLE

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.

Circuit Number	Schematic Location
ASSY A27	
C03	B2
C10	B2
C27	B2
C31	B2
C56	D2
C57	B1
C88	B1
C95	C1
CR53	C1
CR66	C1
CR74	C1
CR75	C1
CR84	C1
CR85	C1
L13	B2
L21	B2
L25	B2
L48	D2
L89	C1
L98	C1
Q58	B1
R33	B2
R43	D2
R44	D2
R45	C1
R53	C1
R55	B1
R58	B1
R62	C1
R66	B1
R68	B1
R72	C1
R73	C1
R75	C1
R82	C1
R83	C1
R84	C1
R94	C1
T55	C1
T65	C1
T94	C1
ASSY A28	
C05	B3
C07	B3
C17	B3
C34	A3
C41	A4
C47	A4
C51	A3
C57	A4
C58	A5
C59	B5
C66	A4
C76	A5
C78	B5
C86	A5
C98	A5
E83	A5
L38	B2
L44	A4
L54	A4
L64	A4
L88	A5
L89	A5
LR14	A3
LR24	B3
P71	A5

COMPONENT LOCATIONS
A27, A28, A29



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.

IF Detection 4

Circuit Number	Schematic Location	Board Location
ASSY A27		
C03	B2	A2
C10	B2	A1
C27	B2	B2
C31	B2	C1
C56	D2	D2
C57	B1	D2
C88	B1	E2
C95	C1	E2
CR53	C1	D1
CR66	C1	D2
CR74	C1	D2
CR75	C1	D2
CR84	C1	E2
CR85	C1	E2
L13	B2	B2
L21	B2	B1
L25	B2	B2
L48	D2	C2
L89	C1	E2
L98	C1	E3
Q58	B1	D2
R33	B2	C1
R43	D2	C2
R44	D2	C2
R45	C1	C2
R53	C1	D1
R55	B1	D2
R58	B1	D2
R62	C1	G1
R66	B1	D2
R68	B1	D2
R72	C1	D1
R73	C1	D1
R75	C1	E2
R82	C1	E1
R83	C1	E1
R84	C1	E2
R94	C1	F1
T55	C1	D2
T65	C1	D2
T94	C1	F2
ASSY A28		
C05	B3	A5
C07	B3	A5
C17	B3	B5
C34	A3	C5
C41	A4	C4
C47	A4	C5
C51	A3	D4
C57	A4	D5
C58	A5	D6
C59	B5	D6
C66	A4	D5
C76	A5	E5
C78	B5	E6
C86	A5	E5
C98	A5	F6
E83	A5	E5
L38	B2	C6
L44	A4	C5
L54	A4	C5
L64	A4	D5
L88	A5	E6
L89	A5	E6
LR14	A3	B5
LR24	B3	B5
P71	A5	E4

Circuit Number	Schematic Location	Board Location
Q11	A3	B4
Q20	A3	B4
Q21	A3	B4
Q31	A3	C4
Q71	A4	E4
Q81	A4	E4
Q83	A5	E5
Q86	A5	F5
R01	B4	A4
R02	B4	A4
R11	B4	A4
R12	B4	A4
R14	B3	B5
R16	B3	B5
R19	B3	B6
R23	A3	B5
R24	A3	B5
R25	A3	B5
R31	A3	C4
R37	A2	B5
R40	A3	C4
R41	A3	C4
R42	A3	C4
R43	A3	C4
R60	A4	D4
R61	A4	D4
R62	B5	D4
R64	A4	D5
R72	A4	E4
R77	A5	E5
R83	A5	E5
R85	A5	E5
R86	B5	E5
R87	A5	E6
R88	A5	E6
R89	A5	E6
R90	A4	F4
R91	A4	F4
R92	A4	F4
R93	A4	F5
R95	A5	F5
R97	A5	F5
T09	B3	A6
T27	A3	B6
U14	A3	A5
VR94	A5	F5
ASSY A29		
C05	D3	A5
C07	D3	A5
C17	D3	B5
C34	C3	C5
C41	C4	C4
C47	C4	C5
C51	C3	D4
C57	C4	D5
C58	C5	D6
C59	D5	D6
C66	C4	D5
C76	C5	E5
C78	D5	E6
C86	C5	E5
C98	D5	F6
E83	C5	E5
L38	D2	C6
L44	C4	C5
L54	C4	C5
L64	C4	D5
L88	C5	E6
L89	C5	E6
LR14	C3	B5
LR24	D3	B5
P71	C5	E4

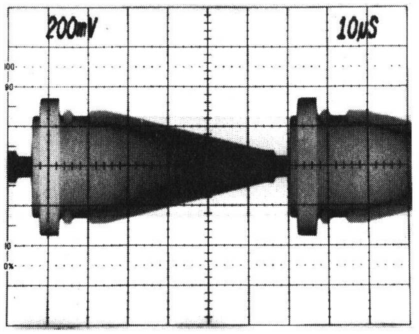
Circuit Number	Schematic Location	Board Location
Q11	C3	B4
Q20	C3	B4
Q21	C3	B4
Q31	C3	C4
Q71	C4	E4
Q81	C4	E4
Q83	C5	E5
Q86	C5	F5
R01	D4	A4
R02	D4	A4
R11	D4	A4
R12	D4	A4
R14	D3	B5
R16	D3	B5
R19	D3	B6
R23	D3	B5
R24	C3	B5
R25	C3	B5
R31	C3	C4
R37	D2	B5
R40	C3	C4
R41	C3	C4
R42	C3	C4
R43	C3	C4
R60	D4	D4
R61	C4	D4
R62	D5	D4
R64	C4	D5
R72	C4	E4
R77	C5	E5
R83	C5	E5
R85	C5	E5
R86	D5	E5
R87	C5	E6
R88	C5	E6
R89	C5	E6
R90	C4	F4
R91	C4	F4
R92	D4	F4
R93	C4	F5
R95	C5	F5
R97	C5	F5
T09	D3	A6
T27	C3	B6
U14	C3	A5
VR94	C5	F5
P/O ASSY A32		
P90	A5	M1
P91	A5	M1
P94	D5	L1
P95	C5	L1
P96	C5	K1
P98	A2	J1

Component locations for A32 are shown on the reverse side of the block diagram.

2998-92

4

1



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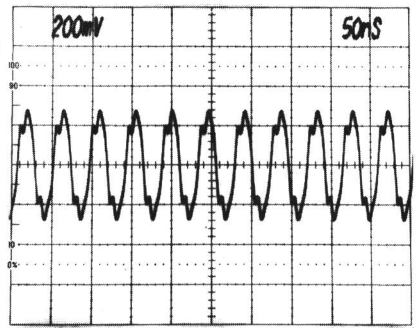
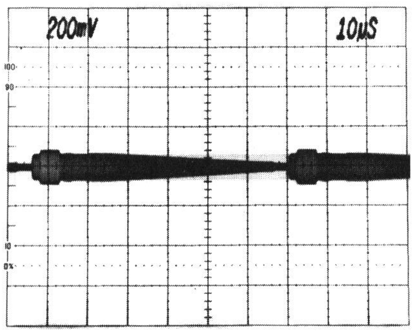
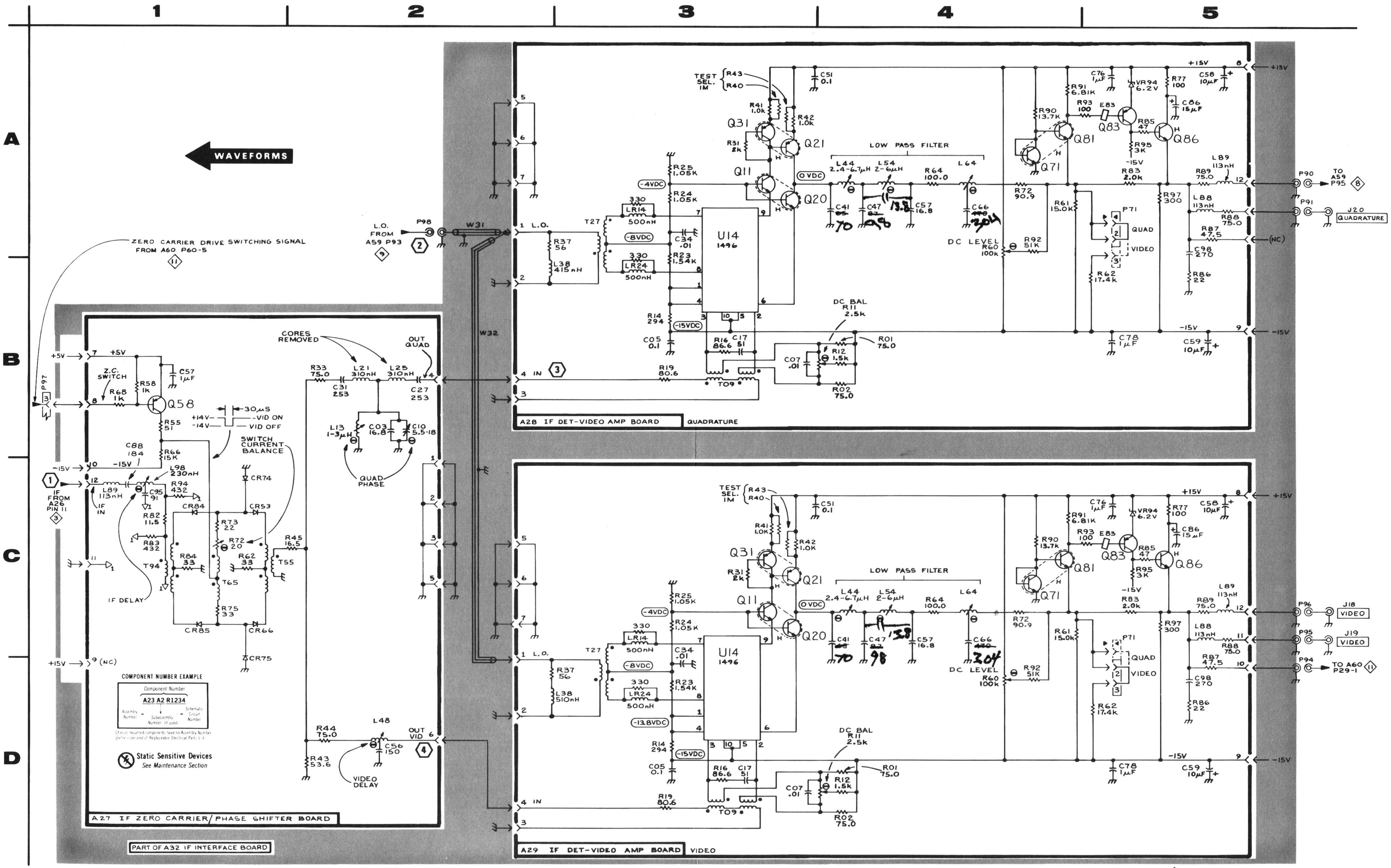


3

4





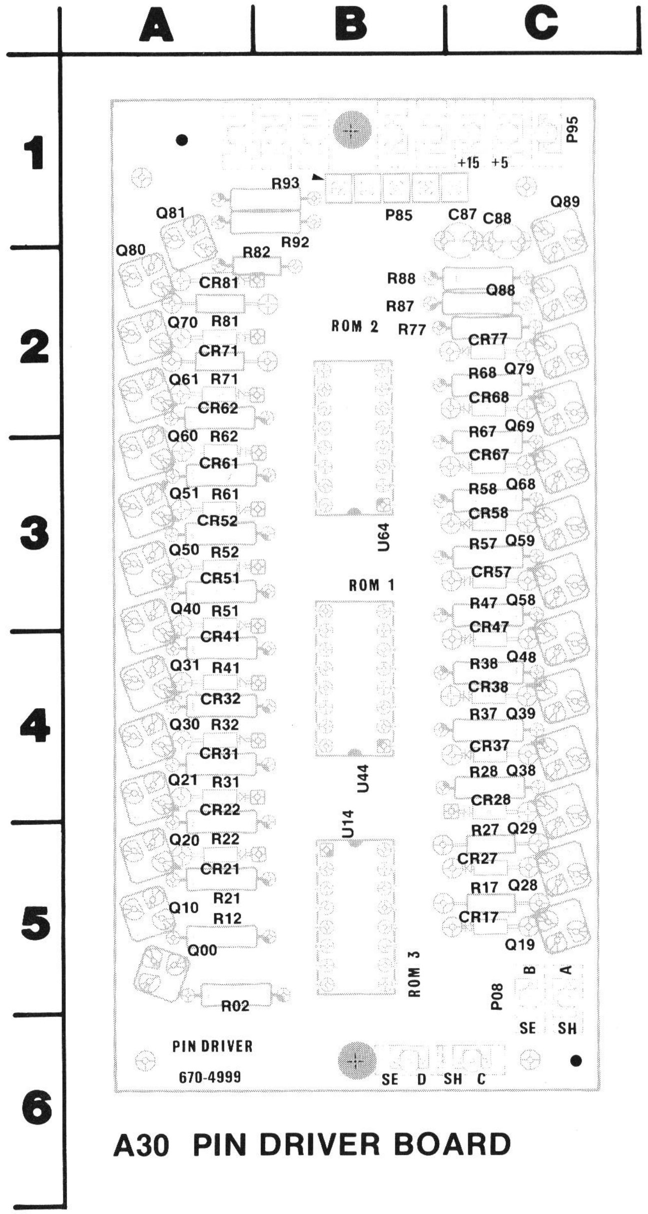
1450-2

@ 2998-109 (2200-154)

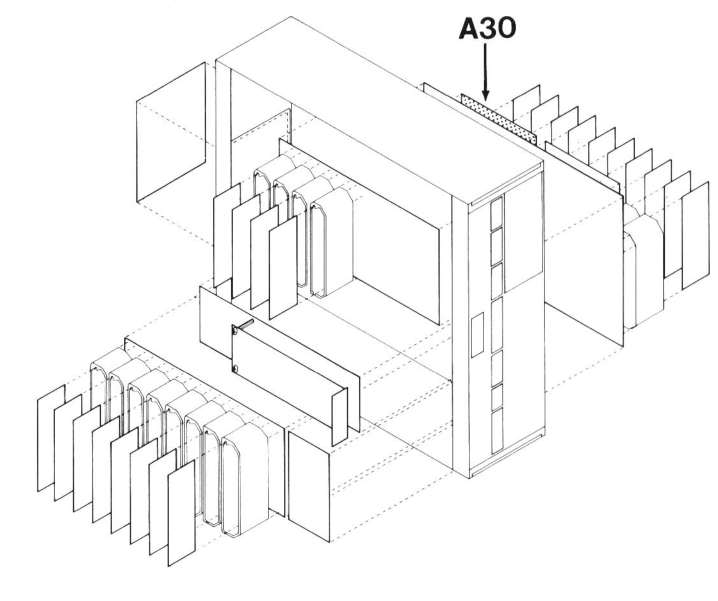
IF DETECTION 4

IF DETECTION
A27, A28, A29

4

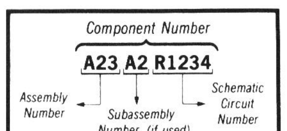


A30 PIN DRIVER BOARD



Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



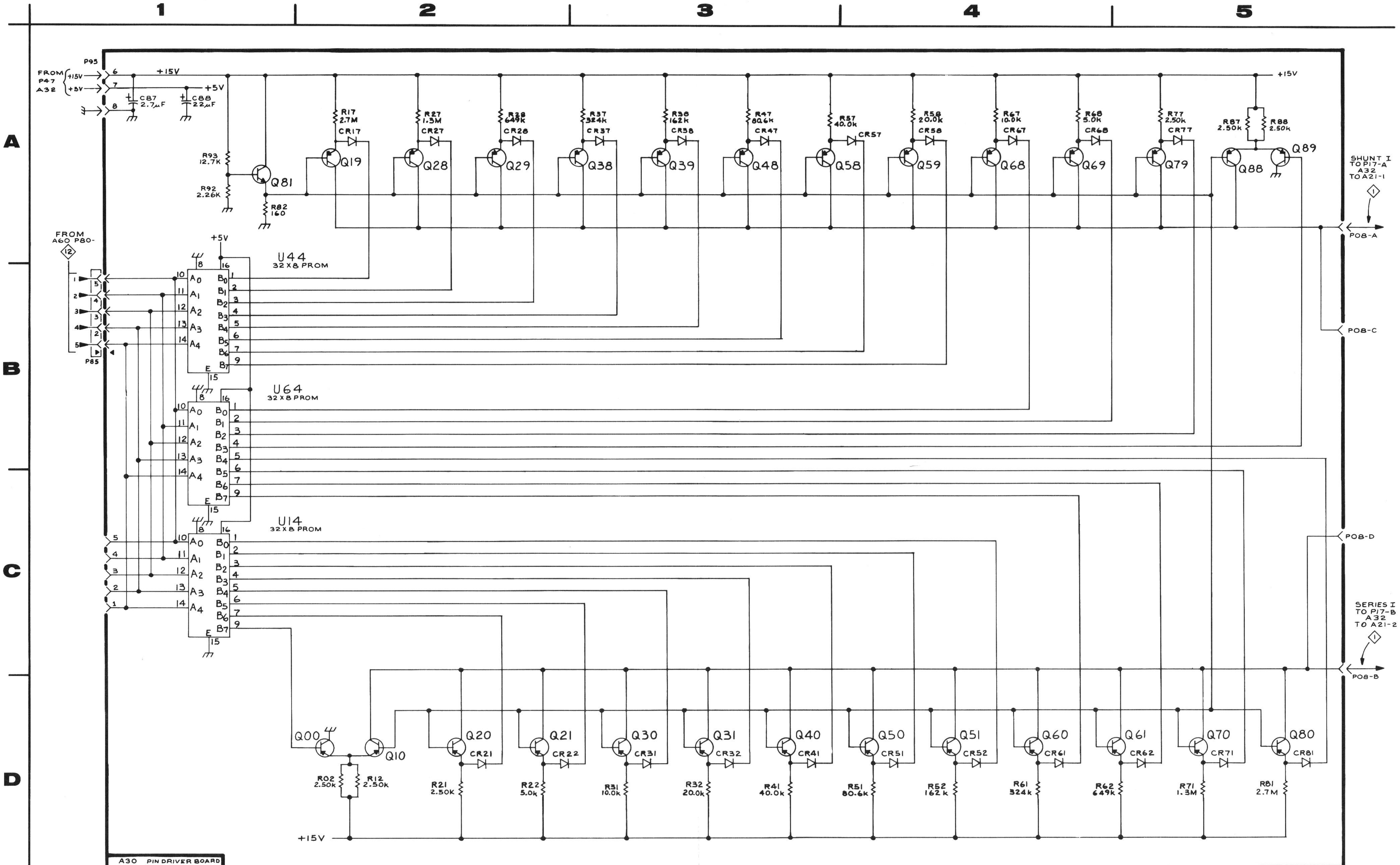
Chassis mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List

Pin Driver 5

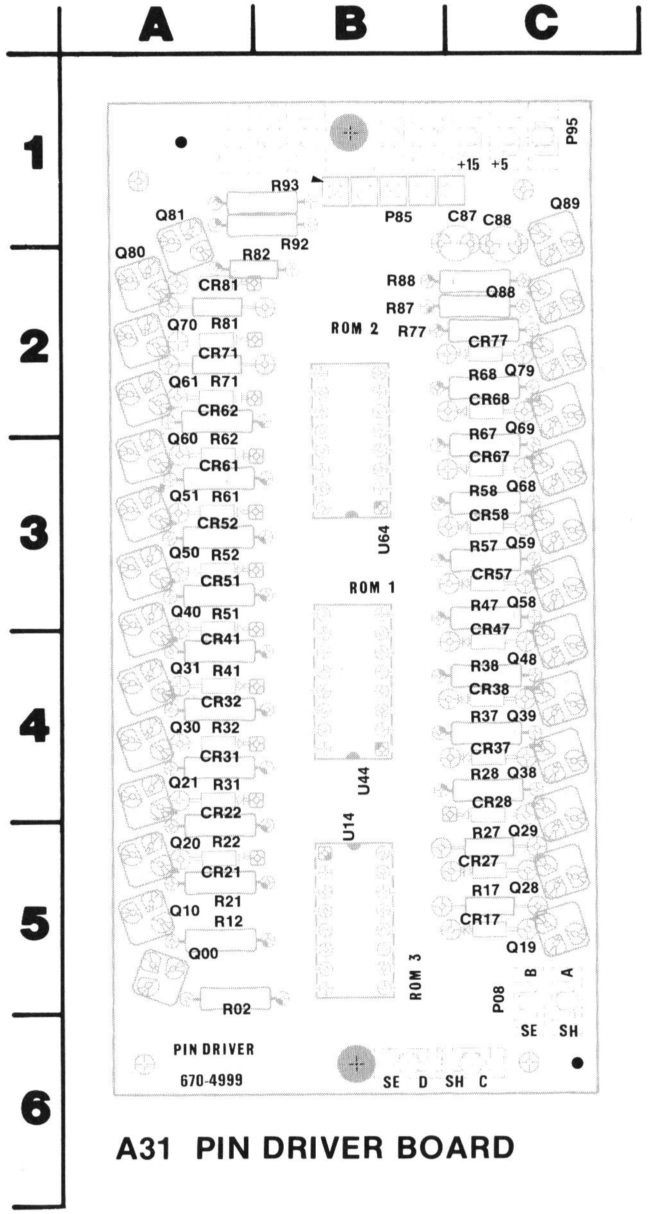
Circuit Number	Schematic Location	Board Location
ASSY A30		
C87	A1	C1
C88	A1	C1
CR17	A2	C5
CR21	D2	A5
CR22	D2	A4
CR27	A2	C5
CR28	A2	C4
CR31	D3	A4
CR32	D3	A4
CR37	A3	C4
CR38	A3	C4
CR41	D3	A4
CR47	A3	C3
CR51	D4	A3
CR52	D4	A3
CR57	A4	C3
CR58	A4	C3
CR61	D4	A3
CR62	D5	A2
CR67	A4	C3
CR68	A4	C2
CR71	D5	A2
CR77	A5	C2
CR81	D5	A2
Q00	D2	A5
Q10	D2	A5
Q19	A2	C5
Q20	D2	A5
Q21	D2	A4
Q28	A2	C5
Q29	A2	C5
Q30	D3	A4
Q31	D3	A4
Q38	A3	C4
Q39	A3	C4
Q40	D3	A3
Q48	A3	C4
Q50	D4	A3
Q51	D4	A3
Q58	A4	C3

Circuit Number	Schematic Location	Board Location
Q59	A4	C3
Q60	D4	A2
Q61	D5	A2
Q68	A4	C3
Q69	A4	C2
Q70	D5	A2
Q79	A5	C2
Q80	D5	A2
Q81	A1	A1
Q88	A5	C2
Q89	A5	C1
R02	D2	A5
R12	D2	A5
R17	A2	C5
R21	D2	A5
R22	D2	A5
R27	A2	C5
R28	A2	C4
R31	D3	A4
R32	D3	A4
R37	A3	C4
R38	A3	C4
R41	D3	A4
R47	A3	C3
R51	D4	A3
R52	D4	A3
R57	A4	C3
R58	A4	C3
R61	D4	A3
R62	D4	A2
R67	A4	C2
R68	A4	C2
R71	D5	A2
R77	A5	C2
R81	D5	A2
R82	A1	A2
R87	A5	C2
R88	A5	C2
R92	A1	B1
R93	A1	B1
U14	C1	B5
U44	A1	B4
U64	B1	B3

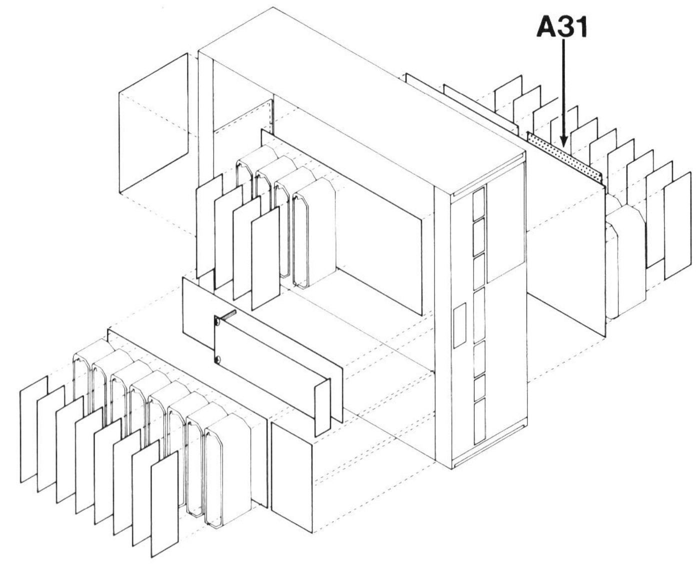
2998-93


1
2
3
4
5
A
B
C
D
P95
FROM P47 A32
+15V
+5V
C87 2.7µF
C88 22µF
R93 12.7K
R92 2.26K
Q81
R82 160
R17 2.7M
CR17
Q19
R27 1.3M
CR27
Q28
R28 649k
CR28
Q29
R37 324k
CR37
Q38
R38 162k
CR38
Q39
R47 80.6k
CR47
Q48
R57 40.0k
CR57
Q58
R58 20.0k
CR58
Q59
R67 10.0k
CR67
Q68
R68 5.0k
CR68
Q69
R77 2.50k
CR77
Q79
R87 2.50k
R88 2.50k
Q88
Q89
SHUNT I TO P17-A A32 TO A21-1
1
P08-A
P08-C
FROM A60 P80-
12
P85
U44 32 X 8 PROM
U64 32 X 8 PROM
U14 32 X 8 PROM
A0
A1
A2
A3
A4
B0
B1
B2
B3
B4
B5
B6
B7
E
P08-D
SERIES I TO P17-B A32 TO A21-2
1
P08-B
Q00
Q10
R02 2.50k
R12 2.50k
Q20
CR21
R21 2.50k
Q21
CR22
R22 5.0k
Q30
CR31
R31 10.0k
Q31
CR32
R32 20.0k
Q40
CR41
R41 40.0k
Q50
CR51
R51 80.6k
Q51
CR52
R52 162k
Q60
CR61
R61 324k
Q61
CR62
R62 649k
Q70
CR71
R71 1.3M
Q80
CR81
R81 2.7M
A30 PIN DRIVER BOARD

1450-2



A31 PIN DRIVER BOARD



Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE

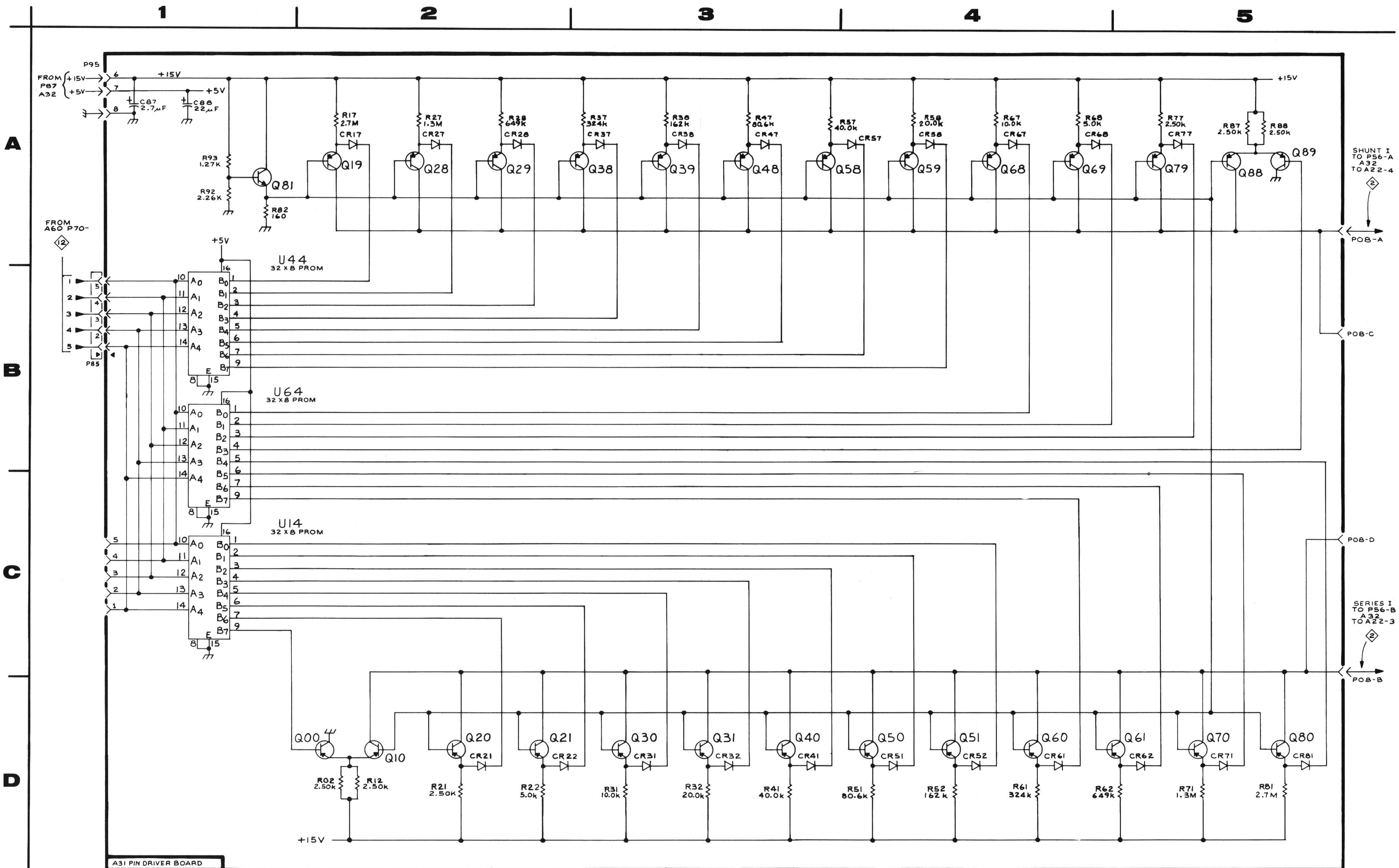
Component Number
A23 A2 R1234
Assembly Number
Subassembly Number (if used)
Schematic Circuit Number

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

Pin Driver 5 A

Circuit Number	Schematic Location	Board Location	Circuit Number	Schematic Location	Board Location
ASSY A31			Q59	A4	C3
			Q60	D4	A3
			Q61	D5	A2
C87	A1	C1	Q68	A4	C3
C88	A1	C1	Q69	A4	C2
			Q70	D5	A2
CR17	A2	C5	Q79	A5	C2
CR21	D2	A5	Q80	D5	A2
CR22	D2	A5	Q81	A1	A1
CR27	A2	C5	Q88	A5	C2
CR28	A2	C4	Q89	A5	C1
CR31	D3	A4			
CR32	D3	A4	R02	D2	A5
CR37	A3	C4	R12	D2	A5
CR38	A3	C4	R17	A2	C5
CR41	D3	A4	R21	D2	A5
CR47	A3	C4	R22	D2	A5
CR51	D4	A3	R27	A2	C5
CR52	D4	A3	R28	A2	C4
CR57	A4	C3	R31	D3	A4
CR58	A4	C3	R32	D3	A4
CR61	D4	A3	R37	A3	C4
CR62	D5	A2	R38	A3	C4
CR67	A4	C3	R41	D3	A4
CR68	A4	C2	R47	A3	C3
CR71	D5	A2	R51	D4	A3
CR77	A5	C2	R52	D4	A3
CR81	D5	A2	R57	A4	C3
			R58	A4	C3
Q00	D2	A5	R61	D4	A3
Q10	D2	A5	R62	D4	A2
Q19	A2	C5	R67	A4	C3
Q20	D2	A5	R68	A4	C2
Q21	D2	A4	R71	D5	A2
Q28	A2	C5	R77	A5	C2
Q29	A2	C5	R81	D5	A2
Q30	D3	A4	R82	A1	A2
Q31	D3	A4	R87	A5	C2
Q38	A3	C4	R88	A5	C2
Q39	A3	C4	R92	A1	B1
Q40	D3	A3	R93	A1	B1
Q48	A3	C4			
Q50	D4	A3	U14	C1	B5
Q51	D4	A3	U44	A1	B4
Q58	A4	C3	U64	B1	B3

2998-94



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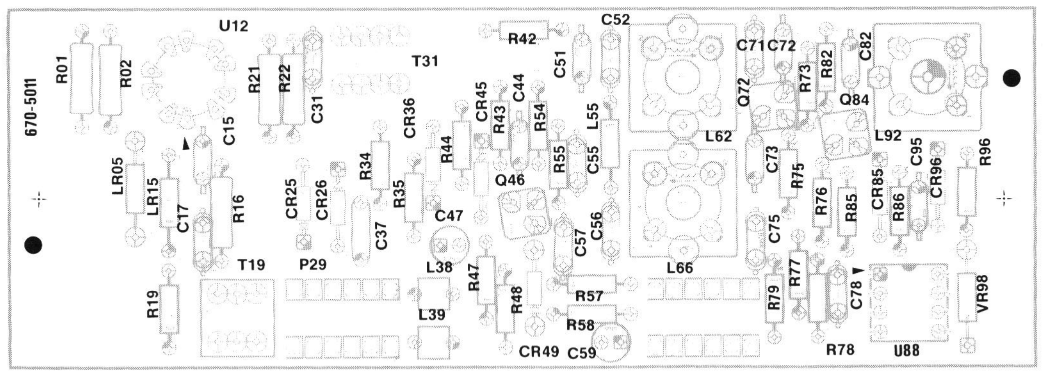
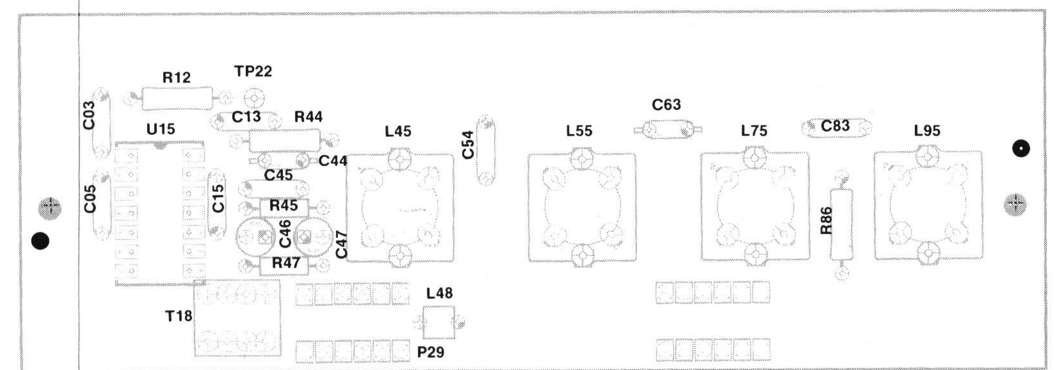
PIN DRIVER 5 A

