Tektronix®

7L14
SPECTRUM ANALYZER

INSTRUCTION MANUAL

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7L14
SPECTRUM ANALYZER

INSTRUCTION MANUAL

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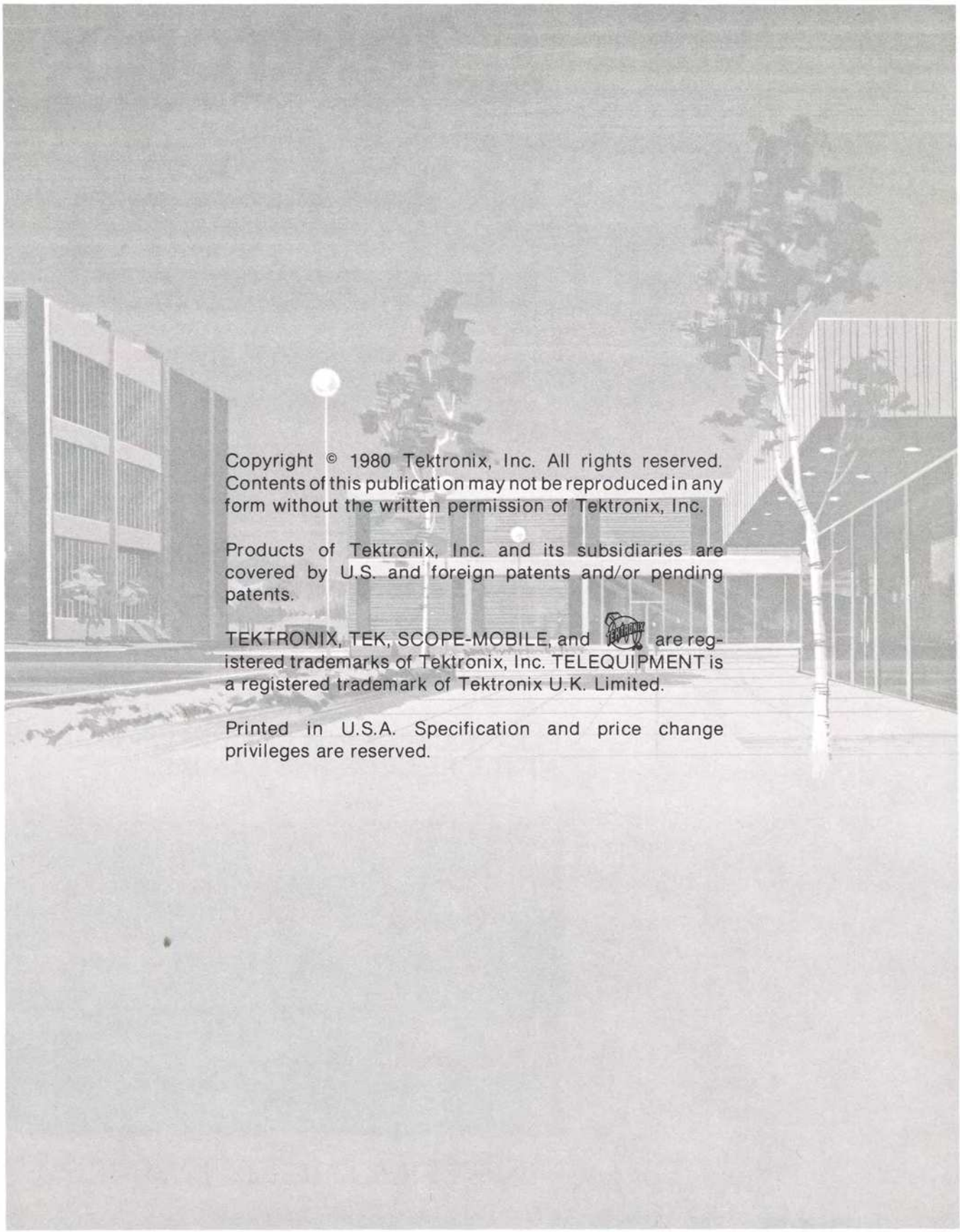

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TABLE OF CONTENTS

Page

LIST OF ILLUSTRATIONS v
OPERATOR SAFETY SUMMARY vii
SERVICE SAFETY SUMMARY ix

Section 1 GENERAL INFORMATION AND SPECIFICATION
General Information 1-1
Product Description 1-1
Standards, Documents, and References Used 1-1
Change and History Information . . 1-1
Accessories 1-1
Specification 1-2
Electrical Characteristics 1-2
Frequency Related 1-2
Amplitude Related 1-3
General Characteristics 1-4
Input Signal Characteristics . . . 1-4
Output Signal Characteristics . . 1-5
Environmental Characteristics 1-7
Physical Characteristics 1-7

Section 2 OPERATING INSTRUCTIONS
Unpacking and Initial Inspection . . 2-1
Installation 2-1
Repackaging for Shipment 2-1
Controls, Indicators and Connectors . 2-2
Frequency Controls 2-2
Sweep Controls 2-2
Span Controls 2-4
Display Controls 2-4
Amplitude Controls 2-6
Vertical Display Controls 2-7
Connectors 2-7
Front-Panel Calibration 2-9
Calibration to the Mainframe 2-9
Calibrate Frequency Readout 2-9
Calibrate Sweep Span 2-11
Check and Adjust LOG AMPL Calibration 2-11

Page

Section 2 OPERATING INSTRUCTIONS (cont)
Adjust Contrast and Check Baseline Clipper Operation 2-11
Functional or Operational Check 2-12
Equipment Required 2-12
Preparation 2-12
Check Operation of Front-Panel Pushbuttons and Controls 2-12
Check 10 dB/DIV and Lin Mode Calibration 2-13
Check Frequency Readout Accuracy 2-14
Check Range of the VAR Control . . 2-14
Check the Operation of the VIDEO FILTERS 2-14
Check Sensitivity 2-14
Check for Spurious Responses from Internal Sources 2-15
Check Resolution Bandwidths and Shape Factor 2-16
Check Residual FM'ing 2-17
Check Sweep Circuit Operation with the TIME/DIV Selector in the Manual and Off Positions 2-18
Check Digital Storage 2-18
General Operating Information 2-19
Signal Application 2-19
Resolution, Sensitivity, and Frequency Span 2-20
Gain Desensitization Near 0 Hz . . . 2-21
Using the Video Filter 2-21
Selecting Sweep Rate 2-21
Triggering the Display 2-21
Manual Scan of the Spectrum 2-21
Using an External Sweep Source . . 2-22
External Trigger Operation 2-22
Digital Storage 2-23
Using the CAL OUT Signal Reference for Accurate Frequency and Amplitude Measurements 2-23
Applications 2-24

TABLE OF CONTENTS (CONT)

Page

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.

Section 3 THEORY OF OPERATION

Block Diagram 3-1
Detailed Circuit Description 3-2
RF or Microwave Circuits 3-2
Phase Lock and Frequency Stabilization 3-3
YIG Driver, Voltage Memory, Phase Lock Logic and Marker Generator . 3-5
Frequency Tuning Control and Readout 3-5
Tuning Control 3-5
YIG Driver 3-6
Frequency Span 3-6
Marker Generator 3-6
105 MHz IF Amplifier, 3rd Mixer and Oscillator 3-6
10 MHz IF Pre-resolution Amplifier and Resolution Filter Circuits 3-6
30 Hz Filter 3-7
50 MHz Calibrator 3-7
Function IF Amplifier 3-7
Video Filter, Baseline Clipper and Vertical Output 3-8
Frequency Readout 3-9
Uncal Circuit 3-11
Sweep Triggering, Sweep Generator and Horizontal Amplifiers 3-11
Digital Storage 3-12
Vertical Section 3-13
Horizontal Section 3-15
Reference Level Readout 3-16

Section 4 CALIBRATION

Introduction 4-1
History Information 4-1

Page

Section 4 CALIBRATION (cont)

Equipment Required (Table 4-1) 4-1

PERFORMANCE CHECK

Introduction 4-2
Incoming Inspection Test 4-2
Check Frequency Readout Accuracy . 4-2
Check Frequency Span Accuracy and Linearity 4-2
Check Display Mode Accuracy 4-4
Check the Calibrator Frequency 4-5
Check the Calibrator Power Level . . . 4-6
Check RF Attenuator Accuracy 4-6
Check IF Gain Step Accuracy 4-7
Check Noise Sidebands 4-8
Check Sweep Accuracy 4-8
Check Triggering Sensitivity 4-8
Check Display Flatness 4-10
Check Resolution Bandwidth Accuracy and Shape Factor 4-11
Check Signal Level Change between any 2 bandwidths 4-13
Check Residual FM (in phaselocked) . 4-13
Check Residual FM (phaselocked) . . . 4-14
Check Stability 4-14
Check Sensitivity 4-14
Check Residual Spurious Responses . 4-15
Check Second Order Intermodulation Products 4-15
Check Third Order Intermodulation Products 4-17

ADJUSTMENT PROCEDURE

Introduction 4-18
Time Base Section 4-18
Adjust Sweep Length, Offset and Triggering 4-18
Function IF Alignment 4-20
Adjust the LIN Mode Baseline Offset 4-21
Adjust the Gain Compensation and Calibrate the Reference Level 4-21
1st LO Phase Lock Loop 4-22
Error Amplifier Offset Adjustment . 4-22

TABLE OF CONTENTS (CONT)

Page

Section 4 CALIBRATION (cont)

Frequency Span and 1st LO Calibration 4-22
Adjust the Frequency Span of the 1st LO and 16-19 MHz Oscillators 4-22
Calibrate the Center Frequency and Frequency Readout 4-24
Adjust Marker Gain and Marker Offset 4-25
Calibration of Digital Storage 4-26
Setting B-SAVE A Reference Level . 4-27
Adjust Digital Storage Compensation 4-27
Phase Lock Calibration Adjustments . 4-28
Adjust the Memory Gain 4-28
Resolution 4-29
Adjust the Bandpass of the 105 MHz IF Amplifier and 300 kHz Filter ... 4-29
Adjust the Resolution Gain Leveling Compensation 4-31
Adjust the Post Resolution Amplifier Gain 4-32
Minimize Intermodulation Products 4-34
50 MHz Calibrator 4-34

Section 5 MAINTENANCE INSTRUCTIONS

Introduction 5-1
Access to the Interior of the 7L14 ... 5-1
Static Sensitive Components 5-1
PREVENTIVE MAINTENANCE 5-2
Cleaning 5-2
Exterior 5-3
Interior 5-3
Lubrication 5-3
Visual Inspection 5-3
Transistor and IC Checks 5-3
Performance Checks and Recalibration 5-3
TROUBLESHOOTING 5-3
Troubleshooting Aids 5-3
Diagrams 5-3
Circuit Board Illustrations 5-3
Wiring Color Code 5-3
Harmonica Connector Holders . 5-4

Page

Section 5 MAINTENANCE INSTRUCTIONS (cont)

Resistor Color Code 5-4
Capacitor Marking 5-4
Diode Color Code 5-4
Transistor and IC Electrode Configuration 5-4
Diode Checks 5-5
IC Checks 5-5
General Troubleshooting Technique 5-6
CORRECTIVE MAINTENANCE 5-6
Obtaining Replacement Parts 5-6
Parts Repair and Return Program . 5-6
Soldering Technique 5-7
Replacing the Square Pin for Multi-pin Connectors 5-7
Selected Components 5-7
MAINTENANCE OF THE LEFT SIDE . 5-8
Replacing Assemblies 5-8
Maintenance Tools 5-8
Replacing the Differential Attenuator Assembly 5-8
Replacing the 1st LO (YIG) Oscillator Assembly 5-8
Replacing the 2.095 GHz Filter Assembly, or the Multiplier, Bandpass Filter Assembly 5-8
Calibration Procedure 5-9
Replacing the 2nd Mixer Assembly 5-9
Adjust the Response of the Filter and Mixer Assemblies 5-11
Replacing Switches 5-11
Replacing the Display Mode LOG/LIN Switches 5-11
MAINTENANCE OF THE RIGHT SIDE 5-12
Replacing Assemblies 5-12
Replacing the Frequency Tuning Assembly 5-12
Replacing the Sweep Circuit Board 5-12
Replacing the Function IF Board .. 5-12
Replacing the Resolution Circuit Board Assembly 5-12
Replacing Circuit Boards in the Phase Lock Circuit Assembly 5-14

TABLE OF CONTENTS (cont)

Page

Section 5 MAINTENANCE INSTRUCTIONS (cont)

Replacing the 5 V Regulator Board 5-14
Replacing the Digital Storage Drawer Assembly 5-14
Removing the DVM Logic and Readout Circuit Board 5-14
Replacement of the Left Interface Assembly 5-14
Replacing Knobs and Switches 5-14
Replacing the FREQ SPAN/DIV and RESOLUTION Knobs and Starts 5-14
Replacing the Cam Switches 5-15
Replacing the FREQ SPAN/RESOLUTION Selector 5-15
TIME/DIV Selector Replacement 5-16
Replacing the Cam Actuator and Potentiometer Switch Assemblies . . . 5-16
Removing the Front-Panel Pushbutton Switches 5-16
Triggering Switches 5-16
Video Filter and Digital Storage Switches 5-16

LIST OF ILLUSTRATIONS

Fig. No.		Page
	7L14 Spectrum Analyzer	x
1-1	Typical filter shape, phase noise sidebands and sensitivity for the 7L14	1-6
2-1	Front-panel controls	2-2
2-2	Frequency controls	2-3
2-3	Sweep controls	2-3
2-4	Span controls	2-5
2-5	Display controls	2-5
2-6	Amplitude controls	2-6
2-7	Vertical Display controls	2-7
2-8	Connectors	2-8
2-9	Front-panel selector positions for front-panel calibration	2-10
2-10	Calibrating the sweep span	2-11
2-11	Video filter operation	2-15
2-12	Measuring bandwidth and shape factor	2-16
2-13	Measuring residual FM	2-17
2-14	Using digital storage to measure the difference between two displays	2-18
2-15	Volts-dBm-Watts Conversion chart for 50 Ω impedance	2-19
2-16	Circuit of a 75 Ω-to-50 Ω matching pad (ac coupled)	2-20
2-17	Graph to illustrate the relationship between dBm, dBmV and dBμV (matching attenuator included where necessary)	2-20
3-1	Functional block diagram of 2nd LO phase lock circuit or frequency servo system	3-4
3-2	Log converter curve	3-8
3-3	Functional block diagram of the frequency readout circuit	3-10
3-4	Basic functional block diagram of the uncal circuit	3-12
4-1	Test equipment set up for checking accuracy of center frequency readout and frequency span	4-3
4-2	Test equipment setup for checking display mode accuracy, calibrator power level and RF attenuator	4-5
4-3	Test equipment set up for checking calibrator frequency	4-6
4-4	Test equipment set up for checking sweep accuracy	4-9
4-5	Display showing time markers for checking sweep accuracy	4-9
4-6	Test equipment set up for checking triggering sensitivity	4-10
4-7	Measuring bandwidth and shape factor	4-12
4-8	Measuring residual FM	4-13
4-9	Resistive bridge used for measuring 2nd order IM products	4-16
4-10	Measuring 3rd order IM products	4-17
4-11	Calibrating the sweep ramp	4-19
4-12	Location of adjustments on the sweep board	4-20
4-13	Calibration adjustments and test points on the Function IF board	4-21
4-14	Grounding strap connected to pin 1 of P1078	4-23
4-15	Location of P69 and R51 on Hybrid Assembly A24	4-23
4-16	Location of the YIG Driver and Voltage Memory adjustments	4-24
4-17	100 MHz markers on a 100 MHz/Div frequency span	4-25
4-18	Location of R1960, Sweep Driver adjustment for the 16-19 MHz oscillator	4-25
4-19	Frequency Readout circuit adjustments	4-25
4-20	Marker Gain and Marker Offset adjustments	4-26
4-21	Location of Digital Storage adjustments	4-27
4-22	Location of the Phase Lock calibration adjustments	4-28
4-23	Location of Memory Adjust R2605	4-29
4-24	105 MHz IF and 3 MHz bandwidth adjustments	4-30
4-25	Wide-band Filter Adjust C456	4-30
4-26	Typical flat-top response when narrow filter is adjusted correctly	4-30
4-27	Typical response characteristics for the 105 MHz IF through the wide filter	4-30
4-28	Connections and adjustments for adjusting the narrow post-amplifier filter	4-31
4-29	300 kHz filter adjustments and typical response charateristics	4-31
4-30	Resolution gain compensating adjustments	4-33

LIST OF ILLUSTRATIONS (cont)

Fig. No.		Page
4-31	Test equipment set up to measure IM distortion	4-34
4-32	Location of C95 in the 3rd Mixer assembly	4-35
4-33	Location of R956, Calibrator Output Level adjustment	4-35
5-1	Gaining access to the 7L14 interior	5-2
5-2	Multipin (harmonica circuit board connectors)	5-4
5-3	Diode polarity markings	5-4
5-4	Electrode configuration for semiconductor components	5-5
5-5	Location of screws and assemblies of the left side	5-9
5-6	Test equipment and illustrations to show the response when calibrating the Multiplier, 2.18 GHz BP Filter, and Mixer Assembly for the 2nd LO frequency Servo system	5-10
5-7	Location of the mixer assembly locking screws	5-11
5-8	Adjustments for filter response	5-11
5-9	Illustrations to show the procedures for removing the Sweep board	5-13
5-10	Removing the Frequency Readout boards	5-15

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.

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.

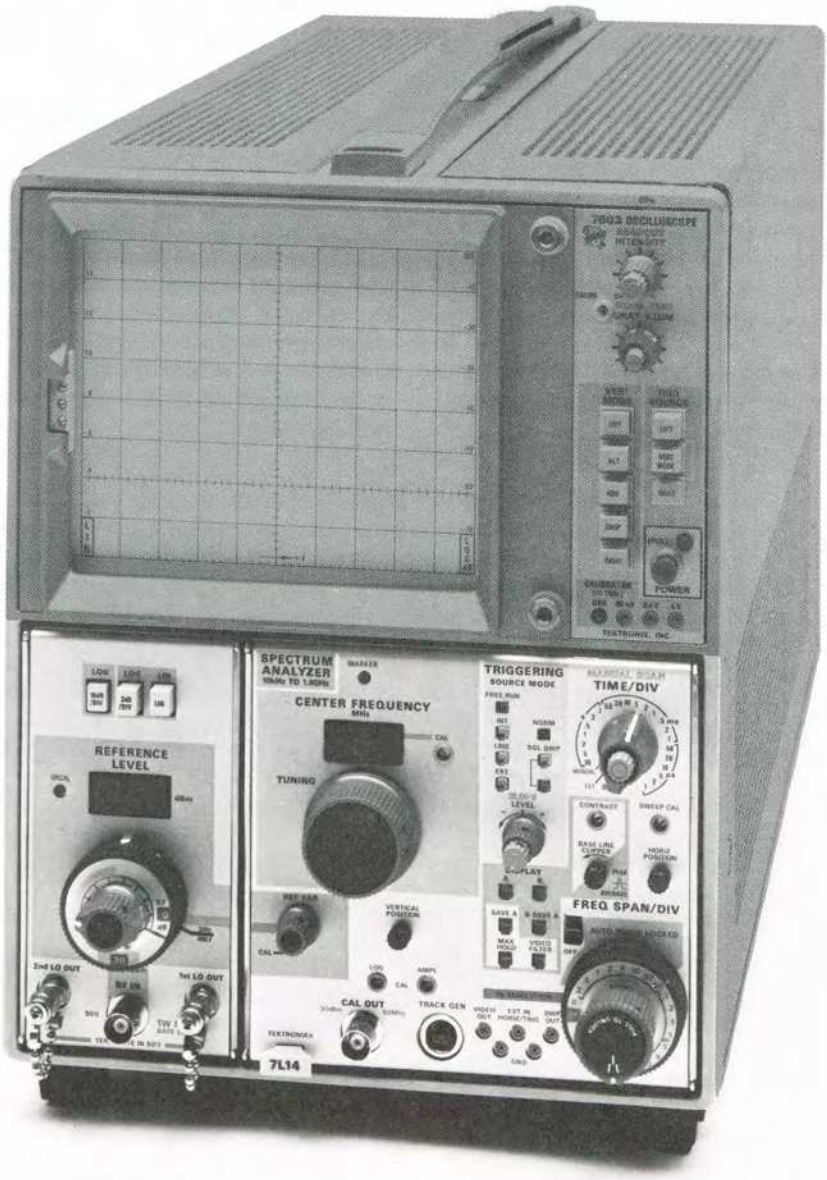
Use Care When Servicing With Power On

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.