COMPONENT LOCATIONS
A40, A41, A42

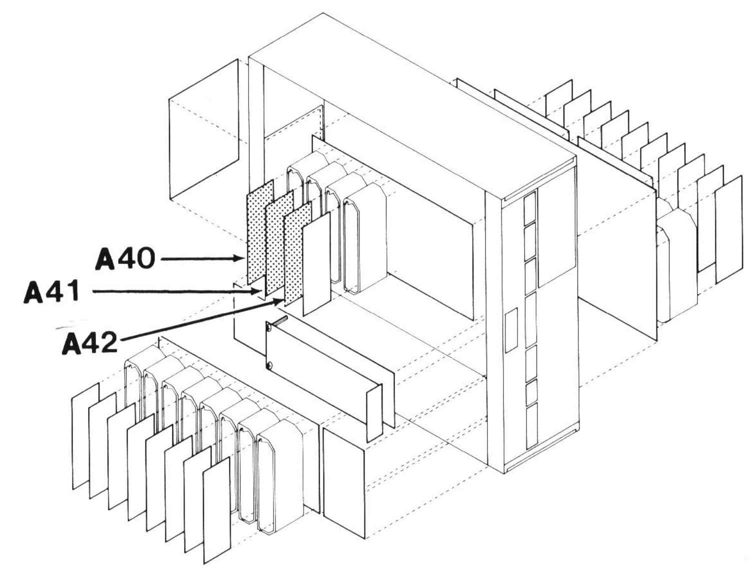
A	B	C	D	E	F	G	H	I	J	K	L

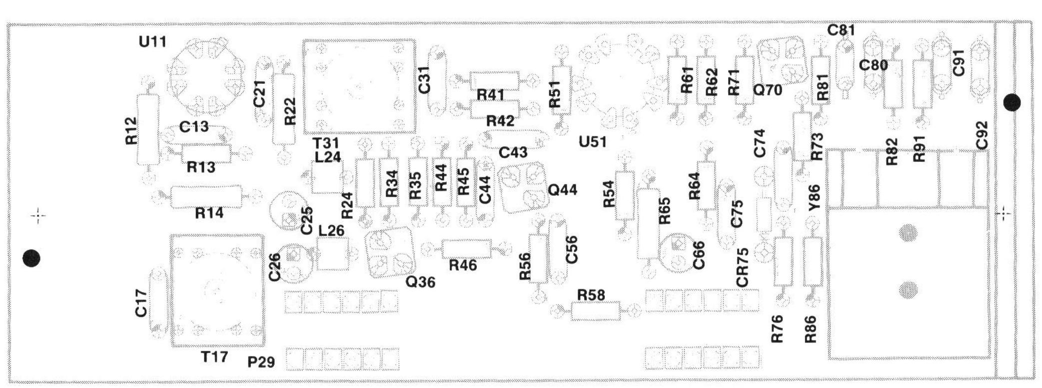


A40 1st AUDIO MIXER BOARD



A42 AUDIO LIMITER BOARD





A41 2nd AUDIO MIXER BOARD

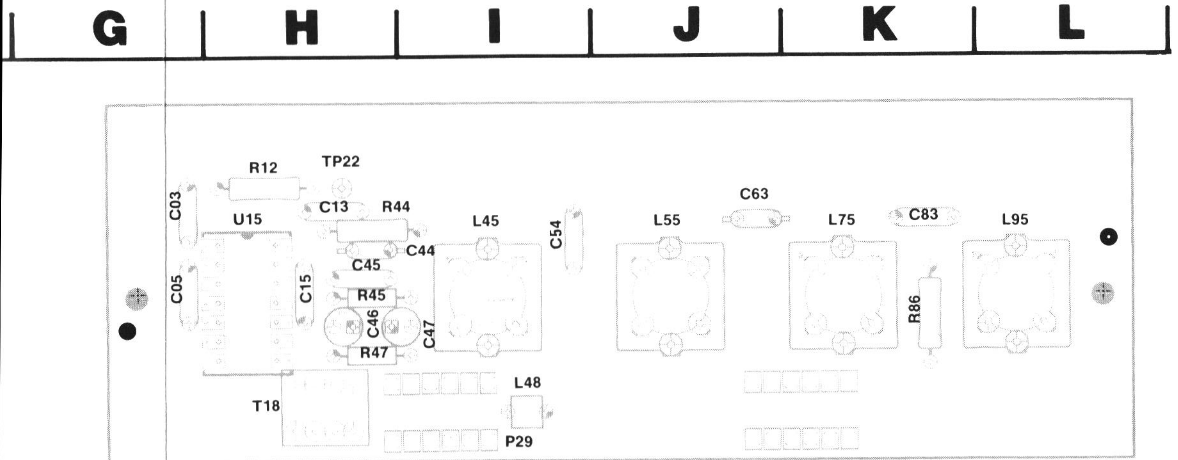
Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE

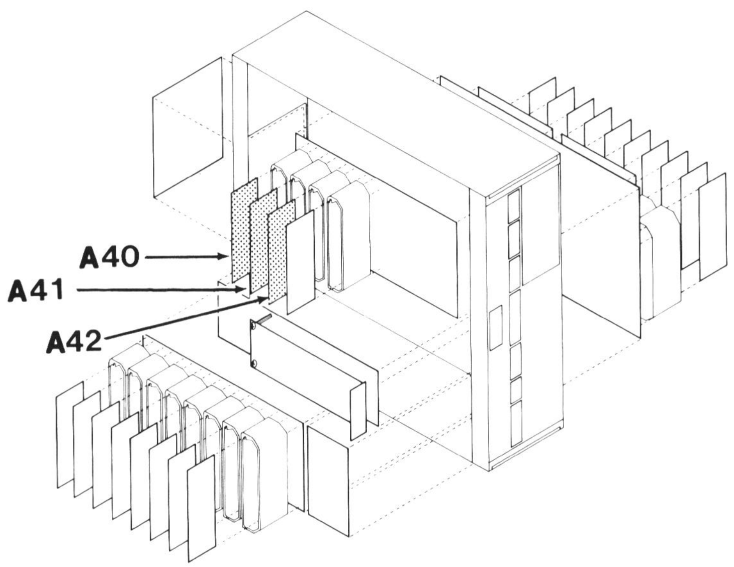
Component Number
A23 A2 R1234
Assembly Number — *Subassembly Number (if used)* — *Schematic Circuit Number*

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

Circuit Number	Schematic Location
ASSY A40	
C15	C2
C17	C1
C31	C1
C37	B1
C44	B1
C47	A1
C51	D2
C52	D1
C55	B1
C56	D1
C57	A1
C59	A1
C71	D1
C72	D2
C73	D2
C75	D1
C78	D2
C82	D2
C95	D3
CR25	B2
CR26	B2
CR36	B2
CR45	B2
CR49	A1
CR85	D3
CR96	D2
L38	A1
L39	A1
L55	D1
L62	D1
L66	D1
L92	D2
LR05	C1
LR15	C1
LR19	C1
Q46	A1
Q72	D2
Q84	D2
R01	C1
R02	C1
R16	C1
R21	C1
R22	C1
R34	B2
R35	B1
R42	D2
R43	B1
R44	B2
R47	B1
R48	A1
R54	A1

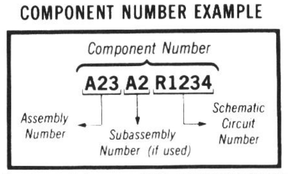


A42 AUDIO LIMITER BOARD



Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



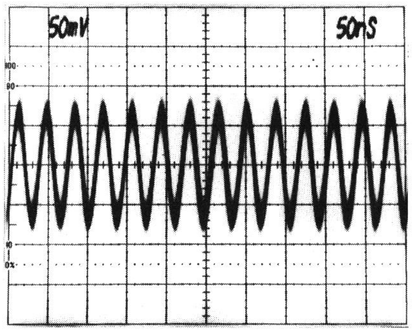
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List

Audio Input Board 6

Circuit Number	Schematic Location	Board Location
ASSY A40		
C15	C2	B1
C17	C1	B2
C31	C1	B1
C37	B1	C2
C44	B1	C1
C47	A1	C2
C51	D2	D1
C52	D1	D1
C55	B1	D1
C56	D1	D2
C57	A1	D2
C59	A1	D2
C71	D1	E1
C72	D2	E1
C73	D2	E1
C75	D1	E2
C78	D2	E2
C82	D2	E1
C95	D3	E2
CR25	B2	B2
CR26	B2	B2
CR36	B2	C1
CR45	B2	C1
CR49	A1	C2
CR85	D3	E2
CR96	D2	F2
L38	A1	C2
L39	A1	C2
L55	D1	D1
L62	D1	D1
L66	D1	D2
L92	D2	E1
LR05	C1	A2
LR15	C1	B2
LR19	C1	B2
Q46	A1	C2
Q72	D2	E1
Q84	D2	E1
R01	C1	A1
R02	C1	A1
R16	C1	B2
R21	C1	B1
R22	C1	B1
R34	B2	C2
R35	B1	C2
R42	D2	C1
R43	B1	C1
R44	B2	C1
R47	B1	C2
R48	A1	C2
R54	A1	D1
R55	A1	D2
R57	A1	D2
R58	A1	D2
R73	D2	E1
R75	D2	E2
R76	D2	E2
R77	D1	E2
R78	D2	E2
R79	D1	E2
R82	D2	E1
R85	D3	E2
R86	D3	E2
R96	D3	F2
T19	C1	B2
T31	D2	C1
U12	C2	B1
U88	D3	E2
VR98	D3	F2
ASSY A41		
C13	B2	B8
C17	B2	B8
C21	A2	B7
C25	C3	B8
C26	C3	B8
C31	A3	C7
C43	A3	C8
C44	A3	C8
C56	A3	D8
C66	A3	D8
C74	C3	E8
C75	B3	E8
C80	C3	E7
C81	C3	E7
C91	C2	F7
C92	C2	F7
CR75	C3	E8
L24	C3	B8
L26	C3	B8
Q36	A3	C8
Q44	A3	D8
Q70	C3	E7
R12	B2	A8
R13	B2	B8
R14	B2	B8
R22	A2	B7
R24	A3	C8
R34	A3	C8
R35	A3	C8
R41	B3	C7
R42	B3	C7
R44	A3	C8
R45	A3	C8
R46	A3	C8
R51	B3	D7
R54	B3	D8
R56	A3	C8
R58	A3	D8
R61	B3	D7
R62	B3	D7
R64	B3	D3
R65	B3	D8
R71	B3	E7
R73	C3	E8
R76	C3	E8
R81	C3	E7
R82	C2	E8
R86	C2	E8
R91	C2	F8
T17	B2	B9
T31	B2	C7
U11	B2	B7
U51	B3	D7
Y86	C2	E8
ASSY A42		
C03	B5	G1
C05	B5	G2
C13	B5	H1
C15	B5	H2
C44	B4	H1
C45	B5	H2
C46	B5	H2
C47	B5	I2
C54	B4	I1
C63	B4	J1
C83	B4	K1
L45	B4	I1
L48	B5	I2
L55	B4	J1
L75	B4	K1
L95	B4	L1
R12	B5	H1
R44	B4	H1
R45	B5	H2
R47	B5	H2
R86	B4	K2
T18	B5	H1
TP22	B4	H1
U15	B5	H1

6

1



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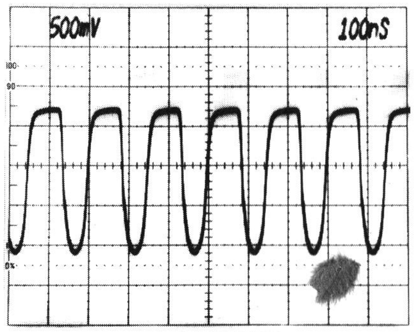

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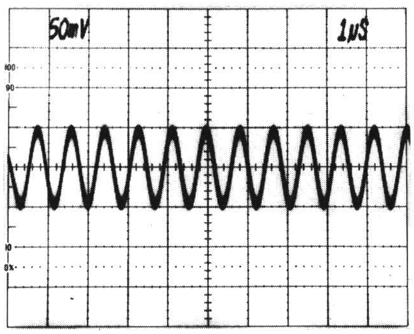
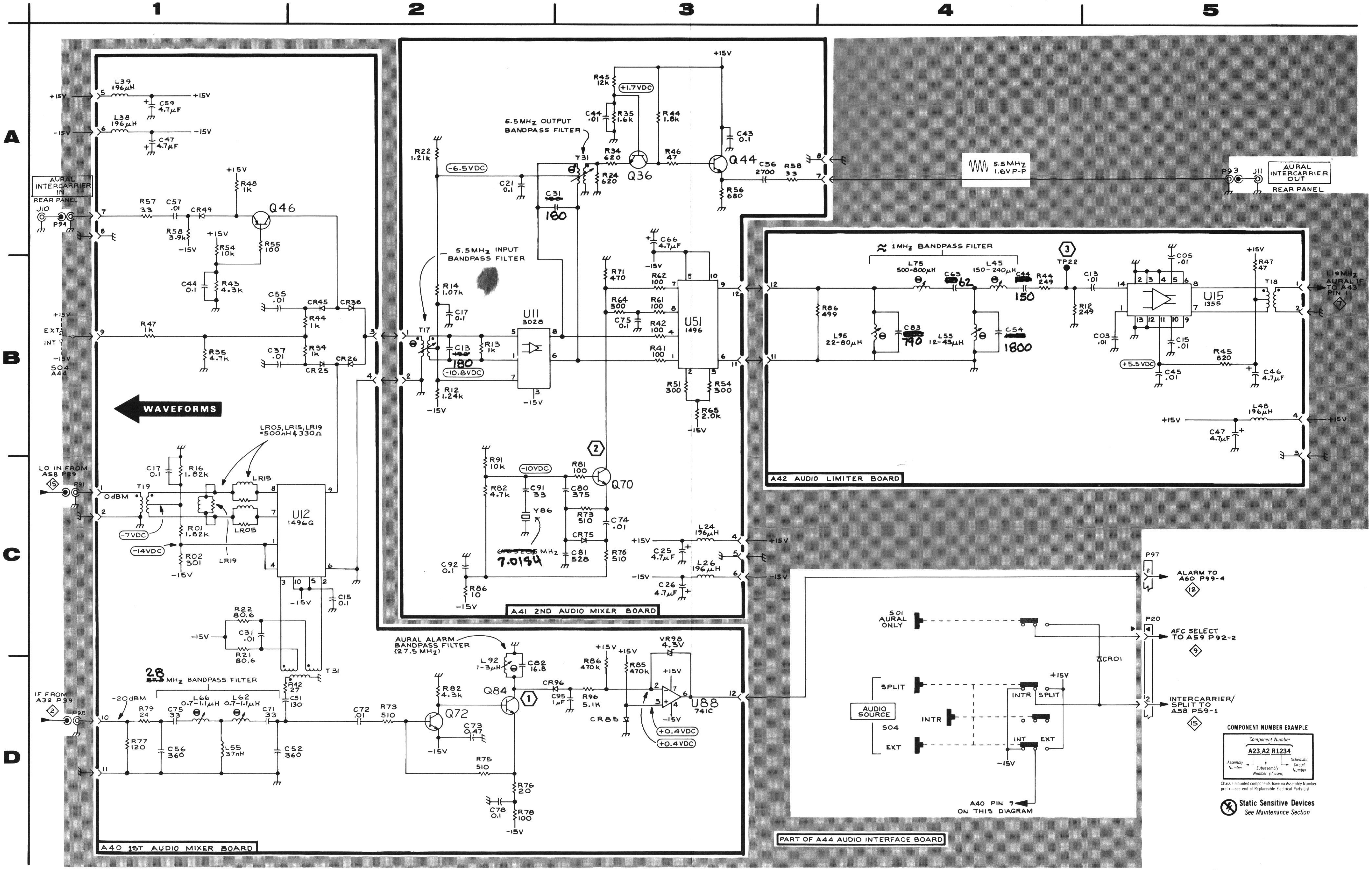
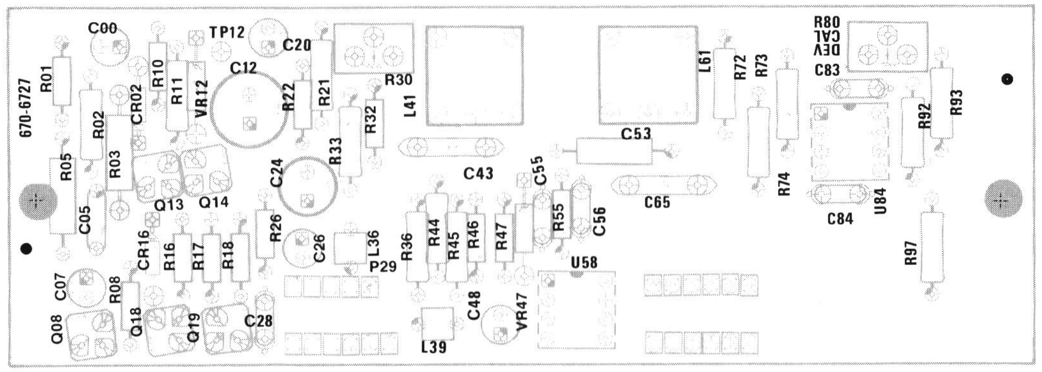




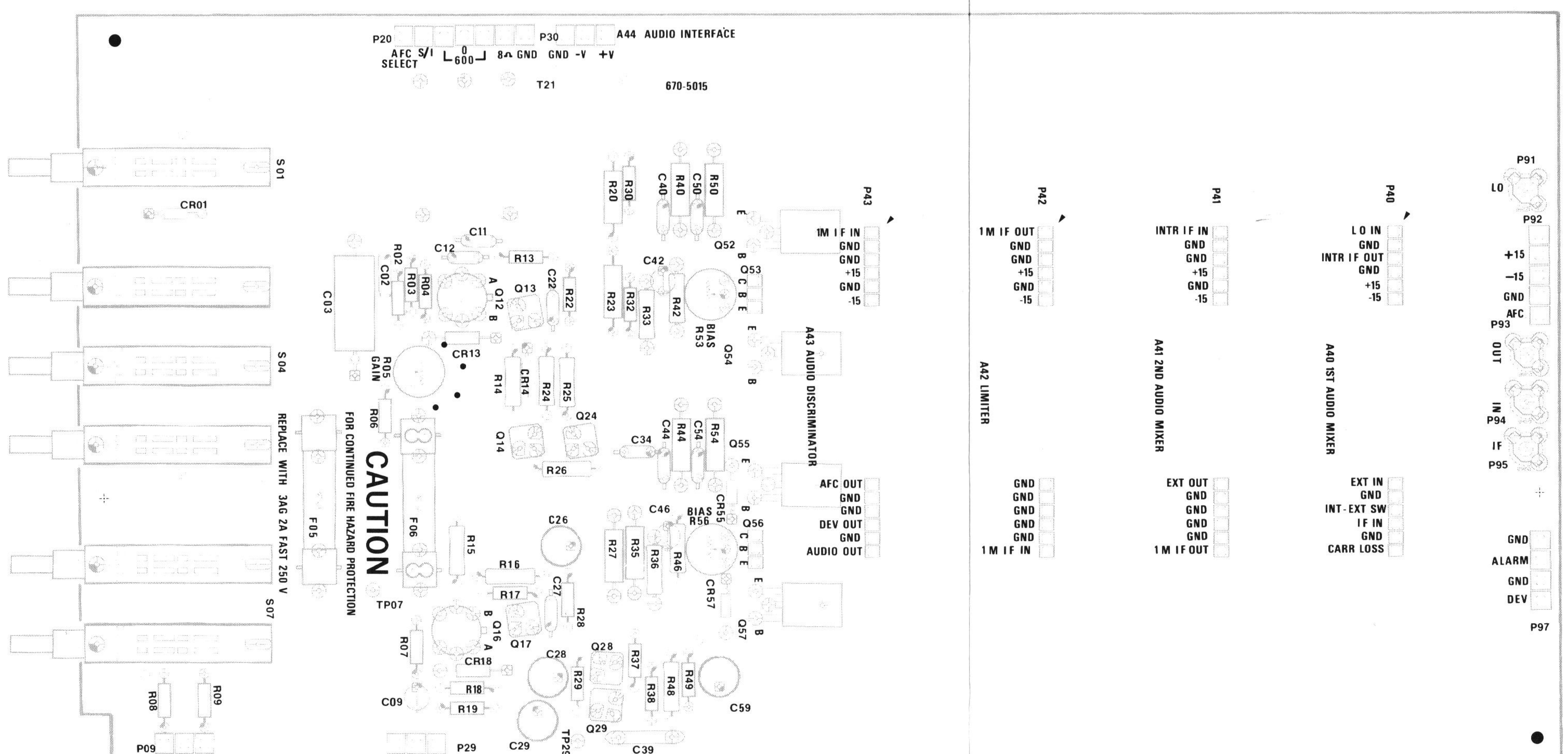
A40 1ST AUDIO MIXER BOARD
A41 2ND AUDIO MIXER BOARD
A42 AUDIO LIMITER BOARD
PART OF A44 AUDIO INTERFACE BOARD
WAVEFORMS
AURAL INTERCARRIER IN
REAR PANEL
AURAL INTERCARRIER OUT
6.5MHz OUTPUT BANDPASS FILTER
5.5MHz INPUT BANDPASS FILTER
1MHz BANDPASS FILTER
AURAL ALARM BANDPASS FILTER (27.5 MHz)
28 MHz BANDPASS FILTER
LO IN FROM A58 P89
IF FROM A32 P39
ALARM TO A60 P99-4
AFC SELECT TO A59 P92-2
INTERCARRIER/SPLIT TO A58 P59-1
1.19MHz AURAL IF TO A43 PIN 1
AUDIO SOURCE
A40 PIN 9 ON THIS DIAGRAM
COMPONENT NUMBER EXAMPLE
A23 A2 R1234
Static Sensitive Devices
See Maintenance Section
AUDIO INPUT

A B C D E F G H I J K

1 2 3 4 5 6 7 8 9



A43 AUDIO DISCRIMINATOR BOARD



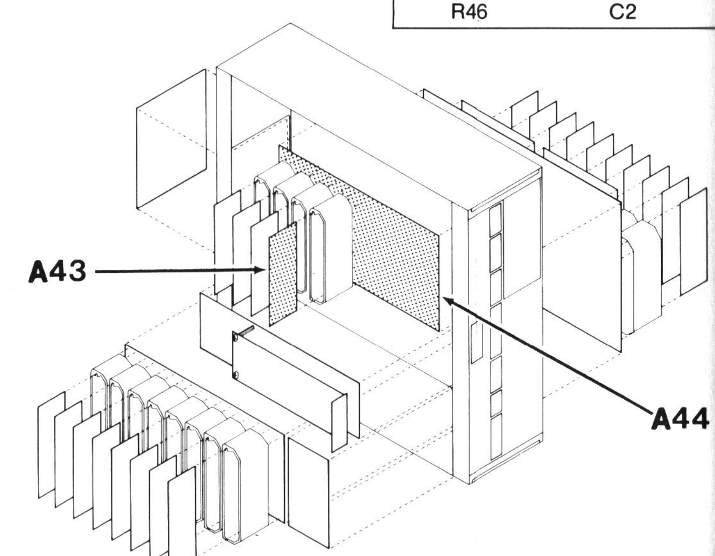
A44 AUDIO INTERFACE BOARD

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE

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

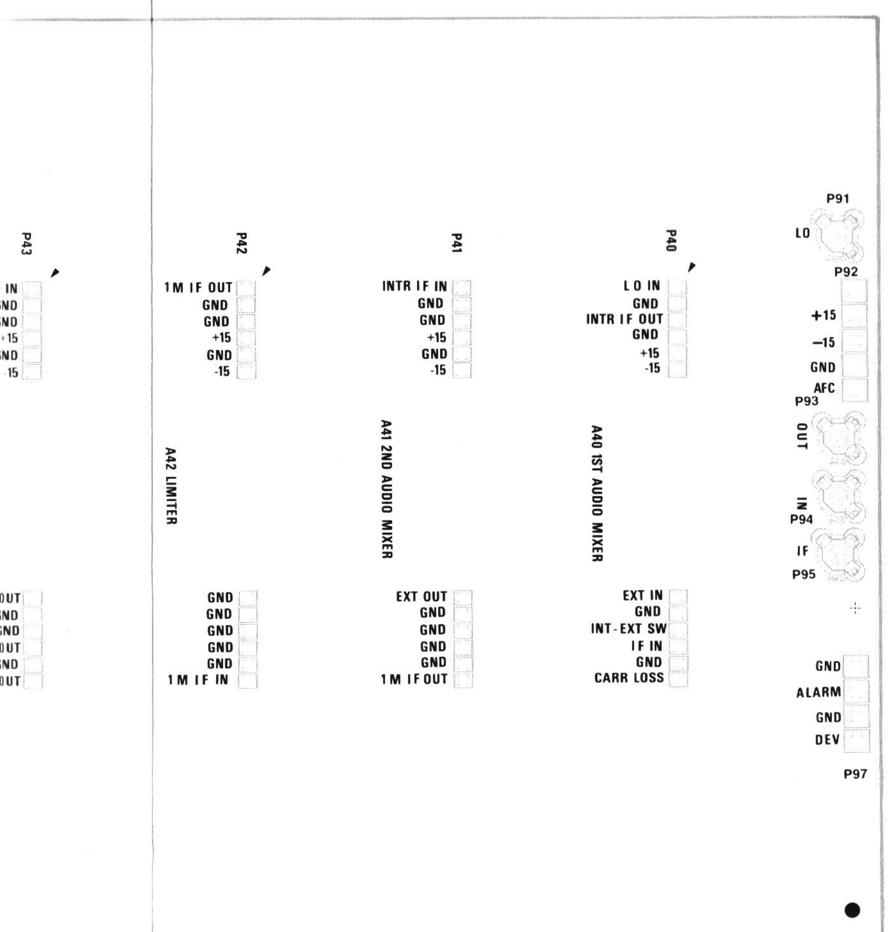
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.



Circuit Number	Schematic Location
ASSY A43	
C00	A1
C05	B1
C07	A1
C12	A1
C20	B1
C24	B2
C26	B1
C28	B1
C43	B2
C48	B1
C53	B2
C55	C2
C56	C2
C65	B2
C83	B3
C84	B3
CR02	A1
CR16	A1
L36	B1
L39	B1
L41	B2
L61	B2
Q08	B1
Q13	B2
Q14	B2
Q18	B1
Q19	B1
Q80	A2
R01	A1
R02	B1
R03	A1
R05	A1
R08	B1
R10	A1
R11	A2
R16	B1
R17	B1
R18	B1
R21	B2
R22	B2
R26	B1
R30	C1
R32	C1
R33	B2
R36	B2
R44	C2
R45	C2
R46	C2

@

G	H	I	J	K



Static Sensitive Devices
See Maintenance Section

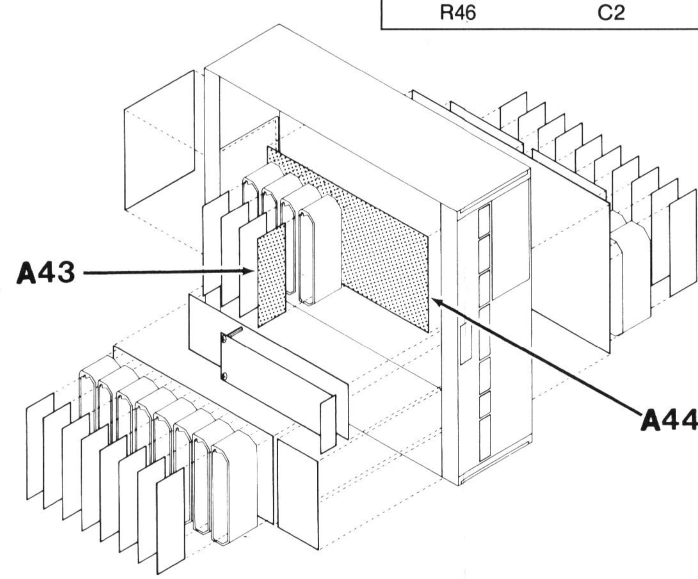
COMPONENT NUMBER EXAMPLE

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.



Audio Output ⟨7⟩

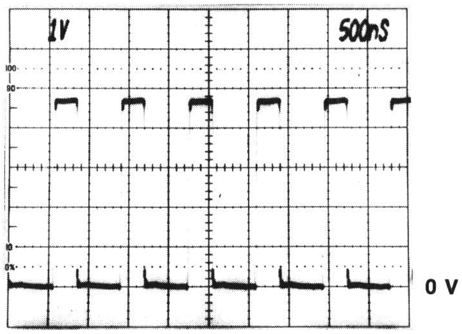
Circuit Number	Schematic Location	Board Location
ASSY A43		
C00	A1	A1
C05	B1	A2
C07	A1	A2
C12	A1	B1
C20	B1	B1
C24	B2	B2
C26	B1	B2
C28	B1	B2
C43	B2	C2
C48	B1	C2
C53	B2	D1
C55	C2	C2
C56	C2	D2
C65	B2	D2
C83	B3	E1
C84	B3	E2
CR02	A1	A1
CR16	A1	A2
L36	B1	C2
L39	B1	C2
L41	B2	C1
L61	B2	D1
Q08	B1	A2
Q13	B2	B2
Q14	B2	B2
Q18	B1	A2
Q19	B1	B2
Q80	A2	E1
R01	A1	A1
R02	B1	A1
R03	A1	A2
R05	A1	A2
R08	B1	A2
R10	A1	B1
R11	A2	B1
R16	B1	B2
R17	B1	B2
R18	B1	B2
R21	B2	B1
R22	B2	B1
R26	B1	B2
R30	C1	C1
R32	C1	C1
R33	B2	C1
R36	B2	C2
R44	C2	C2
R45	C2	C2
R46	C2	C2

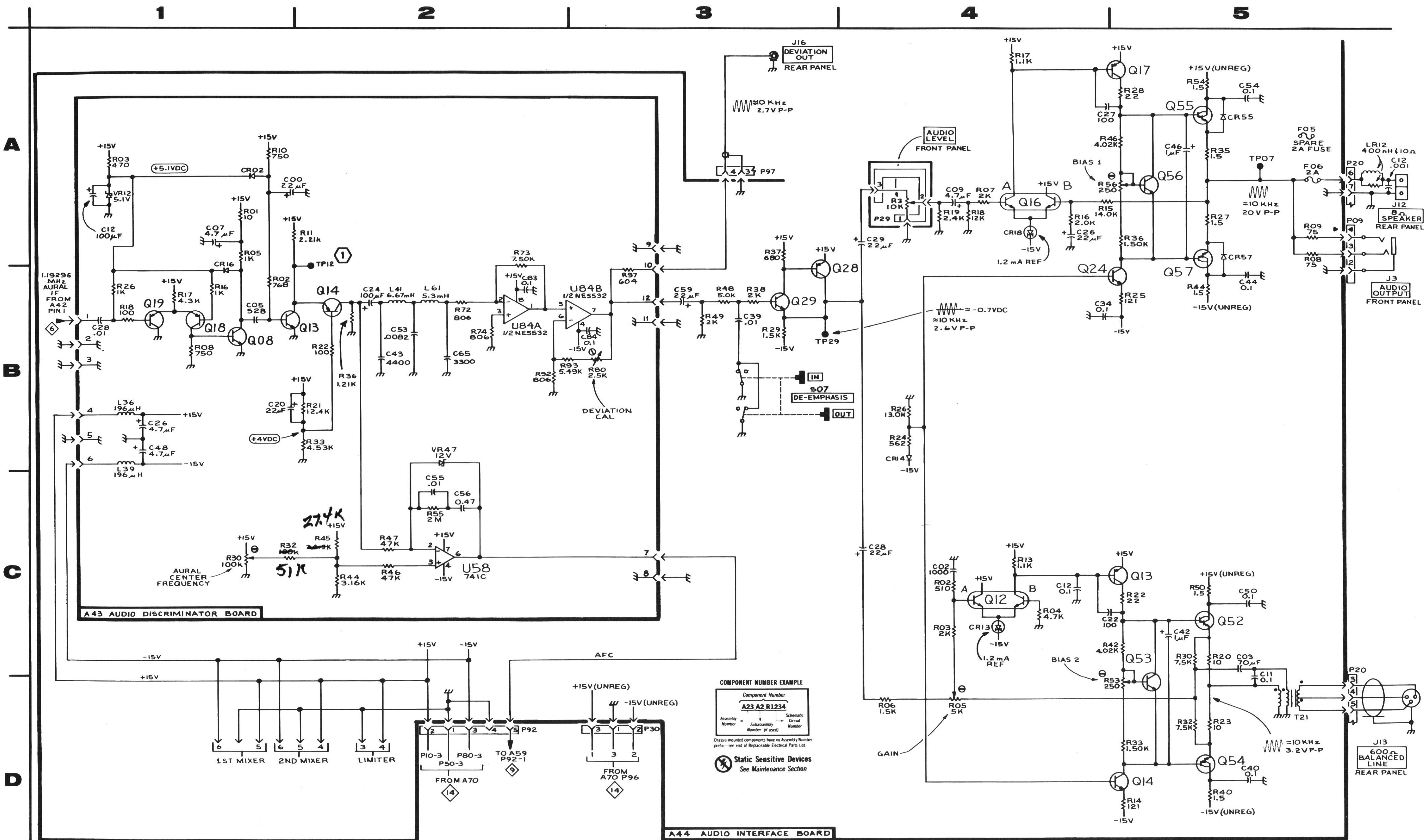
Circuit Number	Schematic Location	Board Location
R47	C2	C2
R55	C2	D2
R72	B2	E1
R73	B2	E1
R74	B3	E2
R80	B3	E1
R92	B2	F1
R93	B2	F1
R97	B3	E2
TP12	A2	B1
U58	C2	D2
U84A	B2	E2
U84B	B3	E2
VR12	A1	B1
VR47	B2	C2
ASSY A44		
C02	C4	D5
C03	C5	C6
C09	A4	D8
C11	D5	D5
C12	C4	D5
C22	C4	E5
C26	A4	E7
C27	A4	E7
C28	C4	E8
C29	A4	D8
C34	B4	E7
C39	B3	E8
C40	D5	E5
C42	C5	E5
C44	B5	E6
C46	A5	E7
C50	C5	F5
C54	A5	F6
C59	B3	F8
CR13	C4	D6
CR14	B4	D6
CR18	A4	D8
CR55	A5	F7
CR57	A5	F8
F05	A5	C7
F06	A5	D7
Q12	C4	D6
Q13	C5	D6
Q14	D5	D6
Q16	A4	D8
Q17	A5	D8

Circuit Number	Schematic Location	Board Location
Q24	B4	E6
Q28	B3	E8
Q29	B3	E8
Q52	C5	F5
Q53	C5	F5
Q54	D5	F6
Q55	A5	F7
Q56	A5	F7
Q57	B5	F8
R02	C4	D5
R03	C4	D5
R04	C4	D5
R05	D4	D6
R06	D4	C6
R07	A4	D8
R08	A5	B8
R09	A5	B8
R13	C4	D5
R14	D5	D6
R15	A4	D7
R16	A4	D7
R17	A4	D7
R18	A4	D8
R19	A4	D8
R20	C5	E5
R22	C5	E6
R23	D5	E6
R24	B4	E6
R25	B5	E6
R26	B4	E7
R27	A5	E7
R28	A5	E8
R29	B3	E8
R30	C5	E5
R32	D5	E6
R33	D5	E6
R35	A5	E7
R36	A5	E7
R37	A3	E8
R38	B3	E8
R40	D3	E5
R42	C4	E6
R44	B5	E6
R46	A4	E7
R48	B3	E8
R49	B3	E8
R50	C5	F5
R53	D5	F6
R54	A5	F6
R56	A4	F7
S07	B3	C8
T21	D5	E4
TP07	A5	D8
TP29	B3	E8

2998-96

7

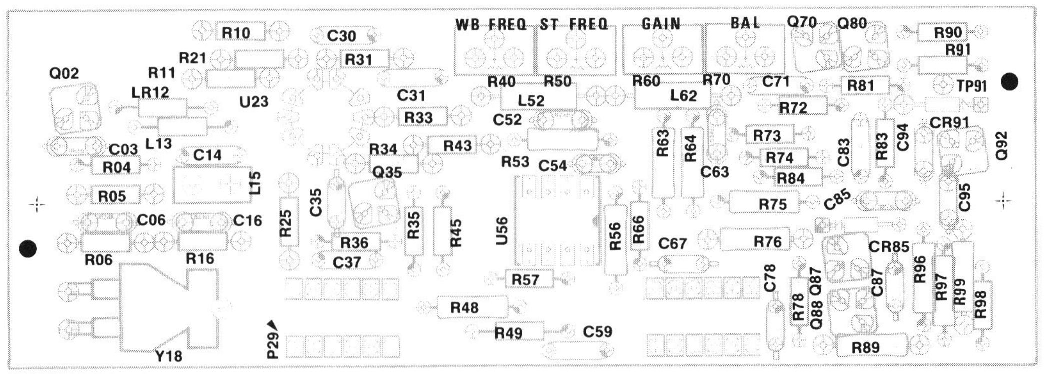




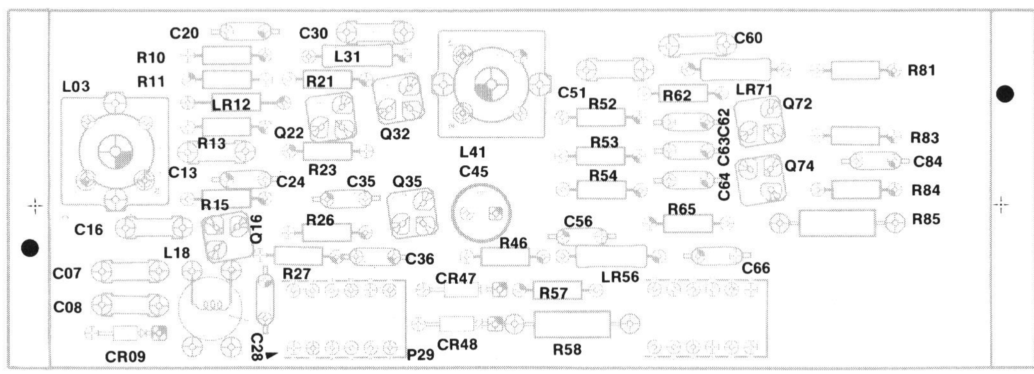
AUDIO OUTPUT
A43, A44

A | B | C | D | E | F | G | H | I | J | K | L | M | N

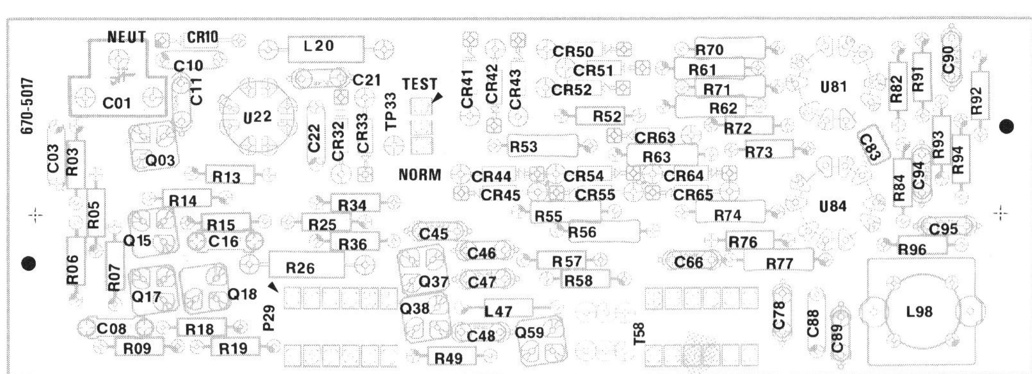
1 2 3 4 5 6 7 8 9



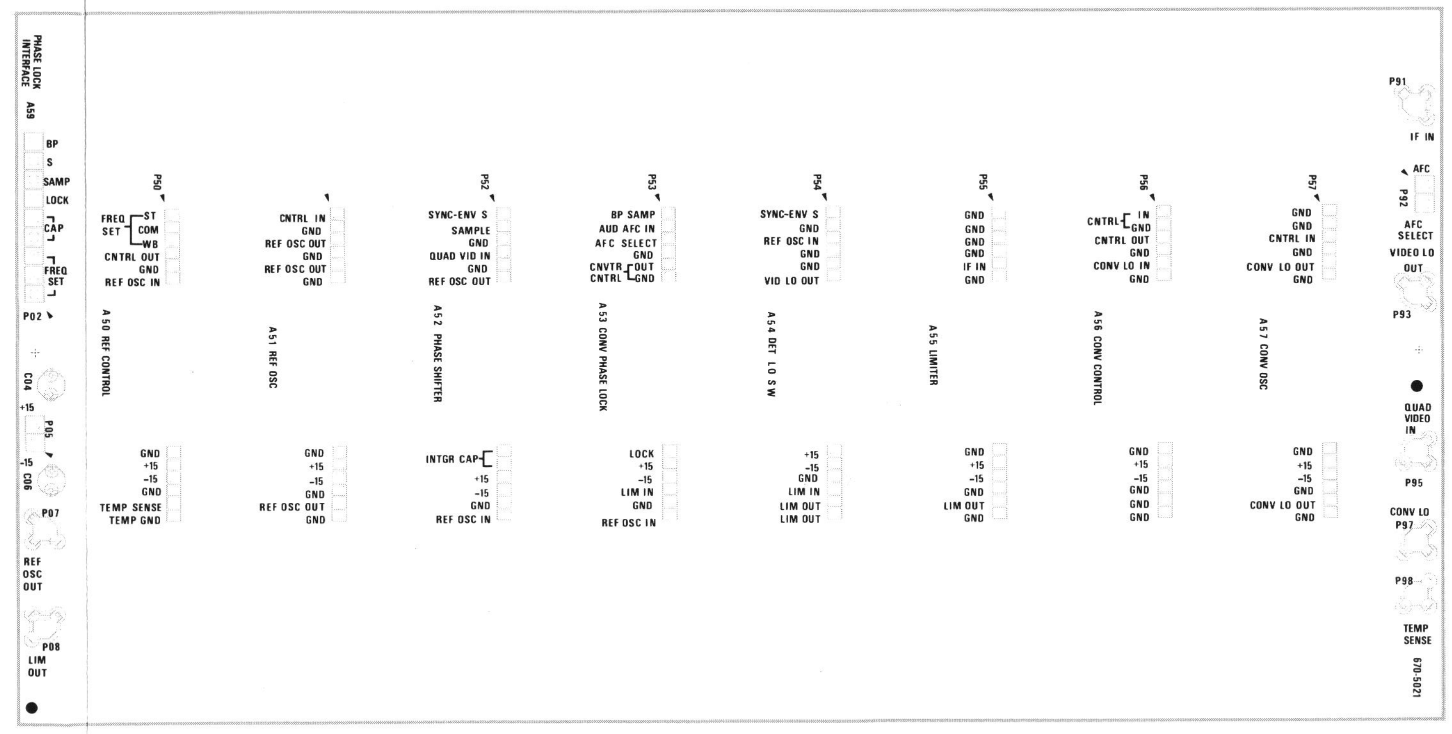
A50 REFERENCE CONTROL BOARD



A51 REFERENCE OSCILLATOR BOARD

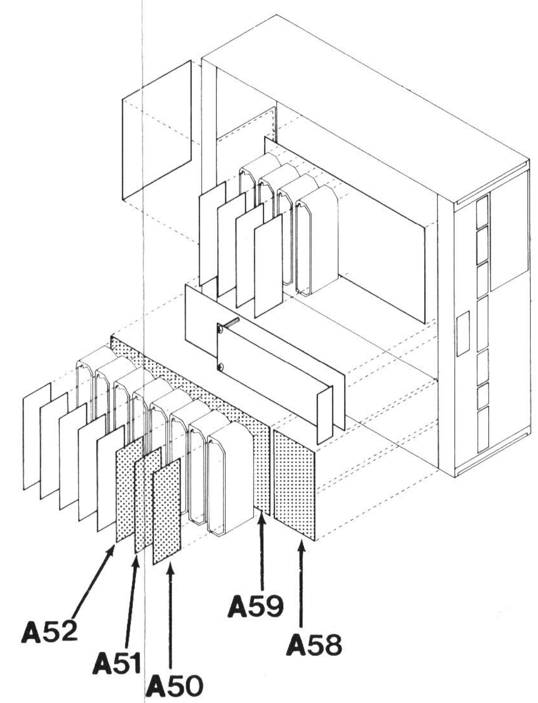


A52 PHASE SHIFTER BOARD



A59 PHASE LOCK INTERFACE BOARD

C55, C56, C57
(On back of board)



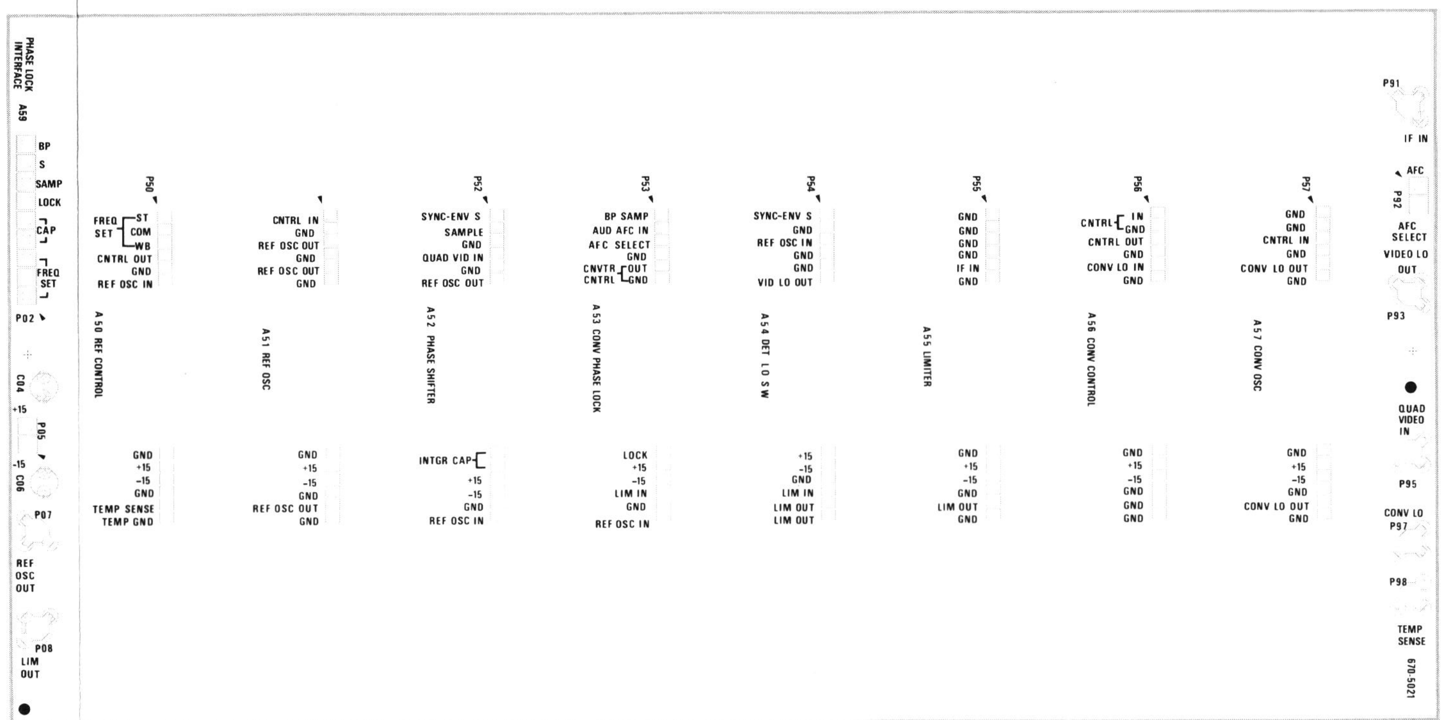
Intermediate Frequency Reference & Phase Shifter 8

Circuit Number	Schematic Location	Board Location
ASSY A50		
C03	A2	A2
C06	A2	A2
C14	A1	B2
C16	A2	B2
C30	B2	B1
C31	A2	C1
C35	B2	B2
C37	B2	B2
C52	B2	C2
C54	B3	D2
C59	B3	D3
C63	B2	D2
C67	A3	D2
C71	A2	E1
C78	B3	E2
C83	A3	E2
C85	A3	E2
C87	A3	E2
C94	B3	E2
C95	A3	F2
CR85	A3	E2
CR91	A3	F2
L13	A2	A2
L15	A1	B2
L52	A2	C2
L62	A2	D1
LR12	A2	A2
Q02	A2	A1
Q35	B2	C2
Q70	A3	E1
Q80	A3	E1
Q87	A3	E2
Q88	B3	E2
Q92	B3	F2
R04	A2	A2
R05	A2	A2
R06	A1	A2
R10	A2	B1
R11	A2	A2
R16	A1	B2
R21	A2	B1
R25	A2	B2
R31	A2	B1
R33	B2	C2
R34	B2	C2
R35	B2	C2
R36	B2	B2
R40	B2	C1
R43	B2	C2
R45	B2	C2
R48	B3	C2
R49	B3	C2
R50	B2	D1
R53	B3	C2
R56	B3	D2
R57	B3	C2
R60	B3	D1
R63	B3	D2
R64	B3	D2
R66	B2	D2
R70	B2	D1
R72	A3	E2
R73	A3	E2
R74	A3	E2
R75	B2	E2
R76	B3	E2

Circuit Number	Schematic Location
R78	A3
R81	A3
R83	A3
R84	A3
R89	B3
R90	A3
R91	A3
R96	B3
R97	A3
R98	A3
R99	A3
TP91	
U23	A2
U56A	B3
U56B	B3
Y18	A1
ASSY A51	
C07	A4
C08	A4
C13	B4
C16	B4
C20	A4
C24	B4
C28	A4
C30	A4
C35	B4
C36	A4
C45	B4
C51	A5
C56	B4
C60	A5
C62	A5
C63	B5
C64	A5
C66	B4
C84	A5
CR09	A4
CR47	B5
CR48	B5
L03	A4
L18	A4
L31	A4
L41	A5
LR12	A4
LR56	B4
LR71	A5
Q16	B4
Q22	A4
Q32	A4
Q35	B4
Q72	A5
Q74	A5
R10	A4
R11	A4
R13	B4
R15	B4
R21	A4
R23	B4
R26	B4
R27	A4
R46	B4
R52	A5
R53	A5
R54	B5
R57	B5
R58	B5
R62	A5
R65	A5
R81	A5
R83	A5
R84	A5
R85	A5

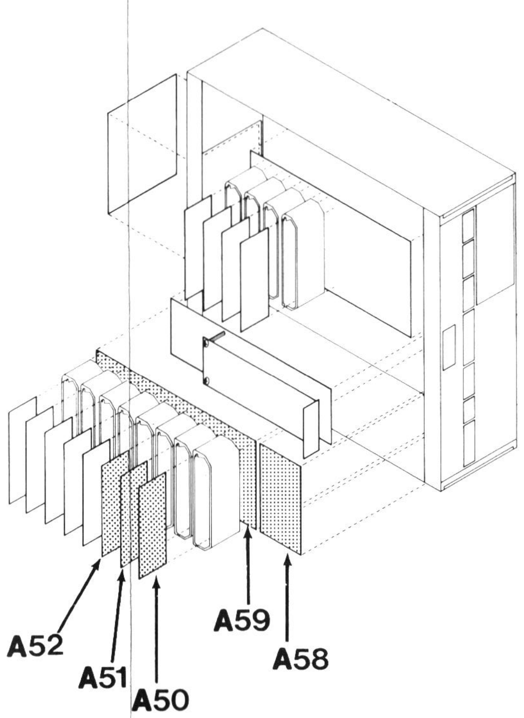
@

G | H | I | J | K | L | M | N



A59 PHASE LOCK INTERFACE BOARD

C55, C56, C57
(On back of board)



Intermediate Frequency Reference & Phase Shifter (8)

Circuit Number	Schematic Location	Board Location
ASSY A50		
C03	A2	A2
C06	A2	A2
C14	A1	B2
C16	A2	B2
C30	B2	B1
C31	A2	C1
C35	B2	B2
C37	B2	B2
C52	B2	C2
C54	B3	D2
C59	B3	D3
C63	B2	D2
C67	A3	D2
C71	A2	E1
C78	B3	E2
C83	A3	E2
C85	A3	E2
C87	A3	E2
C94	B3	E2
C95	A3	F2
CR85	A3	E2
CR91	A3	F2
L13	A2	A2
L15	A1	B2
L52	A2	C2
L62	A2	D1
LR12	A2	A2
Q02	A2	A1
Q35	B2	C2
Q70	A3	E1
Q80	A3	E1
Q87	A3	E2
Q88	B3	E2
Q92	B3	F2
R04	A2	A2
R05	A2	A2
R06	A1	A2
R10	A2	B1
R11	A2	A2
R16	A1	B2
R21	A2	B1
R25	A2	B2
R31	A2	B1
R33	B2	C2
R34	B2	C2
R35	B2	C2
R36	B2	B2
R40	B2	C1
R43	B2	C2
R45	B2	C2
R48	B3	C2
R49	B3	C2
R50	B2	D1
R53	B3	C2
R56	B3	D2
R57	B3	C2
R60	B3	D1
R63	B3	D2
R64	B3	D2
R66	B2	D2
R70	B2	D1
R72	A3	E2
R73	A3	E2
R74	A3	E2
R75	B2	E2
R76	B3	E2

Intermediate Frequency Reference & Phase Shifter (8)

Circuit Number	Schematic Location	Board Location
R78	A3	E2
R81	A3	E1
R83	A3	E2
R84	A3	E2
R89	B3	E3
R90	A3	F1
R91	A3	F1
R96	B3	F2
R97	A3	F2
R98	A3	F2
R99	A3	F2
TP91		F1
U23	A2	B2
U56A	B3	C2
U56B	B3	C2
Y18	A1	A3
ASSY A51		
C07	A4	A6
C08	A4	A6
C13	B4	B5
C16	B4	A5
C20	A4	B4
C24	B4	B5
C28	A4	B6
C30	A4	B4
C35	B4	B5
C36	A4	C6
C45	B4	C5
C51	A5	D5
C56	B4	D5
C60	A5	D4
C62	A5	D5
C63	B5	D5
C64	A5	D5
C66	B4	D6
C84	A5	E5
CR09	A4	A6
CR47	B5	C6
CR48	B5	C6
L03	A4	A5
L18	A4	B6
L31	A4	B4
L41	A5	C5
LR12	A4	B5
LR56	B4	D6
LR71	A5	E5
Q16	B4	B5
Q22	A4	B5
Q32	A4	C5
Q35	B4	C5
Q72	A5	E5
Q74	A5	E5
R10	A4	B4
R11	A4	B5
R13	B4	B5
R15	B4	B5
R21	A4	B5
R23	B4	B5
R26	B4	B5
R27	A4	B6
R46	B4	C5
R52	A5	D5
R53	A5	D5
R54	B5	D5
R57	B5	D6
R58	B5	D5
R62	A5	D5
R65	A5	D5
R81	A5	E5
R83	A5	E5
R84	A5	E5
R85	A5	E5
ASSY A52		
C01	C2	A8
C03	C2	A8
C08	C1	A9
C10	C2	B8
C11	C2	B8
C16	C2	B9
C21	D2	B8
C22	D2	B8
C45	D4	C8
C46	C4	C8
C47	D4	C9
C48	C5	C9
C66	D1	D9
C78	C4	E9
C83	C3	E8
C88	C1	E9
C89	C3	E9
C90	C3	F8
C94	C3	E8
C95	C3	F8
CR10	C2	B8
CR32	D2	B8
CR33	D2	B8
CR41	C3	C8
CR42	C3	C8
CR43	C3	C8
CR44	D3	C8
CR45	D3	C8
CR50	C3	D8
CR51	C3	D8
CR52	C3	D8
CR54	D3	D8
CR55	D3	D8
CR63	C3	D8
CR64	D3	D8
CR65	D3	D8
E37	D4	C9
L20	C2	B8
L98	C3	E9
LR47	C4	C9
P34	D3	C8
Q03	C2	B8
Q15	C2	A8
Q17	C2	A9
Q18	C2	B9
Q37	C4	C9
Q38	C4	C9
Q59	C4	C9
R03	C2	A8
R05	C1	A8
R06	C2	A9
R07	C2	A9
R09	C1	A9
R13	C2	B8
R14	C2	B8
R15	C2	B8
R18	C1	B9
R19	C1	B9
R25	C4	B8
R26	C4	B9
R34	D4	B8
R36	D4	B9
R49	C5	C9
R52	C3	D8
R53	C3	C8
R55	D3	C8
R56	D3	D9
R57	C4	D9
R58	C4	D9
R61	C3	D8
R62	C3	D8
R63	D3	D8
R70	C3	D8
R71	C3	D8
R72	C3	D8
R73	D3	E8
R74	D3	D8
R76	D3	D9
R77	D3	E9
R82	C3	E8
R84	D3	E8
R91	C3	E8
R92	C3	F8
R93	C3	F8
R94	C3	F8
R96	D3	E9
T58	C4	D9
TP33	D2	C8
U22	D2	B8
U81	C3	E8
U84	D3	E8
P/O ASSY A58		
S22	C1	A2
S25	B1	D2
Component locations for A58 are shown on the reverse side of the power supply.		
P/O ASSY A59		
C04	C5	G3
C06	C5	G3
P07	B5	G4
P08	D5	G4
P93	D5	N2
P95	C1	N3
P98	B1	N4
CHASSIS		
C01	D1	
C02	D1	
C03	D1	
C04	D1	
C05	D1	

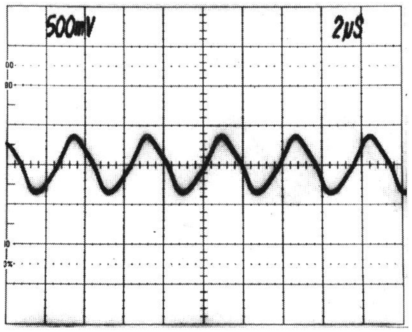
Static Sensitive Devices
See Maintenance Section

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.

8

1


AC COUPLED

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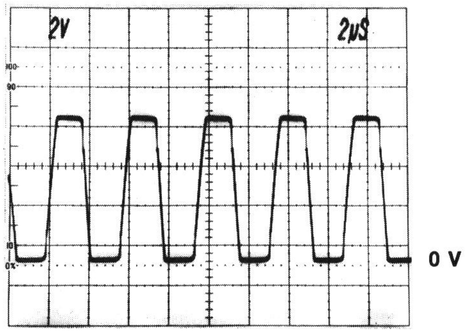

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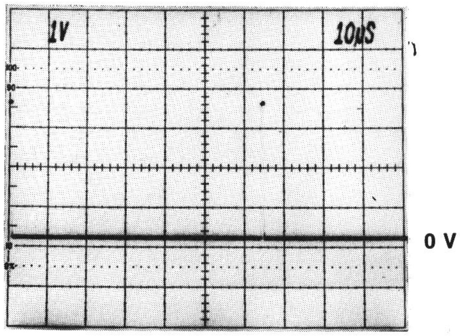

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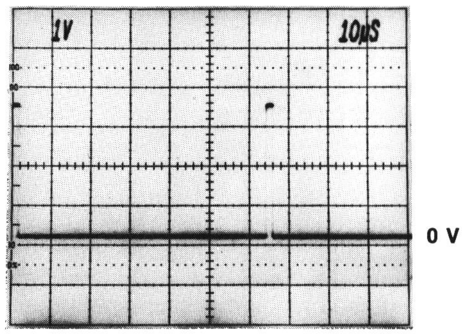

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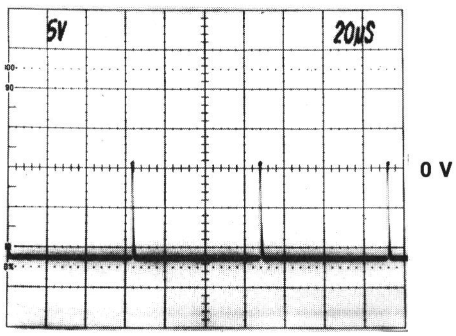

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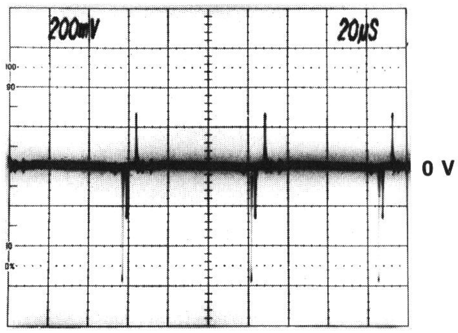
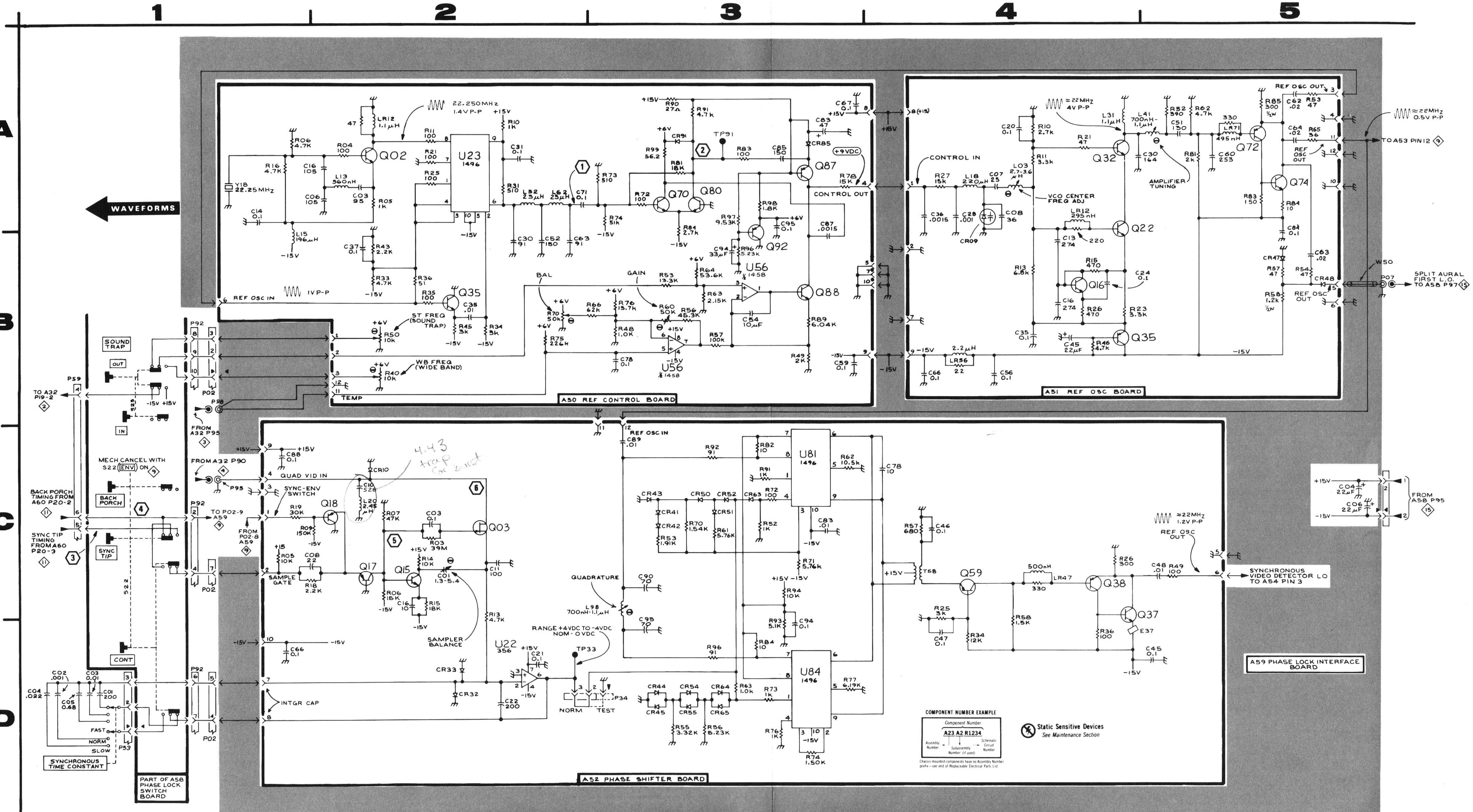


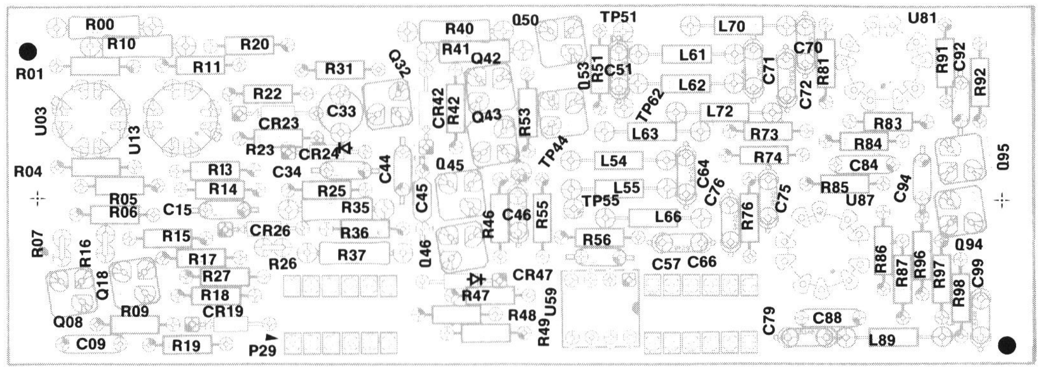


1450-2

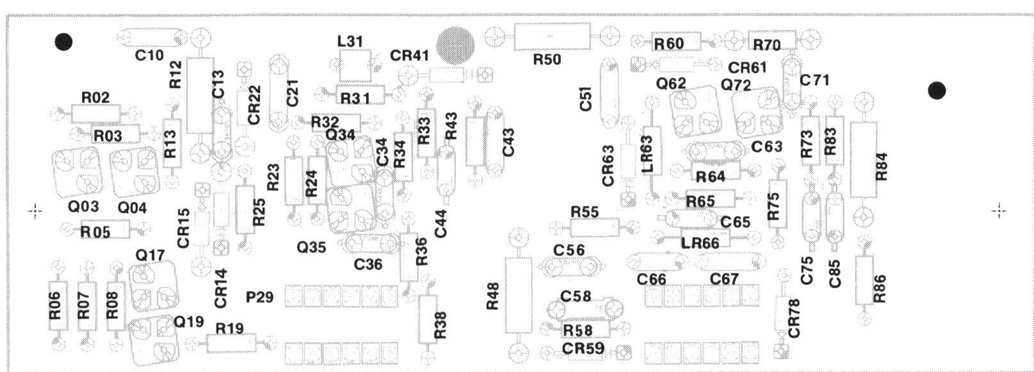
@ E998-114 (2200-160) INTERMEDIATE FREQUENCY REFERENCE & PHASE SHIFTER 8

1450-2

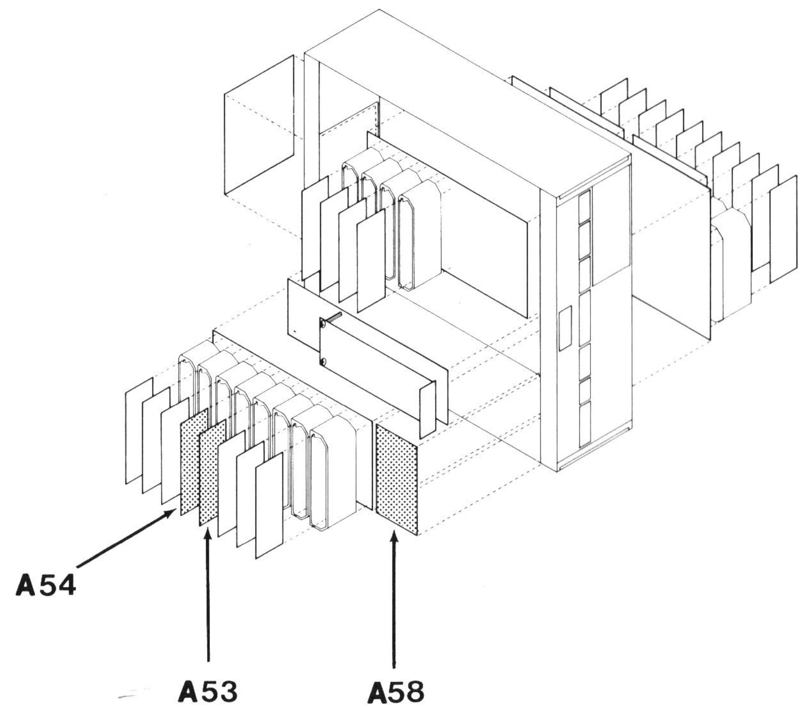
A	B	C	D	E	F



A53 CONVERTER PHASE LOCK BOARD



A54 DETECTOR-LO SWITCH BOARD



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.