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7L14 Spectrum Analyzer

GENERAL INFORMATION AND SPECIFICATION

GENERAL INFORMATION

Product Description

The 7L14 Spectrum Analyzer displays information of signals within the frequency span of 10 kHz to 1.8 GHz. It contains horizontal sweep and timing circuits for frequency and time domain displays, and provides means for using an external sweep source to slave the 7L14 to some external device, such as a recorder.

The 7L14's digital storage capability permits flicker-free displays at slow sweep speeds. In the storage mode, the vertical display can be divided with a positionable threshold level: above this level video peaks are detected, below it video peaks are averaged. This threshold level is indicated by a horizontal cursor on the display.

The 7L14 requires three plug-in widths in any of the TEKTRONIX 7000 series mainframe oscilloscopes.

Standards, Documents, and References Used

Terminology used in the manual is in accordance with industry practice. Abbreviations are in accordance with ANSI Y1.1-1972, with exceptions and additions explained in parentheses after the abbreviation. Graphic symbology is based on ANSI Y32.2-1975. Logic symbology is based on ANSI Y32.14-1973 and the manufacturer's data books or sheets. A copy of ANSI standards may be obtained from the Institute of Electrical and Electronic Engineers, 345 47th Street, New York, NY 10017.

Change and History Information

Change information that involves manual corrections and/or additional data is located at the back of the manual in the CHANGE INFORMATION section. History information with the updated data is integrated into the text or diagrams when a page or diagram is updated.

Accessories

For a complete listing of the Standard and Recommended Accessories for the 7L14, refer to the Mechanical Parts List in the back of this manual.

SPECIFICATION

The following list of instrument characteristics and features apply to the 7L14 Spectrum Analyzer after a 20 minute warmup, except as noted.

The Performance Requirement column describes the limits of the characteristic, and the Supplemental column describes features and typical values or information that may be useful to the user. Procedures to verify performance requirements are provided in the Calibration section of the Service Instructions. The Performance Check procedures require sophisticated equipment as well as technical expertise to perform.

The Operator's Section contains a procedure that checks all functions of the 7L14. This check is recommended for incoming inspections to verify that the instrument is performing properly.

Table 1-1

ELECTRICAL CHARACTERISTICS

Characteristic	Performance Requirement	Supplemental Information
Frequency Related		
Center Frequency		
Range	10 kHz to 1.8 GHZ	
Readout Resolution	Within 1 MHz	
Readout Accuracy	±(5 MHz +20% of Frequency Span/Div)	
Frequency Span	200 Hz/Div to 100 MHz/Div	In calibrated steps in a 1-2-5 sequence
Accuracy	Within 5% of the span selected	
Linearity	Within 5% of the span selected	
Max Span		Provides 1.8 GHz of span
0 Span		Provides fixed frequency operation for time domain display
Resolution Bandwidth Range		30 Hz to 3 MHz, in decade steps
Accuracy (6 dB down)	Within ±20% of the resolution selected	
Shape Factor (60/6 dB)	4:1 or less for 3 MHz to 0.3 kHz; 12:1 or less for 30 Hz resolution	
Signal Level Change Between Any Two Bandwidths	±0.5 dB at room temperature[a] ±2.0 dB max over temperature	
Incidental Fm'ing	≤13 Hz (P-P) when phaselocked ≤10 kHz (P-P) for 20 ms when not phaselocked	
Stability	At a fixed temperature after two-hour warm up: Within 2 kHz/Hr phaselocked Within 50 kHz/Hr not phaselocked	

[a] **0 RF attenuation, −30 dBm reference level**

Table 1-1 (cont.)

Characteristic	Performance Requirement	Supplemental Information
Amplitude Related		
Display Modes LOG 10 dB/Div		Provides 70 dB dynamic range
Accuracy	Within 0.15 dB/dB to 2 dB max over 70 dB dynamic range	
LOG 2 dB/Div		Provides 14 dB dynamic range
Accuracy	Within ±0.4 dB/2 dB to 1.0 dB max over 14 dB dynamic range	
LIN	Within 10% over 8 divisions	
Deviation Between Display Modes[b]	≤2 dB from 2 dB/Div to 10 dB/Div ≤0.5 Divisions from 2 dB/Div to LIN	
Reference Level Below 100 KHz		+30 dBm to −50 dBm, as the center frequency approaches 10 KHz
Above 100 KHz		+30 dBm to −100 dBm in 10 dB calibrated steps
Display Flatness	±1.5 dB, with respect to 50 MHz, over any selected frequency span.	
Sensitivity At 50 MHz Resolution Bandwidth	Equivalent (average) Input Noise Level (worst case)	Applicable from 100 KHz to 1.8 GHz
30 Hz 300 Hz 3 kHz 30 kHz 0.3 MHz 3 MHz	−130 dBm −120 dBm −110 dBm −100 dBm − 90 dBm − 80 dBm	
Spurious Responses Residual	≤−100 dBm (referenced to the 1st mixer input)	
Second order inter-modulation products	100 kHz −1.8 GHz: down 70 dB or more from two −40 dBm signals, within any frequency span	
Third order inter-modulation products	100 kHz −1.8 GHz: down 70 dB or more from two −30 dBm signals, within any frequency span	
RF Attenuator		Calibrated in 10 dB steps
Accuracy	±0.25 dB or 1.2% of dB reading; whichever is greater	

Table 1-1 (cont.)

Characteristic	Performance Requirement	Supplemental Information
Amplitude Related		
IF Gain		
Range		70 dB (80 dB when operating in 30 Hz resolution bandwidth)
Step Accuracy	±1 dB per 10 dB step to ±2 dB max over entire range[c]	
General Characteristics		
Noise Sidebands	70 dB down; 25X resolution bandwidth	See Fig. 1-1
Sweep		Triggered, manual, external
Sweep Time		10 s/Div to 1 μs/Div in a 1-2-5 sequence
Accuracy	±6% of selected Time/Div	
Triggering Modes		INTERNAL, EXTERNAL, EXT in HORIZ/TRIG and LINE
Sensitivity	≤0.5 division of internal signal (P-P) and/or ≤0.5 volt (P-P) of external signal	
Power Requirements From The Mainframe		
To +50 V		Approx 35 mA
−50 V		Approx 65 mA
+15 V		Approx 875 mA
−15 V		Approx 900 mA
+5 V		Approx 1080 mA
+5 V Lights		Approx 130 mA
Total Lights		38 Watts typical
Input Signal Characteristics		
RF Input		
Maximum Input Power Level		+30 dBm
Maximum Input Power Level to the RF Attenuator ≥10 dB		1 watt average (including DC), 100 watts peak simultaneously
Input Impedance		50 ohm; vswr 1.35 max with 10 db of RF attenuation

Table 1-1 (cont.)

Characteristic	Performance Requirement	Supplemental Information
Input Signal Characteristics (cont)		
External Horizontal/Trigger Input Connector		
Input Voltage Range		Typically 0 V to 10 V for 10 division sweep Typically 0.5 V (P-P) to trigger the sweep circuits. 40 V peak max
Output Signal Characteristics		
CAL OUT	−30 dBm, ±0.3 dB at 50 MHz, ±0.01%	50 MHz comb markers are provided for frequency and span calibration
1st LO OUT and 2nd LO OUT		Provide access to the output of the respective local oscillators (1st LO +5 dBm min., 2nd LO −10 dBm min. +10 dBm max. These ports must be terminated in 50 ohms.
SWP OUT		0 to −5 V
Video Output		Typically 0.5 V of video signal per display division. Output impedance approx. 10 K ohm. Markers can be inserted upon the stored or non-stored trace by providing the VIDEO OUT port with a negative-going signal. Max. input level −10 V peak.

[b] **For full screen signal.**

[c] **Gain and Attenuation not off-setting each other.**

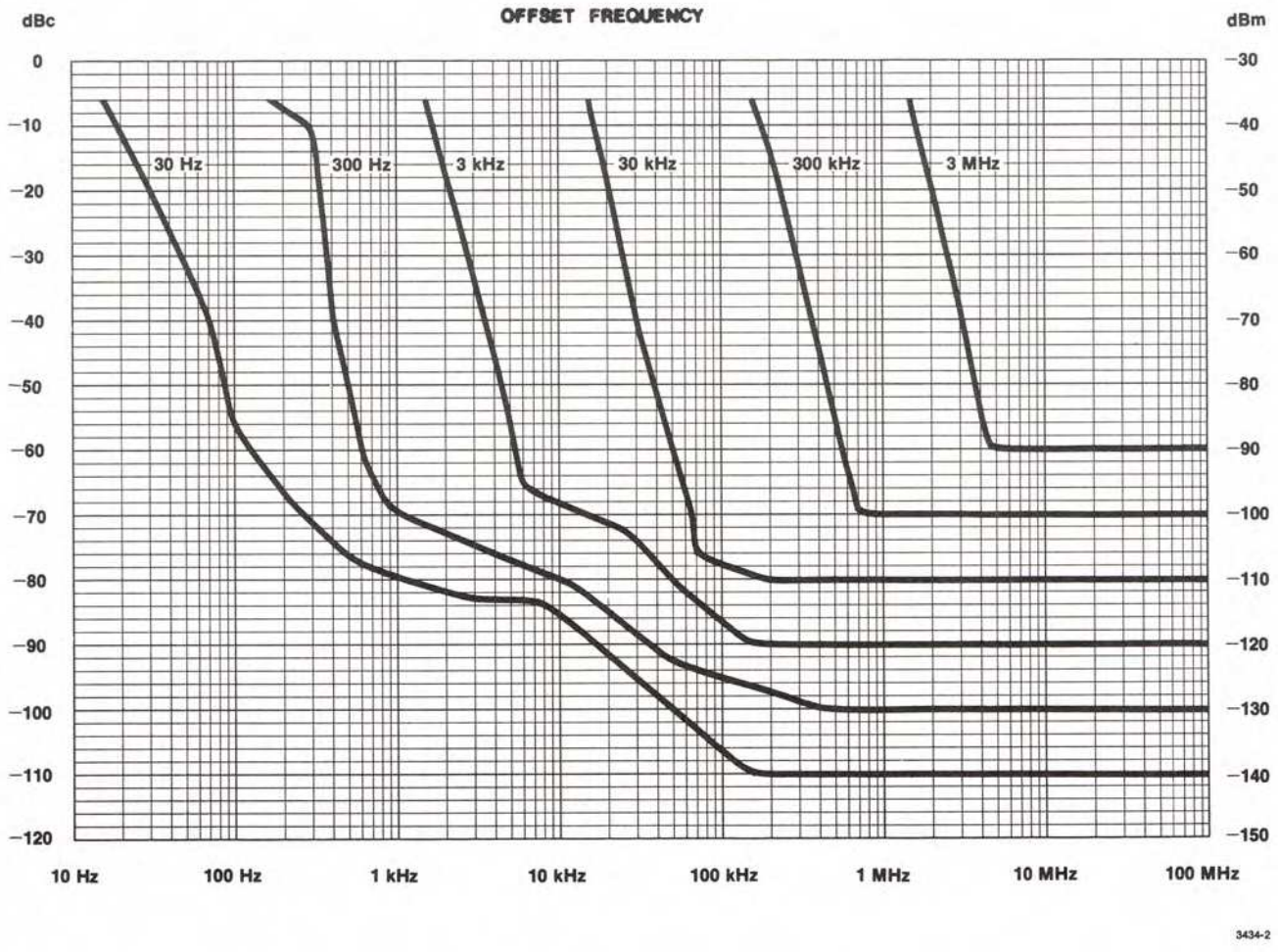


Fig. 1-1. Typical filter shape, phase noise sidebands and sensitivity for the 7L14.

Table 1-2

ENVIRONMENTAL CHARACTERISTICS

Characteristic	Description	
Temperature and Relative Humidity		
Operating	+10° C to +40° C (75% humidity)	
Non-operating	−55° C to +75° C (75% humidity)	
Vibration		
Operating	Resonant searches along all three axes at 0.015 inch, frequency varied from 10-55 Hz, 15 minutes. All major resonances must be minimum per axis plus dwell at resonant frequency or 55 Hz for 10 minutes minimum per axis. Instrument secured to vibration platform during test. Total vibration time about 75 minutes.	
Shock		
Operating	Three shocks of 30g, one-half sine, 11 ms duration, each direction along each major axis. Guillotine-type shocks. Total of 18 shocks.	
Electromagnetic Interference (EMI)	**Test Method**	**Remarks**
Conducted Emissions	CE01	60 Hz to 20 KHz
	CE03 20 KHz to 50 MHz power leads	Full limits
Conducted Susceptibility	CS01 30 Hz to 50 KHz power leads	Full limits
	CS02 50 KHz to 400 KHz power leads	Full limits
	CS06 spike power leads	Full limits
Radiated Emissions	RE01 30 Hz to 30 KHz magnetic field	Full limit
	RE02 14 ± 3 KHz to 1 GHz	Full limits
Radiated Susceptibility	RS01 30 Hz to 30 KHz magnetic field	Full limit
	RS03 up to 1 GHz	Except 100 to 110 MHz

Table 1-3

PHYSICAL CHARACTERISTICS

Characteristic	Performance Requirement	Supplemental Information
Weight		16 lbs. (7.2 kg)
Length		14.75 inches (375 mm)
Height		5.00 inches (120 mm)
Width		8.15 inches (200.5 mm)

OPERATING INSTRUCTIONS

Unpacking and Initial Inspection

Before unpacking the 7L14 from its shipping container or carton, inspect for signs of external damage. If the carton is damaged, notify the carrier, as well as TEKTRONIX, Inc. The shipping carton contains the basic instrument and its standard accessories. Optional accessories are shipped in separate containers. Refer to the Accessories listing in the Mechanical Parts List for a complete listing.

If the contents of the shipping container are incomplete, if there is mechanical damage or defect, or if the instrument does not meet operational check requirements, contact your local Tektronix Field Office or representative.

The instrument has been inspected both mechanically and electrically before shipment. It should be free of mechanical damage and meet or exceed all electrical specifications. Procedures to check functional or operational performance are in the Operational Check Procedures. This check should satisfy the requirements for most receiving or incoming inspections. The electrical performance check procedure is part of the Service Instructions.

Installation

Installation of the 7L14 into the 7000 series mainframe consists of sliding the unit into the mainframe compartment.

CAUTION

Power to the mainframe should be OFF when installing the 7L14.

Ensure that the 7L14 is securely latched into place.

NOTE

A safety latch is used to reduce the possibility of the instrument slipping out of the mainframe.

For information on power source and power requirements, and environmental considerations, refer to the manual supplied with the 7000 series mainframe oscilloscope.

Repackaging for Shipment

When the 7L14 is to be shipped to a Tektronix Service Center for service or repair, attach a tag showing: owner and address, name of individual at your firm that can be contacted, complete serial number, and a description of the service required. If the original packaging is unfit for use or not available, repackage the equipment as follows:

1. Obtain a carton of corrugated cardboard having inside dimensions that are at least six inches more than the equipment dimensions, to allow for cushioning. Carton test strength should be 275 lbs (102.5 kg).

2. Surround the 7L14 with polyethylene sheeting to protect the finish.

3. Cushion the equipment on all sides with packing material or urethane foam between the carton and the sides of the equipment.

4. Seal with shipping tape or industrial stapler.

CAUTION

A safety latch must be released before the 7L14 can be pulled from the oscilloscope compartment. The unit will pull out part way when the front panel release (see Fig. 2-1) is pulled, then the spring safety latch must be pushed up to free the unit completely. This safety latch is located underneath the right rail, near the front corner.

CAUTION

Do not ship the 7L14 when it is installed in the mainframe, unless it is bolted into the mainframe. A spectrum analyzer securing kit is available from Tektronix, Inc. for the following instruments: 7313/R, 7603/R, 7613/R, 7623/R, 7623A/R, and 7633/R. Order by Tektronix part number 016-0637-00.

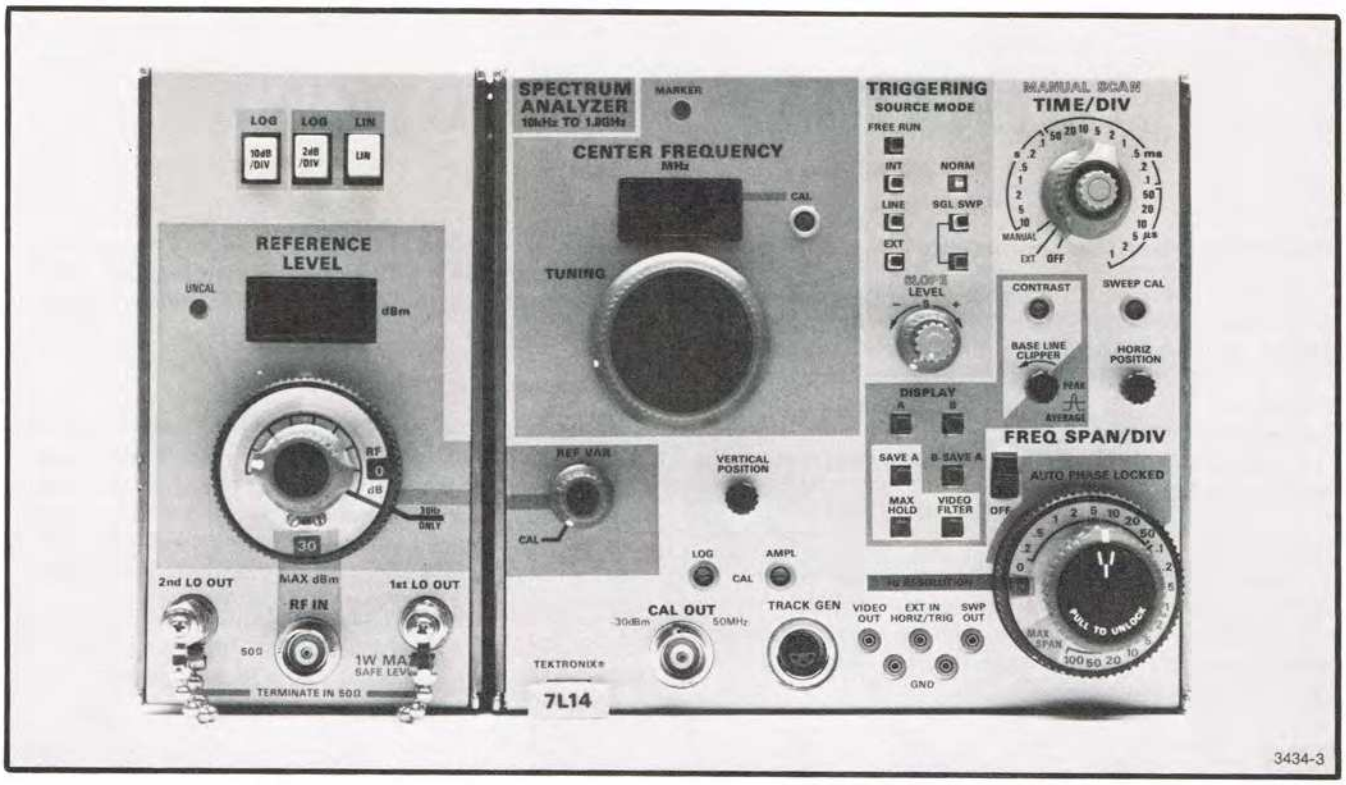


Fig. 2-1. Front-panel controls.