Converter Phase Lock & Detector LO Switch (9)

ASSY A53

Circuit Number	Schematic Location	Board Location
C09	A3	A3
C15	C3	B2
C33	C4	B1
C34	C3	B2
C44	C4	C2
C45	C4	C2
C46	C2	C2
C51	B3	D1
C57	C3	D2
C64	C2	D2
C66	B1	D2
C70	B2	E1
C71	B2	E1
C72	A2	E1
C75	C2	E2
C76	C2	D2
C79	C1	E2
C84	B1	E2
C88	A1	E2
C92	B2	F1
C94	C2	E2
C99	C1	F2
CR19	A3	B2
CR23	C4	B1
CR24	C3	B2
CR26	C3	B2
CR42	C4	C1
CR47	C3	C2
L54	C2	D2
L55	C2	D2
L61	B2	D1
L62	A3	D1
L63	C2	D1
L66	C2	D2
L70	B2	D1
L72	A2	D1
L89	C1	E2
Q08	A3	A2
Q18	A4	A2
Q32	C4	C1
Q42	C4	C1
Q43	B3	C1
Q45	C3	C2
Q46	C3	C2
Q50	B3	D1
Q53	A3	D1
Q94	C2	F2
Q95	B2	F2
R00	B3	A1
R01	A1	A1
R04	A1	A2
R05	A1	A2
R06	A1	A2
R07	A3	A2
R09	A4	A2,
R10	B4	A1,
R11	B4	B1,
R13	C3	B2
R14	C3	B2
R15	A1	B2
R16	A3	A2
R17	A3	B2.
R18	A3	B2
R19	C3	B3
R20	C4	B1
R22	B4	B1
R23	C4	B1
R25	B3	B2
R26	A3	B2
R27	A1	B2
R31	C4	B1
R35	C3	B2
R36	C3	C2
R37	C3	B2
R40	A3	C1
R41	A4	C1
R42	B3	C1
R46	C2	C2
R47	C3	C2
R48	C3	C2
R49	C3	C2
R51	B3	D1
R53	B3	C1
R55	C3	C2
R56	C3	D2
R73	C1	E1
R74	B1	E2
R76	C2	E2
R81	B2	E1
R83	C2	E1
R84	B2	E1
R85	C1	E2
R86	B1	E2
R87	C2	E2
R91	B2	F1
R92	B2	F1
R96	C2	E2
R97	C1	F2
R98	C1	F2
TP44	C2	D2
TP51	B3	D1
TP55	C3	D2
TP62	A3	D1
U03	A1	A1
U13	B4	B1
U59A	C3	D2
U59B	C3	D2
U81	B2	E1
U87	C2	E2

ASSY A54

Circuit Number	Schematic Location	Board Location
C10	D4	B7
C13	D4	B8
C21	D4	B8
C34	D5	C8
C36	D5	C8
C43	D4	C8
C44	D5	C8
C51	D4	D7
C56	D1	D8
C58	D3	D9
C63	D1	D8
C65	D1	D8
C66	D2	D8
C67	D1	D8
C71	D2	E7
C75	D3	E8
C85	D1	E8
CR14	D4	B8
CR15	D4	B8
CR22	D4	B8
CR41	D4	C7
CR59	D3	D9
CR61	D4	D7
CR63	D4	D8
CR78	D3	E9
L31	D4	C7
LR63	D1	D8
LR66	D2	D8
Q03	D3	A8
Q04	D4	A8
Q17	D4	B8
Q19	D3	B9
Q34	D5	C8
Q35	D5	C8
Q62	D1	D8
Q72	D1	E8
R02	D4	A8
R03	D3	A8
R05	D4	A8
R06	D3	A9
R07	D3	A9
R08	D3	A9
R12	D4	B7
R13	D3	B8
R19	D3	B9
R23	D4	B8
R24	D5	B8
R25	D4	B8
R31	D4	C8
R32	D5	B8
R33	D5	C8
R34	D5	C8
R36	D5	C8
R38	D5	C9
R43	D5	C8
R48	D3	C9
R50	D4	D7
R55	D1	D8
R58	D3	D9
R60	D4	D7
R64	D1	D8
R65	D1	D8
R70	D2	E7
R73	D2	E8
R75	D1	E8
R83	D1	E8
R84	D1	E8
R86	D1	E8

P/O ASSY A58

Circuit Number	Schematic Location	Board Location
CR51	C5	A2
P60	C5	A2
R52	C5	B2
R53	C5	B2
R61	C5	A2
S22	C5	A2

Component locations for A58 are shown on the reverse side of the power supply.

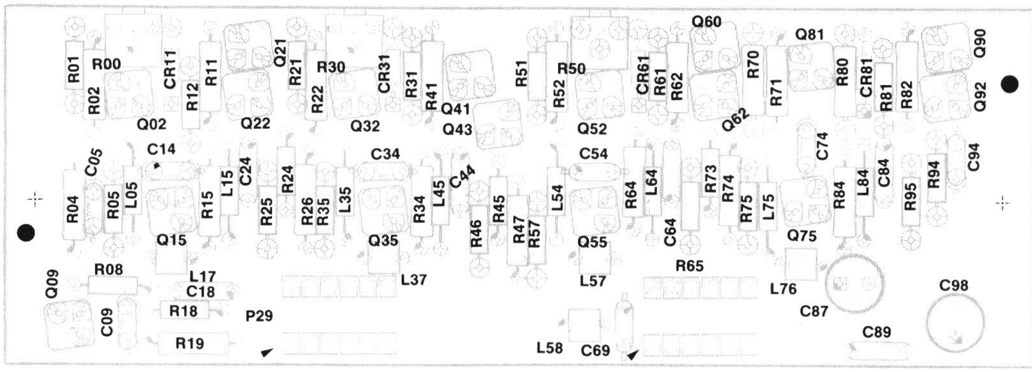
CHASSIS

Circuit Number	Schematic Location	Board Location
DS2	B5	

2998-98

A B C D E F

1

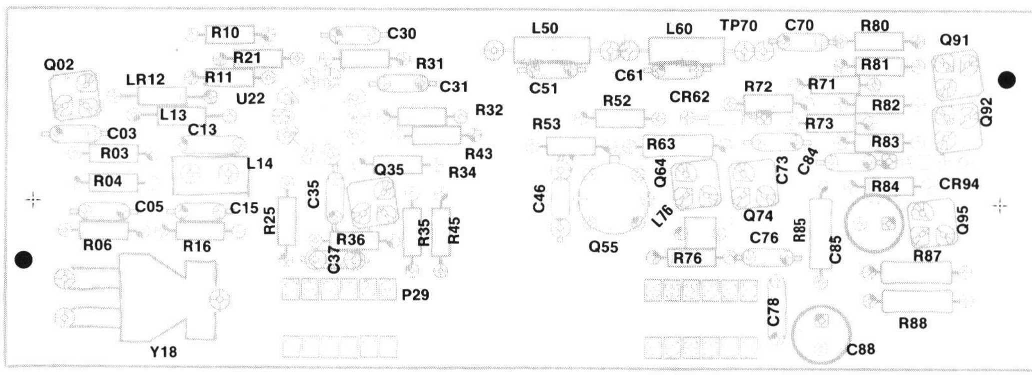


2

A55 LIMITER BOARD

3

4

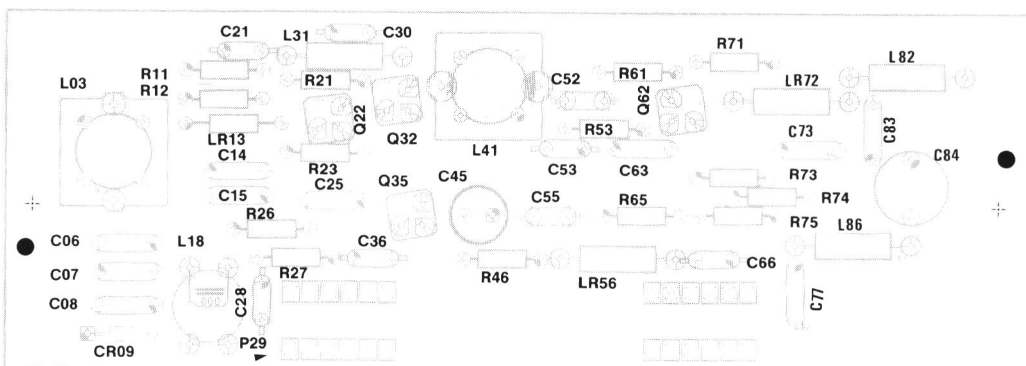


5

A56 CONVERTER CONTROL BOARD

6

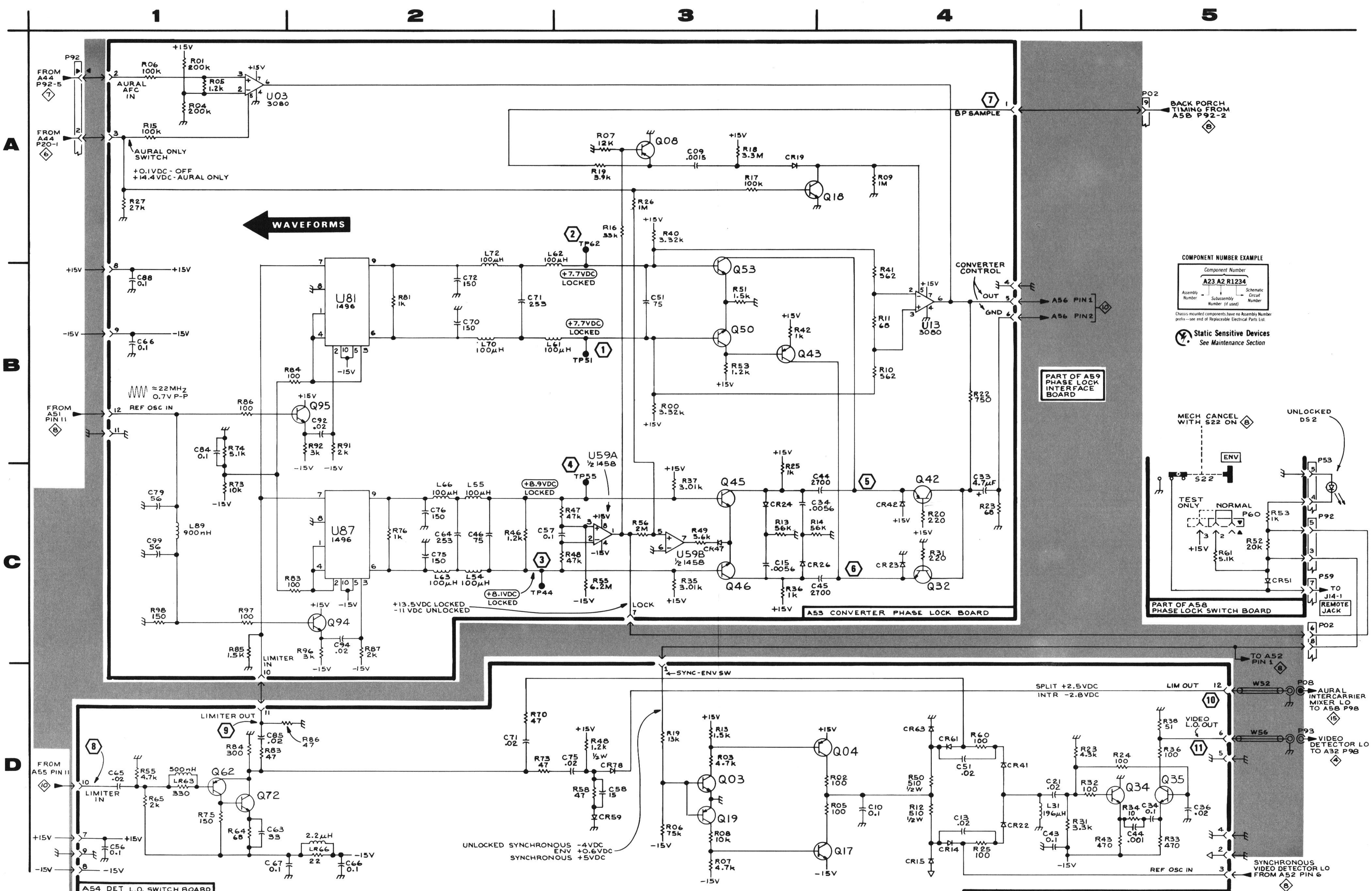
7



8

9

A57 CONVERTER OSCILLATOR BOARD



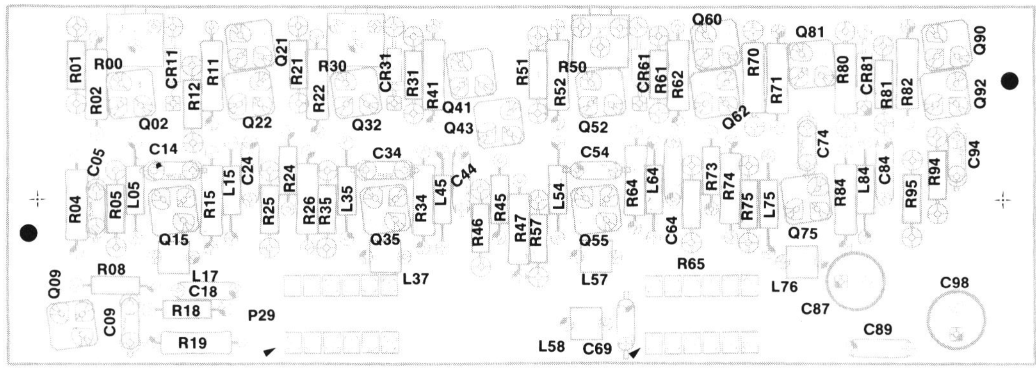
1450-2

@ 2998-115 (2200-161)

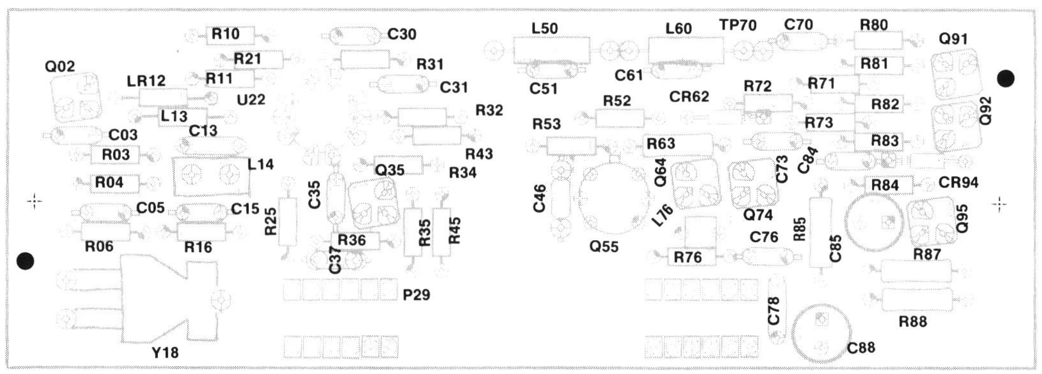
41% R78-2

CONVERTER PHASE LOCK & DETECTOR LO SWITCH 9

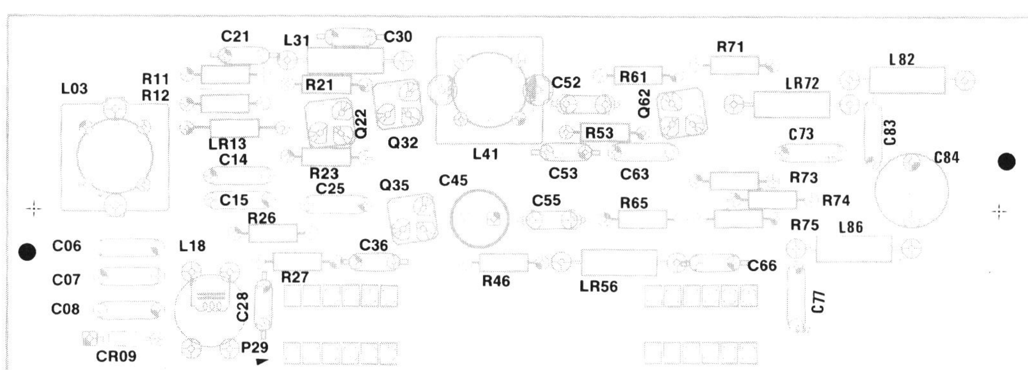
COMPONENT LOCATIONS
A55, A56, A57



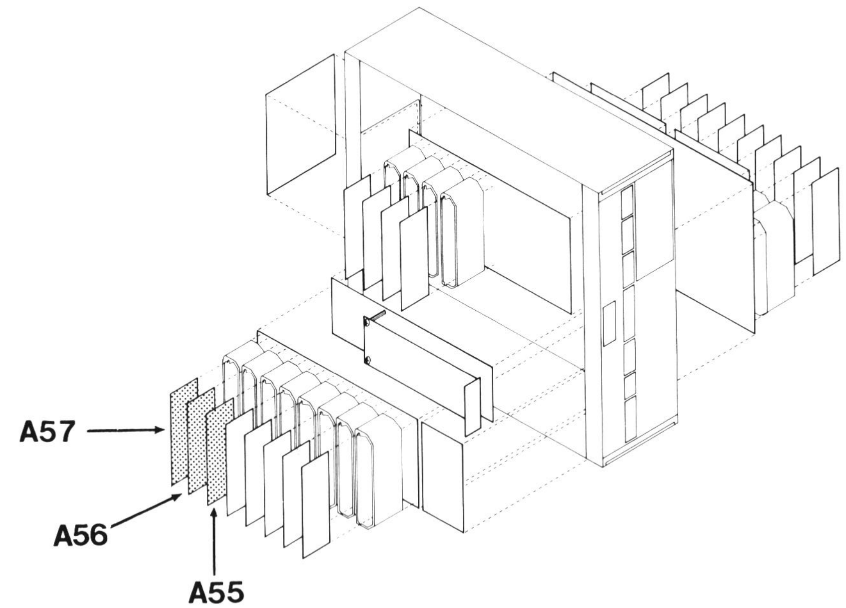
A55 LIMITER BOARD



A56 CONVERTER CONTROL BOARD

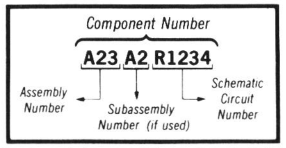


A57 CONVERTER OSCILLATOR BOARD



Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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

Converter LO & Limiter (10)

ASSY A55

Circuit Number	Schematic Location	Board Location
C05	C1	A2
C09	C1	A2
C14	C2	B2
C18	D2	B2
C24	C2	B2
C34	C2	C2
C44	C2	C2
C54	C3	D2
C64	C3	D2
C69	C4	D2
C74	C3	E1
C84	C3	E2
C87	C3	E2
C89	D3	E2
C94	C4	F1
C98	D4	F2
CR11	D1	B1
CR31	D2	C1
CR61	D3	D1
CR81	D3	E1
L05	C1	A2
L15	C2	B2
L17	C1	B2
L35	C2	B2
L37	C2	C2
L45	C2	C2
L54	C2	D2
L57	C2	D2
L58	C4	D2
L64	C3	D2
L75	C3	E2
L76	C3	E2
L84	C3	E2
Q02	D2	A1
Q09	C1	A2
Q15	C1	B2
Q21	D2	B1
Q22	C2	B1
Q32	D2	C1
Q35	C2	C2
Q41	D2	C1
Q43	C2	C1
Q52	D3	D1
Q55	C3	D2
Q60	D3	D1
Q62	C3	D1
Q75	C3	E2
Q81	D3	E1
Q90	D4	F1
Q92	C4	F1
R00	D1	A1
R01	D1	A1
R02	D2	A1
R04	C1	A2
R05	C1	A2
R08	C1	A2
R11	D2	B1
R12	C2	B1
R15	C2	B2
R18	D1	B2
R19	C1	B2
R21	D2	B1
R22	D2	B1
R24	C2	B2
R25	C2	B2
R26	C2	B2
R30	D2	B1
R31	C2	C1
R34	C2	C2
R35	C2	B2
R41	D2	C1
R45	C2	C2
R46	C2	C2
R47	C2	C2
R50	D3	D1
R51	D3	C1
R52	D3	D1
R57	C3	C2
R61	C3	D1
R62	D3	D1
R64	C3	D2
R65	C3	D2
R70	D3	E1
R71	D3	E1
R73	C3	D2
R74	C3	D2
R75	C3	E2
R80	D3	E1
R81	C3	E1
R82	D4	E1
R84	C3	E2
R94	C4	F2
R95	C4	E2

ASSY A56

Circuit Number	Schematic Location	Board Location
C03	A2	A4
C05	B1	A5
C13	B1	B4
C15	A1	B5
C30	B2	C4
C31	A2	C4
C35	B2	B5
C37	B2	B5
C46	A2	D5
C51	B2	D4
C61	B3	D4
C70	B3	E4
C73	A3	E4
C76	A3	E5
C78	A1	E5
C84	A3	E5
C85	A3	E5
C88	A1	E6
CR62	A3	D4
CR94	A3	F5
L13	B1	B4
L14	B1	B5
L50	B2	D4
L60	B2	D4
L76	A1	D5
L78	A1	D5
LR03	A1	A5
LR12	A2	A4
Q02	A2	A4
Q35	B2	C5
Q55A	A2	D5
Q55B	A2	D5
Q64	A3	D5
Q74	A3	E5
Q91	B3	F4
Q92	B3	F4
Q95	A3	F5
R03	A1	A5
R04	B2	A5
R06	A1	A5
R10	A2	B4
R11	A2	B4
R16	A1	B5
R21	A2	B4
R25	A2	B5
R31	A2	C4
R32	B2	C4
R34	B2	C5
R35	B2	C5
R36	B2	B5
R43	B2	C4
R45	B2	C5
R52	A2	D4
R53	A2	D5
R63	A3	D5
R71	B3	E4
R72	B3	E4
R73	A3	E4
R76	A3	D5
R80	B3	E4
R81	B3	E4
R82	A3	E4
R83	A3	E4
R84	A3	E5
R85	A3	E5
R87	A3	E5
R88	A3	E5
TP70	B3	E4
U22	A2	B4
Y18	A1	A5

ASSY A57

Circuit Number	Schematic Location	Board Location
C06	A4	
C07	A4	
C08	A4	
C14	A4	
C15	A4	
C21	A4	
C25	B5	
C28	A4	
C30	A5	
C36	A4	
C45	B5	
C52	A5	
C53	B5	
C55	A5	
C63	A5	
C66	A5	
C73	B5	
C77	B5	
C83	B5	
C84	B5	
CR09	A4	
L03	A4	
L18	A4	
L31	A5	
L41	A5	
L82	B5	
L86	B5	
LR13	A4	
LR56	B5	
LR72	A5	
Q22	A5	
Q32	A5	
Q35	B5	
Q62	A5	
R11	A4	
R12	A4	
R21	A4	
R23	A5	
R26	A4	
R27	A4	
R46	B5	
R53	A5	
R61	A5	
R65	A5	
R71	A5	
R73	A5	
R74	A5	
R75	A5	

P/O ASSY A59

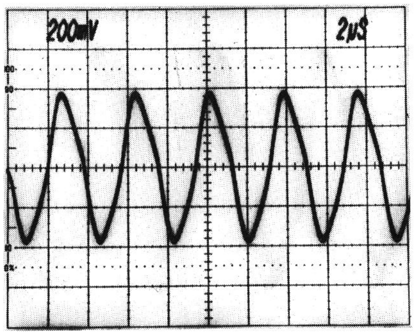
Circuit Number	Schematic Location	Board Location
C55	C4	K5
C56	D4	K5
C57	B5	K5
P91	C1	N2
P97	A5	N4

Component locations for A59 are shown on the reverse side of Audio Output

2998-99

10

1



AC COUPLED

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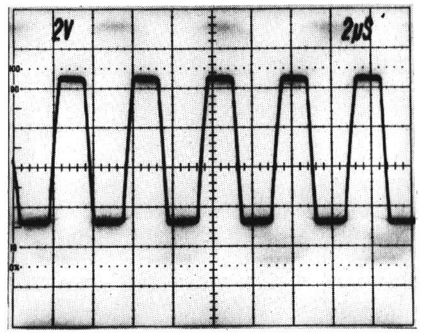

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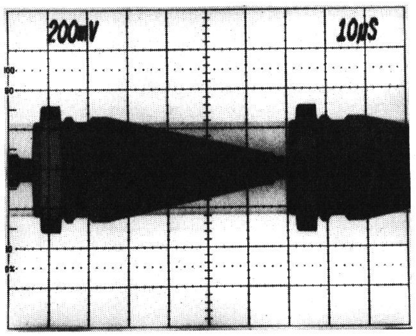

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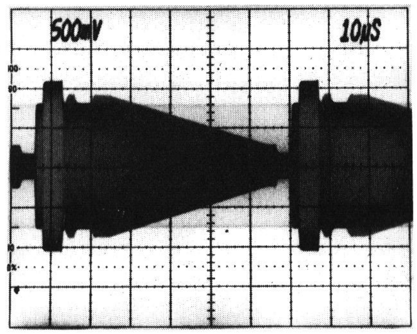

AC COUPLED

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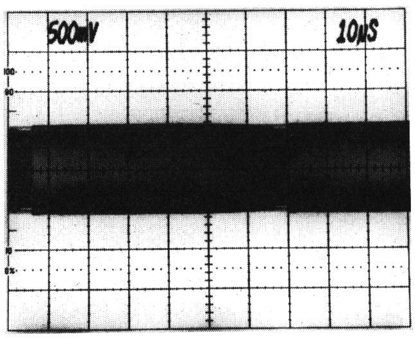

0 V

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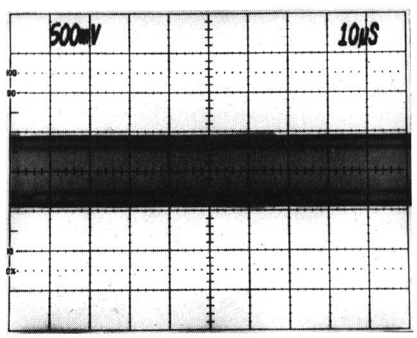
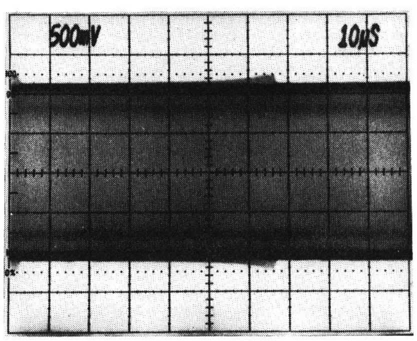


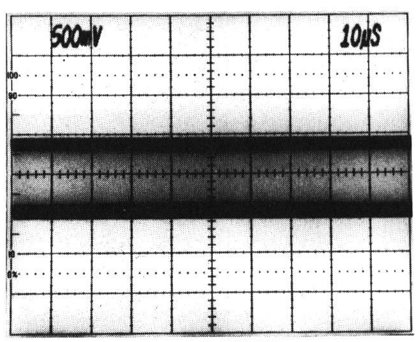
0 V

7

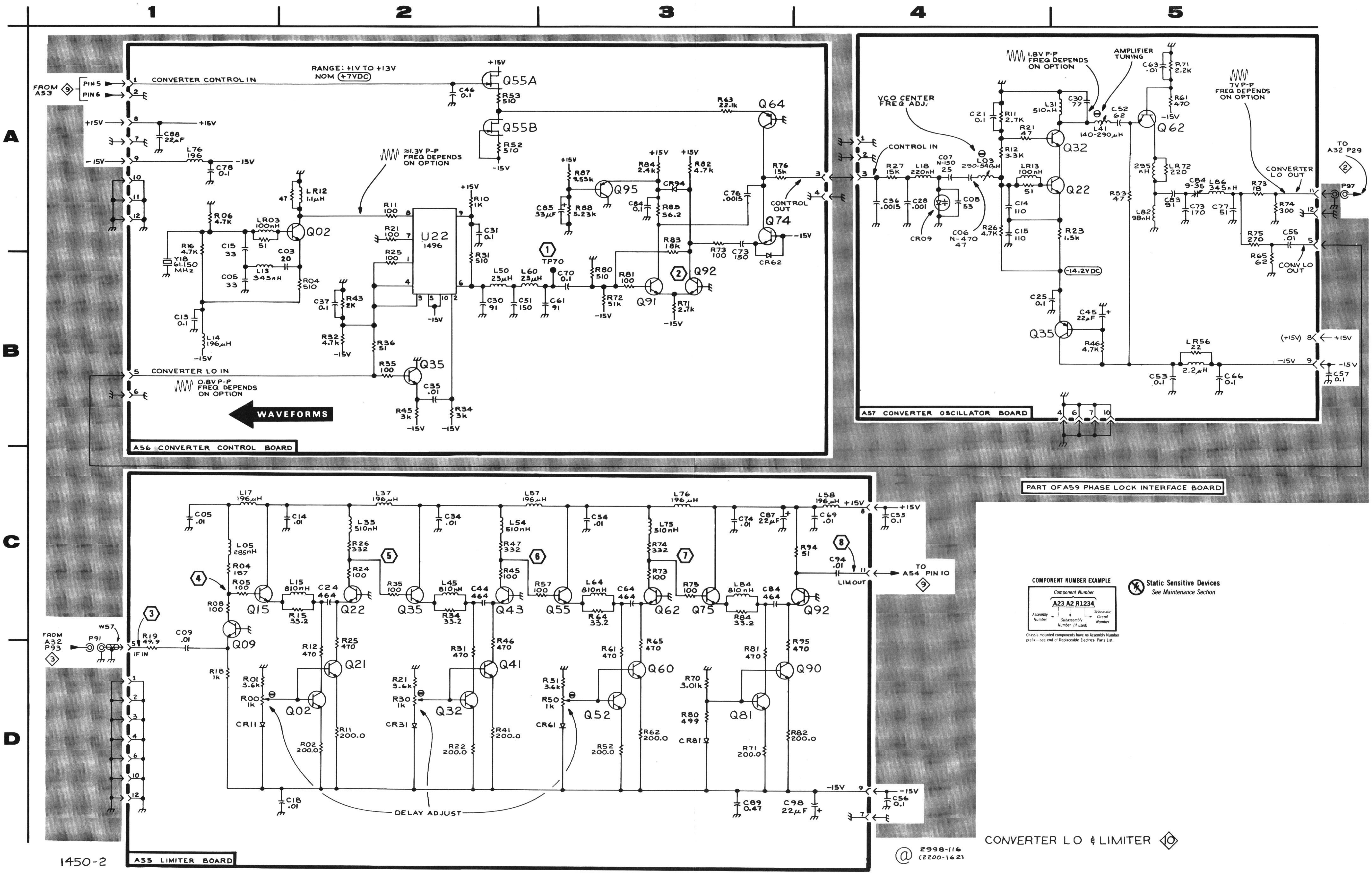


AC COUPLED

8



AC COUPLED



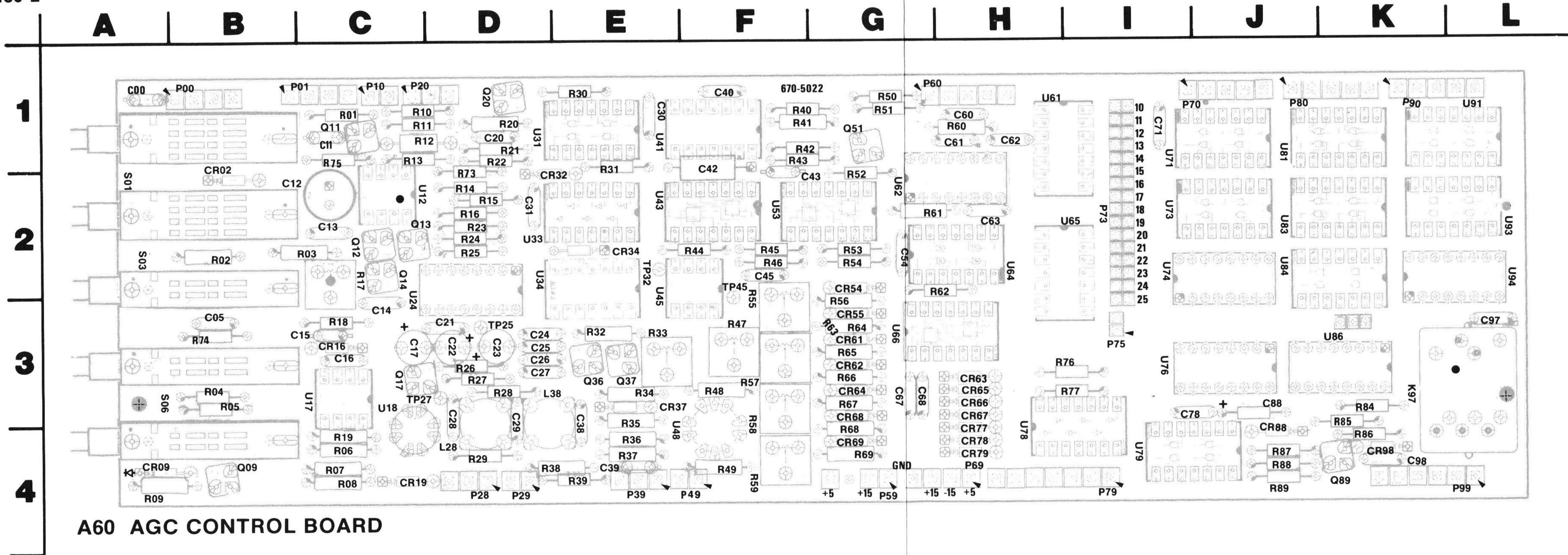
1450-2

2998-116 (2200-162)

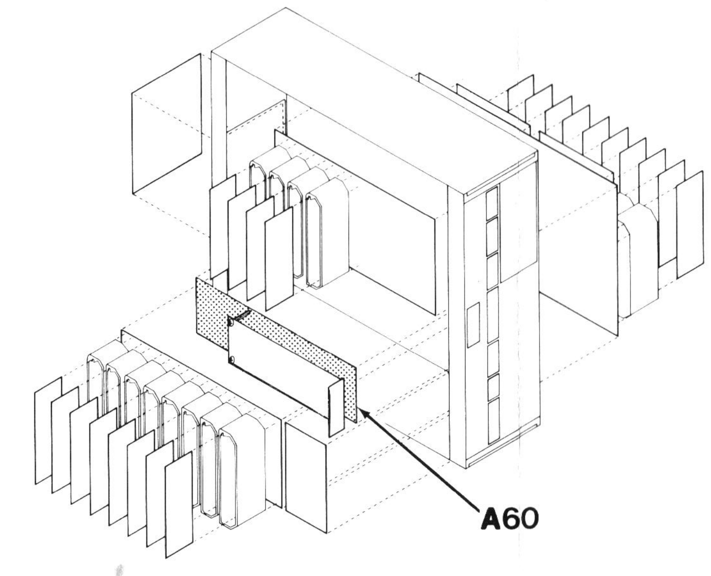
CONVERTER LO & LIMITER 10

CONV. LO & LIMITER A55, A56, A57

1450-2



A60 AGC CONTROL BOARD



Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE

Component Number

A23 A2 R1234

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

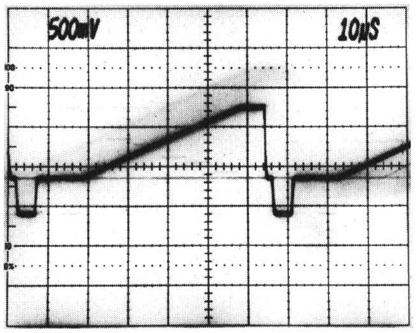
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

AGC Sample & Hold and Zero Carrier Timing 11

Circuit Number	Schematic Location	Board Location
P/O ASSY A60		
C00	C5	A1
C05	B2	B3
C11	B5	C1
C12	B4	C2
C13	B2	C2
C14	A4	C3
C17	C2	C3
C20	B3	D1
C21	B2	D3
C22	C2	D3
C23	C2	D3
C24	C2	D3
C25	C2	D3
C26	C2	D3
C27	C2	D3
C28	C1	D3
C29	C1	D3
C30	A3	E1
C31	B2	D2
C38	C1	E3
C40	B2	F1
C42	C3	F1
C43	C3	F2
C45	A5	F2
C54	B3	C5
C60	D1	H1
C61	C4	H1
C62	B2	H1
C63	C4	H2
C67	B1	G3
C68	B1	G3
C71	B2	I1
C78	B2	I3
C97	B2	L3
C98	B2	K4
CR02	C4	B2
CR09	A1	A4
CR19	A2	C4
CR32	A3	D2
L28	C1	D4
L38	C1	D3
P73	B4	I2
Q09	A1	B4
Q11	B4	C1
Q12	A4	C2
Q13	A5	C2
Q14	A4	C2
Q17	C1	C3
Q20	B3	D1
Q51	D2	G1
R01	B5	C1
R02	D2	B2
R03	C2	C2
R04	A1	B3
R07	A1	C4
R08	A1	C4
R09	A1	A4
R10	B5	C1
R11	B4	C1
R12	B4	C1
R13	A4	C1
R14	C2	D2
R15	C2	D2
R16	D2	D2

Circuit Number	Schematic Location	Board Location
R17	A1	C2
R20	B3	D1
R21	B3	D1
R22	A3	D1
R23	A4	D2
R24	A4	D2
R25	A4	D2
R26	C2	D3
R27	C1	D3
R28	C1	D3
R29	A2	D4
R30	A3	E1
R31	A3	E1
R38	C1	D4
R39	A3	E4
R40	A5	F1
R41	C3	F1
R42	C3	F1
R43	C3	F1
R44	A4	F2
R45	A5	F2
R46	A5	F2
R50	D4	G1
R51	D1	G1
R52	D2	G2
R60	C4	H1
R61	C4	G2
R62	B3	G2
R73	A4	D1
R76	D1	I3
R77	D1	I3
S01	B4	A2
S03	C4	A2
S06	A1	A3
TP27	B1	D3
TP32	A4	E2
U18	A4	C3
U24	C2	D2
U31A	A3	E1
U31B	A3	E1
U31C	A3	E1
U31D	A3	E1
U33A	A2	E2
U33B	A2	E2
U33C	D2	E2
U33D	C2	E2
U33E	C2	E2
U33F	D1	E2
U34	C3	E2
U41	D3	F1
U43A	C3	F2
U45A	A5	F2
U53A	B4	F2
U53B	B3	F2
U61	C4	H1
U62A	C4	G2
U62B	C4	G2
U64A	B3	H2
U64C	D5	H2
U65	C4	H2
W34	B3	E2

11

1


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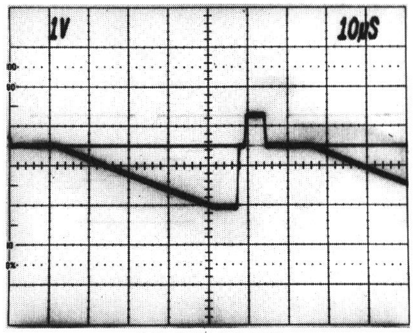

AC COUPLED

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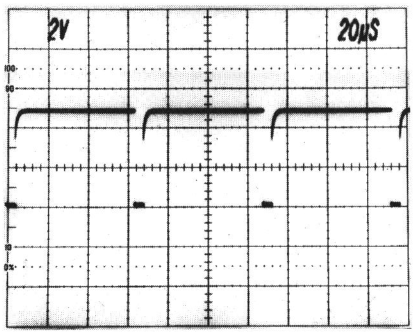

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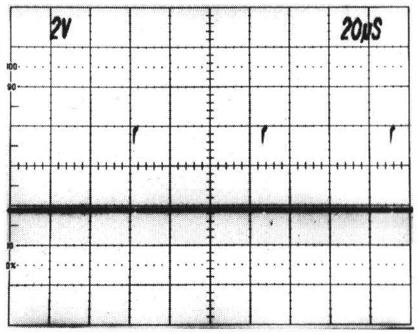

0 V

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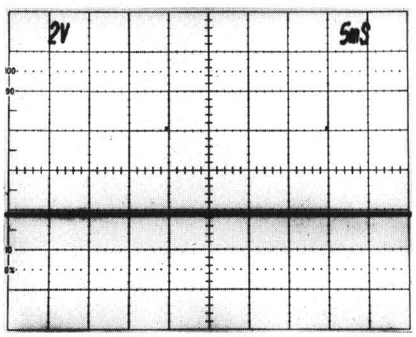
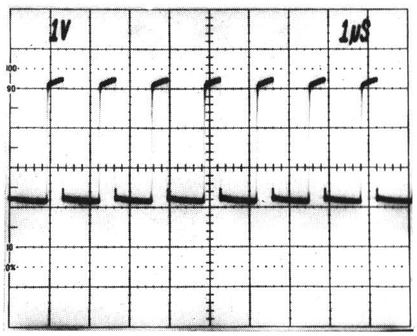


0 V

6


0 V

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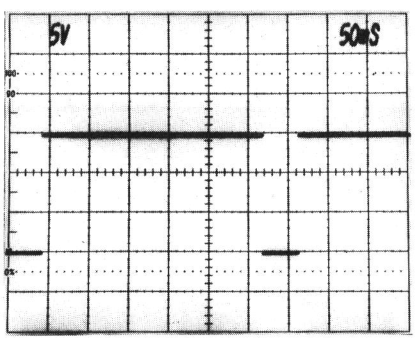
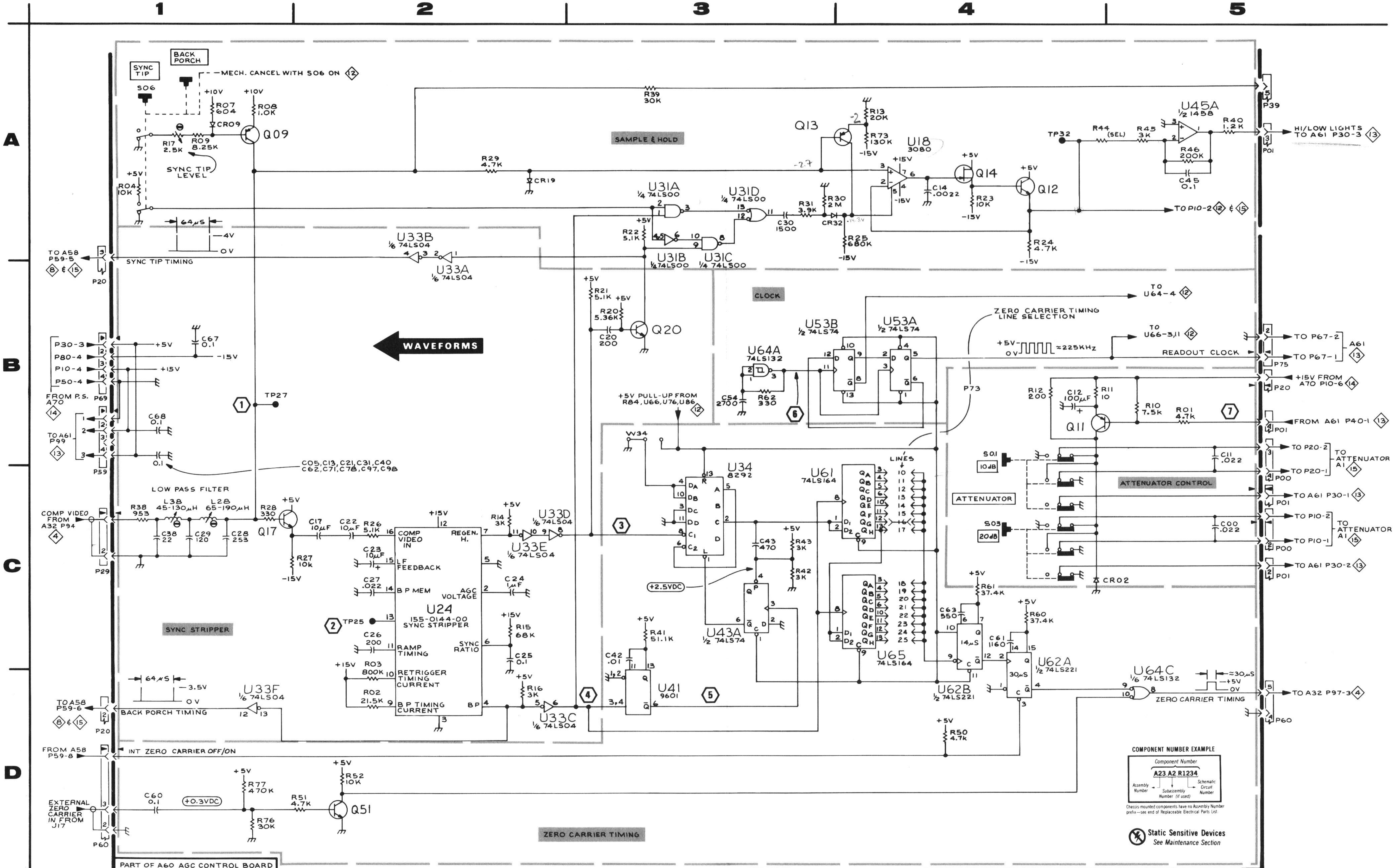


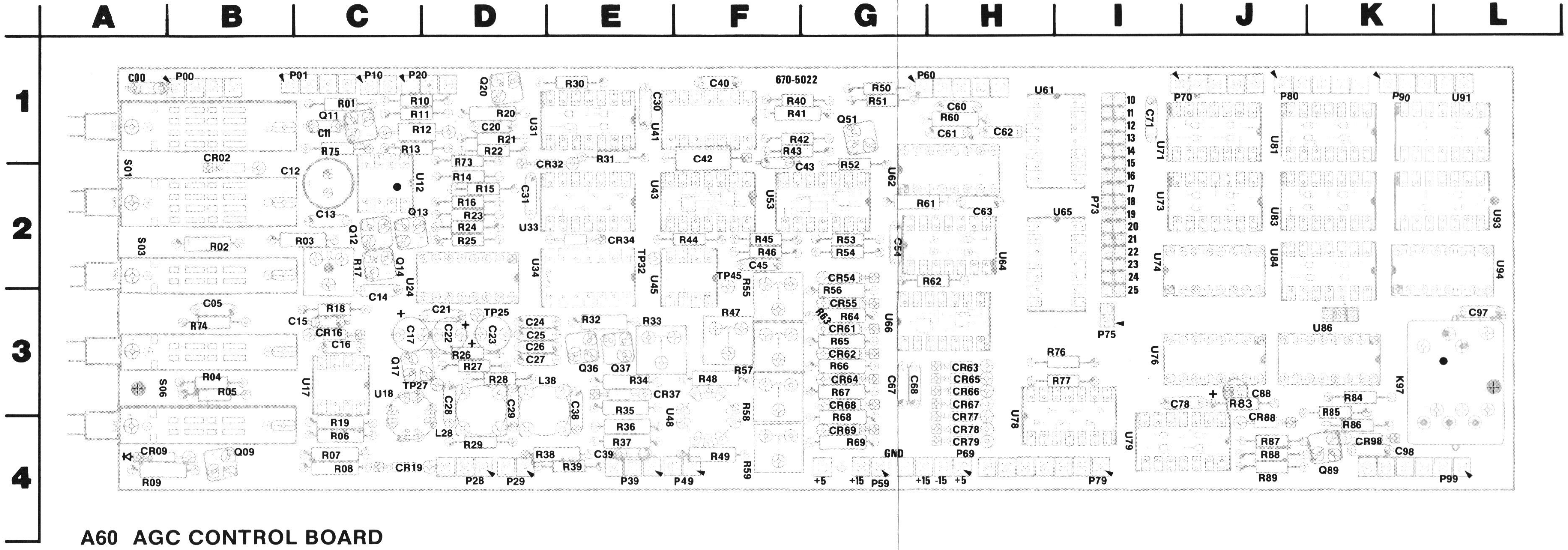
0 V



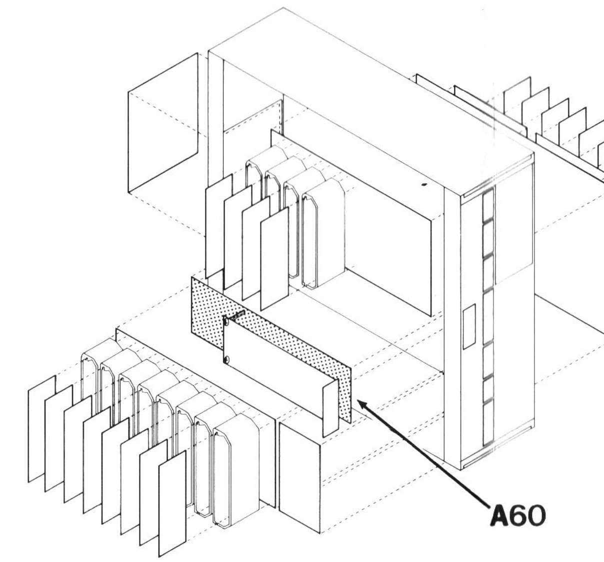
1450-2

@ 2998-117 (2200-163)

AGC SAMPLE & HOLD and ZERO CARRIER TIMING 11

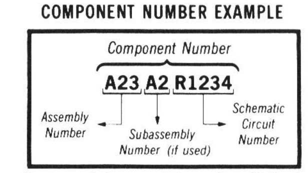


A60 AGC CONTROL BOARD



Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE

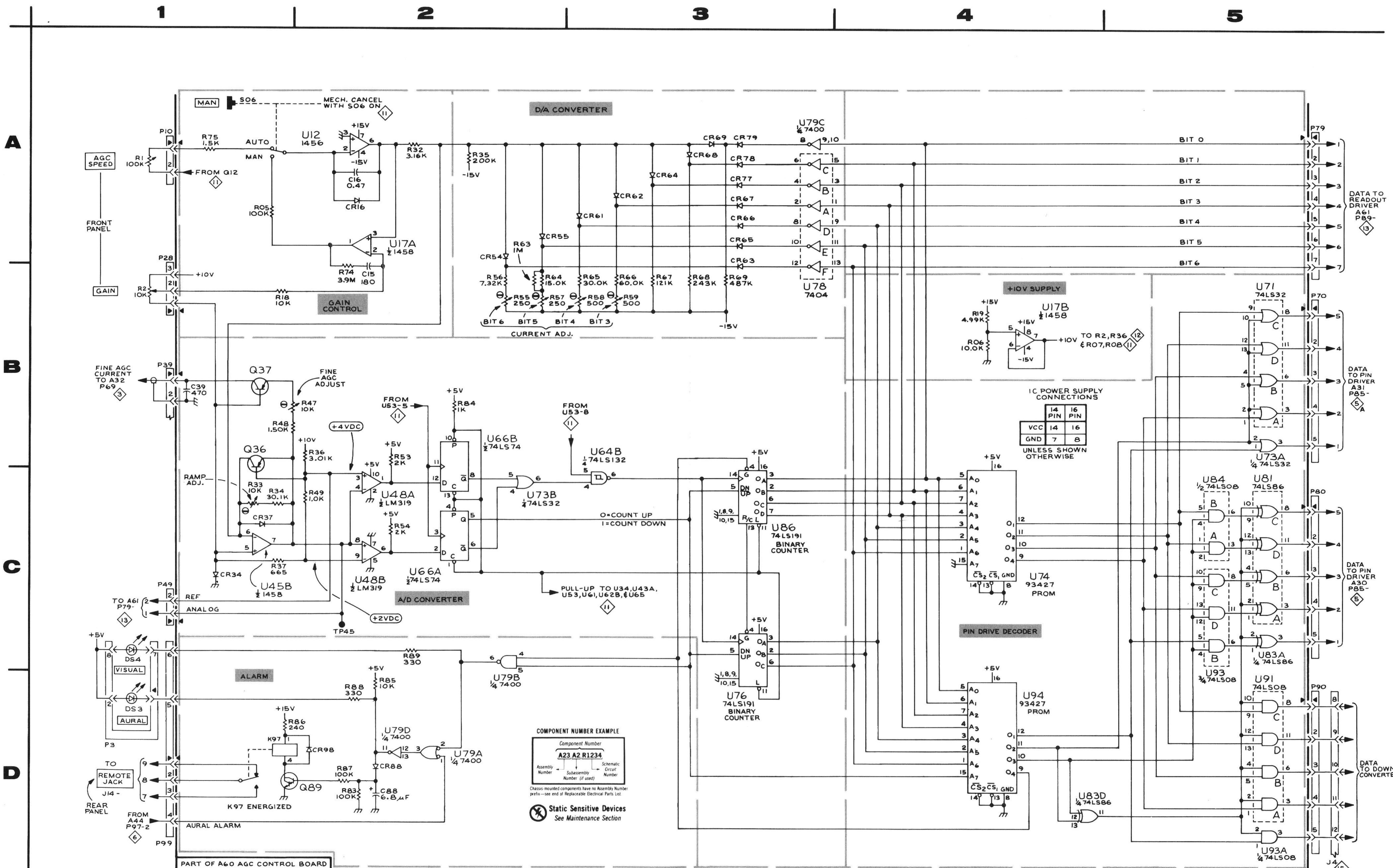


Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

@

AGC A/D Converter & Pin Drive Decoder ⟨12⟩

Circuit Number	Schematic Location	Board Location
P/O ASSY A60		
C15	B2	C3
C16	A2	C3
C39	B1	E4
C88	D2	J3
CR16	A2	C3
CR34	C1	E2
CR37	C1	E3
CR54	A2	G2
CR55	A2	G3
CR61	A3	G3
CR62	A3	G3
CR63	A3	H3
CR64	A3	G3
CR65	A3	H3
CR66	A3	H3
CR67	A3	H3
CR68	A3	G3
CR69	A3	G4
CR77	A3	H4
CR78	A3	H4
CR79	A3	H4
CR88	D2	J4
CR98	D2	K4
K97	D1	K3
Q36	B1	E3
Q37	B1	E3
Q89	D1	K4
R05	A1	B3
R06	B4	C4
R18	B1	C3
R19	B4	C4
R32	A2	E3
R33	C1	E3
R34	C1	E3
R35	A2	E3
R36	B2	E4
R37	C1	E4
R47	B1	F3
R48	B1	F3
R49	C2	F4
R53	B2	G2
R54	C2	G2
R55	B2	F3
R56	B2	G2
R57	B2	F3
R58	B3	F3
R59	B3	F4
R63	A2	G3
R64	B2	G3
R65	B3	G3
R66	B3	G3
R67	B3	G3
R68	B3	G3
R69	B3	G4
R74	B2	B2
R75	A1	C1
R83	D2	J3
R84	B2	K3
R85	D2	K3
R86	D1	K4
R87	D2	J4
R88	D2	J4
R89	C2	J4
S06	A1	A3
TP45	C2	F2
U12	A2	C2
U17A	A2	C3
U17B	B4	C3
U45B	C1	E2
U48A	C2	F3
U48B	C2	F3
U64B	C3	H2
U66A	C2	G3
U66B	B2	G3
U71	B5	I1
U73A	B5	I2
U73B	C2	I2
U74	C4	I2
U76	C3	I3
U78	A3	H4
U79A	D2	I4
U79B	C2	I4
U79C	A3	I4
U79D	D2	I4
U81	C5	J1
U83A	C5	J2
U83D	D4	J2
U84A	C5	J2
U84B	C5	J2
U86	C3	K3
U91	D5	L1
U93A	D5	L2
U93B	C5	L2
U93C	C5	L2
U93D	C5	L2
U94	D4	L2
CHASSIS		
DS3	D1	
DS4	C1	
R1	A1	
R2	B1	



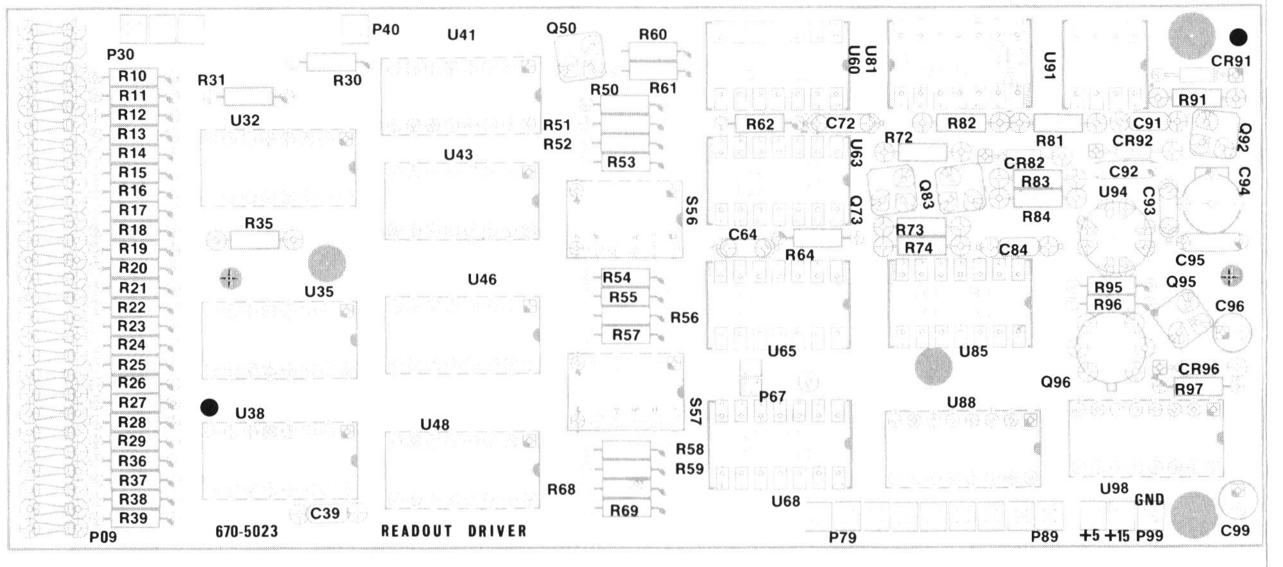
1450-2

@ 2998-118 (2200-165)

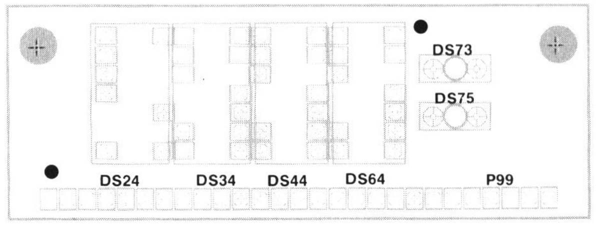
AGC A/D CONVERTER AND PIN DRIVE DECODER 12

A B C D E F G

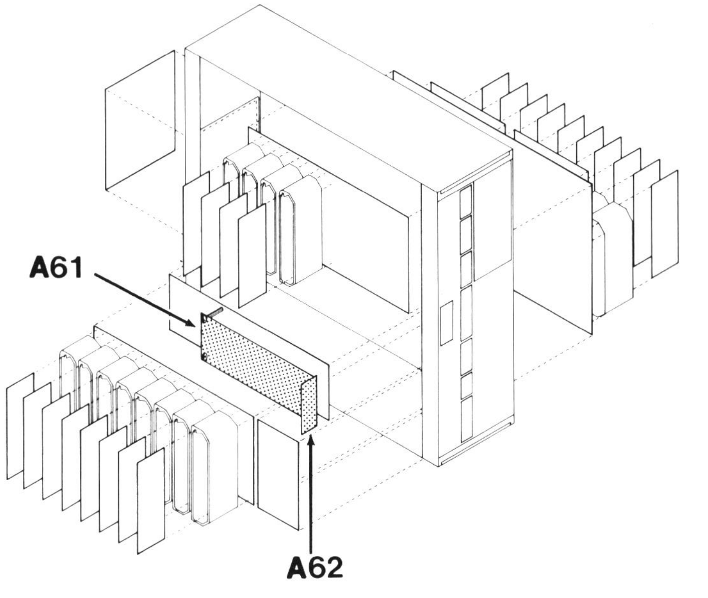
1 2 3 4 5 6



A61 READOUT DRIVER BOARD



A62 READOUT BOARD



Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE

Component Number

$\underbrace{\text{A23 A2 R1234}}$

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

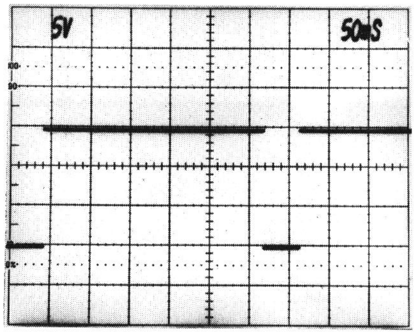
Chassis mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List

Read Out Driver 13

Circuit Number	Schematic Location	Board Location
ASSY A61		
C39	C1	B3
C64	B4	E2
C72	B2	E1
C84	C1	F2
C91	B1	G1
C92	A3	G2
C93	A2	G2
C94	A2	G2
C95	A3	G2
C96	C1	G2
C99	C1	G3
CR82	A2	F2
CR91	B1	G1
CR92	A2	G1
CR96	A2	G3
Q50	A4	D1
Q73	A2	E2
Q83	A2	F2
Q92	A2	G1
Q95	A2	G2
Q96A	A2	F3
Q96B	B2	F3
R10	B5	A1
R11	B5	A1
R12	C5	A1
R13	C5	A1
R14	C5	A1
R15	C5	A2
R16	C5	A2
R17	C5	A2
R18	B5	A2
R21	C5	A2
R22	C5	A2
R23	C5	A2
R24	C5	A3
R25	C5	A3
R26	D5	A3
R27	D5	A3
R28	D5	A3
R29	D5	A3
R30	B4	C1
R31	B4	B1
R35	B5	B2
R36	D5	A3
R37	D5	A3
R38	D5	A3
R39	D5	A3
R50	B4	D1
R51	B3	D1
R52	B3	D1
R53	B4	D2
R54	C4	D2
R55	C4	D2
R56	C4	D2
R57	C4	D2
R58	D4	D3
R59	D4	D3
R60	A4	D1
R61	A4	D1
R62	B1	E1
R64	B4	E2
R68	D4	D3
R69	D4	D3
R72	A2	E1
R73	A2	E2
R74	A2	E2
R81	B1	F1
R82	A1	F1
R83	A2	F2
R84	A3	F2
R91	B1	G1
R95	A2	F3
R96	A2	F3
R97	B2	G3
S56	C3,C4	D2
S57	C4,D4	D3
TP67	A2	E3
U32	C5	B1
U35	D5	B2
U38	D5	B3
U41	C4	C1
U43	B4	C2
U46	D4	C2
U48	D4	C3
U60A	B2	E1
U60B	C2	E1
U60C	B1	E1
U60D	B2	E1
U63A	B4	E2
U63B	B1	E2
U65A	B1	E2
U65B	B4	E2
U65C	A4	E2
U68A	A2	E3
U68B	B2	E3
U68C	B3	E3
U68D	C3	E3
U81	C2	E1
U85	B2	F2
U88	D3	F3
U91	B1	F1
U94	A3	G2
U98	C2	G3
ASSY A62		
DS24	B5	A5
DS34	B5	B5
DS44	C5	B5
DS64	D5	C5
DS73	A5	C5

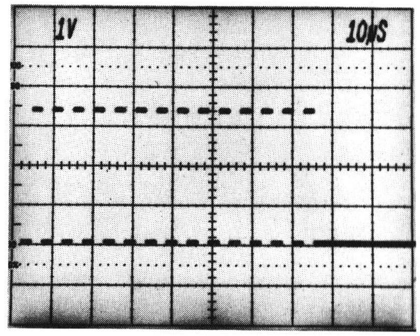
13

1



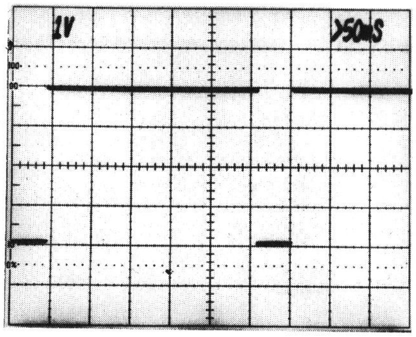
0 V

2



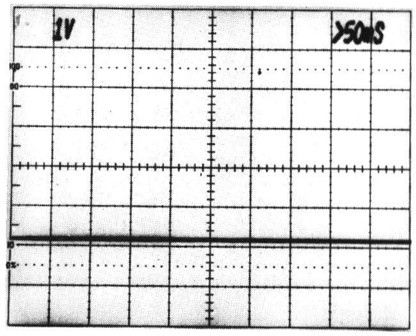
0 V

3



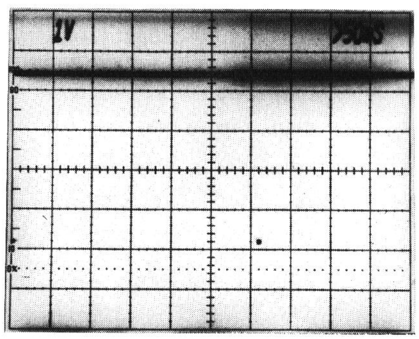
0 V

4



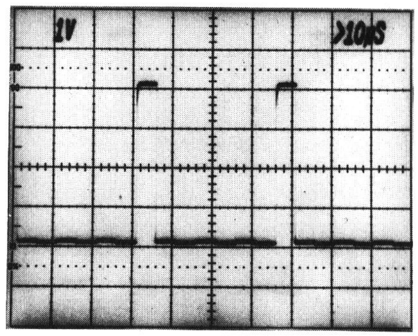
0 V

5

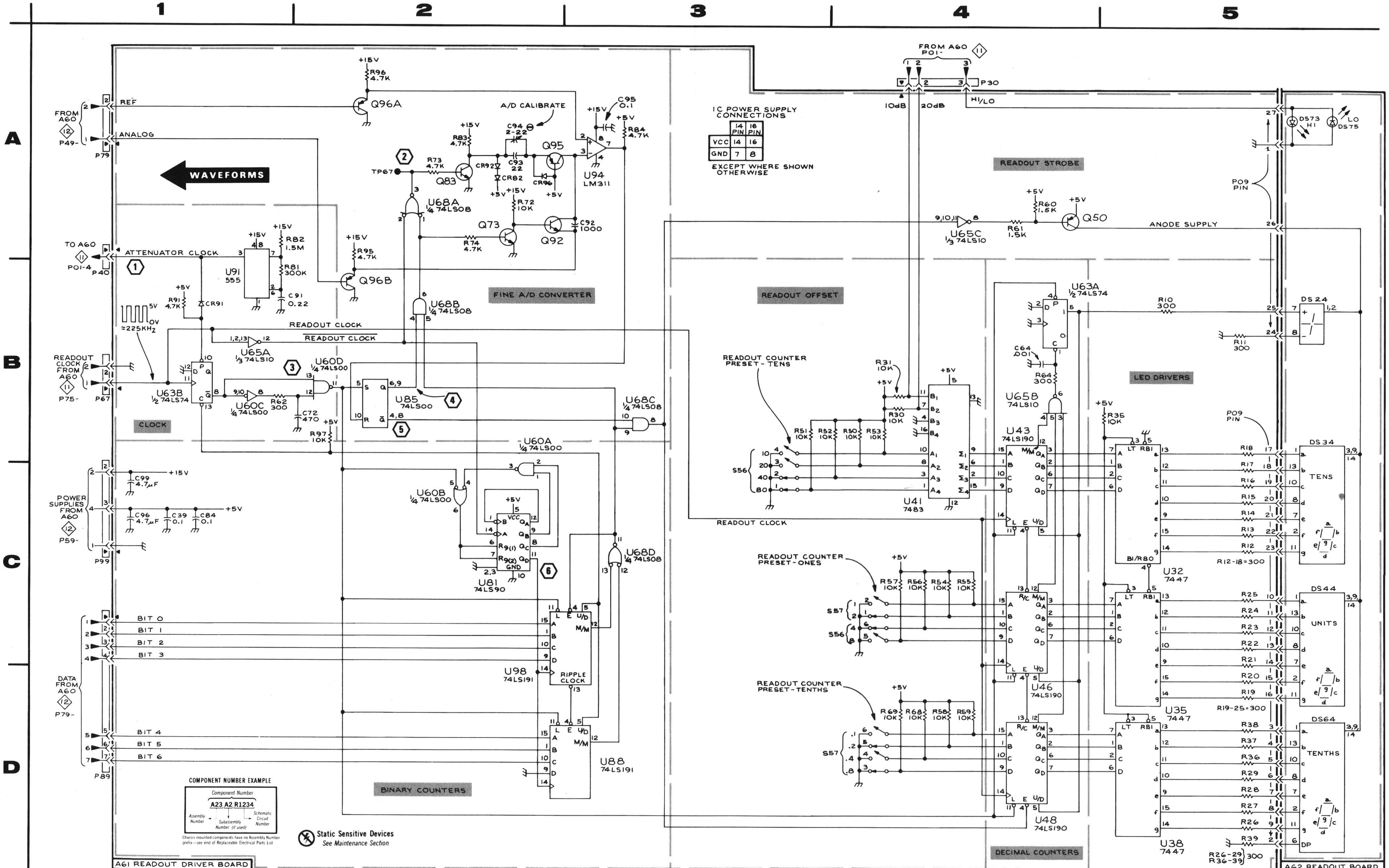


0 V

6



0 V



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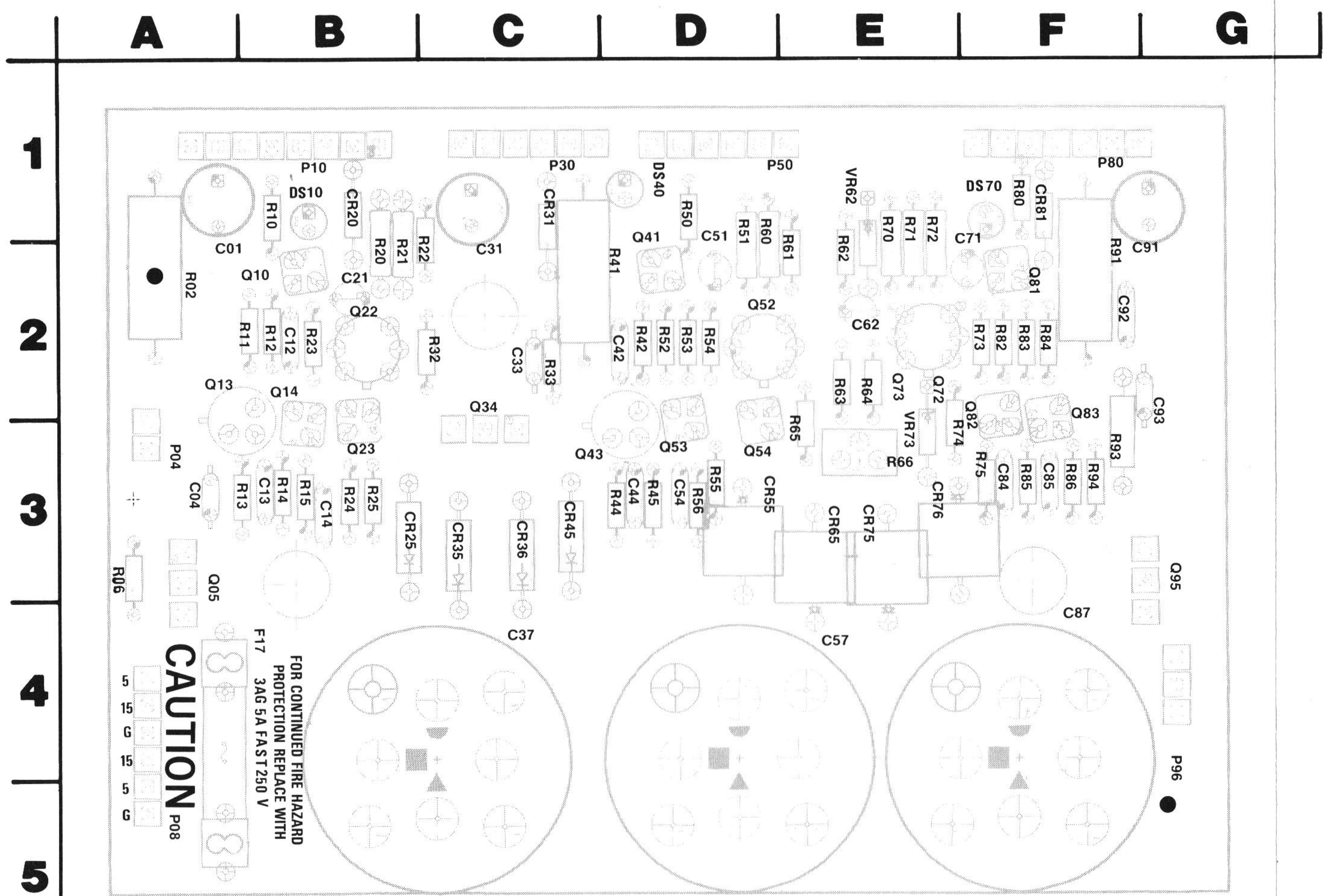
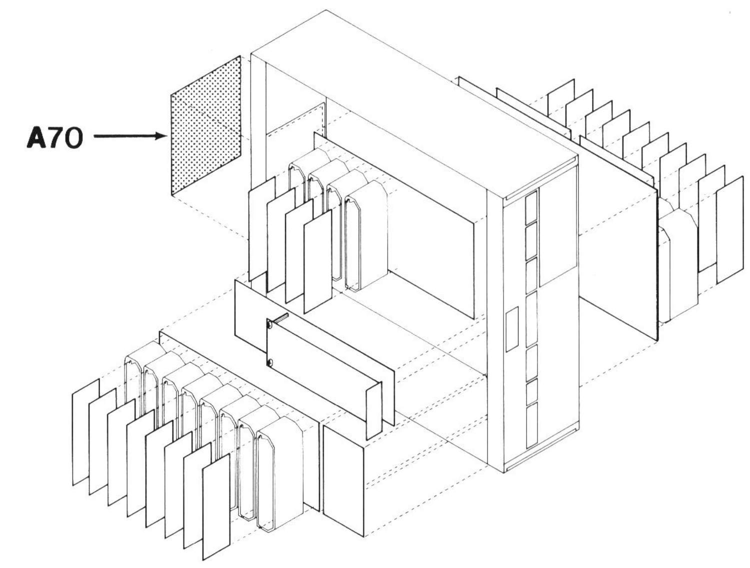
@ 2998-113 (2200-166)