CONTROLS, INDICATORS, AND CONNECTORS

The following describes the function of the controls, indicators, and connectors on the front panel of the 7L14.

FREQUENCY CONTROLS (See Fig. 2-2)

TUNING

The center frequency is tuned with this one-speed control. The tuning range is decreased to +50 kHz when the FREQ SPAN/DIV is 50 kHz or less, and the AUTO PHASE LOCKED switch is on.

CENTER FREQUENCY

The center frequency or marker frequency is indicated by this LED readout.

MARKER

This indicator lights when the FREQ SPAN/DIV is at the MAX span position. A notch on the baseline of the display indicates the center portion of the span that will be displayed when the FREQ SPAN/DIV is reduced.

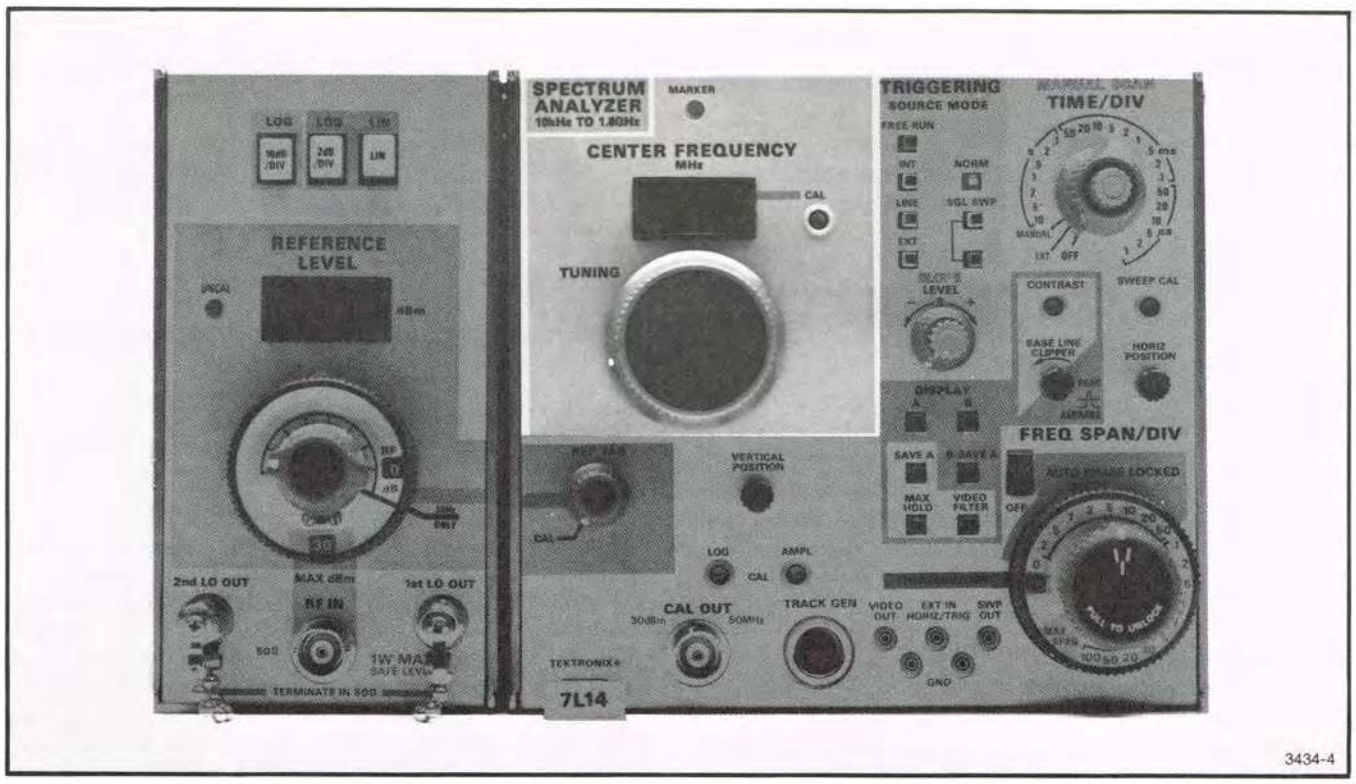
CAL

The frequency readout can be calibrated to center frequency by adjusting the TUNING control for the correct reading.

SWEEP CONTROLS (See Fig. 2-3)

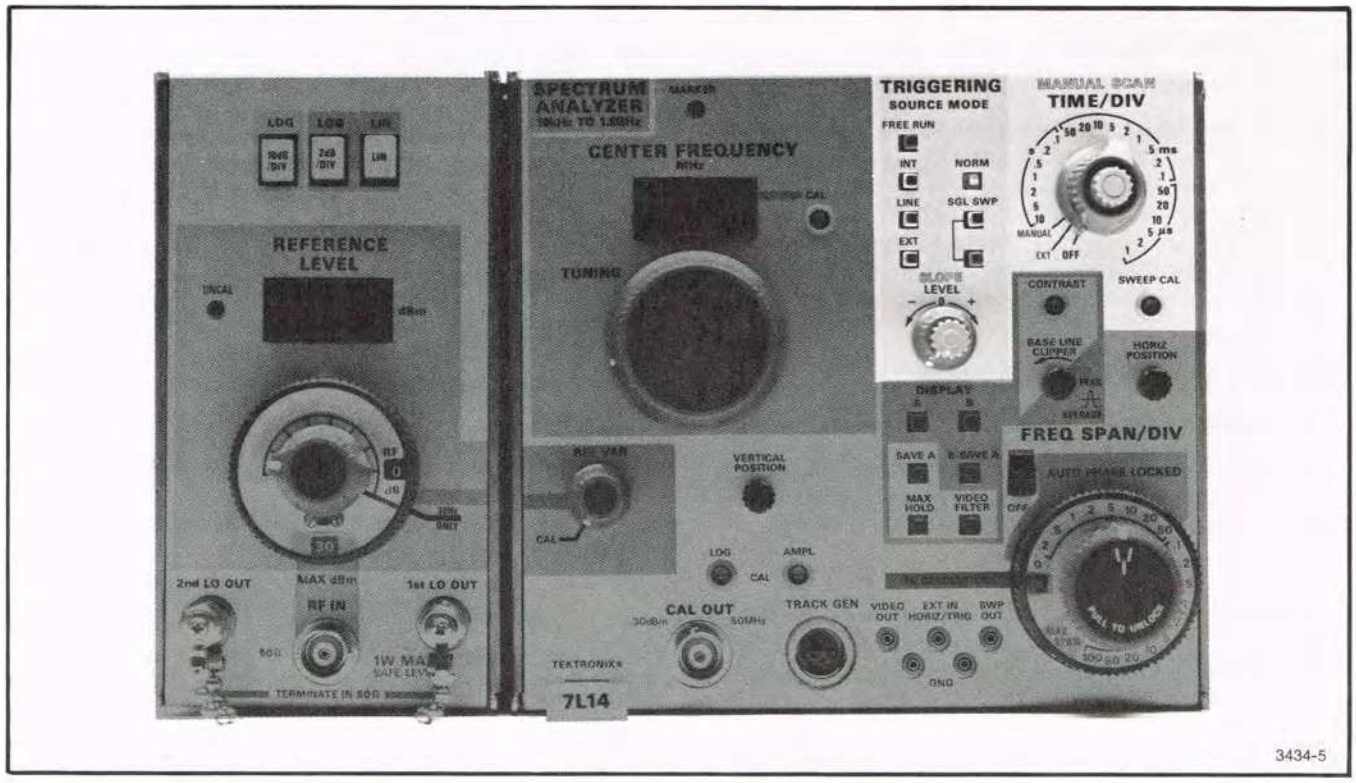
TRIGGERING SOURCE

One of four triggering modes can be selected.



3434-4

Fig. 2-2. Frequency controls.



3434-5

Fig. 2-3. Sweep controls.

— **FREE RUN.** The sweep is free running without regard to trigger signals.

— **INT.** Uses the displayed signal as a trigger source. The signal is ac coupled with an approximate frequency range from 15 Hz to 1 MHz.

— **LINE.** The trigger signal source is a sample of the ac power line. Line signals are dc coupled to the triggering circuits.

— **EXT.** Selects the signal that is applied to the EXT IN HORIZ/TRIG connector. External signals are dc coupled to the triggering circuits. Maximum signal input to the external input connector should not exceed 40 V (dc+ac peak) for triggering. Input impedance for the external input is about 30 k Ω.

TRIGGERING MODE

— **NORM.** The sweep will automatically recur at the end of holdoff time, if a trigger signal is absent. This feature provides a baseline on the display. In this mode triggering occurs at the slope and level selected by the SLOPE/LEVEL controls unless the triggering signal is below the required amplitude, or beyond the frequency limits of the circuit. Minimum signal amplitude for internal triggering is 0.5 division of signal (peak-to-peak) and 0.5 V of signal for external triggering.

— **IN THE SGL SWP** mode, the sweep is triggered by pushing the adjoining button. This button lights during sweep time and serves as an indicator to determine camera shutter time when photographing slow scan-time displays. Minimum signal amplitude for triggering is 0.5 division of signal and 0.5 V of external signal.

TIME/DIV and MANUAL SCAN

Three sweep modes and an OFF state are provided:

— TIME/DIV, calibrated in a 1, 2, 5 sequence from 10 S/Div to 1 μS/Div. This control selects the sweep rates and the MANUAL, EXT and OFF modes.

— In the OFF position, the crt beam is horizontally centered and the analyzer becomes a tuned receiver to the frequency indicated by the readout.

— The EXT position connects any signal applied to the EXT/HORIZ TRIG connector to the horizontal deflection circuits of the 7L14. External sweep voltage (0 V to 10 V) signal can be used to slave the 7L14 to an external device, such as a recorder.

— The MANUAL position connects the sweep circuits of the 7L14 to the MANUAL SCAN control, so the crt beam deflection can be manually controlled.

SWEEP CAL

The adjustment compensates for differences in deflection sensitivities between oscilloscopes.

SPAN CONTROLS (See Fig. 2-4)

FREQ SPAN/DIV

This control sets the horizontal frequency calibration on the crt. The calibrated range of the selector is 100 MHz/Div to 200 Hz/Div in a 1, 2, 5 sequence. A MAX span position provides approximately 1.8 GHz of spectrum and a 0 Hz position converts the analyzer to a fixed tuned receiver for time domain displays. Time analysis of the signal characteristics, within the bandwidth capabilities selected with the RESOLUTION control, can then be performed. In this case, Time/Div is read out on the crt instead of Span/Div.

RESOLUTION

This control allows the operator to analyze discrete frequency components within a frequency span. The calibrated range (within 20%) is 30 Hz to 3 MHz in decade steps. The RESOLUTION control can be coupled to the FREQ SPAN/DIV control when the knobs align with indicating marks. A concentric sleeve labeled PULL TO UNLOCK will uncouple the two selectors when it is pulled out and allow independent settings of each control.

AUTO PHASE LOCKED

This switch is used to disable the phase lock for some applications, such as tuning the analyzer more than 1 MHz when the instrument is used as a tuned receiver (0 span).

DISPLAY CONTROLS (See Fig. 2-5)

Without any of the pushbuttons activated, the 7L14 display is stored, but not displayed.

DISPLAY A, DISPLAY B

When either or both these pushbuttons are selected, the contents of memory A and/or memory B are displayed. With SAVE A mode off, all memory locations are displayed and updated continuously. Data in A memory is interlaced with data from B memory.

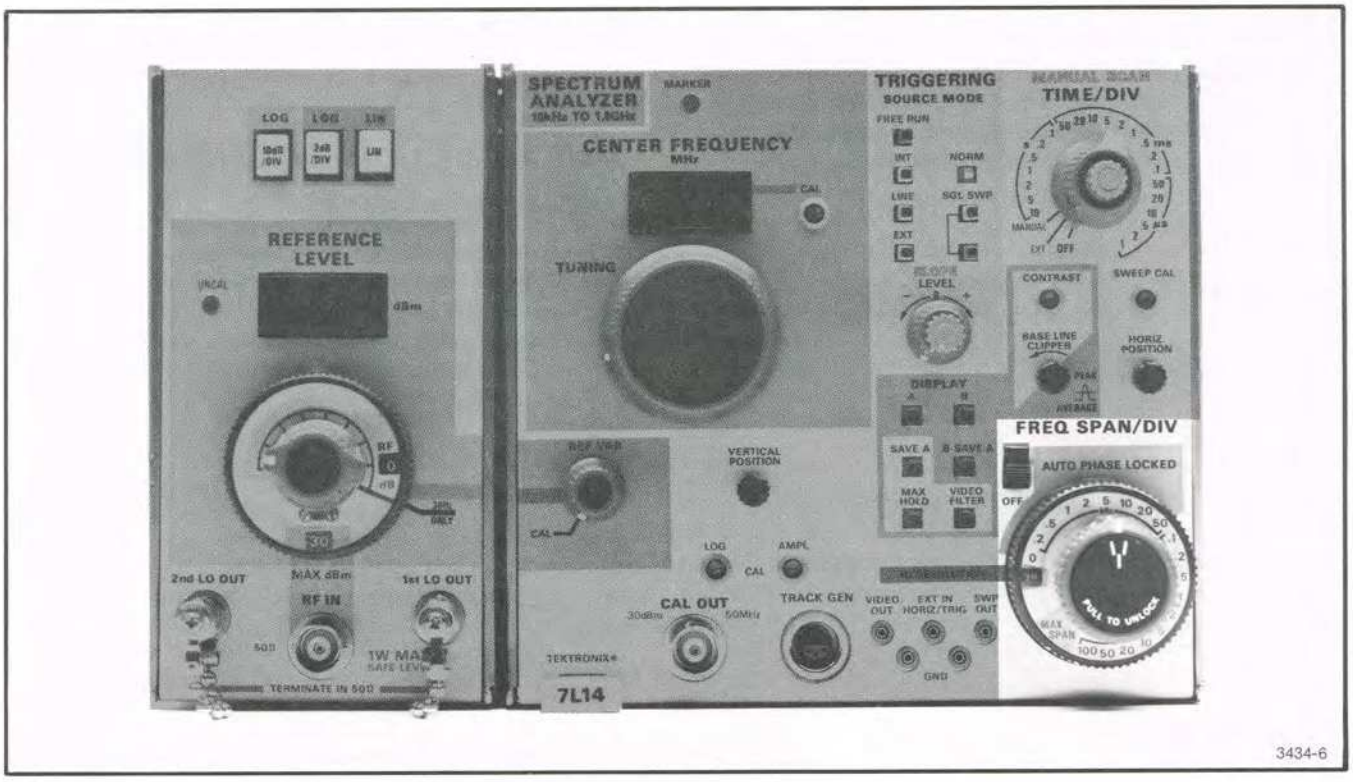


Fig. 2-4. Span controls.

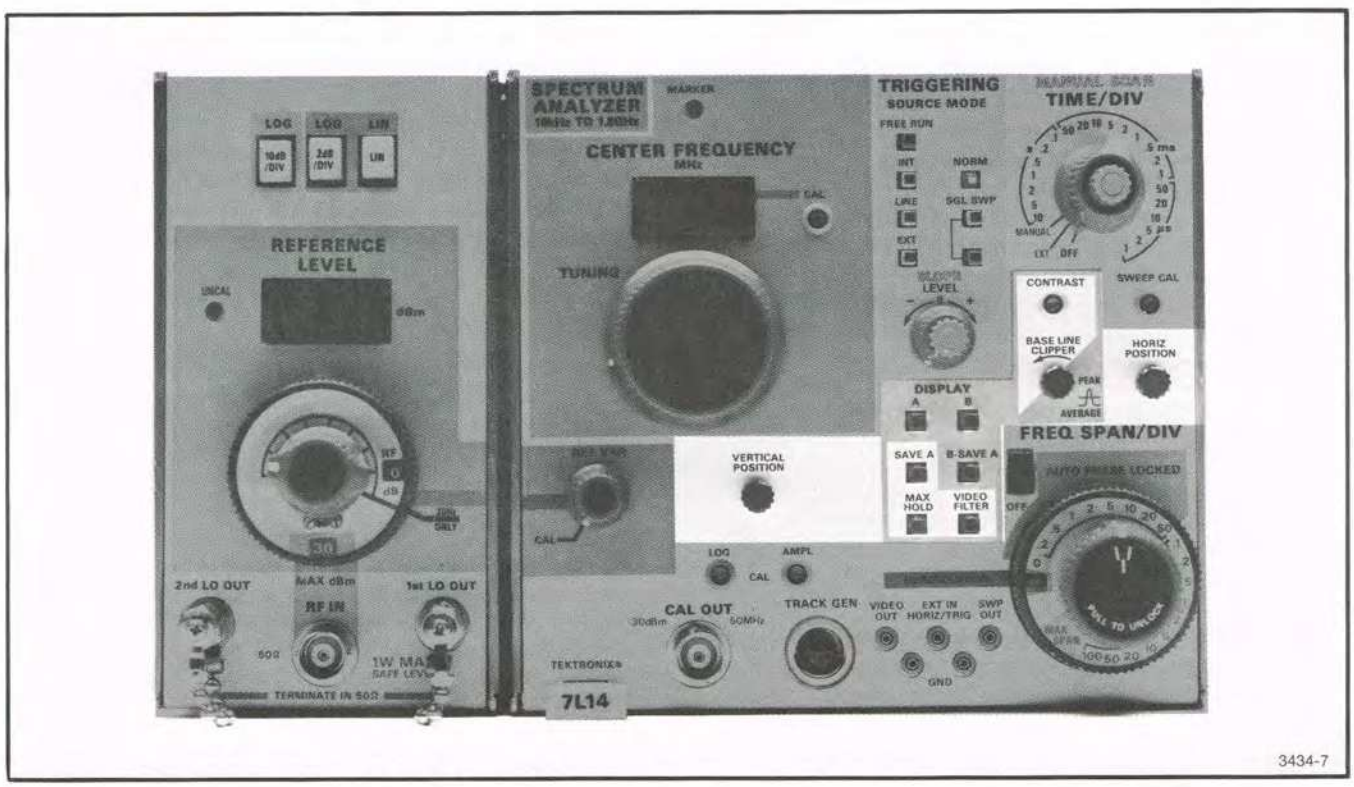


Fig. 2-5. Display controls.