READ OUT DRIVER 13



A70 POWER SUPPLY BOARD



Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE

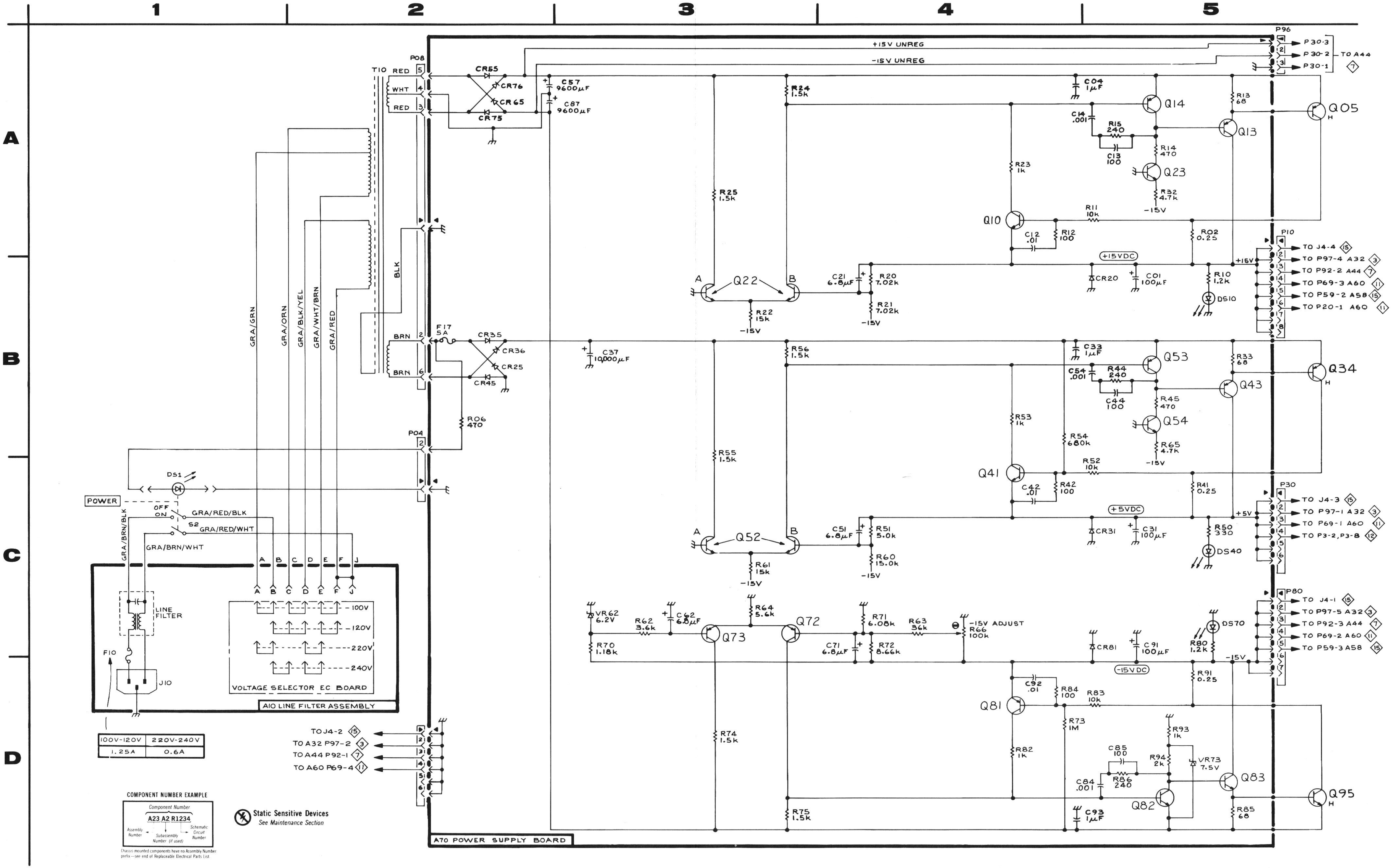
Component Number
A23 A2 R1234
Assembly Number — *Subassembly Number (if used)* — *Schematic Circuit Number*

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

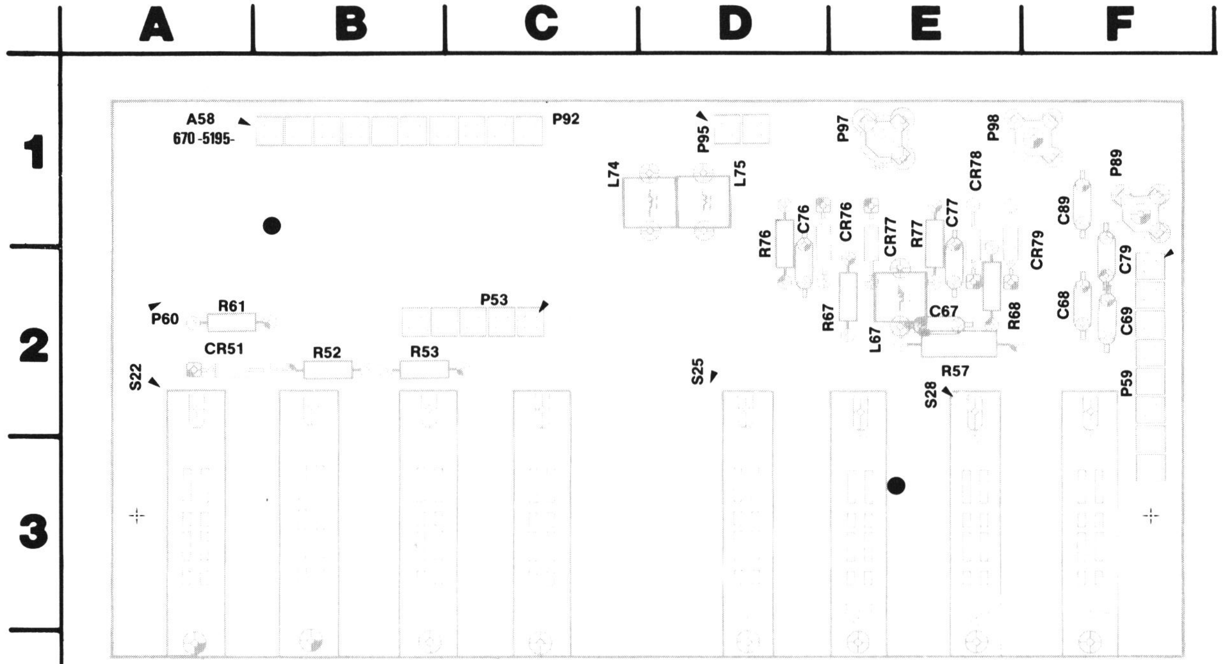
Power Supply 14

Circuit Number	Schematic Location	Board Location
ASSY A70		
C01	B5	A1
C04	A5	A3
C12	A4	B2
C13	A5	B3
C14	A4	B3
C21	B4	B2
C31	C5	C1
C33	B4	C2
C37	B3	C4
C42	C4	D2
C44	B5	D3
C51	C4	D2
C54	B4	D3
C57	A3	E4
C62	C3	E2
C71	C4	F1
C84	D5	F3
C85	D5	F3
C87	A3	F4
C91	C5	G1
C92	D4	F2
C93	D4	G2
CR20	B5	B1
CR25	B2	B3
CR31	C5	C1
CR35	B2	C3
CR36	B2	C3
CR45	B2	C3
CR55	A2	D3
CR65	A2	E3
CR75	A2	E3
CR76	A2	E3
CR81	C5	F1
DS10	B5	B1
DS40	C5	D1
DS70	C5	F1
F17	B2	A4
Q10	A4	B2
Q13	A5	A2
Q14	A5	B2
Q22A	B3	B2
Q22B	B3	B2
Q23	A5	B2
Q41	C4	D2
Q43	B5	D3
Q52A	C3	D2
Q52B	C3	D2
Q53	B5	D3
Q54	B5	D3
Q72	C3	E2
Q73	C3	E2
Q81	D4	F2
Q82	D5	F3
Q83	D5	F3

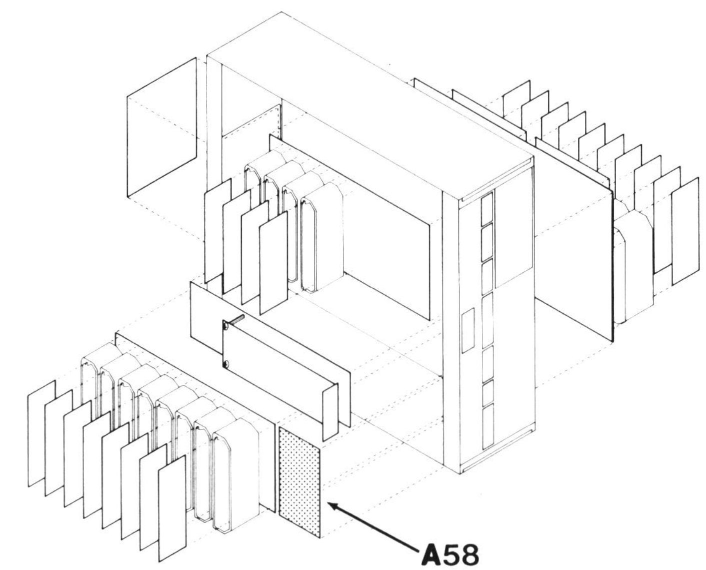
Circuit Number	Schematic Location	Board Location
R02	A5	A2
R06	B2	A3
R10	B5	B1
R11	A5	B2
R12	A4	B2
R13	A5	B3
R14	A5	B3
R15	A5	B3
R20	B4	B1
R21	B4	B1
R22	B3	D2
R23	A4	B2
R24	A3	B3
R25	A3	B3
R32	A5	C2
R33	B5	C2
R41	C5	C2
R42	C4	D2
R44	B5	D3
R45	B5	D3
R50	C5	D1
R51	C4	D1
R52	C5	D2
R53	B4	D2
R54	B4	D2
R55	B3	D3
R56	B3	D3
R60	C4	D1
R61	C3	E2
R62	C3	E2
R63	C4	E2
R64	C3	E2
R65	B5	E3
R66	C4	E3
R70	C3	E1
R71	C4	E1
R72	C4	E1
R73	D4	F2
R74	D3	E3
R75	D3	F3
R80	C5	F1
R82	D4	F2
R83	D5	F2
R84	D4	F2
R85	D5	F3
R86	D5	F3
R91	D5	F2
R93	D5	F3
R94	D5	F3
VR62	C3	E1
VR73	D5	E3



1
2
3
4
5
A
B
C
D
+15V UNREG
-15V UNREG
P96
P30-3
P30-2
P30-1
TO A44
T10
RED
WHT
RED
BLK
BRN
BRN
P08
P04
CR55
CR76
CR65
CR75
C57 9600μF
C87 9600μF
F17 5A
CR35
CR36
CR25
CR45
R06 470
C37 10,000μF
R24 1.5k
R25 1.5k
Q22
R22 15k
C21 6.8μF
R20 7.02k
R21 7.02k
-15V
C04 1μF
C14 .001
R15 240
C13 100
R14 470
Q14
Q23
R32 4.7k
R23 1k
Q10
R11 10k
C12 .01
R12 100
+15VDC
CR20
C01 100μF
R13 68
Q13
Q05
R02 0.25
R10 1.2k
DS10
+15V
P10
TO J4-4
TO P97-4 A32
TO P92-2 A44
TO P69-3 A60
TO P59-2 A58
TO P20-1 A60
R56 1.5k
R55 1.5k
C33 1μF
C54 .001
R44 240
C44 100
Q53
Q43
Q34
R45 470
Q54
R65 4.7k
R53 1k
R54 680k
R52 10k
Q41
C42 .01
R42 100
+5VDC
CR31
C31 100μF
R33 68
R41 0.25
R50 330
DS40
+5V
P30
TO J4-3
TO P97-1 A32
TO P69-1 A60
TO P3-2,P3-8
Q52
C51 6.8μF
R51 5.0k
R60 15.0k
R61 15k
VR62 6.2V
R62 3.6k
C62 6.8μF
R64 5.6k
Q73
Q72
R70 1.18k
C71 6.8μF
R71 6.08k
R72 8.66k
R63 36k
-15V ADJUST R66 100k
CR81
C91 100μF
-15VDC
R80 1.2k
DS70
-15V
P80
TO J4-1
TO P97-5 A32
TO P92-3 A44
TO P69-2 A60
TO P59-3 A58
R91 0.25
C92 .01
R84 100
R83 10k
Q81
R73 1M
R74 1.5k
R82 1k
R93 1k
C85 100
R94 2k
VR73 7.5V
R86 240
C84 .001
Q83
Q82
Q95
R85 68
C93 1μF
R75 1.5k
A70 POWER SUPPLY BOARD
DS1
POWER
OFF
ON
S2
GRA/RED/BLK
GRA/RED/WHT
GRA/BRN/WHT
GRA/BRN/BLK
GRA/GRN
GRA/ORN
GRA/BLK/YEL
GRA/WHT/BRN
GRA/RED
LINE FILTER
F10
J10
-100V
-120V
-220V
-240V
VOLTAGE SELECTOR EC BOARD
A10 LINE FILTER ASSEMBLY
TO J4-2
TO A32 P97-2
TO A44 P92-1
TO A60 P69-4
| 100V-120V | 220V-240V |
| 1.25A | 0.6A |
COMPONENT NUMBER EXAMPLE
Component Number
A23 A2 R1234
Assembly Number
Subassembly Number (if used)
Schematic Circuit Number
Static Sensitive Devices
See Maintenance Section



A58 PHASE LOCK SWITCH



Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE

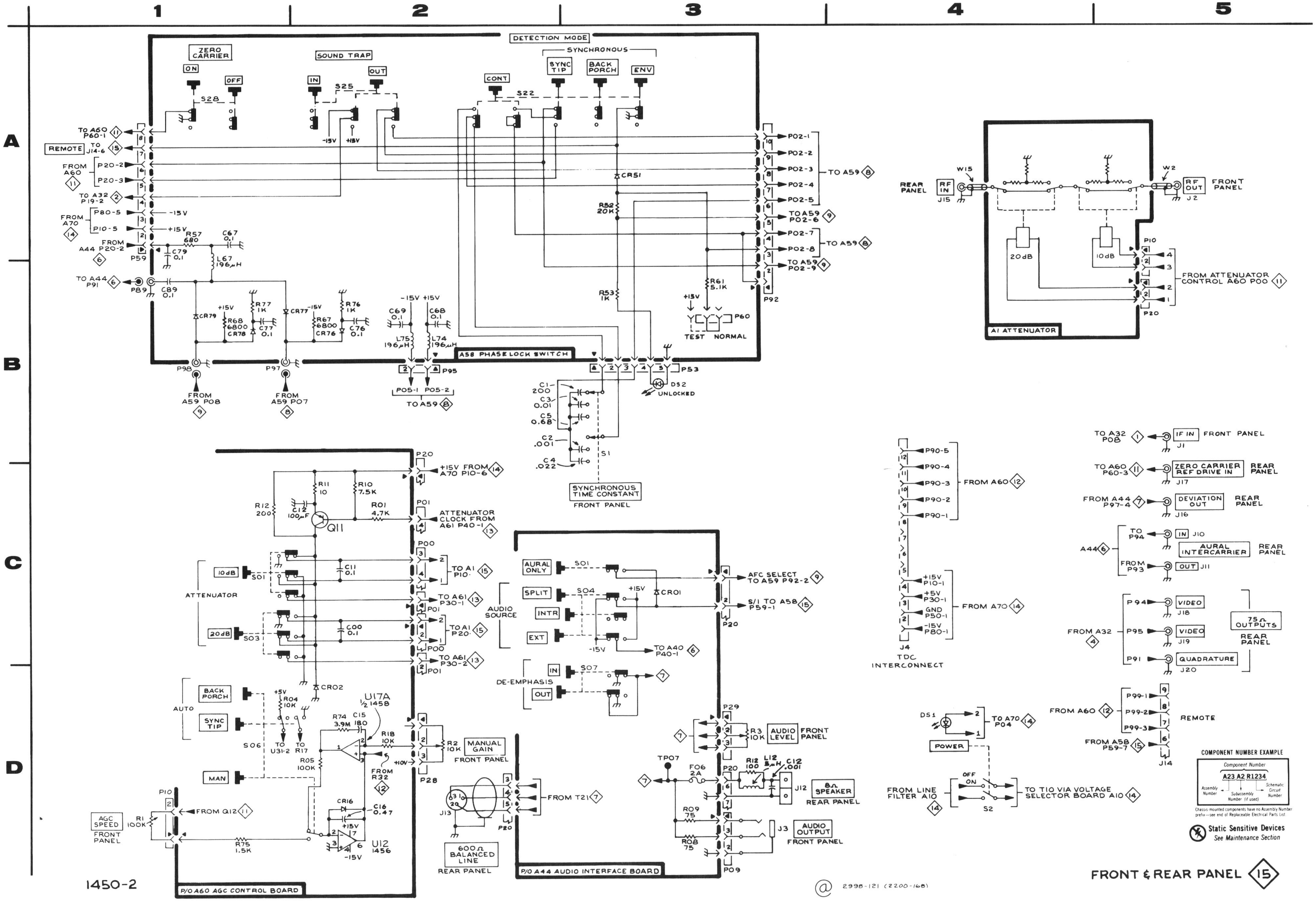
Component Number

A23 A2 R1234

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

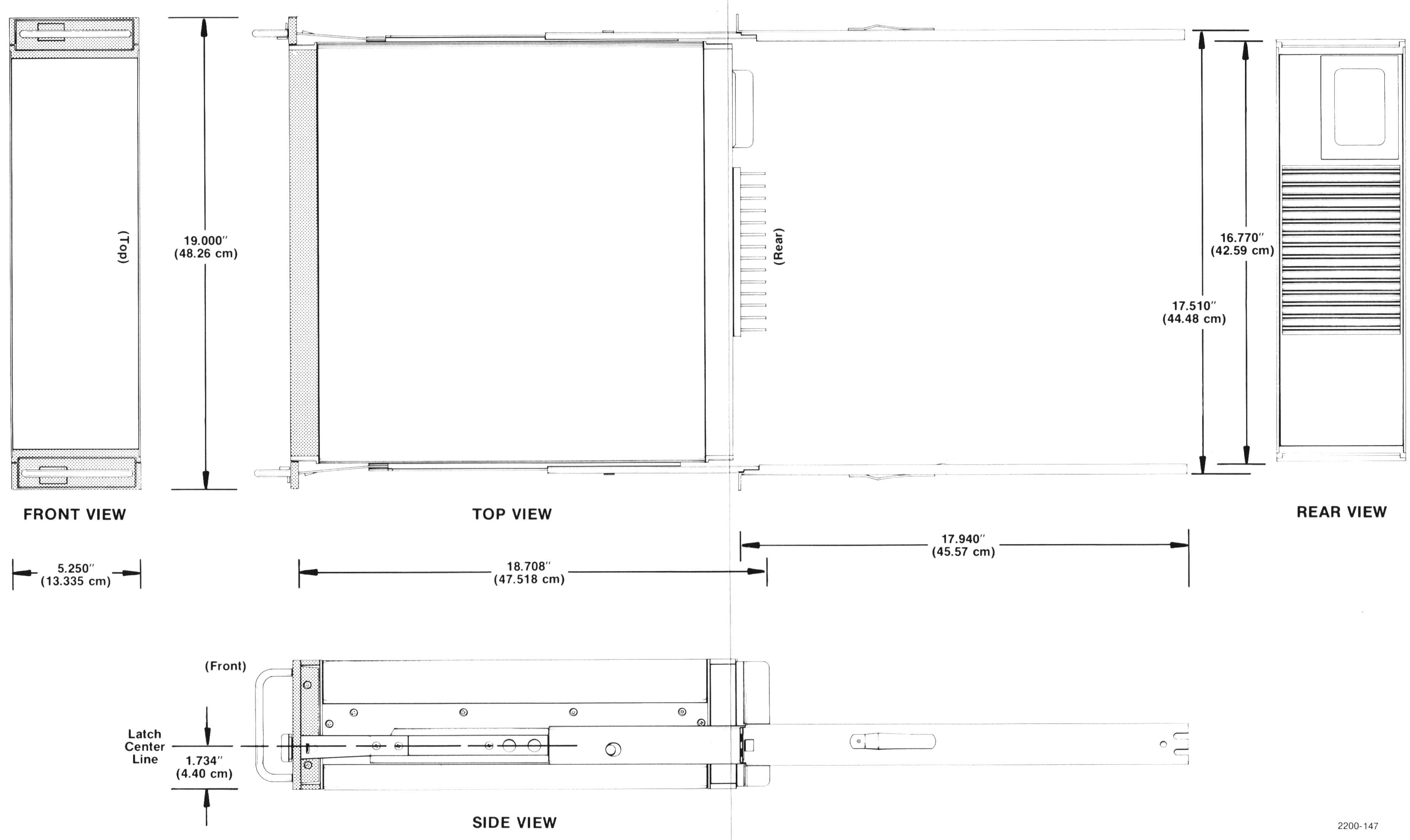
Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

Front & Rear Panel ⟨15⟩		
Circuit Number	**Schematic Location**	**Board Location**
ASSY A58		
C67	A1	E2
C68	B2	F2
C69	B2	F2
C76	B2	D2
C77	B1	E2
C79	A1	F2
C89	B1	F1
CR51	A3	A2
CR76	B2	E1
CR77	B1	E1
CR78	B1	E1
CR79	B1	E2
L67	A1	E2
L74	B2	D1
L75	B2	D1
P60	B3	A2
P89	B1	F1
P97	B1	E1
P98	B1	E1
R52	A3	B2
R53	B3	B2
R57	A1	E2
R61	B3	A2
R67	B2	D2
R68	B1	E2
R76	B2	D2
R77	B1	E1
S22	A2	A2
S25	A2	D2
S28	A1	E2



FRONT & REAR PANEL 15

FRONT & REAR PANEL A1, A44, A58, A60


(Top)
19.000″
(48.26 cm)
FRONT VIEW
5.250″
(13.335 cm)
(Rear)
TOP VIEW
18.708″
(47.518 cm)
17.940″
(45.57 cm)
16.770″
(42.59 cm)
17.510″
(44.48 cm)
(Bottom)
REAR VIEW
(Front)
Latch
Center
Line
1.734″
(4.40 cm)
SIDE VIEW
2200-147

REPLACEABLE MECHANICAL PARTS

PARTS ORDERING INFORMATION

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

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

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

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

SPECIAL NOTES AND SYMBOLS

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

FIGURE AND INDEX NUMBERS

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

INDENTATION SYSTEM

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

1 2 3 4 5 — Name & Description

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

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

Attaching parts must be purchased separately, unless otherwise specified.

ITEM NAME

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

ABBREVIATIONS

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

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

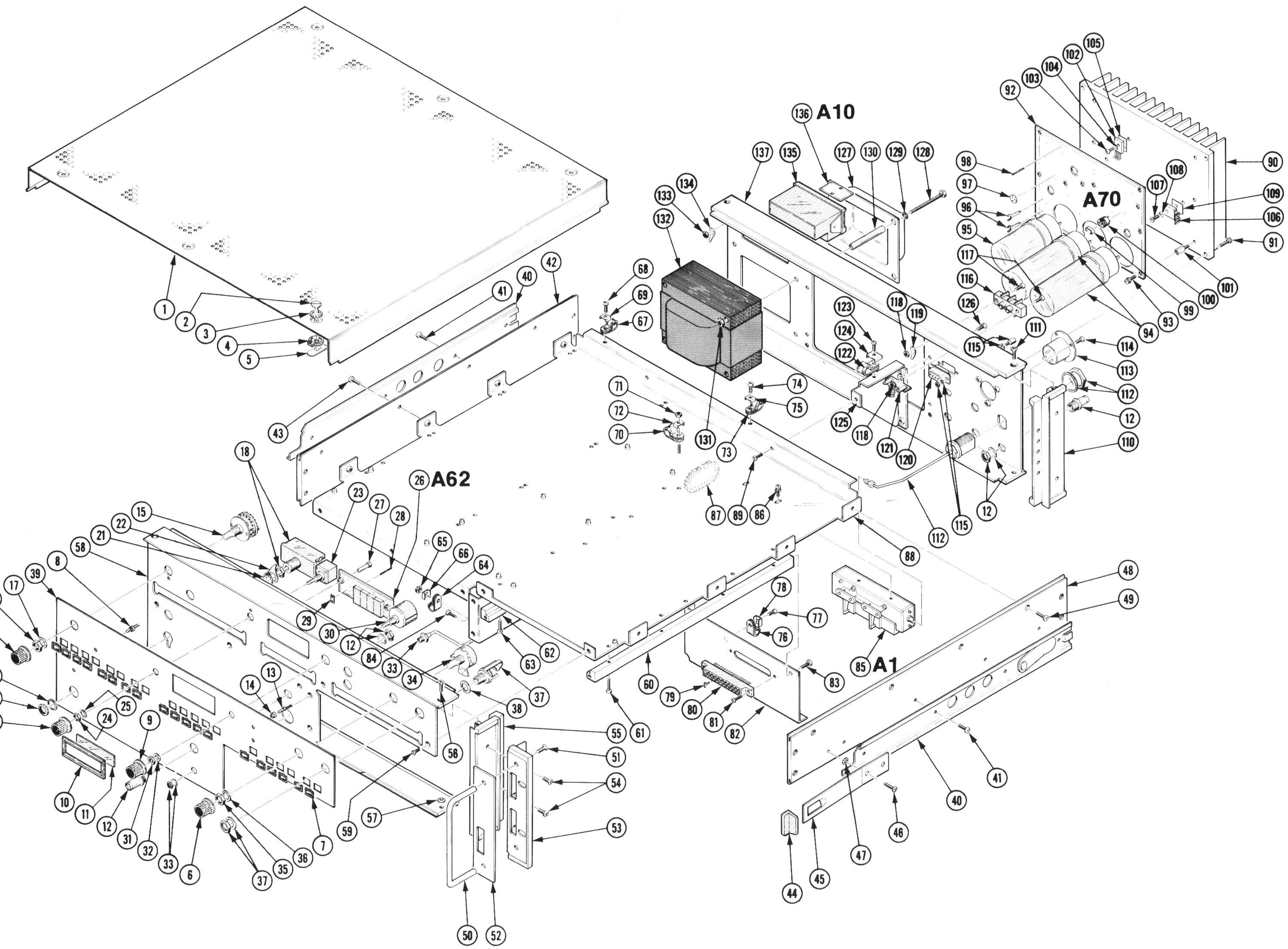
Mfr. Code	Manufacturer	Address	City, State, Zip
000AH	STANDARD PRESSED STEEL CO., UNBRAKO DIV.	8535 DICE ROAD	SANTA FE SPRINGS, CA 90670
000CB	PALM ABRASIVE AND TOOL COMPANY	825 SE BELMONT	PORTLAND, OR 97214
000CY	NORTHWEST FASTENER SALES, INC.	7923 SW CIRRUS DRIVE	BEAVERTON, OREGON 97005
00779	AMP, INC.	P O BOX 3608	HARRISBURG, PA 17105
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P O BOX 5012, 13500 N CENTRAL EXPRESSWAY	DALLAS, TX 75222
02777	HOPKINS ENGINEERING COMPANY	12900 FOOTHILL BLVD.	SAN FERNANDO, CA 91342
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD,PO BOX 20923	PHOENIX, AZ 85036
06666	GENERAL DEVICES CO., INC.	525 S. WEBSTER AVE.	INDIANAPOLIS, IN 46219
07707	USM CORP., USM FASTENER DIV.	510 RIVER RD.	SHELTON, CT 06484
08261	SPECTRA-STRIP CORP.	7100 LAMPSON AVE.	GARDEN GROVE, CA 92642
11897	PLASTIGLIDE MFG. CORPORATION	P O BOX 867, 1757 STANFORD ST.	SANTA MONICA, CA 90406
12089	BEAV MOTOR DIVISION UMC ELECTRONICS CO.	460 SACKETT POINT RD.	NORTH HAVEN, CT 06473
12300	POTTER AND BRUMFIELD, DIV. AMF CANADA LTD.	52 ROYAL ROAD, P O BOX 698	GUELPH, ONTARIO, CANADA
12327	FREEWAY CORPORATION	9301 ALLEN DRIVE	CLEVELAND, OH 44125
14566	COORS PORCELAIN COMPANY	600 9TH STREET	GOLDEN, CO 80401
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
24931	SPECIALITY CONNECTOR CO., INC.	2620 ENDRESS PLACE	GREENWOOD, IN 46142
26742	METHODE ELECTRONICS INC.	7447 W. WILSON AVE.	CHICAGO, ILL 60656
30817	INSTRUMENT SPECIALTIES COMPANY, INC.		LITTLE FALLS, NJ 07424
71400	BUSSMAN MFG., DIVISION OF MCGRAW-EDISON CO.	2536 W. UNIVERSITY ST.	ST. LOUIS, MO 63107
71468	ITT CANNON ELECTRIC	666 E. DYER RD.	SANTA ANA, CA 92702
71590	CENTRALAB ELECTRONICS, DIV. OF GLOBE-UNION, INC.	P O BOX 858	FORT DODGE, IA 50501
71785	TRW, CINCH CONNECTORS	1501 MORSE AVENUE	ELK GROVE VILLAGE, IL 60007
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
73803	TEXAS INSTRUMENTS, INC., METALLURGICAL MATERIALS DIV.	34 FOREST STREET	ATTLEBORO, MA 02703
75915	LITTELFUSE, INC.	800 E. NORTHWEST HWY	DES PLAINES, IL 60016
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120
78471	TILLEY MFG. CO.	900 INDUSTRIAL RD.	SAN CARLOS, CA 94070
79807	WROUGHT WASHER MFG. CO.	2100 S. O BAY ST.	MILWAUKEE, WI 53207
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
82389	SWITCHCRAFT, INC.	5555 N. ELSTON AVE.	CHICAGO, IL 60630
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153
86445	PENN FIBRE AND SPECIALTY CO., INC.	2032 E. WESTMORELAND ST.	PHILADELPHIA, PA 19134
86928	SEASTROM MFG. COMPANY, INC.	701 SONORA AVENUE	GLENDALE, CA 91201
91506	AUGAT, INC.	33 PERRY AVE.	ATTLEBORO, MA 02703
91836	KINGS ELECTRONICS CO., INC.	40 MARBLEDALE ROAD	TUCKAHOE, NY 10707
93907	CAMCAR SCREW AND MFG. CO.	600 18TH AVE.	ROCKFORD, IL 61101
95354	METHODE MANUFACTURING CORP.	1700 SO. HICKS RD.	ROLLING MEADOWS, IL 60008
95987	WECKESSER CO., INC.	4444 WEST IRVING PARK RD.	CHICAGO, IL 60641

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
1-1	390-0585-00			1	CABINET TOP:	80009	390-0585-00
	390-0586-00			1	CABINET BOTTOM:	80009	390-0586-00
	----- -----			-	. EACH CABINET INCLUDES:		
-2	214-0603-01			6	. PIN,SECURING:0.27 INCH LONG	80009	214-0603-01
-3	214-0604-00			6	. WASH.,SPG TNSN:0.26 ID X 0.47 INCH OD	80009	214-0604-00
-4	386-0227-04			6	. STOP,CLP,RIM CL:SIL GY DELRIN	80009	386-0227-04
-5	386-1151-00			6	. CLAMP,RIM CLENC:SPG STL CD PL	80009	386-1151-00
-6	366-1024-00			2	KNOB:GY,0.252 ID X0.706 OD X 0.6H	80009	366-1024-00
	----- -----			-	. EACH KNOB INCLUDES:		
	213-0153-00			2	. SETSCREW:5-40 X 0.125,STL BK OXD,HEX	000CY	OBD
-7	426-0681-00			19	FR,PUSH BUTTON:GRAY PLASTIC	80009	426-0681-00
-8	----- -----			1	LED:GREEN(SEE DS1 EPL)		
-9	366-0497-00			2	KNOB:GY,0.127 ID X0.706 OD	80009	366-0497-00
	----- -----			-	. EACH KNOB INCLUDES:		
	213-0153-00			1	. SETSCREW:5-40 X 0.125,STL BK OXD,HEX	000CY	OBD
-10	426-0916-00			1	FRAME,RDOUT WINDOW:	80009	426-0916-00
-11	331-0314-00			1	WINDOW,READOUT:RED	80009	331-0314-00
-12	131-1315-01			8	CONN,RCPT,ELEC:BNC,FEMALE	24931	28JR 306-1
-13	----- -----			3	LED:RED(SEE DS2,DS3,DS4 EPL)		
-14	352-0451-00			3	HOLDER,LENS:0.125 ID,PLASTIC	80009	352-0451-00
-15	----- -----			1	SWITCH,ROTARY:(SEE S1 EPL)		
					(ATTACHING PARTS)		
-16	210-0978-00			1	WASHER,FLAT:0.375 ID X 0.50 INCH OD,STL	78471	OBD
-17	210-0590-00			1	NUT,PLAIN,HEX.:0.375 X 0.438 INCH,STL	73743	2X28269-402
					- - - * - -		
-18	----- -----			1	SWITCH,TOGGLE:(SEE S2 EPL)		
					(ATTACHING PARTS)		
-19	210-0473-01			1	NUT,PLAIN,DODEC:0.469-32 X 0.638,BRASS	80009	210-0473-01
-20	210-0902-01			1	WASHER,FLAT:0.47 ID X 0.03 THK,STEEL	80009	210-0902-01
-21	354-0055-00			1	WASHER,KEY:0.469 ID X 0.688 INCH OD,STL	80009	354-0055-00
-22	210-0241-00			1	TERMINAL,LUG:0.515 ID X 0.625 INCH OD SE	80009	210-0241-00
					- - - * - - -		
-23	----- -----			1	RES.,VAR:100K OHM (SEE R1 EPL)		
					(ATTACHING PARTS)		
-24	210-0583-00			1	NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20317-402
-25	210-0940-00			1	WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
					- - - * - - -		
-26	----- -----			1	CKT BOARD ASSY:A.G.C. READOUT (SEE A62 EPL)		
					(ATTACHING PARTS)		
-27	220-0413-00			2	NUT,SLEEVE:4-40 X 0.562 INCH LONG	80009	220-0413-00
					- - - * - - -		
	----- -----			-	. CKT BOARD INCLUDES:		
-28	131-0589-00			27	. TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
-29	361-0411-00			2	. SPACER,PUSH SW:0.13 W X 0.375 INCH L,PLSTC	71590	J64285-00
	361-0884-00			2	. SPACER,SLEEVE:0.203 L X 0.14 ID,BRASS	80009	361-0884-00
-30	----- -----			1	RES.,VAR:10K OHM (SEE R2 EPL)		
					(ATTACHING PARTS)		
-31	210-0583-00			1	NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20317-402
-32	210-0940-00			1	WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
					- - - * - - -		
-33	175-2079-00			1	CABLE ASSY,RF:50 OHM COAX,16.0 L	80009	175-2079-00
-34	----- -----			1	RES.,VAR:10K OHM (SEE R3 EPL)		
					(ATTACHING PARTS)		
-35	210-0590-00			1	NUT,PLAIN,HEX.:0.375 X 0.438 INCH,STL	73743	2X28269-402
-36	210-0978-00			1	WASHER,FLAT:0.375 ID X 0.50 INCH OD,STL	78471	OBD
					- - - * - - -		
-37	131-0267-00			1	PLUG TELEPHONE:3 CONDUCTOR	82389	12B
-38	210-0012-00			1	WASHER,LOCK:INTL,0.375 ID X 0.50" OD STL	78189	1220-02-00-0541C
-39	333-2584-01			1	PANEL,FRONT:	80009	333-2584-01
-40	351-0104-03			1	SLIDE SECT,DWR:12.625 L,W/O HARDWARE	06666	C-720-2
					(ATTACHING PARTS)		
-41	212-0008-00			8	SCREW,MACHINE:8-32 X 0.500 INCH,PNH STL	83385	OBD
					- - - * - - -		
-42	426-1406-00			1	FRAME SECT,CAB.:LEFT	80009	426-1406-00
					(ATTACHING PARTS)		
-43	211-0507-00			4	SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
					- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
1-44	366-1729-00			2	KNOB:GRAY,LATCH	80009	366-1729-00
-45	214-2558-00			2	SPRING,FLAT:CHASSIS TRACK LOCK	80009	214-2558-00
					(ATTACHING PARTS)		
-46	212-0008-00			2	SCREW,MACHINE:8-32 X 0.500 INCH,PNH STL	83385	OBD
-47	210-1266-00			2	WASHER,FLAT:0.193 ID X 0.475 OD X 0.0075"	86928	5702-79-75
					- - - * - - -		
-48	426-1407-00			1	FRAME SECT,CAB.:RIGHT	80009	426-1407-00
					(ATTACHING PARTS)		
-49	211-0507-00			4	SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
					- - - * - - -		
-50	367-0104-00			2	HANDLE,BOW:5.5 INCHES LONG	80009	367-0104-00
					(ATTACHING PARTS)		
-51	212-0574-00			4	SCREW,MACHINE:10-32 X 0.438"100 DEG FLH STL	83385	OBD
					- - - * - - -		
-52	386-3723-00			2	PLATE,TRIM:FRONT	80009	386-3723-00
-53	407-0570-04			2	BRACKET,ANGLE:FRONT,RIGHT &LEFT,AL	80009	407-0570-04
					(ATTACHING PARTS)		
-54	212-0043-00			4	SCREW,MACHINE:8-32 X 0.500 INCH,FLH STL	83385	OBD
					- - - * - - -		
-55	426-0482-09			2	FRAME SECT,CAB.:UPRIGHT,REAR CORNER	80009	426-0482-09
					(ATTACHING PARTS)		
-56	212-0506-00			4	SCREW,MACHINE:10-32 X 0.375 INCH,FLH STL	83385	OBD
					- - - * - - -		
-57	210-0804-00			1	WASHER,FLAT:0.17 ID X 0.375 INCH OD,STL	12327	OBD
-58	386-3721-00			1	SUBPANEL,FRONT:	80009	386-3721-00
					(ATTACHING PARTS)		
-59	211-0025-00			7	SCREW,MACHINE:4-40 X 0.375 100 DEG,FLH STL	83385	OBD
					- - - * - - -		
-60	351-0534-00			1	SLIDE,GUIDE:PLUG-IN,RIGHT	80009	351-0534-00
					(ATTACHING PARTS)		
-61	211-0164-00			4	SCREW,CAP,SCH:4-40 X 0.625 INCH,L STL	83385	OBD
					- - - * - - -		
-62	351-0539-00			1	SLIDE,GUIDE:PLUG-IN,LEFT	80009	351-0539-00
					(ATTACHING PARTS)		
-63	211-0164-00			4	SCREW,CAP,SCH:4-40 X 0.625 INCH,L STL	83385	OBD
					- - - * - - -		
-64	343-0001-00			2	CLAMP,LOOP:0.15 INCH DIA,PLASTIC	95987	1-8-6B
					(ATTACHING PARTS)		
-65	210-0457-00			2	NUT,PL,ASSEM WA:6-32 X 0.312 INCH,STL	83385	OBD
-66	210-0863-00			2	WSHR,LOOP CLAMP:FOR 0.50" WIDE CLAMP,STL	95987	C191
					- - - * - - -		
-67	343-0013-00			2	CLAMP,LOOP:0.375 INCH DIA	95987	3-8-6B
					(ATTACHING PARTS)		
-68	211-0507-00			2	SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
-69	210-0863-00			2	WSHR,LOOP CLAMP:FOR 0.50" WIDE CLAMP,STL	95987	C191
					- - - * - - -		
-70	343-0005-00			2	CLAMP,LOOP:0.438 INCH	95987	7-16-6B
					(ATTACHING PARTS)		
-71	210-0457-00			2	NUT,PL,ASSEM WA:6-32 X 0.312 INCH,STL	83385	OBD
-72	210-0863-00			2	WSHR,LOOP CLAMP:FOR 0.50" WIDE CLAMP,STL	95987	C191
					- - - * - - -		
-73	343-0007-00			1	CLAMP,LOOP:	95987	5-8-6B
					(ATTACHING PARTS)		
-74	211-0507-00			1	SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
-75	210-0863-00			1	WSHR,LOOP CLAMP:FOR 0.50" WIDE CLAMP,STL	95987	C191
					- - - * - - -		
-76	343-0002-00			1	CLAMP,LOOP:0.188 INCH DIA	95987	3-16-6B
					(ATTACHING PARTS)		
-77	211-0507-00			1	SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
-78	210-0863-00			1	WSHR,LOOP CLAMP:FOR 0.50" WIDE CLAMP,STL	95987	C191
					- - - * - - -		
-79	214-2836-00			1	KEY,CONN PLZN:WHITE NYLON	26742	116-1056-00
-80	131-0934-00			1	CONN,RCPT,ELEC:	95354	80-6024-110000
					(ATTACHING PARTS)		
-81	211-0014-00			2	SCREW,MACHINE:4-40 X 0.50 INCH,PNH STL	83385	OBD
					- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
1-82	407-2015-00			1	BRACKET,CONN:D.C.,ALUMINUM	80009	407-2015-00
					(ATTACHING PARTS)		
-83	212-0004-00			2	SCREW,MACHINE:8-32 X 0.312 INCH,PNH STL	83385	OBD
-84	211-0008-00			2	SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
					- - - * - - -		
-85	----- -----			1	SWITCH,ATTENUATOR:(SEE A1 EPL)		
					(ATTACHING PARTS)		
-86	211-0116-00			2	SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
					- - - * - - -		
-87	255-0334-00			IN	PLASTIC CHANNEL:12.75 X 0.175X 0.155,NYL	11897	122-37-2500
-88	426-1408-00			1	FRAME SECT,CAB.:CENTER	80009	426-1408-00
					(ATTACHING PARTS)		
-89	211-0507-00			2	SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
					- - - * - - -		
-90	214-2540-02			1	HEAT SINK,ELEC:POWER SUPPLY,AL	80009	214-2540-02
					(ATTACHING PARTS)		
-91	211-0640-00			4	SCREW,CAP.:6-32 X 0.625,SCH,STL,BD OXD	000AH	OBD
					- - - * - - -		
-92	----- -----			1	CKT BOARD ASSY:POWER SUPPLY(SEE A70 EPL)		
					(ATTACHING PARTS)		
-93	211-0116-00			8	SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
					- - - * - - -		
	----- -----			-	. CKT BOARD ASSY INCLUDES:		
-94	----- -----			2	. CAP.,FXD,ELCTLT:(SEE A70C57,A70C87 EPL)		
-95	----- -----			1	. CAP.,FXD,ELCTLT:(SEE A70C37 EPL)		
-96	344-0286-00			2	. CLIP,ELECTRICAL:FOR 3AG FUSE,BRS	75915	102069
-97	214-0817-00			2	. HEAT SINK,XSTR:	14566	A11193-T05
-98	131-0589-00			40	. TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
-99	214-0973-00			1	. HEAT SINK,ELEC:0.28 X 0.18 OVAL X 0.187"H	80009	214-0973-00
-100	136-0235-00			3	. SOCKET,PLUG-IN:6,CONTACT,ROUND	71785	133-96-12-062
-101	129-0762-00			8	SPACER,POST:0.375 L,W/4-40 INT THD	80009	129-0762-00
-102	----- -----			2	TRANSISTOR:(SEE Q05,Q34 EPL)		
					(ATTACHING PARTS)		
-103	211-0008-00			2	SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-104	210-1122-00			2	WASHER,LOCK:0.228 ID X 0.375 INCH OD,STL	04713	B52200F006
					- - - * - - -		
-105	342-0163-00			2	INSULATOR,PLATE:XSTR,0.675 X 0.625 X 0.001"	80009	342-0163-00
-106	----- -----			1	TRANSISTOR:(SEE Q95 EPL)		
					(ATTACHING PARTS)		
-107	211-0008-00			1	SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-108	210-1122-00			1	WASHER,LOCK:0.228 ID X 0.375 INCH OD,STL	04713	B52200F006
					- - - * - - -		
-109	342-0163-00			1	INSULATOR,PLATE:XSTR,0.675 X 0.625 X 0.001"	80009	342-0163-00
-110	426-0482-09			2	FRAME SECT,CAB.:UPRIGHT,REAR CORNER	80009	426-0482-09
					(ATTACHING PARTS)		
-111	212-0043-00			4	SCREW,MACHINE:8-32 X 0.500 INCH,FLH STL	83385	OBD
					- - - * - - -		
-112	175-2078-00			1	CABLE ASSY,RF:50 OHM COAX,6.0 L	80009	175-2078-00
-113	131-0014-00			1	CONN,RCPT,ELEC:MALE,3 CONTACT	82389	C3M
					(ATTACHING PARTS)		
-114	211-0012-00			3	SCREW,MACHINE:4-40 X 0.375,PNH STL CD PL	83385	OBD
					- - - * - - -		
-115	131-0890-00			2	LOCK,CONNECTOR:4-40 X 0.312 L	71468	D 20418-2
-116	124-0342-00			1	TERMINAL BOARD:2 CONTACTS	12089	72202
					(ATTACHING PARTS)		
-117	211-0514-00			2	SCREW,MACHINE:6-32 X 0.750 INCH,PNH STL	83385	OBD
-118	210-0457-00			2	NUT,PL,ASSEM WA:6-32 X 0.312 INCH,STL	83385	OBD
-119	210-0202-00			1	TERMINAL,LUG:0.146 ID,LOCKING,BRZ TINNED	78189	2104-06-00-2520N
					- - - * - - -		
-120	131-1006-00			1	CONN,RCPT,ELEC:9 CONTACT,FEMALE	71468	DE 9S
-121	131-1023-00			1	CONN,RCPT,ELEC:CENTER,BRASS	80009	131-1023-00
-122	343-0013-00			2	CLAMP,LOOP:0.375 INCH DIA	95987	3-8-6B
					(ATTACHING PARTS)		
-123	211-0507-00			1	SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
-124	210-0863-00			1	WSHR,LOOP CLAMP:FOR 0.50" WIDE CLAMP,STL	95987	C191
					- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
1-125	407-2016-00			2	BRACKET,XFMR:GROUNDING,ALUMINUM	80009	407-2016-00
					(ATTACHING PARTS)		
-126	211-0507-00			2	SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
					- - - * - - -		
-127	200-0772-05			1	COVER,ELEC XFMR:	80009	200-0772-05
					(ATTACHING PARTS)		
-128	212-0515-00			4	SCREW,MACHINE:10-32 X 2.250" HEX.HD STL	83385	OBD
-129	210-0812-00			4	WASHER,NONMETAL:#10,FIBER	86445	OBD
-130	166-0457-00			4	INSUL SLVG,ELEC:0.19 ID X 1.875"LONG MYLAR	80009	166-0457-00
-131	220-0410-00			8	NUT,PL,ASSEM WA:10-32 X 0.375 HEX,STL CD PL	83385	OBD
					- - - * - - -		
-132	----- -----			1	TRANSFORMER:(SEE T10 EPL)		
-133	210-0407-00			2	NUT,PLAIN,HEX.:6-32 X 0.25 INCH,BRS	73743	3038-0228-402
-134	210-0202-00			2	TERMINAL,LUG:0.146 ID,LOCKING,BRZ TINNED	78189	2104-06-00-2520N
-135	119-0813-00			1	SELECTOR,VOLTS:W/LINE FLTR RCPT & FUSE	02777	F65003
-136	----- -----			1	. CIRCUIT BOARD:VOLTAGE SELECTION(SEE A10 EPL)		
-137	333-2317-00			1	PANEL,REAR:	80009	333-2317-00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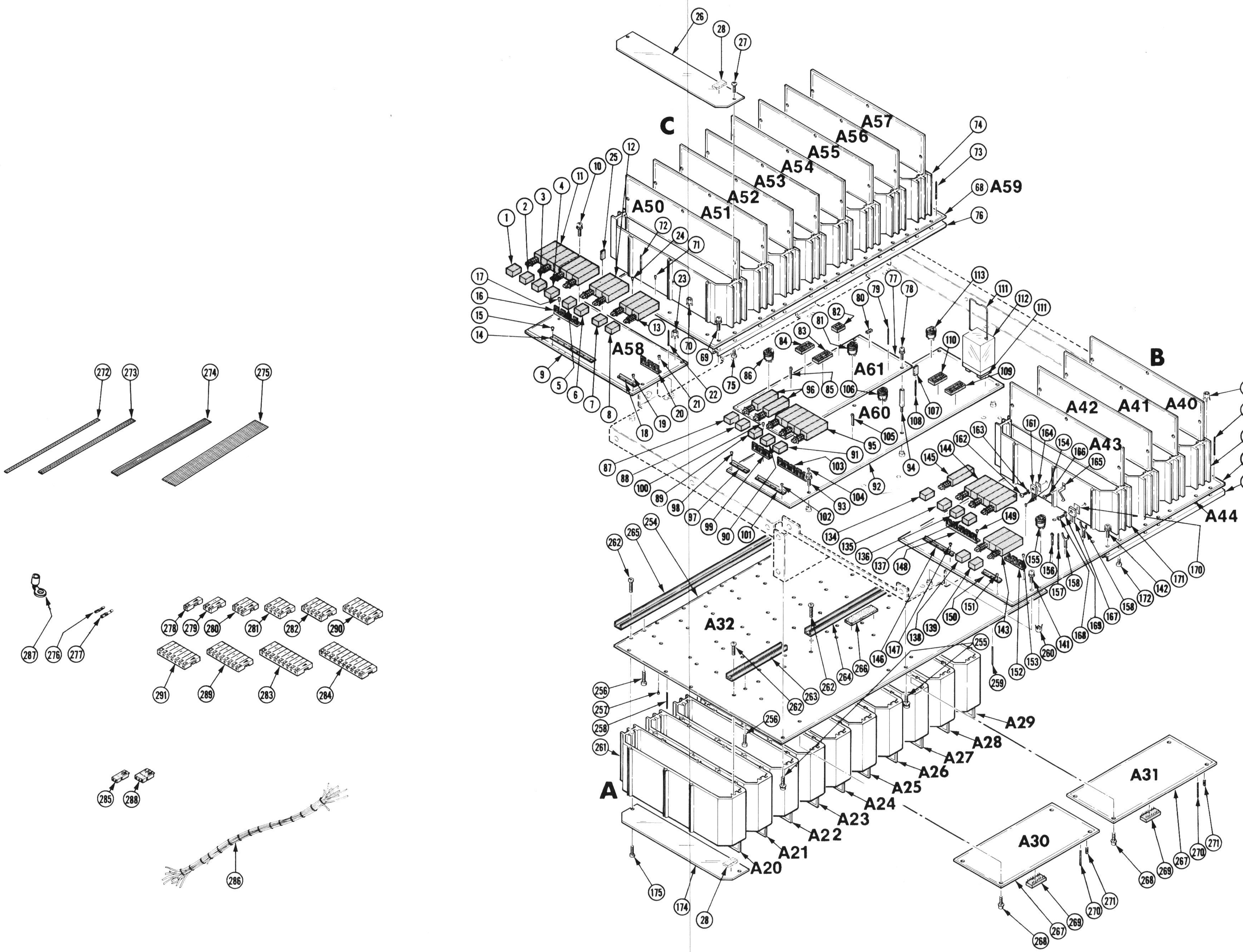
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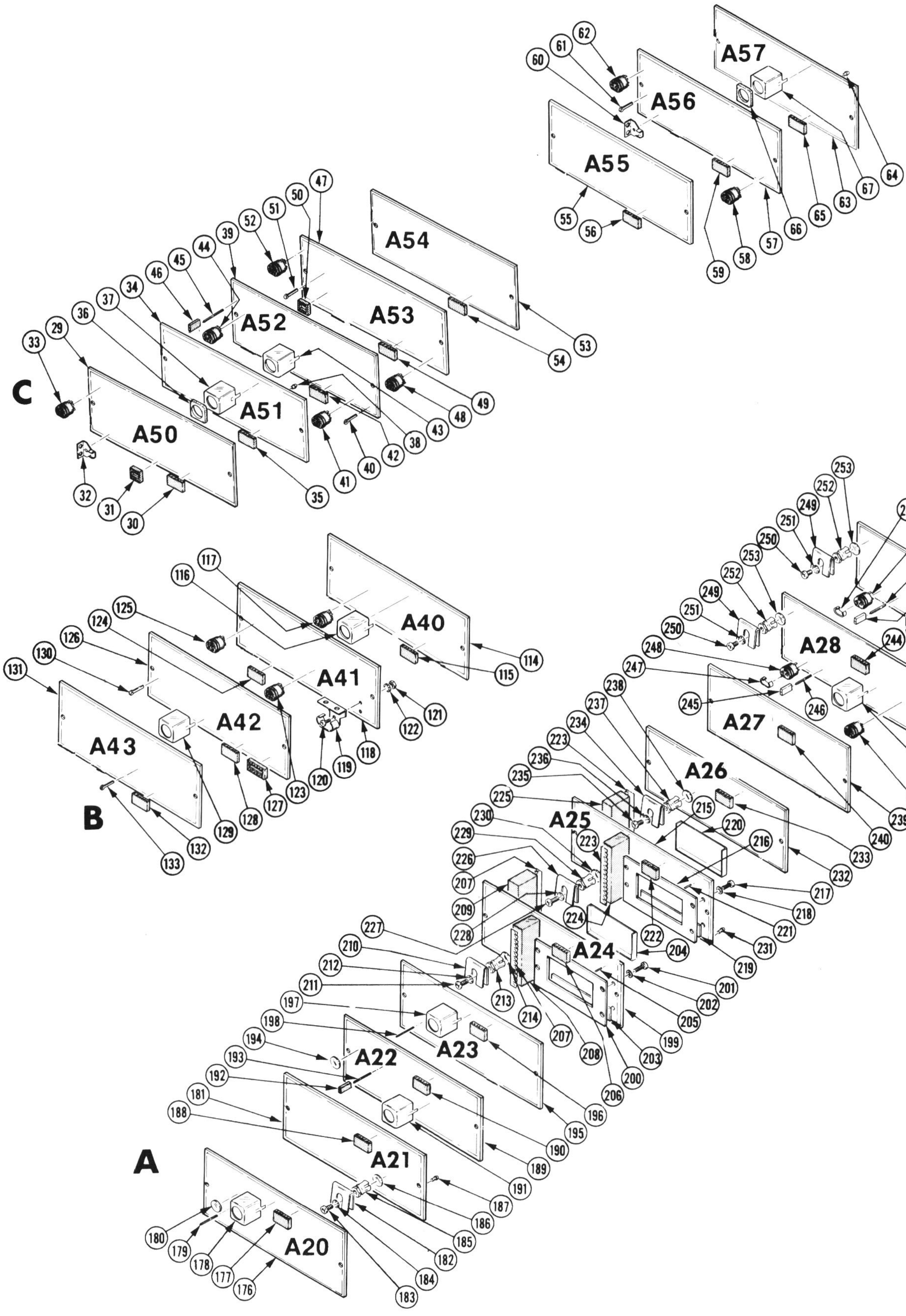
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Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
2-1	366-1557-71			1	PUSH BUTTON:ENV	80009	366-1557-71
-2	366-1557-72			1	PUSH BUTTON:BACK PORCH	80009	366-1557-72
-3	366-1557-01			1	PUSH BUTTON:SYNC TIP	80009	366-1557-01
-4	366-1557-75			1	PUSH BUTTON:CONT	80009	366-1557-75
-5	366-1557-69			1	PUSH BUTTON:OUT	80009	366-1557-69
-6	366-1557-70			1	PUSH BUTTON:IN	80009	366-1557-70
-7	366-1402-98			1	PUSH BUTTON:OFF	80009	366-1402-98
-8	366-1489-95			1	PUSH BUTTON:ON	80009	366-1489-95
-9	----- -----			1	CKT BOARD ASSY:PHASE LOCK SW(SEE A58 EPL)		
					(ATTACHING PARTS)		
-10	211-0116-00			4	SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBOARD
					- - - * - - -		
	----- -----			-	. CKT BOARD ASSY INCLUDES:		
-11	----- -----			1	. SWITCH PB ASSY:(SEE A58S22 EPL)		
-12	----- -----			1	. SWITCH PB ASSY:(SEE A58S25 EPL)		
-13	----- -----			1	. SWITCH PB ASSY:(SEE A58S28 EPL)		
-14	343-0495-07			1	. CLIP,SWITCH:FRONT,7.5MM,7 UNIT	80009	343-0495-07
					(ATTACHING PARTS)		
-15	210-3033-00			5	. EYELET,METALLIC:0.59 OD X 0.156 INCH LONG	07707	SE-25
					- - - * - - -		
-16	343-0499-04			1	. CLIP,SWITCH:REAR,7.5MM X 4 UNIT	80009	343-0499-04
					(ATTACHING PARTS)		
-17	210-3033-00			3	. EYELET,METALLIC:0.59 OD X 0.156 INCH LONG	07707	SE-25
					- - - * - - -		
-18	343-0495-03			2	. CLIP,SWITCH:FRONT,7.5 MM,3 UNIT	80009	343-0495-03
					(ATTACHING PARTS)		
-19	210-3033-00			4	. EYELET,METALLIC:0.59 OD X 0.156 INCH LONG	07707	SE-25
					- - - * - - -		
-20	343-0499-03			3	. CLIP,SWITCH:7.5 MM,4 UNIT	80009	343-0499-03
					(ATTACHING PARTS)		
-21	210-3033-00			6	. EYELET,METALLIC:0.59 OD X 0.156 INCH LONG	07707	SE-25
					- - - * - - -		
-22	131-0589-00			8	. TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
-23	131-1003-00			3	. CONN,RCPT,ELEC:CKT BOARD MT,3 PRONG	80009	131-1003-00
-24	136-0252-07			3	. SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-25	131-0993-00			1	. BUS,CONDUCTOR:2 WIRE BLACK	00779	530153-2
-26	200-2077-00			12	COVER,CKT BOARD:ALUMINUM	80009	200-2077-00
					(ATTACHING PARTS)		
-27	213-0774-00			24	SCREW,TPG,TF:M3-0.5 X 10 MM L,PNH,TAPTITE	93907	OBD
					- - - * - - -		
-28	348-0594-00			24	PAD,CUSHIONING:0.8 X 0.4,SILICONE RUBBER	80009	348-0594-00
-29	----- -----			1	CKT BOARD ASSY:REF CONTROL(SEE A50 EPL)		
-30	131-1771-00			2	. CONNECTOR,RCPT,:CIRCUIT BOARD,6 FEMALE	22526	65001-111
-31	136-0514-00			1	. SKT,PL-IN ELEC:MICROCIRCUIT,8 DIP	73803	CS9002-8
-32	136-0208-00			1	. SOCKET,PLUG-IN:CRYSTAL AUGAT	91506	8004-1G5
-33	136-0241-00			1	. SOCKET,PLUG-IN:10 CONTACT,ROUND	71785	133-99-12-064
-34	----- -----			1	CKT BOARD ASSY:REF OSCILLATOR(SEE A51 EPL)		
-35	131-1771-00			2	. CONNECTOR,RCPT,:CIRCUIT BOARD,6 FEMALE	22526	65001-111
-36	348-0562-00			2	. PAD,CUSHIONING:0.5 SQ,SILICONE RUBBER	80009	348-0562-00
-37	337-1417-00			2	. SHLD,ELECTRICAL:0.55 SQ X 0.685 INCH HIGH	80009	337-1417-00
-38	386-1635-00			1	. SUPPORT,CKT BD:CHASSIS MT,ACETAL	80009	386-1635-00
-39	----- -----			1	CKT BOARD ASSY:PHASE SHIFTER(SEE A52 EPL)		
-40	----- -----			1	. TERM.,TEST PT:BRS CD PL(SEE A52TP33 EPL)		
-41	136-0241-00			2	. SOCKET,PLUG-IN:10 CONTACT,ROUND	71785	133-99-12-064
-42	131-1771-00			2	. CONNECTOR,RCPT,:CIRCUIT BOARD,6 FEMALE	22526	65001-111
-43	337-1417-00			1	. SHLD,ELECTRICAL:0.55 SQ X 0.685 INCH HIGH	80009	337-1417-00
-44	136-0237-00			1	. SOCKET,PLUG-IN:8 CONTACT,ROUND	71785	133-98-12-062
-45	131-0589-00			3	. TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
-46	131-0993-00			1	. BUS,CONDUCTOR:2 WIRE BLACK	00779	530153-2
-47	----- -----			1	CKT BOARD ASSY:CONV PHASE LOCK(SEE A53 EPL)		
-48	136-0241-00			2	. SOCKET,PLUG-IN:10 CONTACT,ROUND	71785	133-99-12-064
-49	131-1771-00			2	. CONNECTOR,RCPT,:CIRCUIT BOARD,6 FEMALE	22526	65001-111
-50	136-0514-00			1	. SKT,PL-IN ELEC:MICROCIRCUIT,8 DIP	73803	CS9002-8
-51	----- -----			4	. TERM.,TEST PT:(SEE A53TP44,A53TP51,A53TP55,		
	----- -----			-	. A53TP62 EPL)		
-52	136-0237-00			2	. SOCKET,PLUG-IN:8 CONTACT,ROUND	71785	133-98-12-062