SAVE A

When activated, this mode holds data in A memory and inhibits further updating. With SAVE A and VIEW A active, data in A memory is displayed but not updated, serving as a reference to compare contents of B memory.

B-SAVE A

When this button is activated, the contents of memory B minus the contents saved in memory A are displayed. This permits a comparison between two displays. The SAVE A function is also in effect.

MAX HOLD

When activated, the digital storage memory retains the maximum signal amplitude at each memory location. This permits visual monitoring of signal frequency and amplitude at each memory location over an indefinite period of time. This feature is used to measure drift, stability, and record peak amplitudes.

VIDEO FILTER

When the VIDEO FILTER button is pushed, one of 3 filters (10 Hz, 300 Hz, or 30 kHz) is selected depending on the Resolution Bandwidth setting. The bandwidth of the filter selected is displayed on the crt. Video filters restrict the video bandwidth and reduce high frequency components for display noise averaging.

BASELINE CLIPPER-PEAK AVERAGE

When the digital storage is off, this control operates as a baseline clipper (i.e., as the control is rotated counterclockwise, more of the vertical display is progressively clipped, or blanked). When the digital storage is on, the control sets the level at which the vertical display is either peak detected or averaged. Video signals above the level set by the control (shown by the horizontal cursor) are peak-detected and stored; video signals below the cursor are averaged and stored.

CONTRAST

When the digital storage is off, this control adjusts the brightness ratio between the blanked and unblanked portion of the display. Overall display intensity is set by the oscilloscope INTENSITY control. When digital storage is on, this control adjusts the intensity of the cursor. This feature is especially helpful for use with a digital processing oscilloscope or a 7854 oscilloscope.

VERTICAL POSITION

This control positions the display vertically.

HORIZONTAL POSITION

This control positions the display horizontally.

AMPLITUDE CONTROLS (See Fig. 2-6)

REFERENCE LEVEL

(Reference and IF Gain). These concentric controls select input attenuation to the input mixer, and the IF gain. The readout windows indicate REFERENCE LEVEL in dBm, of the full scale display, MAXimum signal input level (in dBm) for linear operation, and the input RF attenuation (from 0 to 60 dB).

The RF attenuation is in series with the input signal path to the input mixer, therefore its settings affect the maximum input signal level to the 7L14. With 0 dB attenuation, maximum input signal level for linear operation is −30 dBm. Changing the RF Attenuator to 60 dB increases the maximum input signal level to +30 dBm.

The IF gain selector has a range of 80 dB in 10 dB steps. The combination of RF attenuator settings and IF gain settings establishes the REFERENCE LEVEL; therefore, both controls function as REFERENCE LEVEL selectors. The maximum sensitivity of the display will not exceed −130 dBm. Since the dynamic window is 70 dB in the 10 dB/Div display mode, the REFERENCE LEVEL readout is valid to −60 dBm. With the RF attenuator at 0 dB and the IF gain fully ccw, the REFERENCE LEVEL is −30 dBm. Increasing the IF gain 30 dB, changes the REFERENCE LEVEL to −60 dBm, which is the limit for a calibrated reference level in the 10 dB/DIV mode. The blue tint that borders the 10 dB/DIV switch, and four position, of the gain selector, correlates REFERENCE LEVEL readout to the gain settings applicable in the 10 dB/DIV mode.

When the gain selector is rotated beyond the blue tint sector, REFERENCE LEVEL readings do not change because the gain is electrically locked out. In the 2 dB/DIV mode, the full 80 dB range of the gain selector is usable. 70 dB of the range is available at all resolutions, 80 dB of gain is available only when the RESOLUTION is set at 30 Hz. With the RF attenuator at 0 dB, switching the gain produces up to an accurate −100 dBm reference level. When the RESOLUTION is 30 Hz, the fully cw gain position permits a −110 dBm reference level, for a calibrated −124 dBm.

REF VAR is a reference level vernier provided with a 10 dB control range. The display amplitude is uncalibrated when this control is out of detent.

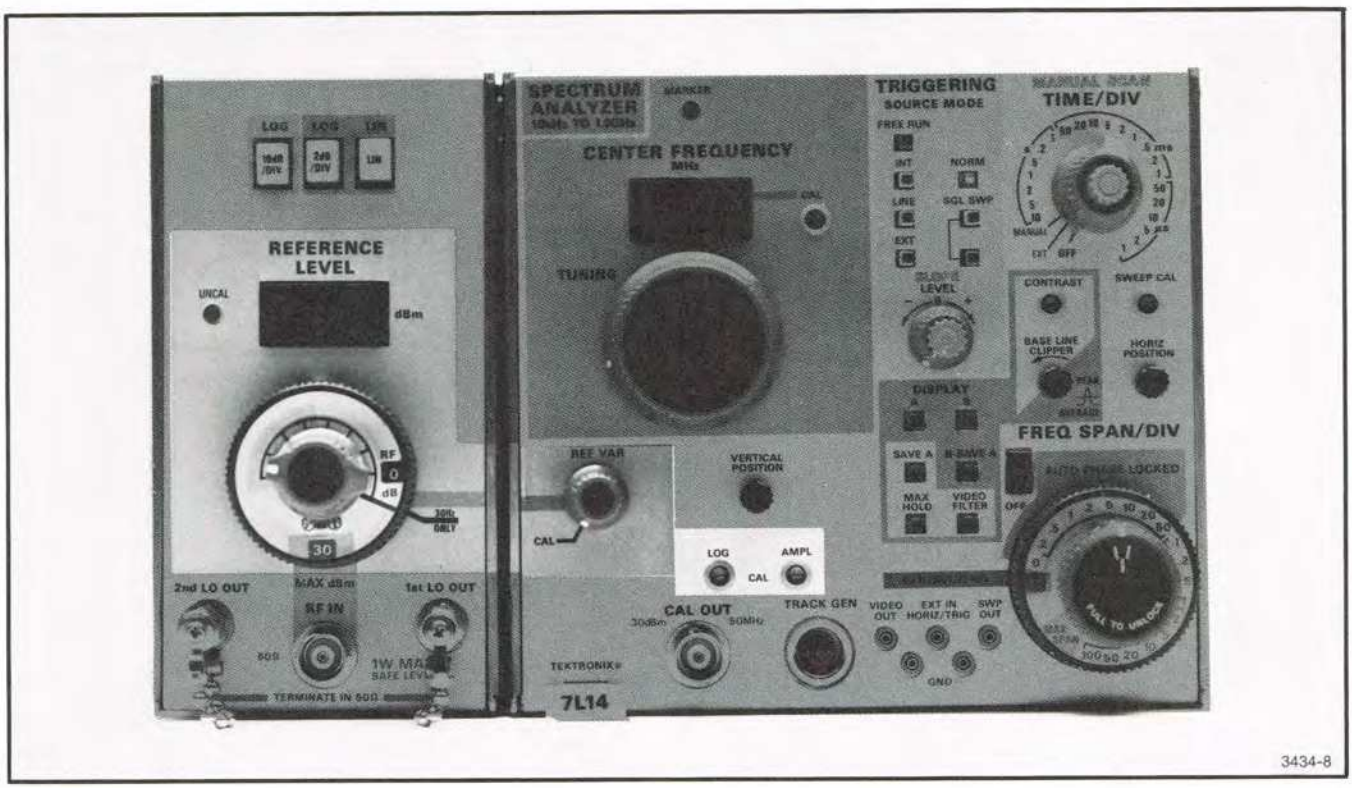


Fig. 2-6. Amplitude controls.

LOG and AMPL CAL

These adjustments calibrate the dynamic range of the display. LOG calibrates the logarithmic gain in dB/div, AMPL calibrates the reference level of the top graticule line at the top of the screen.

VERTICAL DISPLAY CONTROLS (See Fig. 2-7)

LOG 10 dB/DIV selects a calibrated display with a dynamic range of 70 dB (to the 7th graticule line, from the reference) at 10 dB/DIV. The bottom graticule division is not calibrated.

LOG 2 dB/DIV. When this pushbutton is depressed, the dynamic range of the display is a calibrated 14 dB at 2 dB/DIV.

LIN selects a linear display. The LIN graticule calibration permits relative signal level measurements as follow: adjust the level of one signal to the 1.0 line, (when used with a spectrum analyzer graticule) with the gain or RF attenuation. Read the level of the other signals as a percentage of this reference.

CONNECTORS (See Fig. 2-8)

SWP OUT. This connector supplies a negative-going ramp of about 0 V to −5 V and a source impedance of about 1 kΩ.

GND. These two pin connectors are connected to signal ground in the instrument. DO NOT use these pins for safety earth connections.

EXT IN HORIZ/TRIG. The function of the dual-purpose input depends on the settings of the IME/DIV control. When the TIME/DIV control is set to any sweep position (or AUTO), a positive applied signal will initiate the sweep. When the TIME/DIV control is set to EXT IN, and applied voltage will position the beam horizontally. To sweep the full span, a voltage of 0 V to +10 V, ±1 V is required (sensitivity is about 1 V/div). 0 V corresponds to the left edge of the graticule; +10 V corresponds to the right edge.

VIDEO OUT. This connector provides a buffered video output to drive an external device such as a chart recorder. Output level is about 500 mV per displayed division. The source impedance is about 10 k Ω.

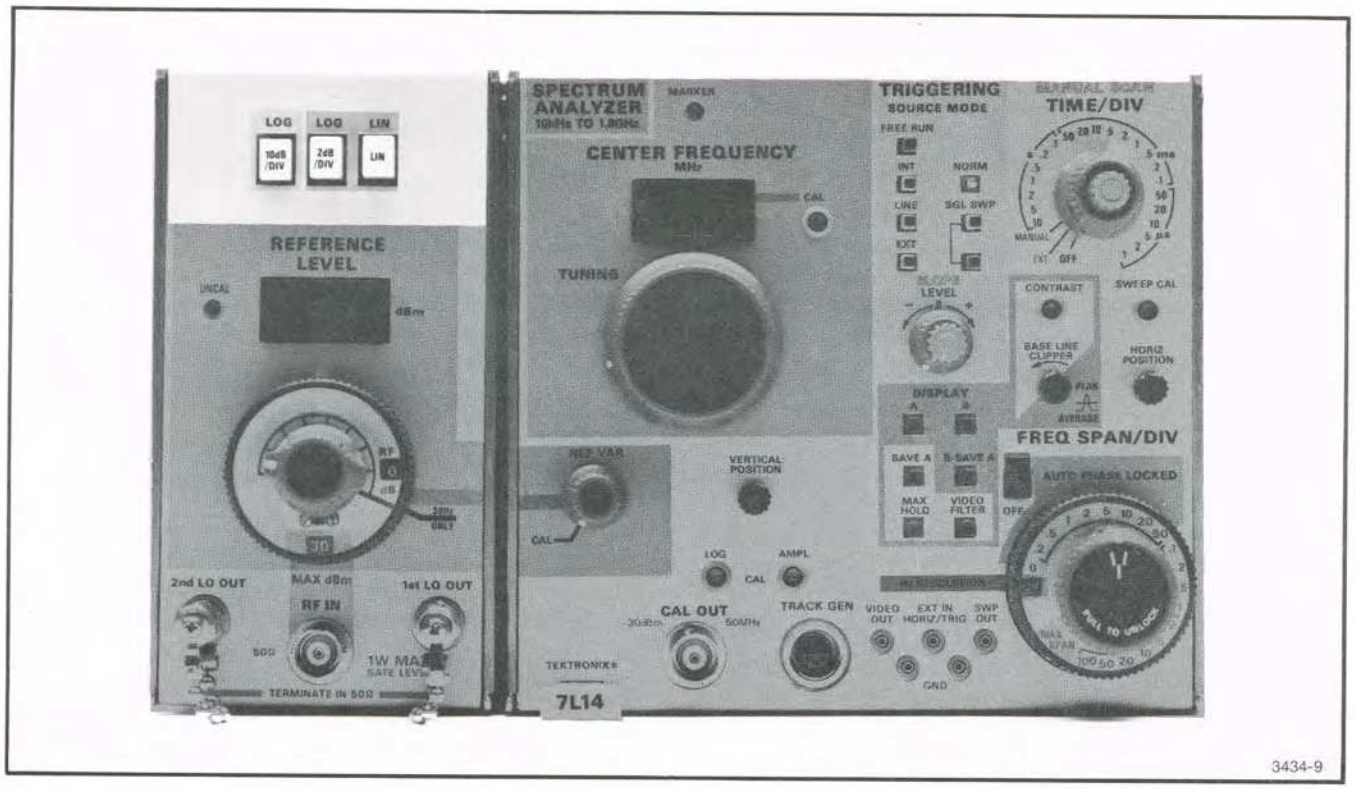


Fig. 2-7. Vertical display controls.

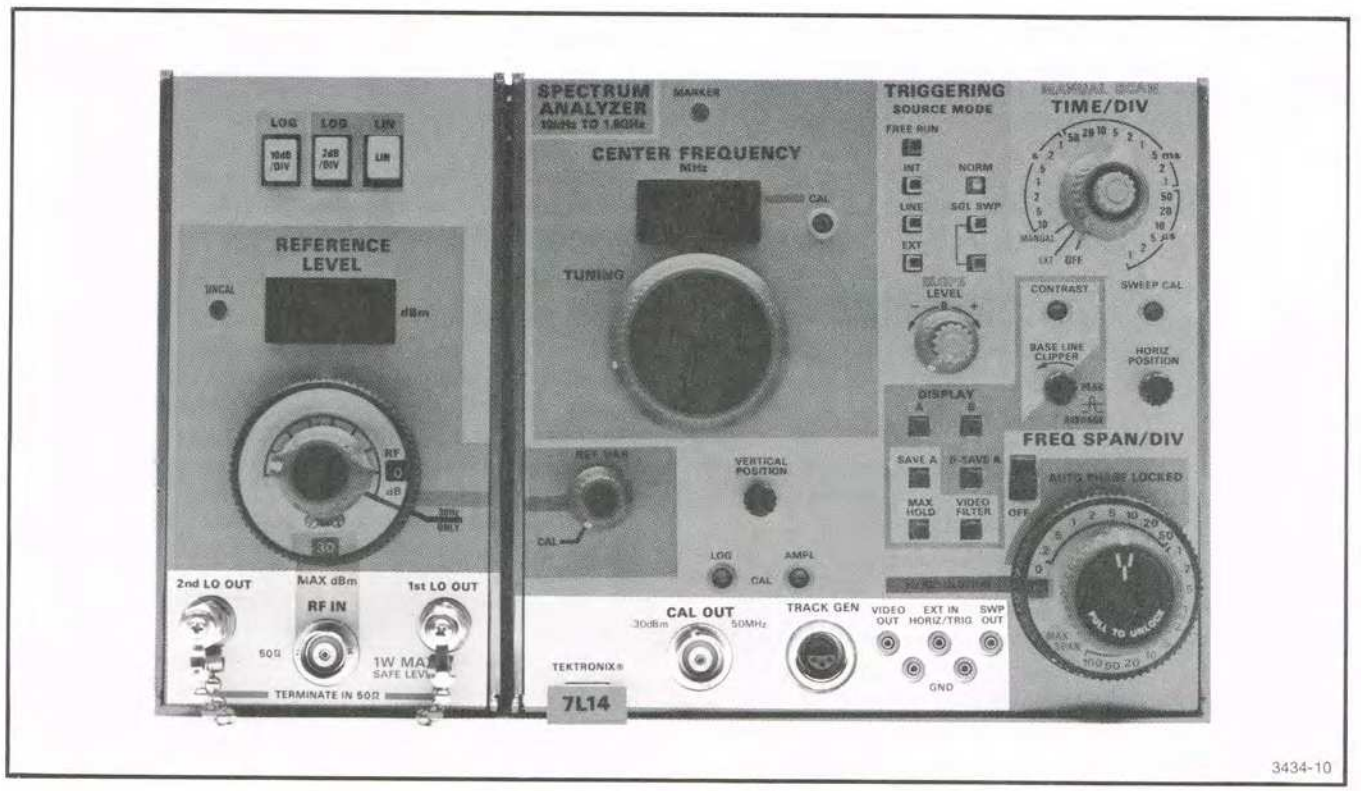


Fig. 2-8. Connectors.

TRACK GEN. A source of control signals for a tracking generator. Pin 5 of the connector is the source of a +10 V to −10 V sweep ramp, with +10 V representing the left edge of the display and −10 V the right edge of the display.

CAL OUT. Provides an accurate −30 dBm, 50 MHz signal source. This signal provides an absolute reference on the display to calibrate the REFERENCE LEVEL and check dBm readings. Harmonics of the 50 MHz fundamental provide a comb of markers across the frequency span for accurate frequency and span measurements.

1ST and 2ND LO OUT. These connectors provide access to the output of the respective local oscillators. They must be terminated into 50 Ω. Keep the termination plugs on the output jacks unless these ports are connected to an external device such as a tracking generator.

RF IN. A 50 Ω input connector for applying the input signal to the 7L14. REFERENCE LEVEL readout refers to the signal level at this connector. Any signals riding on some dc potential must be applied through a dc block. Refer to the General Operating Information with regard to signal applications.

FRONT-PANEL CALIBRATION

1. Preliminary Operational Procedure that Calibrates the 7L14 to the Oscilloscope Mainframe

When the 7L14 plug-in unit is installed in a 7000-Series mainframe, the spectrum analyzer should be calibrated to ensure correlation between plug-in and and mainframe deflection sensitivities. We recommend that the front-panel calibration procedure be performed anytime the instrument is turned on, and before making critical measurements, to ensure optimum accuracy.

a. Plug the 7L14 Spectrum Analyzer into the 7000-Series mainframe. Ensure that the 7L14 is securely latched in the compartment.

NOTE

A safety latch is used to reduce the possibility of the instrument slipping out of the mainframe.

b. Connect the oscilloscope mainframe to a suitable power source and switch the power on. Allow about 30 minutes for instrument stabilization.

c. Set the front-panel controls as illustrated in Fig. 2-9 and connect the CAL OUT signal through a short coaxial cable to the RF INput.

d. Adjust the oscilloscope Intensity and Focus controls for optimum display.

e. Depress the 2 dB/DIV display mode button. Position the baseline of the display to the bottom graticule line with the VERTICAL POSITION control and line up the first marker with the first vertical graticule line, using the HORIZ POSITION control.

f. Depress the 10 dB/DIV display button. The display should now resemble that shown in Fig. 2-9.

2. Calibrate the Frequency Readout

Due to hysteresis in the tuning system, the calibration and accuracy of the readout must be performed and checked from the same direction (low to high).

a. Without applying the calibrator signal to the RF INput, decrease the FREQUENCY SPAN/DIV setting to 10 MHz, and increase the CENTER FREQUENCY readout to 50 MHz.

b. Apply the CAL OUT signal to the RF INput. Center the 50 MHz calibrator signal over the center graticule line.

c. Adjust the frequency CAL for a CENTER FREQUENCY readout of 50 MHz.

NOTE

It is important to tune the signal from low to high. If the tuning direction is reversed, repeat the procedure by returning the FREQ SPAN/DIV to MAX and the CENTER FREQUENCY to 000 to establish the same reference point on the hysteresis loop.

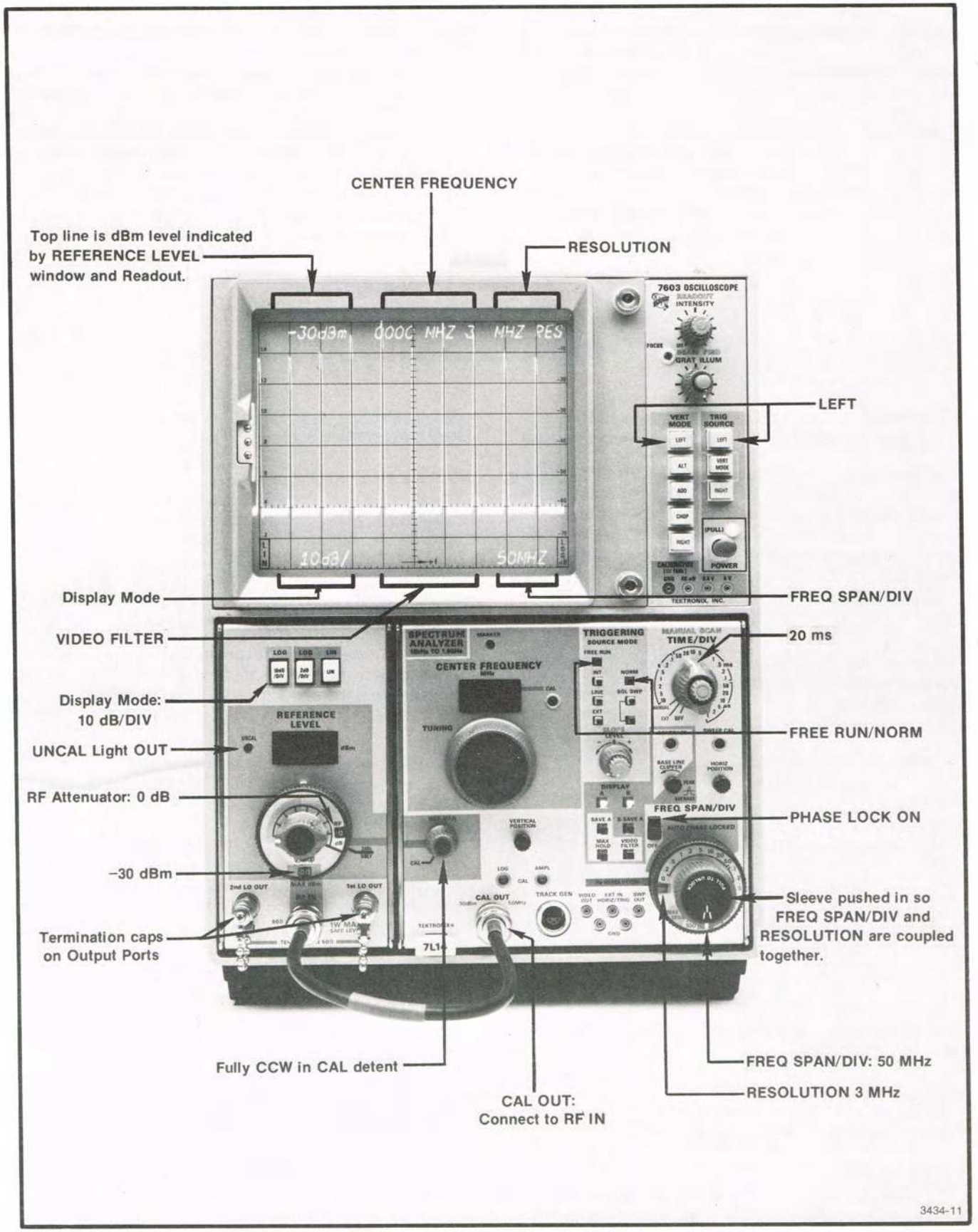


Fig. 2-9. Front-panel selector positions for front-panel calibration.

3. Calibrate the Sweep Span

a. With the CAL OUT signal applied to the RF INput, increase the FREQ SPAN/DIV to 50 MHz and tune the 250 MHz marker to the center graticule line (see Fig. 2-10).

b. Calibrate the frequency span to 50 MHz/div by adjusting the SWP CAL for 1 marker per division. It may be necessary to keep the 250 MHz marker centered with the frequency TUNING control as the sweep is calibrated. Final display should resemble that in Fig. 2-10.

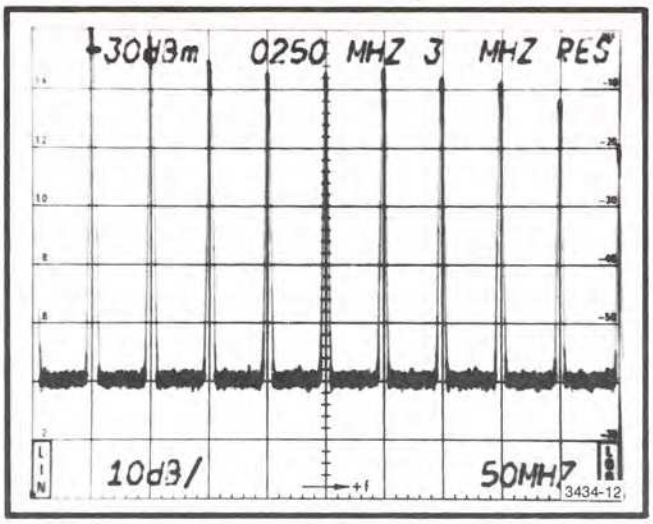


Fig. 2-10. Calibrating the sweep span.

4. Check and Adjust LOG-AMPL Calibration

The LOG CAL adjustment calibrates the gain of the analyzer vertical output so the 2 dB/DIV and 10 dB/DIV modes may be accurately set. The AMPL CAL adjustment sets the reference level to the top graticule line.

a. Set the 7L14 selectors and controls as directed in step 2 and tune the fundamental 50 MHz calibrator signal to the center of the graticule.

b. Alternately switch Vertical Display from 10 dB/DIV to 2 dB/DIV and adjust AMPL CAL so the peak amplitude of the signal is the same for each logarithmic display mode. Adjustments should be made in 2 dB/DIV mode.

c. With the Vertical Display mode at 10 dB/DIV, set the top of the calibrator signal to the top graticule line with the LOG CAL adjustment so the signal level indicates −30 dBm.

d. Check the display log scale by switching the REFERENCE LEVEL in 10 dB steps from −30 dBm to +30 dBm and note that the display amplitude decreases 10 dB, or one division, per step.

e. Switch the display modes from 2 dB/DIV to LIN. Signal amplitude reference level should not change more than 2 dB for 2 dB/DIV to 10 dB/DIV, or 0.5 division from 2 dB/DIV to LIN mode.

5. Adjust Contrast and Check Baseline Clipper Operation

NOTE

The contrast ratio between the clipped portion of the display baseline and the rest of the display is affected by the sweep rate, frequency span, resolution, and ambient light.

a. With the BASELINE CLIPPER control set midrange, adjust the CONTRAST control for the desired ratio between the clipped or subdued portion and the rest of the display. Usually the contrast is adjusted so the clipped baseline portion is just visible.

NOTE

When the 7L14 is in digital storage mode and a Digital Processing Oscilloscope is used, the CONTRAST control should be turned clockwise so the baseline clipper is not visible on the display.

b. Adjust the BASELINE CLIPPER control so the baseline is subdued. If there is excessive noise, it may be desirable to clip noise level as well.

FUNCTIONAL OR OPERATIONAL CHECK

This procedure uses minimum test equipment to check instrument operating modes, functions, and basic performance. The procedure serves to check for instrument malfunctions and should satisfy most incoming inspection or pre-operational check-out requirements. A detailed Performance Check, which requires extensive test equipment, is part of the Calibration Procedure in tthe Service Instructions. This operational check also familiarizes the user with instrument operation.

Equipment Required

The internal calibrator, and the internal attenuator are used as the reference source for the checks in this procedure. Also required are:

50 Ω coaxial cable: 18 inch, BNC to BNC connectors (part of the Standard Accessories).
20 dB of attenuation.

Preparation

Set and calibrate the front-panel controls as described in the previous procedure.

1. Check Operation of Front-Panel Pushbuttons and Controls

VERTICAL DISPLAY. Display modes are activated by three pushbuttons. Pressing any of these buttons cancels the other mode.

— **10 dB/DIV.** Active, display is a calibrated 10 dB/division, 80 dB dynamic range. Calibration is checked later in this procedure.

— **2 dB/DIV.** Active, display is calibrated 2 dB/division, 16 dB dynamic range. Calibration is checked later in this procedure.

— **LIN.** Active, display is linear between the reference level (top of graticule) and zero volt (bottom of graticule).

REFERENCE LEVEL. (Reference level and IF Gain). Continuous controls that change the reference level 10 dB for each detent. Reference level goes from −30 dBm to +30 dBM in all display modes, without the gain control. With the gain control, and the Vertical Display in 10 dB/Div, the range is from −60 dBm to +30 dBm. In 2 dB/DIV and LIN Display Modes, the range is −100 dBm to +30 dBm.

REF VAR is a reference level vernier with a 10 dB control range.

TRIGGERING. Triggering source is activated by pressing one of four pushbuttons. Pressing any one of the buttons cancels or deactivates the other mode.

— FREE RUN Active, the trace free runs.

— INT Active, the displayed signal is used as a trigger source.

— LINE Active, the trace is triggered at power line frequency.

— EXT Active, trace runs only when an external signal is applied to the EXT IN HORIZ/TRIG connector.

SGL SWP. Pressing this button aborts the current sweep. Pressing the adjoining button arms the sweep generator; the button lights and remains lighted until the sweep completes. The analyzer makes a single sweep of the selected spectrum.

TIME/DIV. Selects sweep rate and manual scan operation. In MNL position, MANUAL SCAN control should vary the crt beam across the full horizontal axis of the crt graticule.

BASELINE CLIPPER. When digital storage is off, this control subdues the display intensity at the baseline. When digital storage is on, this control positions a horizontal line, or cursor, on the display. Signals above the cursor are peak detected; signals below the cursor are averaged. The cursor should position anywhere within the graticule window.

DISPLAY A. Active, half of digital storage memory is displayed. Signal amplitude should remain constant. Vary the BASELINE CLIPPER control and note that the noise level below the cursor is averaged.

DISPLAY B. Active, the other half of memory is displayed. Signal amplitude should remain constant. Vary the BASELINE CLIPPER control and note that the noise level below the cursor is averaged.

When both DISPLAY A and DISPLAY B are active, contents of A and B memory are interlaced and displayed.

Both sections are updated each sweep. Update of A memory depends on the state of SAVE A.

SAVE A. Active, contents in A memory are saved and not updated. Verify operation by changing REFERENCE LEVEL and observe that the DISPLAY A display does not change when DISPLAY B is inactive.

MAX HOLD. Active stores maximum signal amplitude at each memory location. Verify operation by changing CENTER FREQUENCY or REFERENCE LEVEL and note that the maximum level at each location is retained.

B—SAVE A. Active, the difference between updated data in B section of memory and that saved in A is displayed. Verify by saving data in A, then changing the reference level and pressing B—SAVE A; only the difference can be observed by canceling DISPLAY A and DISPLAY B. The reference (zero difference) level is normally set at graticule center, but can be internally adjusted by service personnel.

VIDEO FILTER. Active, one of three filters is selected depending on the resolution bandwidth setting, for display noise averaging.

FREQUENCY SPAN/DIV. As this control is rotated clockwise or counterclockwise, frequency span/div should change from 0 to MAX in 5-2-1 sequence. Display should indicate this change.

RESOLUTION. As this control is rotated, resolution bandwidth should range from 30 Hz to 3 MHz in decade steps. The RESOLUTION control can be coupled to the FREQ SPAN/DIV control when the knobs align with indicing marks.

CAUTION

The 1st and 2nd LO OUT ports must be terminated into 50 Ω at all times. For optimum performance, keep the termination caps in place when these ports are not used.

2. Check the 10 dB/DIV (within 0.15 dB/dB to 2 dB max. over 70 dB dynamic range) **and LIN Mode** (within 10% over 8 divisions) **Calibration**

a. Set the FREQ SPAN/DIV to 10 MHz and the RESOLUTION bandwidth to 300 kHz. Turn the BASELINE CLIPPER control fully clockwise.

b. Apply the Calibrator signal to the RF INput and tune the fundamental 50 MHz signal to center screen.

c. Reduce the FREQ SPAN/DIV setting to 5 kHz and the RESOLUTION bandwidth to 3 kHz, keeping the signal centered on screen with the TUNING control. Activate AUTO PHASELOCKED.

d. Switch in VIDEO FILTER, and increase the TIME/DIV setting to 50 ms.

e. Position the top of the signal to the top graticule line with the VERTICAL POSITION control to establish a reference.

f. Increase the RF Attenuator settings in 10 dB increments, noting that the signal amplitude decreases 1, ±0.1 division between steps.

NOTE

It may be easier to observe the change if the video filter is switched in. If used, decrease the sweep speed until the UNCAL indicator light goes out.

g. Since the RF Attenuator range is 60 dB, the last 10 dB step of the 70 dB dynamic range may be checked as follows:

(1) Return the RF Attenuator to 30 dB and add a 20 dB attenuator between the RF INput and CAL OUT signal. Adjust the signal amplitude to some reference line on the graticule with the REF VARiable control.

(2) Increase the RF Attenuator setting 20 dB and note that the signal is still visible above the noise level.

The total deviation over the 70 dB dynamic range of the display must not exceed 1.5 dB or 0.75 minor divisions.

h. Remove the 20 dB attenuator and again apply the CAL OUT signal directly to the RF INput. Switch off the VIDEO FILTER and set the RF Attenuator to 10 dB. Set the FREQ SPAN/DIV to 1 MHz and the RESOLUTION to .3 MHz.

i. Change the display mode to LIN. Position the baseline of the display on the bottom graticule line then adjust the 50 MHz amplitude with the REF VARiable control so it is 6.3 divisions.

j. Increase the RF Attenuation 10 dB by switching to 20 dB, and note that the signal amplitude decreases to 2.0, ±0.6 division for an amplitude change ratio of 3:16:1, ±10%.

k. Return the REF VARiable control in its CAL detent and the RF Attenuator to 0 dB.

3. Check the Frequency Readout Accuracy [± (5 MHz +20% of Frequency Span/Div)]

NOTE

Due to hysteresis in the tuning system (1st LO), the accuracy of the frequency readout should be checked by approaching each check point from the same direction (low to high). The FREQ SPAN/DIV is first switched to MAX SPAN and the center frequency tuned to 0000 before tuning to the desired check point. If for any reason the direction of tuning is reversed, this procedure must be repeated to establish the same point of reference on the hysteresis loop.

a. Switch the display mode to 10 dB/DIV, RESOLUTION bandwidth to 300 kHz, FREQ SPAN/DIV to MAX and tune the CENTER FREQUENCY to 0000. With the Calibrator signal applied to the RF INput, decrease the FREQ SPAN/DIV to 1 MHz and increase the CENTER FREQUENCY readout towards 50 MHz until the 50 MHz signal is centered on screen. (The signals will move from right to left as the frequency is increased.)

b. Adjust the front-panel CAL for a CENTER FREQUENCY readout of 50 MHz.

c. Tune the CENTER FREQUENCY from low to high, checking the accuracy of the readout in 50 MHz increments. Readout accuracy, when the signal is centered on the screen, should be within ±(5 MHz + 20% of the FREQ SPAN/DIV) or within ±5 MHz with a frequency span of 1 MHz/DIV.

4. Check the Range of the REF VAR Control

a. Switch the display mode to 10 dB/DIV, FREQ SPAN/DIV to 500 kHz and the RESOLUTION bandwidth to 30 kHz. Apply the CAL OUT signal to the RF INput and tune the 50 MHz signal to the center of the screen. Decrease the FREQ SPAN/DIV to 50 kHz keeping the signal centered with the TUNING control.

b. Switch VIDEO FILTER in, turn the Gain selector ccw and switch the RF Attenuator to 50 dB to establish +20 dBm REFERENCE LEVEL. Set the TIME/DIV selector to 50 ms.

c. Position the top of the signal at the 4th graticule line (center screen) with the VERTICAL POSITION control.

d. Check the REF VAR control range by turning it fully cw from its CAL detent. Gain increase should equal approximately 10 dB or the signal amplitude should increase 1 division. Return the REF VAR control to its CAL detent.

5. Check the Operation of the VIDEO FILTERS

The VIDEO FILTER reduces or averages the noise level on the display. See Fig. 2-11. Tune to one of the Calibrator signals and check the operation of the filters with RESOLUTION settings of 3 MHz, 30 kHz, and 300 Hz.