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
2-53	----- -----			1	CKT BOARD ASSY:DET/PHASE CONT(SEE A54 EPL)		
-54	131-1771-00			2	. CONNECTOR,RCPT,:CIRCUIT BOARD,6 FEMALE	22526	65001-111
-55	----- -----			1	CKT BOARD ASSY:LIMITER(SEE A55 EPL)		
-56	131-1771-00			2	. CONNECTOR,RCPT,:CIRCUIT BOARD,6 FEMALE	22526	65001-111
-57	----- -----			1	CKT BOARD ASSY:CONV CONTROL(SEE A56 EPL)		
-58	136-0241-00			1	. SOCKET,PLUG-IN:10 CONTACT,ROUND	71785	133-99-12-064
-59	131-1771-00			2	. CONNECTOR,RCPT,:CIRCUIT BOARD,6 FEMALE	22526	65001-111
-60	136-0208-00			1	. SOCKET,PLUG-IN:CRYSTAL AUGAT	91506	8004-1G5
-61	----- -----			1	. TERM.,TEST PT:BRS CD PL(SEE A56TP70 EPL)		
-62	136-0235-00			1	. SOCKET,PLUG-IN:6 CONTACT,ROUND	71785	133-96-12-062
-63	----- ----			1	CKT BOARD ASSY:CONVERTER OSC(SEE A57 EPL)		
-64	386-1635-00			1	. SUPPORT,CKT BD:CHASSIS MT,ACETAL	80009	386-1635-00
-65	131-1771-00			2	. CONNECTOR,RCPT,:CIRCUIT BARD,6 FEMALE	22526	65001-111
-66	348-0562-00			2	. PAD,CUSHIONING:0.5 SQ,SILICONE RUBBER	80009	348-0562-00
-67	337-1417-00			2	. SHLD,ELECTRICAL:0.55 SQ X 0.685 INCH HIGH	80009	337-1417-00
-68	----- -----			1	CKT BOARD ASSY:PH LOCK INTFC(SEE A59 EPL)		
					(ATTACHING PARTS)		
-69	211-0121-00			8	SCR,ASSEM WSHR:4-40 X 0.438 INCH,PNH BRS	83385	OBD
					- - - * - - -		
	----- -----			-	. CKT BOARD ASSY INCLUDES:		
-70	131-1003-00			7	. CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
-71	136-0252-07			7	. SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-72	131-0589-00			13	. TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
-73	131-0787-00			96	. CONTACT,ELEC:0.64 INCH LONG	22526	47359
-74	380-0503-02			11	HOUSING,CKT BD:5.775 L X 1.92 W,AL	80009	380-0503-02
					(ATTACHING PARTS)		
-75	213-0774-00			88	SCREW,TPG,TF:M3-0.5 X 10 MM L,PNH,TAPTITE	93907	OBD
					- - - * - - -		
-76	386-3726-00			2	STIF,CKT CD:7.35 L,AL	80009	386-3726-00
-77	----- -----			1	CKT BOARD ASSY:AGC RDOUT DRVR(SEE A61 EPL)		
					(ATTACHING PARTS)		
-78	211-0116-00			2	SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
					- - - * - - -		
	----- -----			-	. CKT BOARD ASSY INCLUDES:		
-79	131-0589-00			18	. TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
-80	136-0328-03			27	. SOCKET,PIN TERM:HORIZ,SQ PIN RCPT	22526	47710
-81	136-0237-00			1	. SOCKET,PLUG-IN:8 CONTACT,ROUND	71785	133-98-12-062
-82	136-0514-00			1	. SKT,PL-IN ELEC:MICROCIRCUIT,8 DIP	73803	CS9002-8
-83	136-0260-02			6	. SKT,PL-IN ELEK:MICROCIRCUIT,16 DIP,LOW CLE	71785	133-51-92-008
-84	136-0269-02			6	. SKT,PL-IN ELEK:MICROCIRCUIT,14 DIP,LOW CLE	73803	CS9002-14
-85	----- -----			1	. TERM,TEST POINT:BRS CD PL(SEE A61TP67 EPL)		
-86	136-0235-00			1	. SOCKET,PLUG-IN:6 CONTACT,ROUND	71785	133-96-12-062
-87	366-1557-77			1	PUSH BUTTON:10 DB	80009	366-1557-77
-88	366-1557-73			1	PUSH BUTTON:20 DB	80009	366-1557-73
-89	366-1557-72			1	PUSH BUTTON:BACK PORCH	80009	366-1557-72
-90	366-1557-01			1	PUSH BUTTON:SYNC TIP	80009	366-1557-01
-91	366-1557-68			1	PUSH BUTTON:MAN	80009	366-1557-68
-92	----- -----			1	CKT BOARD ASSY:A.G.C. LOGIC(SEE A60 EPL)		
					(ATTACHING PARTS)		
-93	211-0116-00			4	SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
-94	129-0456-00			2	SPACER,POST:0.75 L,W/4-40STUD,TAP,BRASS	80009	129-0456-00
					- - - * - - -		
	----- -----			-	. CKT BOARD ASSY INCLUDES:		
-95	----- -----			1	. SWITCH PB ASSY:(SEE A60S06 EPL)		
-96	----- -----			2	. SWITCH PB ASSY:(SEE A60S01,A60S03 EPL)		
-97	343-0495-03			1	. CLIP,SWITCH:FRONT,7.5 MM,3 UNIT	80009	343-0495-03
					(ATTACHING PARTS)		
-98	210-3033-00			2	. EYELET,METALLIC:0.59 OD X 0.156 INCH LONG	07707	SE-25
					- - - * - - -		
-99	343-0499-03			1	. CLIP,SWITCH:7.5 MM,4 UNIT	80009	343-0499-03
					(ATTACHING PARTS)		
-100	210-3033-00			2	. EYELET,METALLIC:0.59 OD X 0.156 INCH LONG	07707	SE-25
					- - - * - - -		
-101	343-0495-05			1	. CLIP,SWITCH:FRONT,7.5MM X5 UNIT	80009	343-0495-05
					(ATTACHING PARTS)		
-102	210-3033-00			3	. EYELET,METALLIC:0.59 OD X 0.156 INCH LONG	07707	SE-25
					- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
2-103	343-0499-05			1	. CLIP,SWITCH:REAR,7.5MM X 5 UNIT	80009	343-0499-05
					(ATTACHING PARTS)		
-104	210-3033-00			3	. EYELET,METALLIC:0.59 OD X 0.156 INCH LONG	07707	SE-25
					- - - * - - -		
-105	----- -----			4	. TERM.,TEST PT:(SEE A60TP25,A60TP27,A60TP32,		
	----- -----			-	. A60TP45 EPL)		
-106	136-0237-00			1	. SOCKET,PLUG-IN:8 CONTACT,ROUND	71785	133-98-12-062
-107	131-0993-00			1	. BUS,CONDUCTOR:2 WIRE BLACK	00779	530153-2
-108	131-0589-00			97	. TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
-109	136-0260-02			2	. SKT,PL-IN ELEK:MICROCIRCUIT,16 DIP,LOW CLE	71785	133-51-92-008
-110	136-0269-02			1	. SKT,PL-IN ELEK:MICROCIRCUIT,14 DIP,LOW CLE	73803	CS9002-14
-111	136-0394-00			1	. SOCKET,PLUG-IN:10 PIN,CKT CD MTG	12300	27E128W/20C249
-112	----- -----			1	. RELAY ARMATURE:(SEE A60K97 EPL)		
-113	136-0241-00			1	. SOCKET,PLUG-IN:10 CONTACT,ROUND	71785	133-99-12-064
-114	----- -----			1	CKT BOARD ASSY:1ST AUD MIXER(SEE A40 EPL)		
-115	131-1771-00			2	. CONNECTOR,RCPT,:CIRCUIT BOARD,6 FEMALE	22526	65001-111
-116	337-1417-00			3	. SHLD,ELECTRICAL:0.55 SQ X 0.685 INCH HIGH	80009	337-1417-00
-117	136-0241-00			1	. SOCKET,PLUG-IN:10 CONTACT,ROUND	71785	133-99-12-064
-118	----- -----			1	CKT BOARD ASSY:2ND AUD MIXER(SEE A41 EPL)		
-119	136-0153-00			1	. SOCKET,PLUG-IN:2 PIN	91506	8000AG6
					(ATTACHING PARTS)		
-120	211-0022-00			2	. SCREW,MACHINE:2-56 X 0.188 INCH,PNH STL	83385	OBD
-121	210-0405:00			2	. NUT,PLAIN,HEX.:2-56 X 0.188 INCH,BRS	73743	2X12157-402
-122	210-0001-00			2	. WASHER,LOCK:INTL,0.092 ID X 0.18"OD,STL	78189	1202-00-00-0541C
					- - - * - - -		
-123	136-0241-00			1	. SOCKET,PLUG-IN:10 CONTACT,ROUND	71785	133-99-12-064
-124	131-1771-00			2	. CONNECTOR,RCPT,:CIRCUIT BOARD,6 FEMALE	22526	65001-111
-125	136-0237-00			1	. SOCKET,PLUG-IN:8 CONTACT,ROUND	71785	133-98-12-062
-126	----- -----			1	CKT BOARD ASSY:AUD LIMITER(SEE A42 EPL)		
-127	136-0269-02			1	. SKT,PL-IN ELEK:MICROCIRCUIT,14 DIP,LOW CLE	73803	CS9002-14
-128	131-1771-00			2	. CONNECTOR,RCPT,:CIRCUIT BOARD,6 FEMALE	22526	65001-111
-129	337-1417-00			4	. SHLD,ELECTRICAL:0.55 SQ X 0.685 INCH HIGH	80009	337-1417-00
-130	----- -----			1	. TERM.,TEST PT:(SEE A42TP22 EPL)		
-131	----- -----			1	CKT BOARD ASSY:AUD DSCRM(SEE A43 EPL)		
-132	131-1771-00			2	. CONNECTOR,RCPT,:CIRCUIT BOARD,6 FEMALE	22526	65001-111
-133	----- -----			1	. TERM.,TEST PT:(SEE A43TP12 EPL)		
-134	366-1480-00			1	PUSH BUTTON:0.328 X 0.253 X 0.43	80009	366-1480-00
-135	366-1557-76			1	PUSH BUTTON:SPLIT	80009	366-1557-76
-136	366-1557-74			1	PUSH BUTTON:INTR	80009	366-1557-74
-137	366-1489-43			1	PUSH BUTTON:EXT	80009	366-1489-43
-138	366-1557-69			1	PUSH BUTTON:OUT	80009	366-1557-69
-139	366-1557-70			1	PUSH BUTTON:IN	80009	366-1557-70
-140	----- -----			1	CKT BOARD ASSY:AUDIO INTFC(SEE A44 EPL)		
					(ATTACHING PARTS)		
-141	211-0116-00			2	SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
-142	211-0121-00			6	SCR,ASSEM WSHR:4-40 X 0.438 INCH,PNH BRS	83385	OBD
					- - - * - - -		
	----- -----			-	. CKT BOARD ASSY INCLUDES:		
-143	----- -----			1	. SWITCH PB ASSY:(SEE A44SW07 EPL)		
-144	----- -----			1	. SWITCH PB ASSY:(SEE A44SW04 EPL)		
-145	----- -----			1	. SWITCH PB ASSY:(SEE A44SW01 EPL)		
-146	343-0495-05			1	. CLIP,SWITCH:FRONT,7.5MM X5 UNIT	80009	343-0495-05
					(ATTACHING PARTS)		
-147	210-3033-00			3	. EYELET,METALLIC:0.59 OD X 0.156 INCH LONG	07707	SE-25
					- - - * - - -		
-148	343-0499-05			1	. CLIP,SWITCH:REAR,7.5MM X 5 UNIT	80009	343-0499-05
					(ATTACHING PARTS)		
-149	210-3033-00			3	. EYELET,METALLIC:0.59 OD X 0.156 INCH LONG	07707	SE-25
					- - - * - - -		
-150	343-0495-03			2	. CLIP,SWITCH:FRONT,7.5 MM,3 UNIT	80009	343-0495-03
					(ATTACHING PARTS)		
-151	210-3033-00			4	. EYELET,METALLIC:0.59 OD X 0.156 INCH LONG	07707	SE-25
					- - - * - - -		
-152	343-0499-03			2	. CLIP,SWITCH:7.5 MM,4 UNIT	80009	343-0499-03
					(ATTACHING PARTS)		
-153	210-3033-00			4	. EYELET,METALLIC:0.59 OD X 0.156 INCH LONG	07707	SE-25
					- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
2-154	136-0252-04			4	. SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
-155	136-0235-00			2	. SOCKET,PLUG-IN:6 CONTACT,ROUND	71785	133-96-12-062
-156	----- -----			2	. TERM.,TEST PT:(SE A44TP07,A44TP29 EPL)		
-157	131-0589-00			25	. TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
-158	344-0286-00			4	. CLIP,ELECTRICAL:FOR 3AG FUSE,BRS	75915	102069
-159	131-0787-00			48	. CONTACT,ELEC:0.64 INCH LONG	22526	47359
-160	131-1003-00			4	. CONN,RCPT,ELEC:CKT BD MT,3 PRONG	80009	131-1003-00
-161	----- -----			2	TRANSISTOR:(SEE Q52,Q55 EPL)		
					(ATTACHING PARTS)		
-162	211-0008-00			2	SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-163	210-1122-00			2	WASHER,LOCK:0.228 ID X 0.375 INCH OD,STL	04713	B52200F006
					- - - * - - -		
-164	342-0224-00			4	INSULATOR,PLATE:TRANSISTOR	80009	342-0224-00
-165	343-0783-00			2	CLAMP,XSTR:COPPER BERYLLIUM	80009	343-0783-00
					(ATTACHING PARTS)		
-166	211-0007-00			2	SCREW,MACHINE:4-40 X 0.188 INCH,PNH STL	83385	OBD
					- - - * - - -		
-167	----- -----			2	TRANSISTOR:(SEE Q54,Q57 EPL)		
					(ATTACHING PARTS)		
-168	211-0008-00			2	SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-169	210-1122-00			2	WASHER,LOCK:0.228 ID X 0.375 INCH OD,STL	04713	B52200F006
					- - - * - - -		
-170	342-0224-00			4	INSULATOR,PLATE:TRANSISTOR	80009	342-0224-00
-171	380-0503-03			1	HOUSING,CKT BOARD:W/HOLES,ALUMINUM	80009	380-0503-03
					(ATTACHING PARTS)		
-172	213-0774-00			8	SCREW,TPG,TF:M3-0.5 X 10 MM L,PNH,TAPTITE	93907	OBD
					- - - * - - -		
-173	386-3724-00			2	STIF,CKT BOARD:5.6 L,AL	80009	386-3724-00
-174	200-2077-00			10	COVER,CKT BOARD:ALUMINUM	80009	200-2077-00
					(ATTACHING PARTS)		
-175	213-0774-00			20	SCREW,TPG,TF:M3-0.5 X 10 MM L,PNH,TAPTITE	93907	OBD
					- - - * - - -		
-176	----- -----			1	CKT BOARD ASSY:I.F. FLTR/AMP(SEE A20 EPL)		
-177	131-1771-00			2	. CONNECTOR,RCPT,:CIRCUIT BOARD,6 FEMALE	22526	65001-111
-178	337-1417-00			2	. SHLD,ELECTRICAL:0.55 SQ X 0.685 INCH HIGH	80009	337-1417-00
-179	131-0608-00			7	. TERMINAL,PIN:0.365 L X 0.25 PH,BRZ,GOLD PL	22526	47357
-180	214-0817-00			4	. HEAT SINK,XSTR:	14566	A11193-T05
-181	----- -----			1	CKT BOARD ASSY:I.F. ATTEN/AMPL(SEE A21 EPL)		
	----- -----			-	(REPLACEABLE AS A UNIT WITH A80)		
-182	214-2746-00			1	. HEAT SINK,XSTR:(1)TO-39,ALUMINUM	80009	214-2746-00
					(ATTACHING PARTS)		
-183	211-0005-00			1	. SCREW,MACHINE:4-40 X 0.125 INCH,PNH STL	83385	OBD
-184	210-0004-00			1	. WASHER,LOCK:#4 INTL,0.015THK,STL CD PL	78189	1204-00-00-0541C
-185	214-2569-00			1	. HEAT SINK,XSTR:(1) TO-5,BE-CU	80009	214-2569-00
					- - - * - - -		
-186	214-0817-00			1	. HEAT SINK,XSTR:	14566	A11193-T05
-187	386-1635-00			1	. SUPPORT,CKT BOARD:CHASSIS MT,ACETAL	80009	386-1635-00
-188	131-1771-00			2	. CONNECTOR,RCPT,:CIRCUIT BOARD,6 FEMALE	22526	65001-111
-189	----- -----			1	CKT BOARD ASSY:I.F. MIXER(SEE A22 EPL)		
	----- -----			-	(REPLACEABLE AS A UNIT WITH A82)		
-190	131-1771-00			2	. CONNECTOR,RCPT,:CIRCUIT BOARD,6 FEMALE	22526	65001-111
-191	337-1417-00			2	. SHLD,ELECTRICAL:0.55 SQ X 0.685 INCH HIGH	80009	337-1417-00
-192	131-0993-00			1	. BUS,CONDUCTOR:2 WIRE BLACK	00779	530153-2
-193	131-0608-00			7	. TERMINAL,PIN:0.365 L X 0.25 PH,BRZ,GOLD PL	22526	47357
-194	214-0817-00			4	. HEAT SINK,XSTR:	14566	A11193-T05
	337-2535-00			IN	. SHIELD BSK,ELEK:BERYLLIUM COPPER	30817	97-555 CD-X
	337-2459-00			1	. SHIELD,ELEC:CKT BOARD	80009	337-2459-00
	337-2601-00			1	. SHIELD,ELEC:CKT BOARD	80009	337-2601-00
-195	----- -----			1	CKT BOARD ASSY:I.F. AURAL SWITCH(SEE A23 EPL)		
-196	131-1771-00			2	. CONNECTOR,RCPT,:CIRCUIT BOARD,6 FEMALE	22526	65001-111
-197	337-1417-00			4	. SHLD,ELECTRICAL:0.55 SQ X 0.685 INCH HIGH	80009	337-1417-00
-198	131-0589-00			8	. TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
-199	----- -----			1	CKT BOARD ASSY:I.F.S.W.F. PREAMP(SEE A24 EPL)		
-200	343-0730-00			1	. CLAMP,FILTER:ALUMINUM	80009	343-0730-00
					(ATTACHING PARTS)		
-201	211-0034-00			4	. SCREW,MACHINE:2-56 X 0.50 INCH,PNH	83385	OBD
-202	210-0001-00			4	. WASHER,LOCK:INTL,0.092 ID X 0.18"OD,STL	78189	1202-00-00-0541C
					- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
2-203	337-2540-00			2	. SHLD GSKT,ELEK:2.25 X 0.375 X0.062	80009	337-2540-00
-204	337-2458-00			1	. SHIELD,ELEC:CIRCUIT BOARD	80009	337-2458-00
-205	136-0333-00			10	. SOCKET,PIN TERM:0.138 INCH LONG	00779	1-331677-4
-206	131-1771-00			2	. CONNECTOR,RCPT,:CIRCUIT BOARD,6 FEMALE	22526	65001-111
-207	337-2535-00			IN	. SHLD,GSKT,ELEK:BERYLLIUM COPPER	30817	97-555 CD-X
-208	337-2459-00			1	. SHIELD,ELEC:CIRCUIT BOARD	80009	337-2459-00
-209	337-2578-00			1	. SHIELD,ELEC:CIRCUIT BOARD	80009	337-2578-00
-210	214-2746-00			1	. HEAT SINK,XSTR:(1)TO-39,ALUMINUM	80009	214-2746-00
					(ATTACHING PARTS)		
-211	211-0005-00			1	. SCREW,MACHINE:4-40 X 0.125 INCH,PNH STL	83385	OBD
-212	210-0004-00			1	. WASHER,LOCK:#4 INTL,0.015THK,STL CD PL	78189	1204-00-00-0541C
-213	214-2569-00			1	. HEAT SINK,XSTR:(1) TO-5,BE-CU	80009	214-2569-00
					- - - * - - -		
-214	214-0817-00			1	. HEAT SINK,XSTR:	14566	A11193-T05
	343-0730-00			1	. CLAMP,FILTER:ALUMINUM	80009	343-0730-00
	386-1635-00			1	. SUPPORT,CKT BOARD:CHASSIS MT,ACETAL	80009	386-1635-00
-215	----- -----			1	CKT BOARD ASSY:I.F.S.W.F. PREAMP(SEE A25 EPL)		
-216	343-0730-00			1	. CLAMP,FILTER:ALUMINUM	80009	343-0730-00
					(ATTACHING PARTS)		
-217	211-0034-00			4	. SCREW,MACHINE:2-56 X 0.50 INCH,PNH	83385	OBD
-218	210-0001-00			4	. WASHER,LOCK:INTL,0.092 ID X 0.18"OD,STL	78189	1202-00-00-0541C
					- - - * - - -		
-219	337-2540-00			2	. SHLD GSKT,ELEK:2.25 X 0.375 X0.062	80009	337-2540-00
-220	337-2458-00			1	. SHIELD,ELEC:CIRCUIT BOARD	80009	337-2458-00
-221	136-0333-00			10	. SOCKET,PIN TERM:0.138 INCH LONG	00779	1-331677-4
-222	131-1771-00			2	. CONNECTOR,RCPT,:CIRCUIT BOARD,6 FEMALE	22526	65001-111
-223	337-2535-00			IN	. SHLD BSK,ELEK:BERYLLIUM COPPER	30817	97-555 CD-X
-224	337-2459-00			1	. SHIELD,ELEC:CIRCUIT BOARD	80009	337-2459-00
-225	337-2578-00			1	. SHIELD,ELEC:CIRCUIT BOARD	80009	337-2578-00
-226	214-2746-00			1	. HEAT SINK,XSTR:(1)TO-39,ALUMINUM	80009	214-2746-00
					(ATTACHING PARTS)		
-227	211-0005-00			1	. SCREW,MACHINE:4-40 X 0.125 INCH,PNH STL	83385	OBD
-228	210-0004-00			1	. WASHER,LOCK:#4 INTL,0.015THK,STL CD PL	78189	1204-00-00-0541C
-229	214-2569-00			1	. HEAT SINK,XSTR:(1) TO-5,BE-CU	80009	214-2569-00
					- - - * - - -		
-230	214-0817-00			1	. HEAT SINK,XSTR:	14566	A11193-T05
-231	386-1635-00			1	. SUPPORT,CKT BOARD:CHASSIS MT,ACETAL	80009	386-1635-00
-232	----- -----			1	CKT BOARD ASSY:I.F.S.W.F. POSTAMP(SEE A26 EPL)		
-233	131-1771-00			2	. CONNECTOR,RCPT,:CIRCUIT BOARD,6 FEMALE	22526	65001-111
-234	214-2746-00			1	. HEAT SINK,XSTR:(1)TO-39,ALUMINUM	80009	214-2746-00
					(ATTACHING PARTS)		
-235	211-0005-00			1	. SCREW,MACHINE:4-40 X 0.125 INCH,PNH STL	83385	OBOARD
-236	210-0004-00			1	. WASHER,LOCK:#4 INTL,0.015THK,STL CD PL	78189	1204-00-00-0541C
-237	214-2569-00			1	. HEAT SINK,XSTR:(1) TO-5,BE-CU	80009	214-2569-00
					- - - * - - -		
-238	214-0817-00			1	. HEAT SINK,XSTR:	14566	A11193-T05
-239	----- -----			1	CKT BOARD ASSY:I.F. ZERO CARRIER(SEE A27 EPL)		
-240	131-1771-00			2	. CONNECTOR,RCPT,:CIRCUIT BOARD,6 FEMALE	22526	65001-111
-241	----- -----			2	CKT BD ASSY:DET-VIDEO AMP(SEE A28,A29 EPL)		
	----- -----			-	. EACH CIRCUIT BOARD ASSY INCLUDES:		
-242	136-0241-00			1	. SOCKET,PLUG-IN:10 CONTACT,ROUND	71785	133-99-12-064
-243	337-1417-00			3	. SHLD,ELECTRICAL:0.55 SQ X 0.685 INCH HIGH	80009	337-1417-00
-244	131-1771-00			2	. CONNECTOR,RCPT,:CIRCUIT BOARD,6 FEMALE	22526	65001-111
-245	131-0993-00			1	. BUS,CONDUCTOR:2 WIRE BLACK	00779	530153-2
-246	131-0589-00			3	. TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
-247	214-0973-00			3	. HEAT SINK,ELEC:0.28 X 0.18 OVAL X 0.187"H	80009	214-0973-00
-248	136-0235-00			3	. SOCKET,PLUG-IN:6 CONTACT,ROUND	71785	133-96-12-062
-249	214-2746-00			1	. HEAT SINK,XSTR:(1)TO-39,ALUMINUM	80009	214-2746-00
					(ATTACHING PARTS)		
-250	211-0005-00			1	. SCREW,MACHINE:4-40 X 0.125 INCH,PNH STL	83385	OBD
-251	210-0004-00			1	. WASHER,LOCK:#4 INTL,0.015THK,STL CD PL	78189	1204-00-00-0541C
-252	214-2569-00			1	. HEAT SINK,XSTR:(1) TO-5,BE-CU	80009	214-2569-00
					- - - * - - -		
-253	214-0817-00			1	. HEAT SINK,XSTR:	14566	A11193-T05
-254	----- -----			1	CKT BOARD ASSY:I.F. INTERFACE(SEE A32 EPL)		
					(ATTACHING PARTS)		
-255	211-0116-00			4	SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
-256	211-0121-00			8	SCR,ASSEM WSHR:4-40 X 0.438 INCH,PNH BRS	83385	OBD
					- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
2-	----- -----			-	. CKT BOARD ASSY INCLUDES:		
-257	136-0252-07			15	. SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-258	131-0589-00			14	. TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
-259	131-0787-00			123	. CONTACT,ELEC:0.64 INCH LONG	22526	47359
-260	131-1003-00			12	. CONN,RCPT,ELEC:CKT BOARD MT,3 PRONG	80009	131-1003-00
	129-0461-00			8	. POST,PRESSMOUNT:0.1632,W/4-40THRU,0.219 OD	80009	129-0461-00
-261	380-0502-00			10	HOUSING,CKT BD:5.775 L X 2.13 W,AL	80009	380-0502-00
					(ATTACHING PARTS)		
-262	213-0774-00			80	SCREW,TPG,TF:M3-0.5 X 10 MM L,PNH,TAPTITE	93907	OBD
					- - - * - - -		
-263	386-3803-00			1	STIF,CKT CD:2.95 L,ALUMINUM	80009	386-3803-00
-264	386-3804-00			1	STIF,CKT BD:9.1 L,ALUMINUM	80009	386-3804-00
-265	386-3725-00			1	STIF,CKT CD:12.65 L,AL	80009	386-2725-00
-266	342-0202-00			3	INSULATOR,PLATE:TRANSISTOR	01295	10-21-023-106
-267	----- -----			2	CKT BOARD ASSY:PIN DRIVER(SEE A30,A31 EPL)		
					(ATTACHING PARTS)		
-268	211-0116-00			8	SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
					- - - * - - -		
	----- -----			-	. EACH CKT BOARD ASSY INCLUDES:		
-269	136-0260-02			3	. SKT,PL-IN ELEK:MICROCIRCUIT,16 DIP,LOW CLE	71785	133-51-92-008
-270	131-0589-00			5	. TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
-271	136-0263-04			10	. SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
	198-3693-00			1	WIRE SET,ELEC:	80009	198-3693-00
-272	175-0825-00			FT	. WIRE,ELECTRICAL:2 WIRE RIBBON	80009	175-0825-00
-273	175-0826-00			FT	. WIRE,ELECTRICAL:3 WIRE RIBBON	80009	175-0826-00
-274	175-0828-00			FT	. WIRE,ELECTRICAL:5 WIRE RIBBON	08261	OBD
-275	175-0832-00			FT	. WIRE,ELECTRICAL:9 WIRE RIBBON	08261	SS-0926(1061)0C
-276	131-0707-00			6	. CONNECTOR,TERM.:22-26 AWG,BRS& CU BE GOLD	22526	47439
-277	131-0621-00			56	. CONNECTOR,TERM:22-26 AWG,BRS& CU BE GOLD	22526	46231
-278	352-0197-00			1	. CONN BODY,PL,EL:1 WIRE BLACK	80009	352-0197-00
-279	352-0198-00			5	. HLDR,TERM CONN:2 WIRE BLACK	80009	352-0198-00
-280	352-0199-00			5	. CONN BODY,PL,EL:3 WIRE BLACK	80009	352-0199-00
-281	352-0200-00			2	. HLDR,TERM CONN:4 WIRE BLACK	80009	352-0200-00
-282	352-0201-00			1	. CONN BODY,PL,EL:5 WIRE BLACK	80009	352-0201-00
-283	352-0205-00			2	. CONN BODY,PL,EL:9 WIRE BLACK	80009	352-0205-00
-284	352-0206-00			1	. HLDR,TERM CONN:10 WIRE BLACK	80009	352-0206-00
-285	352-0169-00			3	. HLDR,TERM CONN:2 WIRE BLACK	80009	352-0169-00
-286	179-2570-00			1	WIRING HARNESS,:MAIN	80009	179-2570-00
	131-0621-00			111	. CONNECTOR,TERM:22-26 AWG,BRS& CU BE GOLD	22526	46231
	131-0622-00			8	. CONTACT,ELEC:0.577"L,28-32 AWG WIRE	22526	46241
	131-0707-00			10	. CONNECTOR,TERM.:22-26 AWG,BRS& CU BE GOLD	22526	47439
	131-0792-00			8	. CONNECTOR,TERM:18-20 AWG,CU BE GOLD PL	22526	46221
-287	210-0287-00			4	. TERMINAL,LUG:# 6 RING	00779	34142
-288	352-0161-00			2	. HLDR,TERM CONN:3 WIRE BLACK	80009	352-0161-00
-289	352-0166-00			1	. CONN BODY,PL,EL:8 WIRE BLACK	80009	352-0166-00
	352-0169-00			1	. HLDR,TERM CONN:2 WIRE BLACK	80009	352-0169-00
	352-0198-00			5	. HLDR,TERM CONN:2 WIRE BLACK	80009	352-0198-00
	352-0199-00			2	. CONN BODY,PL,EL:3 WIRE BLACK	80009	352-0199-00
	352-0200-00			3	. HLDR,TERM CONN:4 WIRE BLACK	80009	352-0200-00
	352-0201-00			9	. CONN BODY,PL,EL:5 WIRE BLACK	80009	352-0201-00
-290	352-0202-00			1	. HLDR,TERM CONN:6 WIRE BLACK	80009	352-0202-00
-291	352-0203-00			7	. HLDR,TERM CONN:7 WIRE BLACK	80009	352-0203-00
	352-0205-00			1	. CONN BODY,PL,EL:9 WIRE BLACK	80009	352-0205-00

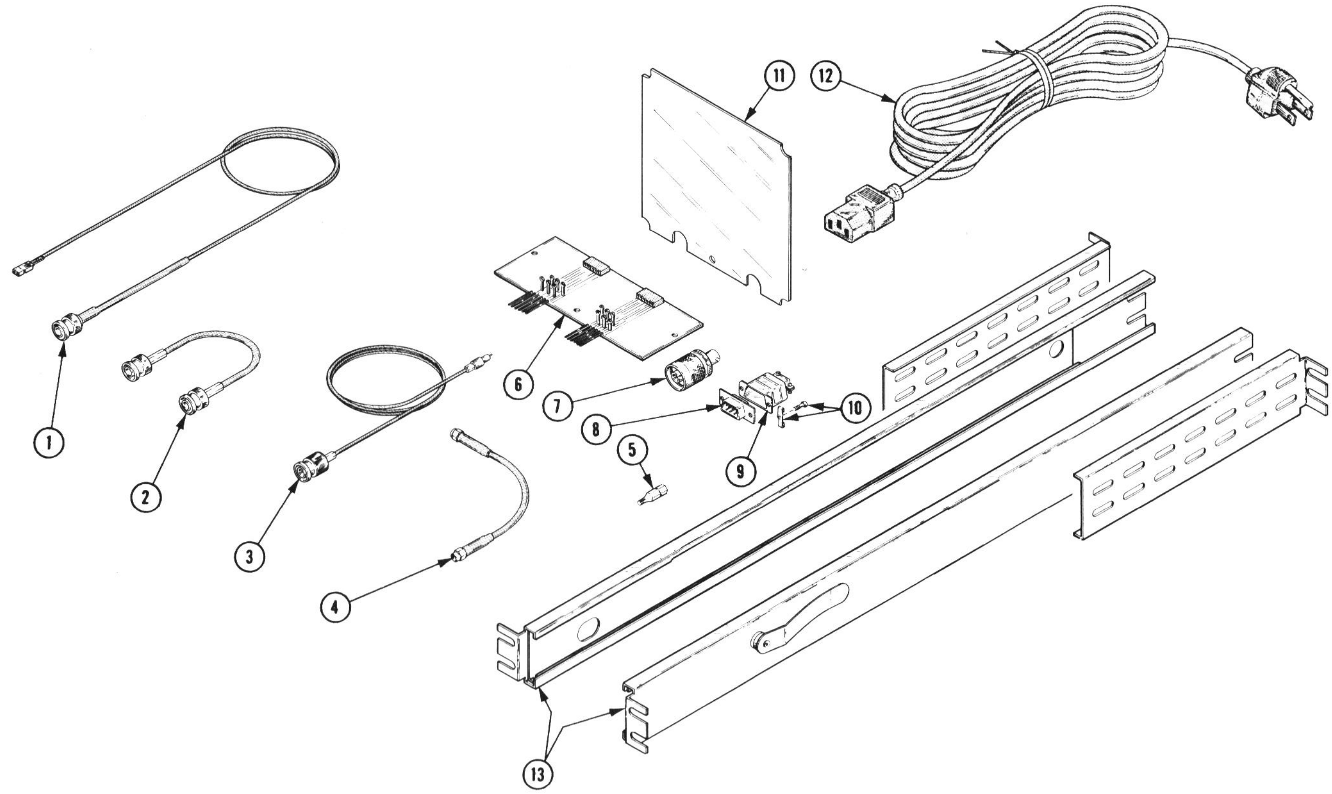

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5 Name & Description	Mfr Code	Mfr Part Number
-1	175-2140-00			2	CABLE,ASSY RF:50 OHM COAX,30.0L	80009	175-2140-00
-2	012-0751-00			1	CABLE,INTERCON:7.375 L(SEE W2 EPL)	80009	012-0751-00
-3	067-0709-00			1	FIXTURE,CAL:30.0 L,CABLE ASSY	80009	067-0709-00
-4	012-0752-00			1	CABLE,INTERCON:7.375 L	80009	012-0752-00
-5	003-0816-00			1	BIT,SCREWDRIVER:W/TORX T10 TIP	000CB	38-217-2
-6	670-5034-00			1	CKT BOARD ASSY:EXTENDER	80009	670-5034-00
-7	103-0045-00			1	ADAPTER,CONN:BNC FEMALE TON MALE	91836	KN99-35TR5
-8	131-1007-00			1	CONNECTOR,RCPT:9 CONTACT,MALE	71785	231-09-11-101
-9	200-1170-00			1	SHLD,ELEC CONN:9 CONTACT,STL CD PL	71468	DE24657
-10	213-0260-00			2	SCREW-LOCK ASSY:4-40 FILH W/STL CLIP	71468	D240A9-16
-11	331-0393-12			1	SCALE,CRT:EXT,NTSC,PHASE,PHOTO,CLEAR	80009	331-0393-15
-12	161-0066-00			1	CABLE ASSY,PWR:3 WIRE,98 INCH LONG	80009	161-0066-00
-13	351-0301-01			1	SLIDE,DWR,EXT:18.0 X 1.69	80009	351-0301-01
	015-0352-00			1	ACCESSORY ASSY:250KHZ,LOW PASS FILTER	80009	015-0352-00
	070-2998-00			1	MANUAL,TECH:INSTRUCTION	80009	070-2998-00

MANUAL CHANGE INFORMATION

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

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

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

SERVICE NOTE

Because of the universal parts procurement problem, some electrical parts in your instrument may be different from those described in the Replaceable Electrical Parts List. The parts used will in no way alter or compromise the performance or reliability of this instrument. They are installed when necessary to ensure prompt delivery to the customer. Order replacement parts from the Replaceable Electrical Parts List.

CALIBRATION TEST EQUIPMENT REPLACEMENT

Calibration Test Equipment Chart

This chart compares TM 500 product performance to that of older Tektronix equipment. Only those characteristics where significant specification differences occur, are listed. In some cases the new instrument may not be a total functional replacement. Additional support instrumentation may be needed or a change in calibration procedure may be necessary.

Comparison of Main Characteristics

DM 501 replaces 7D13		
PG 501 replaces 107	PG 501 - Risetime less than 3.5 ns into 50 Ω.	107 - Risetime less than 3.0 ns into 50 Ω.
108	PG 501 - 5 V output pulse; 3.5 ns Risetime	108 - 10 V output pulse 1 ns Risetime
PG 502 replaces 107		
108	PG 502 - 5 V output	108 - 10 V output
111	PG 502 - Risetime less than 1 ns; 10 ns Pretrigger pulse delay	111 - Risetime 0.5 ns; 30 to 250 ns Pretrigger pulse delay
PG 508 replaces 114 115 2101	Performance of replacement equipment is the same or better than equipment being replaced.	
PG 506 replaces 106	PG 506 - Positive-going trigger output signal at least 1 V; High Amplitude output, 60 V.	106 - Positive and Negative-going trigger output signal, 50 ns and 1 V; High Amplitude output, 100 V.
067-0502-01	PG 506 - Does not have chopped feature.	0502-01 - Comparator output can be alternately chopped to a reference voltage.
SG 503 replaces 190, 190A, 190B	SG 503 - Amplitude range 5 mV to 5.5 V p-p.	190B - Amplitude range 40 mV to 10 V p-p.
191 067-0532-01	SG 503 - Frequency range 250 kHz to 250 MHz.	0532-01 - Frequency range 65 MHz to 500 MHz.
SG 504 replaces 067-0532-01	SG 504 - Frequency range 245 MHz to 1050 MHz.	0532-01 - Frequency range 65 MHz to 500 MHz.
067-0650-00		
TG 501 replaces 180, 180A	TG 501 - Trigger output-slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	180A - Trigger pulses 1, 10, 100 Hz; 1, 10, and 100 kHz. Multiple time-marks can be generated simultaneously.
181		181 - Multiple time-marks
184	TG 501 - Trigger output-slaved to market output from 5 sec through 100 ns. One time-mark can be generated at a time.	184 - Separate trigger pulses of 1 and 0.1 sec; 10, 1, and 0.1 ms; 10 and 1 μs.
2901	TG 501 - Trigger output-slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	2901 - Separate trigger pulses, from 5 sec to 0.1 μs. Multiple time-marks can be generated simultaneously.

NOTE: All TM 500 generator outputs are short-proof. All TM 500 plug-in instruments require TM 500-Series Power Module.

Tektronix®
COMMITTED TO EXCELLENCE

MANUAL CHANGE INFORMATION

Date: 6-20-80 Change Reference: C1/680

Product: 1450-2 EFF SN B010100 Manual Part No.: 070-2998-00

DESCRIPTION

Pilot Change #5

REPLACEABLE ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES

DIAGRAM 4

CHANGE TO:

A28C41	283-0647-00	CAP.,FXD,MICA DI:70PF,1%,100V
A28C47	283-0599-00	CAP.,FXD,MICA DI:98PF,5%,500V
A28C66	283-0604-00	CAP.,FXD,MICA DI:304PF,2%,300V
A29C41	283-0647-00	CAP.,FXD,MICA DI:70PF,1%,100V
A29C47	283-0599-00	CAP.,FXD,MICA DI:98PF,5%,500V
A29C66	283-0604-00	CAP.,FXD,MICA DI:304PF,2%,300V

ADD:

A28C54	281-0716-00	CAP.,FXD,CER DI:13.8PF,1%,500V
A29C54	281-0716-00	CAP.,FXD,CER DI:13.8PF,1%,500V

In schematic diagram 4, add C54 (13.8 pF) in parallel with L54 on A28 and A29.