6. Check Sensitivity <−130 dBm to −80 dBm, depending on Resolution Bandwidth.

NOTE

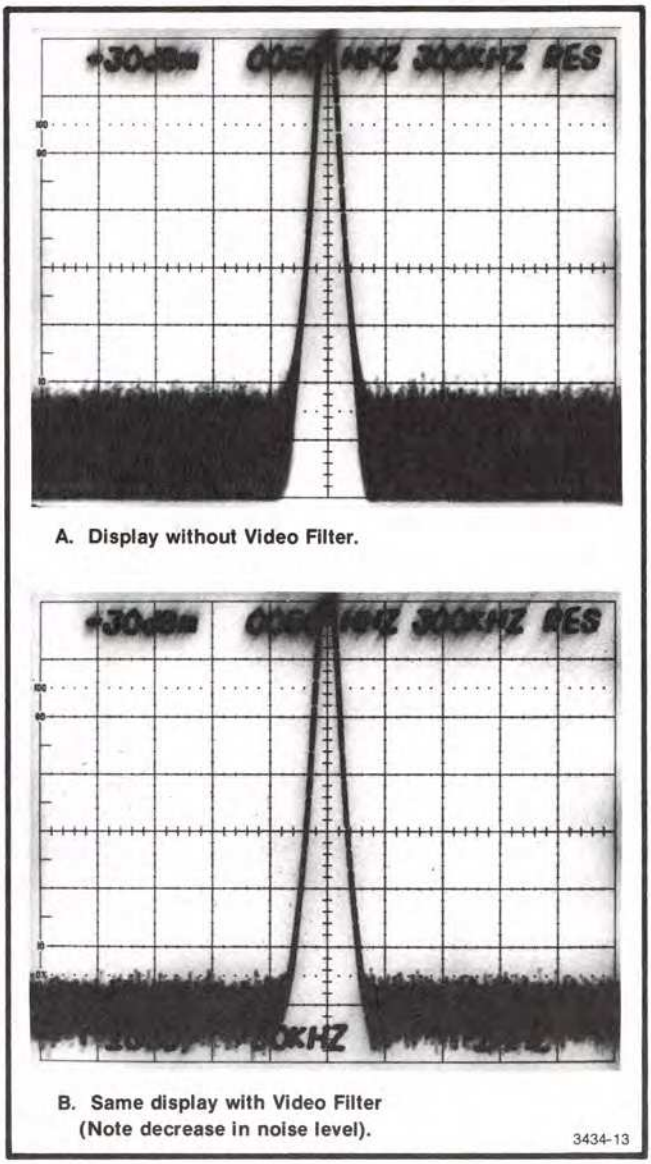
Sensitivity is specified according to the input or average noise level. The 7L14 calibrator is the reference used to calibrate the display.

a. Set the 7L14 front-panel controls as follows:

REFERENCE LEVEL	−80 dBm
Display Mode	2 dB/Div
TIME/DIV	50 ms
FREQ SPAN/DIV	0
RESOLUTION	3 MHz
DISPLAY A	on
VIDEO FILTER	on
TRIGGERING SOURCE	FREE RUN
TRIGGERING MODE	NORM

b. Terminate the RF INput into 50 Ω. Note that the displayed noise level is below the top of the screen (−80 dBm).

c. Decrease the resolution to 300 kHz and the reference level to −90 dBm. Note that the displayed noise level is below the top of the screen (−90 dBm).



A. Display without Video Filter.

B. Same display with Video Filter (Note decrease in noise level).

3434-13

Fig. 2-11. Video Filter Operation.

d. Decrease the resolution to 30 kHz and the reference level to −100 dBm. Decrease the TIME/DIV to .5 seconds. Note that the displayed noise level is below the top of the screen (−100 dBm).

e. Decrease the resolution to 3 kHz and switch the display mode to 10 dB/DIV. Decrease the TIME/DIV to 1 second/div. Note that the displayed noise level is below the 5th graticule line from the top (−110 dBm).

f. Decrease the resolution to 300 Hz. Decrease the TIME/DIV to 2 seconds/div. Note that the displayed noise level is below the 6th graticule line from the top (−120 dBm).

g. Decrease the resolution to 30 Hz. Decrease the TIME/DIV to 5 seconds/div. Note that the displayed noise level is below the 7th graticule line from the top (−130 dBm).

7. Check for Spurious Signals from Internal Sources (Residual Responses) ($\leqslant -100$ dBm, referenced to the RF INput)

a. Remove any signal connected to the RF INput so it is free of signals from any external source. Switch the RF Attenuator to 30 dB to further isolate the 1st mixer from the input.

b. Switch out the VIDEO FILTER, turn the Gain selector fully ccw and ensure that the REF VARiable control is in its CAL detent. The REFERENCE LEVEL will now read 0 dBm. The signal level at the 1st mixer however represents −30 dBm, because the RF Attenuator subtracts an additional 30 dB.

c. Set the FREQ SPAN/DIV to 1 MHz and the RESOLUTION bandwidth to 30 kHz. Switch the TIME/DIV to 50 ms or less so the UNCAL indicator is not lighted.

d. Switch to the 2 dB/DIV display mode, verify that the trace is on the bottom graticule line, then switch the display mode to 10 dB/DIV. The dynamic range of the graticule is now a calibrated 10 dB/DIV, with the top line representing −30 dBm into the 1st mixer as described in step b.

e. Tune slowly across the frequency band (10 kHz to 1.8 GHz) checking for spurious signals. The amplitude of any spurious signal must not exceed −100 dBm (signals above the 7th graticule line from the top). NOTE: Subtract 2 dB for noise which will be riding on top of the signal. If the spur is marginal (within a 3 dB of specifications) and you desire to check its amplitude more accurately, proceed as follows:

(1) Decrease the FREQ SPAN/DIV to 50 kHz or less and the RESOLUTION bandwidth to 3 kHz. (This will decrease the noise with respect to the signal amplitude.) Keep the signal centered on screen with the TUNING control as the FREQ SPAN is decreased.

(2) Decrease the sweep speed if the UNCAL indicator lights. Note the spurious response amplitude and verify that it does not exceed specifications.

f. Return the FREQ SPAN/DIV and RESOLUTION selectors to their original settings (step c).

8. Check Resolution Bandwidths and Shape Factor (Bandwidth 3 MHz to 30 Hz within 20% in decade steps; shape factor 4:1 to 300 Hz except 3 MHz resolution. Maximum bandwidth 60 dB down, with 3 MHz resolution is 13 MHz. Shape factor for 30 Hz is 12:1)

a. Apply the Calibrator signal to the RF INput and set the RF Attenuator to 0 dB. Turn the Gain selector fully ccw for a REFERENCE LEVEL of −30 dBm.

b. Tune the 50 MHz marker to the center of the screen, set the FREQ SPAN/DIV to 1 MHz, and the RESOLUTION bandwidth to 3 MHz.

c. Switch the display mode to 2 dB/DIV and adjust the REF VARiable control if necessary, for a full screen display.

NOTE

Ensure that the sweep rate is set so the UNCAL light is out and the baseline of the display is on the bottom graticule line.

d. Check the bandwidth of the signal at the 6 dB down level (see Fig. 2-12a). Bandwidth must equal 3 MHz ±600 kHz.

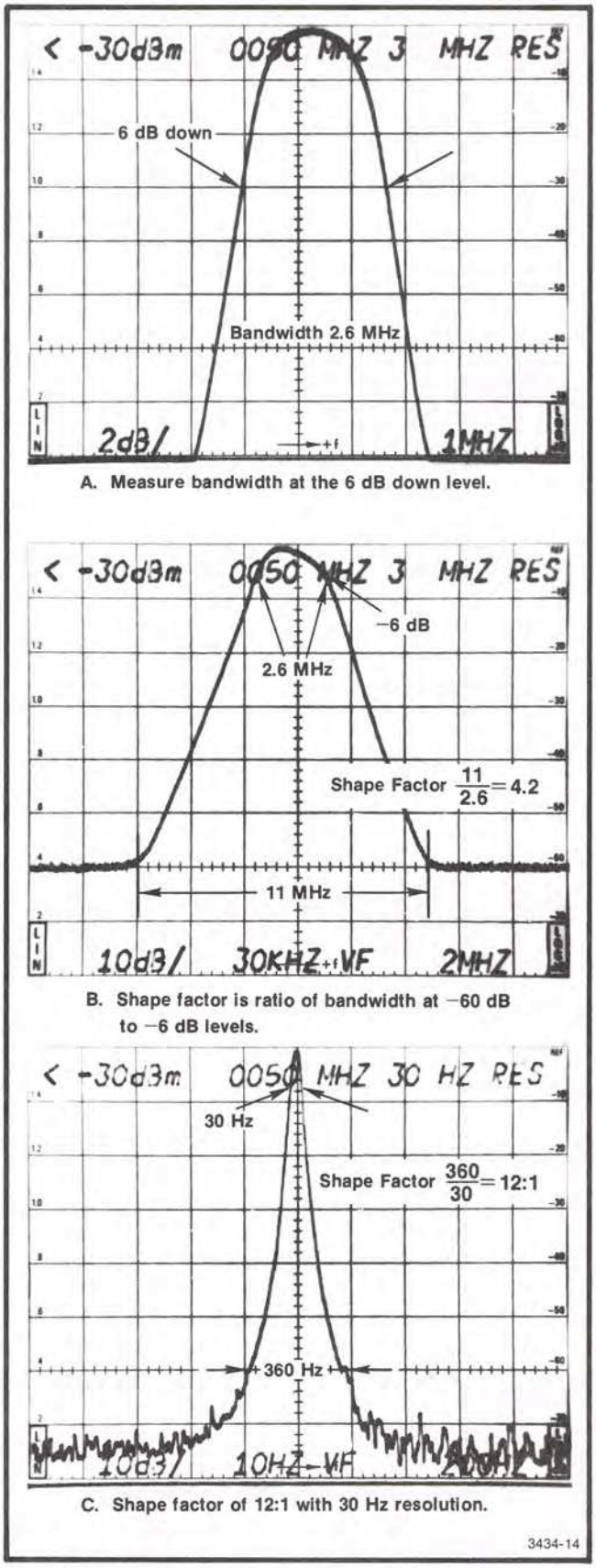
e. Switch the display mode to 10 dB/DIV and the VIDEO FILTER in. Switch the FREQ SPAN/DIV to 2 MHz and check the shaper factor (see Fig. 2-12b).

f. Return the display mode to 2 dB/DIV, decrease the FREQ SPAN/DIV to 100 kHz and the RESOLUTION bandwidth to 300 kHz. Keep the signal centered on screen with the TUNING control as the FREQ SPAN is decreased.

g. Check the bandwidth at the 6 dB down level. Bandwidth must equal 300 kHz ±60 kHz.

h. Switch the FREQ SPAN/DIV to 200 kHz, display mode to 10 dB/DIV, and check the shape factor as described in step e.

i. Reduce the FREQ SPAN/DIV to 10 kHz, the RESOLUTION bandwidth to 30 kHz, and the display mode to 2 dB/DIV. Center the display with the TUNING control if necessary.



A. Measure bandwidth at the 6 dB down level.

B. Shape factor is ratio of bandwidth at −60 dB to −6 dB levels.

C. Shape factor of 12:1 with 30 Hz resolution.

Fig. 2-12. Measuring bandwidth and shape factor.

j. Check the bandwidth. Bandwidth must equal 30 kHz ±6 kHz.

k. Reduce the FREQ SPAN/DIV to 200 Hz and the RESOLUTION bandwidth to 300 Hz. Center the display with the TUNING control if necessary. Adjust the REF VARiable control for a full screen display.

l. Check the bandwidth of the response at the −6 dB level. Bandwidth must equal 300 Hz ±60 Hz.

m. Switch the display mode to 10 dB/DIV, reduce the sweep speed to 2 s/Div to maintain a calibrated display. Measure the response shape factor.

n. Reduce the RESOLUTION to 30 Hz and change the display mode to 2 dB/DIV. Check the bandwidth at the −6 dB (half screen) level. Bandwidth must equal 30 Hz ±6 Hz.

o. Switch the display mode to 10 dB/DIV and measure the shape factor. Shape factor for 30 Hz resolution must equal 12:1 or better (see Fig. 2-12c).

9. Check Residual (Incidental) FM (10 kHz (p-p) for 20 ms when not phaselocked)

a. Set the 7L14 front-panel controls as follows:

Display Mode	2 dB/Div
REFERENCE LEVEL	−40 dBm (0 RF Attenuation, 10 dB gain)
TIME/DIV	20 ms
TRIGGERING SOURCE	FREE RUN
TRIGGERING MODE	NORM
DISPLAY A	on
RESOLUTION	300 kHz
FREQ SPAN/DIV	100 kHz
AUTO PHASELOCKED	OFF

b. Apply the CAL OUT signal to the RF INput. Tune the center frequency to 50 MHz. Center the signal on screen.

c. Position the marker signal with the CENTER FREQUENCY control so the slope (horizontal versus vertical excursion) of the response can be measured as illustrated in Fig. 2-13A. It may be advantageous to SAVE A to freeze the display. The slope must be calculated on the linear portion of the waveform.

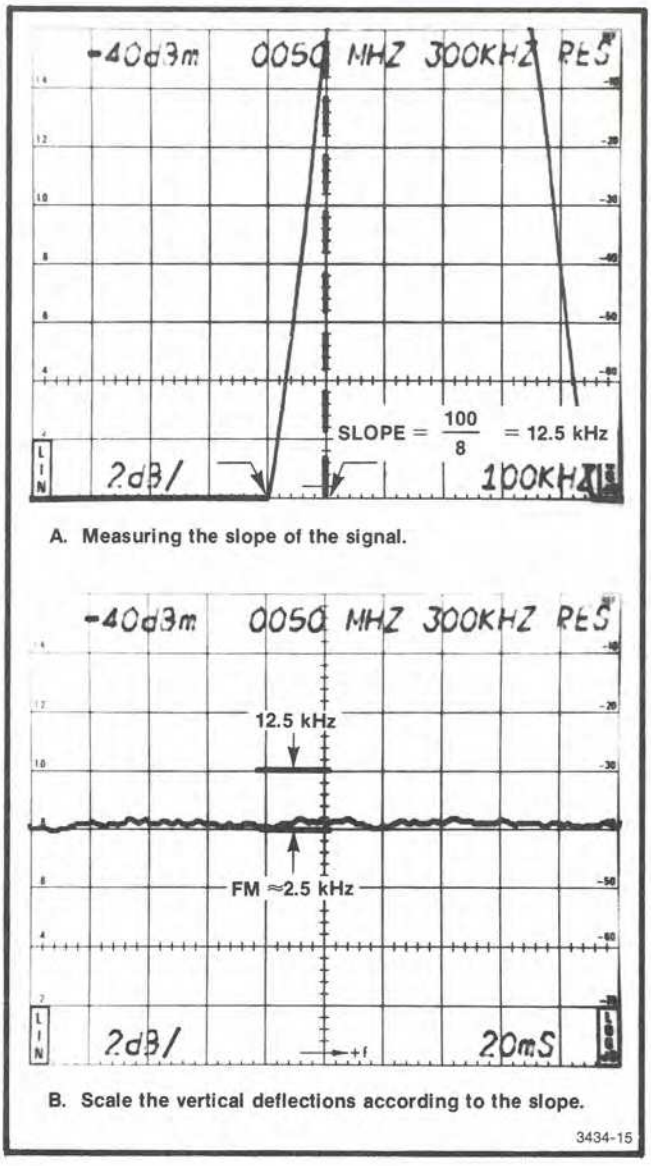


Fig. 2-13. Measuring residual FM.

d. Switch FREQ SPAN/DIV to 0 (time domain) and adjust CENTER FREQUENCY to position the display near center screen as shown in Fig. 2-13B. Note the peak-to-peak amplitude of the display within any horizontal division, scaling the vertical deflections according to the slope estimated in step c. Residual FM must not exceed 1 kHz for 20 ms, measured within the linear portion determined in step c.

10. Check Residual (Incidental) FM (≤13 Hz (p-p) for 20 ms when phaselocked)

a. Set the 7L14 front-panel controls as follows:

Display Mode	2 dB/DIV
REFERENCE LEVEL	−40 dBm (0 RF Attenuation)
TIME/DIV	20 ms
TRIGGERING SOURCE	FREE RUN
TRIGGERING MODE	NORM
DISPLAY A	on
RESOLUTION	300 Hz
FREQ SPAN/DIV	200 Hz
AUTO PHASELOCKED	on

b. Apply the CAL OUT signal to the RF INput. Tune the center frequency to 50 MHz. Center the signal on screen.

c. Calculate the slope as described in procedure 9, step c.

d. Switch FREQ SPAN/DIV to 0 (time domain). Measure residual FM using the same technique as described in procedure 9, step d. Residual FM must not exceed 13 Hz for a 20 ms period.

11. Check Sweep Circuit Operation with the TIME/DIV Selector in the MANUAL and OFF Positions

a. Switch the TIME/DIV selector to the MANUAL position and rotate the MANUAL SCAN control through its range. Note that the crt beam scans the full 10 division graticule width.

b. With DISPLAY A off, switch the selector to the OFF position. Note that the crt beam is now vertically centered on the screen.

c. Return the TIME/DIV selector to 50 ms position for normal operation.

12. Check Digital Storage

a. Set the 7L14 front-panel controls as follows:

REFERENCE LEVEL	−30 dBm
Display Mode	10 dB/Div
RESOLUTION	300 kHz
FREQ SPAN/DIV	200 kHz
TIME/DIV	50 ms
DISPLAY A	on
VIDEO FILTER	on

b. With the calibrator signal applied to the RF INput, tune the signal to center screen, then activate SAVE A.

c. Change the REFERENCE LEVEL to −10 dBm and activate DISPLAY B. The display of the calibrator signal should be 2 divisions lower (20 dB less) than DISPLAY A.

d. Activate B-SAVE A and check display. It should show the difference between DISPLAY B and DISPLAY A (see Fig. 2-14).

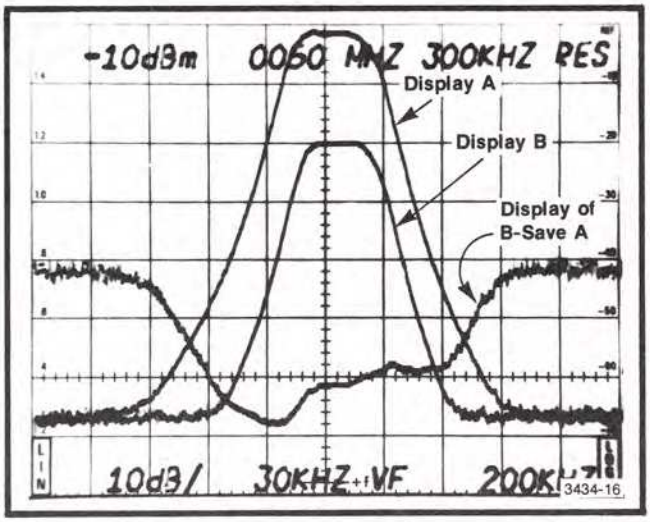


Fig. 2-14. Using digital storage to measure the difference between two displays.

e. Deactivate SAVE A, B-SAVE A, and VIDEO FILTER. Activate MAX HOLD.

f. Change both CENTER FREQUENCY and REFERENCE LEVEL and note that MAX HOLD function retains and holds the maximum signal amplitude and frequency excursion.

g. Deactivate MAX HOLD and select DISPLAY A.

h. Vary the PEAK/AVERAGE control to shift the cursor over the screen height and note that signal and noise are averaged below the cursor.

This completes the operational check of the 7L14.

GENERAL OPERATING INFORMATION

1. Signal Application

The RF INput impedance to the 7L14 is 50 Ω. At high frequencies, impedance mismatches between the RF INput and the signal source can cause reflections in the transmission line and degrade instrument performance. Flatness, sensitivity, spurious response, etc., are all affected. To reduce mismatch, use good quality 50 Ω coaxial cable to connect the signal source to the RF INput and keep the cable as short as possible. Cable losses become excessive above frequencies of 1 GHz.

Avoid applying high level signals (above −30 dBm) to the 1st mixer of the 7L14. High level signals overload the mixer and may produce spurious signals. A conversion chart shown in Fig. 2-15 will aid in determining input signal level, in dBm, μV, and μW, from a voltage or power source.

CAUTION

The maximum input power level to the RF attenuator is 1 W average and 100 W peak. When the RF input signals are riding on a dc potential, use a dc block (Part number 015-0221-00), to prevent the dc from reaching the 1st mixer. When the signal source is 75 Ω and you are using the 75 to 50 Ω minimum loss attenuator, a dc block is not required (one is incorporated in the attenuator.). Line stabilization networds, used for conducting EMI/RFI measurements, will often have several volts of 60 Hz signal at the output. The dc block will protect the input mixer and prevent its destruction.

Spurious response, caused by signal overload into the 1st mixer, can be minimized if the signal amplitude is kept within the graticule limits. A recommended procedure is to adjust the Gain selector for some baseline noise on the display, then increase the RF Attenuator setting until the strongest signals are within the graticule limits. If this does not bring these signals within limits, add external attenuators.

The 7L14 can be used with a 75 Ω signal source by using a 75 Ω to 50 Ω minimum loss attenuator. This attenuator is available as an optional accessory (refer to the Accessory page for ordering information). 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 1mV across 75 Ω). Figure 2-16 is a circuit diagram of a suitable matching pad for this purpose. Figure 2-17 shows the relationship between 50 Ω and 75 Ω units, with matching attenuators included; the conversion is described as follows:

(1) dBmV (75 Ω) = dBm (50 Ω) + 54.47 dB. For example, −60 dBm (50 Ω) + 54.47 dB = 5.5 dBmV (75 Ω).

(2) dBm (75 Ω) = dBm (50 Ω) +5.72 dB. For example, −60 dBm (50 Ω) +5.72 dB = −54.3 dBm (75 Ω).

(3) For some applications you may wish to know the relationship between dBm and dBμV. For 50 Ω systems dBμV = (dBm) + 107 dB.

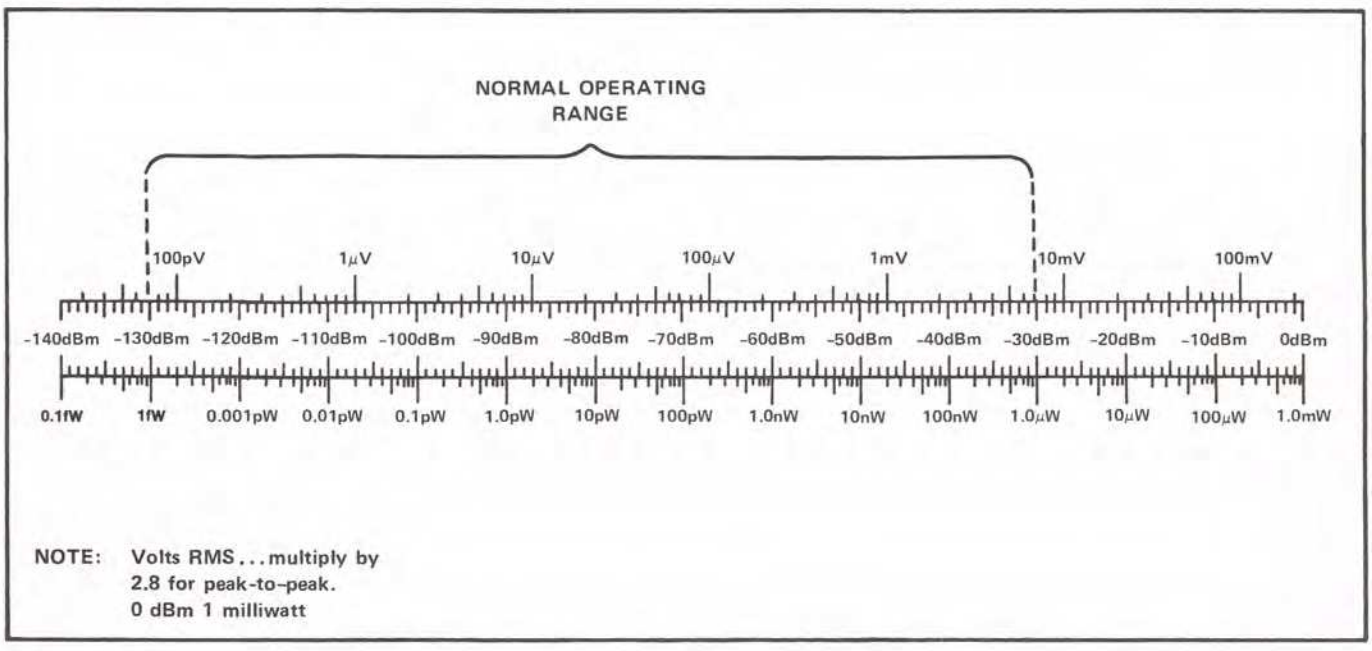


Fig. 2-15. Volts-dBm-Watts conversion chart for 50 Ω impedance.

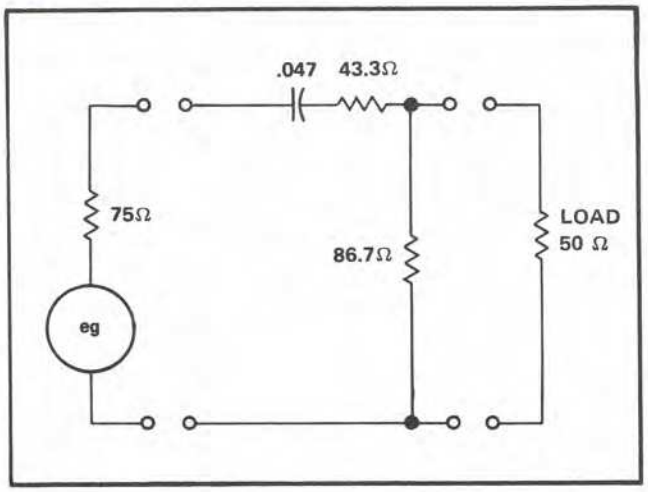


Fig. 2-16. Circuit of a 75 Ω-to-50 Ω matching pad (ac coupled)

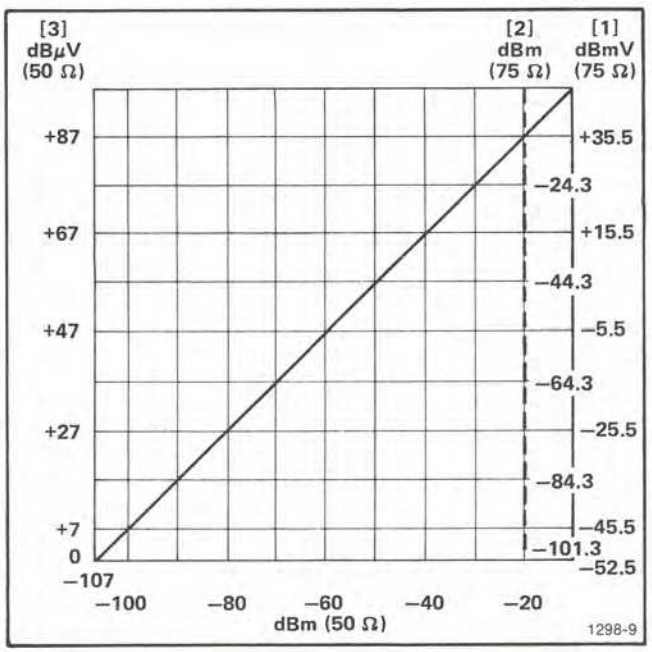


Fig. 2-17. Graph to illustrate the relationship between dBm, dBmV and dBμV (matching attenuator included where necessary).

2. Resolution, Sensitivity, and Frequency Span

Resolution is the ability of a spectrum analyzer to discretely display adjacent signals within a frequency span. This resolution ability is a function of analyzer bandwidth, sweep speed, frequency span, and incidental FM. The frequency span and sweep time are adjusted for minimum bandwidth to a cw signal. Theoretically, resolution and resolution bandwidth become synonymous at very long sweep times.

Resolution bandwidth is measured and specified for the 7L14 as the bandwidth (separation) at the 6 dB down point on the signal.

As the analyzer sweep rate is increased, the signal amplitude will decrease and bandwidth will increase, signifying that both sensitivity and resolution have been degraded.

The best resolution with no video filter, for a given frequency span and sweep time is expressed as:

$$R_0 = \sqrt{\frac{\text{Frequency Span (in kHz)}}{\text{Sweep Time (in ms)}}}$$

Bandwidth determines both noise level and the resolution capability of the analyzer. As the bandwidth decreases, the signal-to-noise level and, therefore, sensitivity increases. Maximum sensitivity, therefore, is obtained at the higher resolution settings.

The frequency span is symmetrical about the center frequency. The frequency span to be used depends on the application. Wide frequency spans are used to monitor a frequency spectrum for spurious signals, check harmonic distortion, etc. Narrow frequency spans are used to identify a particular signal and check its characteristics such as modulation, bandwidth, etc.

When wide frequency spans are displayed, sweep rate is usually increased to eliminate flicker; this requires the use of wide resolution bandwidths. When narrow frequency spans are used, high resolution capability is usually desired and slow sweep speeds are required.

The FREQ SPAN/DIV and RESOLUTION selectors for the 7L14 are normally coupled together to optimize resolution for the frequency span selected; however, either can be independently set by pulling out the "PULL TO UNLOCK" sleeve around the FREQ SPAN/DIV selector.

An UNCAL indicator will light when the sweep time is too fast for an amplitude calibrated display. Sweep speed should be reduced to maintain a calibrated reference level if the UNCAL indicator lights.

For pulsed applications, the resolution bandwidth of the analyzer should be on the order of 1/10 the side lobe frequency width, or the reciprocal of the pulse width, in order to ensure adequate resolution. The RESOLUTION selector is usually set for optimum main lobe detail after the sweep rate has been adjusted.

3. Gain Desensitization Near 0 Hz

If the Gain selector is set for a REFERENCE LEVEL that is −50 dBm or more (e.g. −60 dBm) with the RF Attenuator at 0 dB, a decrease in sensitivity will be noticed below 1 MHz. This effect is caused by the 0 Hz response overdriving the 1st IF amplifier. If you are operating between 0 Hz and 2 MHz, do not set the Gain selector in this region.

4. Using the Video Filter

The video filter is used for effective averaging of distributed signals, such as noise, and high frequency components on the display. When signals are closely spaced, the filter may be useful in reducing modulation between the two signals so they can be more easily analyzed. The filters can also be used to average the envelope of pulsed RF spectra that has a relatively high PRF (pulse repetition frequency); however, because the filter is basically an integrating circuit, low PRF signals produce poor results.

The use of the video filter may require a reduction in sweep speed in order to maintain a calibrated display. Again, the UNCAL indicator will light if the sweep speed is too fast for the video filtering, RESOLUTION and FREQ SPAN/DIV selected.

5. Selecting Sweep Rate

Because the FREQ SPAN changes the resolution and sensitivity, the sweep rate must be decreased as the frequency span and resolution bandwidth are decreased, or when the UNCAL indicator lights. When the FREQ SPAN is reduced to 0, the analyzer functions as a fixed tuned receiver. The analyzer now displays time domain characteristics of the signal, within the bandwidth capabilities of the analyzer. Sweep Time/Div can now be used to examine or analyze such characteristics as modulation pattern, pulsed repetition rates, etc.

NOTE

The RESOLUTION bandwidth should be maximum for time domain analysis.

6. Triggering the Display

The sweep trigger source is usually switched to the FREE RUN mode for normal spectrum displays; however, it may be desirable or necessary to trigger the display when the event is time related to some source, or when the frequency span has been reduced to zero and a time domain analysis is performed.

The sweep can be triggered from the vertical or video signal from either vertical plug-in compartment, from the power line voltage, or from an external source. Trigger slope for any mode can be + or −; the triggering level is adjustable over the full range of a displayed signal when using INTernal trigger source, over a 10 V range of an external signal when using EXTernal source, and over the peak-to-peak range of the line signal when using LINE.

In the NORM triggering mode, the display is triggered when the triggering signal source is within specifications. If the triggering signal is absent or outside of specifications, the sweep recurs automatically to provide a display baseline.

The amplitude of triggering signal that is required to trigger the sweep depends on the sweep mode selected. The internal signal is ac coupled; the line and external signals are dc coupled. Trigger sensitivities are: 1) ≤0.5 division of signal (peak-to-peak) and ≤0.5 volt (peak-to-peak) of external signal for NORM mode. 2) ≤0.5 division of signal (peak-to-peak) and ≤0.5 volt (peak-to-peak) of external signal for SGL SWP mode.

Maximum safe trigger input signal level to the EXT INputs is 50 volts (dc + peak ac).

In the FREE RUN state, the sweep will not synchronize with any input trigger signal.

When the SGL SWP button is depressed, the sweep will run after the adjoining button is depressed. During the sweep cycle, the activating button lights to indicate that the sweep is running. This feature is useful when photographing displays at slow sweep rates. The activating button does not arm the trigger circuit like some time base units.

When triggering on pulsed spectra, it may be necessary to fine tune the sweep start away from a null point to trigger the display.

7. Manual Scan of the Spectrum

This position is used to examine a particular point or portion of the display, such as one of the null points of a frequency modulation spectrum.

a. Calibrate the sweep span with the TIME/DIV selector in one of the scan positions as previously described, then switch to the MANUAL position.

b. Use the MANUAL SCAN control to scan the selected frequency spectrum.

8. Using an External Sweep Source

A signal source is required to sweep the analyzer externally. A voltage ramp from 0 V to 10 V ±1 V will sweep the analyzer through its full span. 0 V corresponds to 0 Hz and 10 V to the high frequency end of the selected span. Input impedance is approximately 12 kΩ for an external sweep signal.

Before switching to external operation, calibrate the sweep span using the internal sweep and the 50 MHz calibrator signal as described under Operational Check. Switch the TIME/DIV selector to its EXT position and apply the external voltage to the EXT IN HORIZ/TRIG jack. Adjust the upper end of the voltage (10 V) until the analyzer sweep span is calibrated.

NOTE

The frequency deviation across the selected span is a linear function (within 20%) of the input voltage, so +5 V dc should tune the analyzer to the center of the selected frequency span.

9. External Trigger Operation

This procedure is applicable when an external trigger source, such as a pulse generator or modulator, is used to trigger the display so it can be synchronized to an event (e.g., measuring PRF of a radar signal).

a. Apply the trigger signal (≥0.5 V peak) to the EXT IN HORIZ/TRIG jack of the 7L14. Switch the TRIGGERING SOURCE to EXT and the TIME/DIV selector to the desired sweep rate.

b. Adjust the triggering SLOPE and LEVEL for the desired triggering point.

c. If time domain information is desired, reduce the FREQ SPAN/DIV to 0 and set the RESOLUTION to 3 MHz.

The analyzer is now triggered by the external source so the display sweep rate can be controlled externally.

10. Digital Storage

Digital storage provides a smooth (flicker free) display. Two complete events can be stored. One of these can be saved and then compared to subsequent updated information. A MAX HOLD feature updates the stored data in memory when the new input is of higher amplitude, thus allowing monitoring and graphic plotting of display changes with time. Vertical information can be divided by a cursor, or horizontal line, that is positioned with the PEAK/AVERAGE control. Above the cursor, video information is peak detected and displayed; below the cursor, signal averaging occurs. The average (number of samples) is a function of sweep speed. The slower the sweep, the greater the number of samples averaged. This feature suppresses noise in that portion below the cursor and allows full peak detection of vertical data above the cursor. An intensified spot on the cursor indicates the horizontal position at which memory is being updated.

When digital storage is used, an additional quantization error of 0.5% of full screen must be added to the amplitude performance characteristics (i.e., frequency response, sensitivity, etc.)

Digital storage memory is functionally divided into two sections—A and B. Data can be stored in A or B or in both. There are 512 horizontal locations in A and 512 horizontal locations in B. When both are displayed, the origin of B is shifted such that the A and B coordinates are interlaced to provide 1024 display increments. Data in memory is continually updated with each sweep so the display, when displaying A or B, is always current.

When SAVE A function is activated, data in A memory is held in storage and only B memory is updated. This inhibition takes place whether A is displayed or not. This mode captures an event or waveform for comparison with a subsequent event displayed by DISPLAY B mode. In this mode all of A memory is displayed, then all of B, each by a separate sweep.

When B—SAVE A is activated, the contents of data in B memory minus the contents saved in A are displayed. This provides the comparison of the two events by presenting the algebraic difference of the two displays. This convenient mode can be used to align filters or other devices when tuning for a null. The reference waveform is stored in A and the unknown in B. If the device under test is active, the B waveform may be larger than the reference which results in a shift in the zero reference line. The position of the zero reference can be selected with an 8-bit digital switch. The reference level is normally set mid-screen so positive and negative quantities can be observed. Qualified service personnel can position the reference anywhere within the graticule window.

MAX HOLD causes the digital memory to be updated only if the new input is of higher magnitude than the former (B memory only if SAVE A is active). This allows

monitoring of signals that may change with time and provides a graphic record of amplitude/frequency excursions.

Signal averaging is useful for suppressing noise. The number of samples averaged per digitized slot (increment) is a function of the spectrum analyzer sweep rate. The slower the sweep speed, the more samples averaged per resolution bandwidth. Resolution bandwidth also affects the amplitude difference between peak detected and average levels of cw signals. When the resolution bandwidth is less than 1/30th the span/division (e.g., 100 kHz or less with 5 MHz span/div) there will be significant difference between peak and average amplitude levels of cw signals. The peak value will be the true value, the average value will be in error, especially if only A or B is displayed. It is best to run digital storage with both A and B interlaced when using narrow resolution bandwidth with wide frequency spans.. To analyze signal amplitude level, set the cursor at least 1/4 division below the signal peak. To average noise, set the cursor at least 1/4 division above the noise level.

11. Using the CAL OUT Signal Reference for Accurate Frequency and Amplitude Measurements

The accuracy of frequency measurements may be improved by using harmonics of the crystal controlled Calibrator. The Calibrator accuracy is within 0.01%. Frequency measurements within 2 MHz are possible by using either of the two methods described below.

Measuring the Frequency Span between a Calibrator Marker and the Signal to Obtain an Absolute Frequency Measurement

a. Tune the signal to the center graticule line, approaching this point from the low frequency side of the display. Couple the FREQ SPAN/DIV and RESOLUTION selectors together and open up the display to obtain an accurate setting, by reducing the FREQ SPAN/DIV to 5 MHz and increasing RESOLUTION to .3 MHz. Adjust SWP CAL, if necessary, to calibrate the display for 10 divisions between the 50 MHz calibration markers. (Remember to approach the center point from the low frequency side.)

b. Connect the CAL OUT signal and the signal source through a BNC "T" connector to the RF INput so both signal and markers are displayed.

c. Measure the frequency span between the signal and the nearest 50 MHz marker. (Frequency span is 5 MHz/Div.)

d. Add or subtract the frequency span to the respective marker to obtain the signal frequency. Since the maximum frequency span between the signal and marker is 25 MHz ±5%, marker accuracy is 0.01% and human observation error is approximately 1/2 a minor division or 0.5 MHz. The accuracy using this method is within 2 MHz.

Measuring the Frequency after the Frequency Readout Correction Factor Has Been Established

a. As described for the frequency span method, tune the signal to the graticule centerline, opening the display to 5 MHz/Div to obtain an accurate setting. Tune the signal to the center from the low frequency side.

b. Note the frequency readout (e.g., 1002 MHz).

c. Apply the CAL OUT signal to the RF INput and tune the nearest 50 MHz marker to the graticule centerline.

d. Set the frequency readout, with the CAL adjustment, to read the exact frequency (e.g., 1000 MHz.).

e. Retune to the unknown signal, approaching it from the low side, and note the frequency readout.

Measuring Absolute Signal Levels

Since the top of the graticule is a calibrated REFERENCE LEVEL and the graticule is calibrated in dB/DIV, as described in the Preliminary Front Panel Calibration procedure at the beginning of this section, it is easy to measure the absolute level of most signals.

a. Calibrate the graticule as previously described in the Operational Check procedure. Ensure that the REF VARiable (gain) control is in its CAL detent.

b. Connect the signal source to the RF INput, as described under Signal Application. Switch to the 10 dB/DIV or 2 dB/DIV display mode.

NOTE

For maximum accuracy, use the same cable that was used to calibrate the REFERENCE LEVEL and use the 2 dB/DIV display mode.

c. Select a REFERENCE LEVEL with the RF Attenuator and gain selector to bring the signal to be measured within the screen or graticule window.

NOTE

If you are operating in the 10 dB/DIV mode, the gain selector should be within the blue sector.

d. The absolute signal level equals the number of dB graticule divisions from the reference level (top of the screen) to the signal reference (usually the signal peak) plus the REFERENCE LEVEL readout in dBm. For example: A signal level 4.5 divisions below the top with a REFERENCE LEVEL readout of −60 dBm, in the 2 dB/DIV display mode, is −60 dBm + (−9 dB) or −69 dBm. This refers to the signal level at the RF INput connector. Add the insertion loss of any external attenuators and cables (if they are used) between the signal source and the RF INput.

NOTE

The maximum input level to the RF INput, for linear operation, is −30 dBm with 0 dB RF attenuation; or +30 dBm with 60 dB of RF attenuation. Accurate measurement of signals above this level can only be performed if an external attenuator is used.

Accurate Signal Level Difference Measurements in dB

a. Using the 2 dB/Div display mode, position the top of the lowest amplitude signal to a reference line within the graticule area with the REF VARiable or VERTICAL POSITION controls. If display noise is excessive, use the VIDEO FILTER and reduce the sweep speed to maintain signal amplitude, or decrease the RESOLUTION bandwidth.

b. Use the RF Attenuator selector to reduce the amplitude of the larger signal until it is within the graticule area, and note the increased attenuator reading.

c. Measure the signal level from the reference line established for the smaller signal (graticule is calibrated in 2 dB/DIV), then add the change in RF Attenuator reading to obtain the difference level (in dB) between the two signals.

Measuring Relative Signal Amplitude in LIN Display Mode

The vertical scale on the spectrum analyzer graticule is calibrated in dB for LOG display and in increments of 0.2 for the LIN display. Relative signal levels can be made by adjusting the amplitude of one signal with the gain and attenuator controls to 1.0 division, then directly reading from the graticule, the amplitude of the other signals as a percentage of this reference.

12. Using the Analyzer Below 100 kHz

The sensitivity of the analyzer degrades about 0.3 dB/kHz below 100 kHz; for example, the sensitivity is about −113 dBm at 50 kHz with 30 Hz resolution. Reference level operation becomes limited to −50 dBm as the center frequency approaches 1 kHz, because of the LO energy that exists in the 1st IF pass-band.

APPLICATIONS

7L14 and the TEKTRONIX TR 502 Tracking Generator

The 7L14 Spectrum Analyzer, combined with the TR 502 Tracking Generator, has the characteristics of a very sensitive synchronized detector. It allows for a number of measurements such as:

- frequency measurements with counter accuracy of low level (below -100 dBm) signals.
- accurate frequency measurements of the modulation components of complex signals.
- return loss and swr measurements.

7L14 and the TEKTRONIX 1405 Sideband Analyzer Adapter

The 7L14 Spectrum Analyzer, in conjunction with the 1405 Sideband Analyzer Adapter, allows sideband analysis to be performed directly on the rf carriers in television appications.

Interconnections for operation with the 1405 Side-band Adapter are described below.

a. Connect the 7L14 1ST LO OUT to the 1405 LO IN.

b. Connect the 1405 Z-AXIS OUT to the oscilloscope mainframe EXT Z-AXIS IN.

c. Connect the 1405 VIDEO OUT to the video input of the tv transmitter or circuit under test.

d. Connect a sample of the output of the tv transmitter or circuit under test to the RF INput of the spectrum

analyzer, using an appropriate cable and coupler to avoid exceeding the maximum input power level of +30 dBm.

CAUTION

Use care to keep the power level into the spectrum analyzer low; an off-screen signal can damage the spectrum analyzer. External attenuators should be used if the internal attenuator will not reduce the signal sufficiently.

For these applications, as well as applications for spectrum analyzers alone, such as: measuring intermodulation products, cross modulation, radiation interference, modulation percentage, modulation index, absolute and relative signal levels, etc. contact your local Tektronix Field Office or representative.

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.

THEORY OF OPERATION

This section describes the functions of the major circuits in the 7L14 and their relationship in the overall operation of the instrument. The description is general and intended as an aid for the technician and operator to help service, or operate the instrument at maximum efficiency.

The section begins with a functional block diagram description, followed with more detailed analysis of the major circuits. Positive logic is used for digital circuits. The diagrams contain typical waveform and voltage data that should be helpful to understand circuit functions and aid in troubleshooting the instrument.

BLOCK DIAGRAM

The 7L14 is a swept front-end spectrum analyzer that covers the frequency range from 10 kHz to 1.8 GHz and provides a frequency span of 1.8 GHz. A detailed block diagram in the Diagrams section, illustrates signal paths and function of the major circuits. Refer to this diagram while reading the description.

The input signal path to the 1st mixer consists of a 0 to 60 dB step attenuator, a limiter (to protect the mixer from a DC voltage), a 1.8 GHz low-pass filter, and a 3 dB isolation pad. The stop band for the filter begins at 2.095 GHz. The filter attenuates frequencies of 2.095 GHz (1st IF) and higher, that may exist between the 1st mixer and the RF INput. This reduces susceptibility to image responses, IF direct feed-through from the RF INput, and keeps the 1st LO output from reaching the RF INput connector.

The 1st mixer is a double-balanced type mixer, with its input and output isolated by a 3 dB pad and a traveling wave directional filter, respectively. The 3 dB pad reduces VSWR interaction and improves the response flatness. The traveling wave directional filter reduces intermodulation distortion and provides a termination for image responses from the 1st mixer.

The frequency of the 1st LO is swept, when the frequency span is 100 kHz/Div or more, through some portion or all of the frequency range from 2.095 GHz to 3.895 GHz. The center frequency of the oscillator can also be tuned through the selected frequency span. When the frequency span is 50 kHz/Div or less, the 1st LO frequency is fixed and the 2nd LO is swept through the selected span.

The output of the 1st mixer (1st IF) is centered at 2.095 GHz. A bandpass filter 10 MHz wide (with a center frequency of 2.095 GHz) attenuates the upper sideband, and a 2.2 GHz low-pass filter ensures the outband integrity of the bandpass filter. The 1st IF is converted to 105 MHz (2nd IF) in the 2nd mixer by mixing the 2nd LO frequency of 2.2 GHz with the 1st IF of 2.095 GHz.

The 2nd IF signal is amplified by a Pre-Resolution amplifier, then reduced in bandwidth to 3 MHz by a three-cavity helical resonator filter. The 105 MHz IF is converted down to 10 MHz in the 3rd mixer by the 3rd LO frequency of 95 MHz mixing with the 2nd IF of 105 MHz. Amplification and bandwidth of the 10 MHz 3rd IF, are controlled in the resolution and function IF amplifier stages. Amplification is controlled by switching in amplifier stages. Bandwidth is controlled, in decade steps from 3.0 MHz to 30 Hz, by switching bandpass filters into the signal path. IF gain can be selected in 10 dB steps from 0 to 70 dB. Gain stages are in the Pre-Resolution amplifier and the Function IF amplifier, with an additional 10 dB of gain in the 30 Hz filter. The additional 10 dB of gain may be added only when the resolution bandwidth is 30 Hz and the display mode is 2 dB/DIV or LIN. Variable gain between the 10 dB steps, is provided by a variable gain stage in the Post-Resolution amplifier.

The Function IF amplifier contains circuits for logarithmic, linear, and vertical deflection factor. The log displays are 2 dB/Div and 10 dB/Div. The amplifier also compensates for the gain variation when the resolution bandwidth and display modes are changed, so the reference level remains constant through all combinations of resolution and display modes.

The detected signal from the Function IF amplifier is amplified and summed with voltage levels for vertical positioning, then applied through push-pull amplifiers to the oscilloscope mainframe interface. Three auxiliary circuits can be switched into the video signal path. These circuits provide: video filtering (30 kHz, 300 Hz, and 10 Hz), digital storage (DISPLAY A, DISPLAY B, SAVE A, B-SAVE A, and MAX HOLD), and baseline suppression, peak detention, or averaging when digital storage is activated.

The sweep circuits provide the frequency base or time base for the display. In the frequency domain, the output from the sweep generator is applied through the horizontal amplifier to the mainframe interface, for the horizontal deflection, and through the frequency span attenuator to

the 1st or 2nd local oscillator, for frequency sweeping. The frequency span of the display is therefore a function of how much the 1st LO or the 2nd LO is swept.

The sweep ramp from the sweep generator is attenuated in calibrated increments by the FREQ SPAN/DIV attenuator, then applied through switch contacts to either the 1st LO (YIG) driver circuits or the voltage controlled 16-19 MHz oscillator in the 2nd LO phase lock loop.

A current ramp through the main tuning coil, sweeps the 1st LO for frequency spans from 100 MHz/Div through 5 MHz/Div, the current ramp is then applied to the FM coil of the YIG oscillator for spans of 2 MHz/Div through 0.1 MHz/Div. When the frequency span is decreased to 50 kHz/Div or less, the 1st LO may be phase locked and the sweep ramp is applied through switch contacts to a voltage controlled 16-19 MHz oscillator in the 2nd LO phase lock loop. The 2nd LO phase lock loop is a servo system which transmits changes of the 16-19 MHz oscillator frequency to the 2nd LO.

The marker (or ditch) in the signal that is displayed when the FREQ SPAN/DIV selector is in MAX position, is produced by the marker generator. The marker position is relative to the setting of the tune control: it indicates the portion of the span that will be the center of the display when the frequency span is reduced. When digital storage is on, the marker is displayed on the signal as well as on the cursor. The marker, summed with the video at the amplifier, drives the vertical output stage.

This completes the signal path flow and the function of the frequency span circuits.

DETAILED CIRCUIT DESCRIPTION

The following is more detailed than the block diagram description and should assist in servicing and operating the instrument.

RF or Microwave Circuits ◇2

The RF section consists of sealed microwave assemblies that contain hybrid circuits on ceramic substrates, or circuit boards mounted in a metal substrate. The cover of the assembly is then sealed with a conductive sealant. This seal should not be broken, nor repair attempted. Components in the RF microwave assemblies are identified with a circuit number when they are referred to in the calibration procedure (e.g., C15, C16, and C17 in A8). The circuitry within the block is simplified to illustrate the function of the hybrid assembly.

As previously described in the block diagram description, input signals to the unit can be attenuated in 10 dB increments up to 60 dB, by A86. A limiter protects the first mixer from signals which have more than 1 W input power, and from those containing a dc component. Signals then pass through a 1.8 GHz low-pass filter (FL2) with a stop band that begins at 2.095 GHz. Signals in the frequency band from 0 to 1.8 GHz, then pass through a 3 dB isolation pad to the 1st mixer.

The 1st mixer, a double balanced type, converts the incoming broad spectrum of signals to a 2.095 GHz IF, by mixing these incoming signal frequencies with the output of the 1st LO (A12). The 1st LO may be swept and tuned within the 2.095 GHz to 3.895 GHz band.

The output of the 1st mixer (A2) is isolated by a traveling wave directional coupler that couples the 2.095 GHz IF signal to a 2.2 GHz LP filter, 2.095 GHz band pass filter, and into the 2nd mixer in assembly A10. As previously described this isolation improves the performance of the 1st mixer and reduces spurious signals.

The 2nd mixer in assembly A10, mixes the output of the 2.2 GHz 2nd LO (in A20) to convert 2.095 GHz down to 105 MHz IF.

The bandpass and center frequency of the 2.095 GHz IF is adjusted by the capacitors C15, C16, and C17 (in A8) and the coupling of the 2nd mixer, in assembly A10. These adjustments are performed to obtain a bandpass of 10 MHz that is centered at 2.095 GHz with optimum skirt shape. The mixer is oriented in the chamber to one of two balance points to provide the best rejection of spurious products generated by the 1st LO and 2nd LO.

Band reject filters, consisting of 1/4 wavelength stubs that are separated 1/4 wavelength, are distributed along the output transmission lines of the 2nd mixer to the 105 MHz IF. These suppress 2.3 GHz and 4.6 GHz.

The active component for the 2nd LO (in A20) is transistor Q20. Its collector load is a stripline resonator. The center frequency of this oscillator and the frequency span are controlled by an error voltage from the 2nd LO frequency servo system. The oscillator output is coupled through a directional coupler to the 2nd mixer and through a low pass filter to another directional coupler which is part of the 2nd LO frequency servo system.

The phase lock loop for the 2nd LO (in A20) contains a 99.2045 MHz oscillator which is multiplied by a factor of 22. This frequency of 2.1825 GHz is then passed through a bandpass filter (A14) and mixed in A22 with the output of

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The bandpass and center frequency of the 2.095 GHz IF is adjusted by the capacitors C15, C16, and C17 (in A8) and the coupling of the 2nd mixer, in assembly A10. These adjustments are performed to obtain a bandpass of 10 MHz that is centered at 2.095 GHz with optimum skirt shape. The mixer is oriented in the chamber to one of two balance points to provide the best rejection of spurious products generated by the 1st LO and 2nd LO.

Band reject filters, consisting of 1/4 wavelength stubs that are separated 1/4 wavelength, are distributed along the output transmission lines of the 2nd mixer to the 105 MHz IF. These suppress 2.3 GHz and 4.6 GHz.

The active component for the 2nd LO (in A20) is transistor Q20. Its collector load is a stripline resonator. The center frequency of this oscillator and the frequency span are controlled by an error voltage from the 2nd LO frequency servo system. The oscillator output is coupled through a directional coupler to the 2nd mixer and through a low pass filter to another directional coupler which is part of the 2nd LO frequency servo system.

The phase lock loop for the 2nd LO (in A20) contains a 99.2045 MHz oscillator which is multiplied by a factor of 22. This frequency of 2.1825 GHz is then passed through a bandpass filter (A14) and mixed in A22 with the output of

the 2nd LO to produce an IF between 16 to 19 MHz. Bandpass characteristics and center frequency response of A14 are adjusted by the same procedure that is used to adjust the bandpass characteristics of assemblies A8 and A10.

The 16-19 MHz IF output from assembly A22, is also passed through a 2.3 GHz and a 4.3 GHz filter that is identical to the filter in assembly A20.

The 1st LO (in A12) is a YIG (yittrium-iron-garnet) tuned oscillator. YIG is a material that changes its resonant frequency when it is subjected to a changing magnetic field. The intensity of this field is controlled by current through the tuning coil. When the oscillator is swept, a current ramp from the YIG driver amplifier stage is applied to this tuning coil. The amplitude of this current depends on the setting of the FREQ SPAN/DIV selector. With FREQ SPAN/DIV setting of 50 kHz/Div or less, the normal state of the 1st LO is to operate in a phase locked mode at a frequency which depends on the setting of the TUNING control and some multiple of a 2.19 MHz reference oscillator.

The front panel 1st LO and 2nd LO OUT jacks (J30 and J36) provide access to the two oscillator outputs. These outputs are used by tracking generators. The two ports must be terminated at all times to prevent reflections back into the system. Termination plugs P30 and P36 provide this termination when the ports are not used.

Phase Lock and Frequency Stabilization ◇3

Frequency stabilization is increased and incidental FM'ing reduced to 10 Hz or less, by a phase lock system that automatically locks the 1st LO at frequency spans of 50 kHz/Div or less unless the front-panel PHASE LOCK switch is in the OFF position. The 2nd LO is always phase locked by a translation phase lock system which is described below.

The 1st LO phase lock loop contains a reference oscillator, a pulse generator and sampler, a phase detector, an error amplifier, and a compensating amplifier that drives the frequency determining element of the oscillator. A narrow rectangular pulse from the sampler driver, at one-half the reference oscillator period, and the output of the 1st LO are applied to a diode detector. The detector output charges to the voltage of the pulse plus the amplitude (at the instant) of the coupled oscillator signal. The summation of these signals is proportional to the phase difference between the 1st LO and the reference oscillator. This voltage is amplified by the error amplifier and drives the compensating amplifier. The output of the compensating amplifier maintains a constant phase difference between the 1st LO and some multiple of the reference oscillator. While a phase difference may exist, there is no frequency error. When locked, the long term frequency stability of the locked oscillator is that of some multiple of the reference oscillator.

To achieve the required stability, the 2nd LO is controlled by a translation phase lock oscillator system. The phase lock loop consists of the circuitry shown in Fig. 3-1. The 2nd LO output is applied through a directional coupler to the phase lock loop mixer A22. It mixes with the 22nd multiple of a 99.2045 reference oscillator in A48A4 and generates an IF signal between 16 to 19 MHz. The 16 to 19 MHz IF signal is amplified and applied to a phase detector (A48A3) where it is compared with the signal from a 16 to 19 MHz oscillator (A48A2). The phase difference is detected, amplified by the error amplifier (A48A5), and applied as a control voltage to the 2nd LO.

When the 1st LO switches from a swept oscillator to phase locked mode, it may shift in frequency. This shift in frequency is coupled through to the VCO for the 2nd LO frequency servo system and pulls the frequency of the 2nd LO in a direction to offset the frequency shift of the 1st LO. The center frequency on the display therefore remains stable. This offset information is provided by the voltage memory circuit.

The memory looks at the offset voltage of the 1st LO before and after phase lock is set, then generates an offset voltage to apply through a summing amplifier to the 2nd LO frequency servo system.

The 16 to 19 MHz oscillator consists of an emitter coupled logic (ECL) IC with a high Q resonant circuit, that is tuned by a hyperabrupt tuning diode CR1564. The frequency of this voltage controlled oscillator (VCO) is affected by the voltage it receives from the TUNE control memory circuit, offset voltage, and, at spans 50 kHz/Div or less, the sweep voltage. The control voltages are applied to both ends of the diode. The summed combination of offset, tune control, and memory voltage is applied through pin F to one side of the tuned circuit and the sweep voltage is applied through pin G, a 30:1 divider (R1560, R1562) to the anode of CR1564.

The sweep voltage comes through the 5 volt regulator circuit board, where its amplitude is adjusted by the Swp Gain adjustment R1960. Additional filtering with C1960, C1962, is switched in at the slower sweep rates to reduce the amount of residual line-related noise that may be riding on the sweep line.

The summing amplifier for the tune control, memory, and offset voltage, is U1735. The memory voltage is applied through pin AC and the tune control voltage through pin AN, to the input of the amplifier. The offset

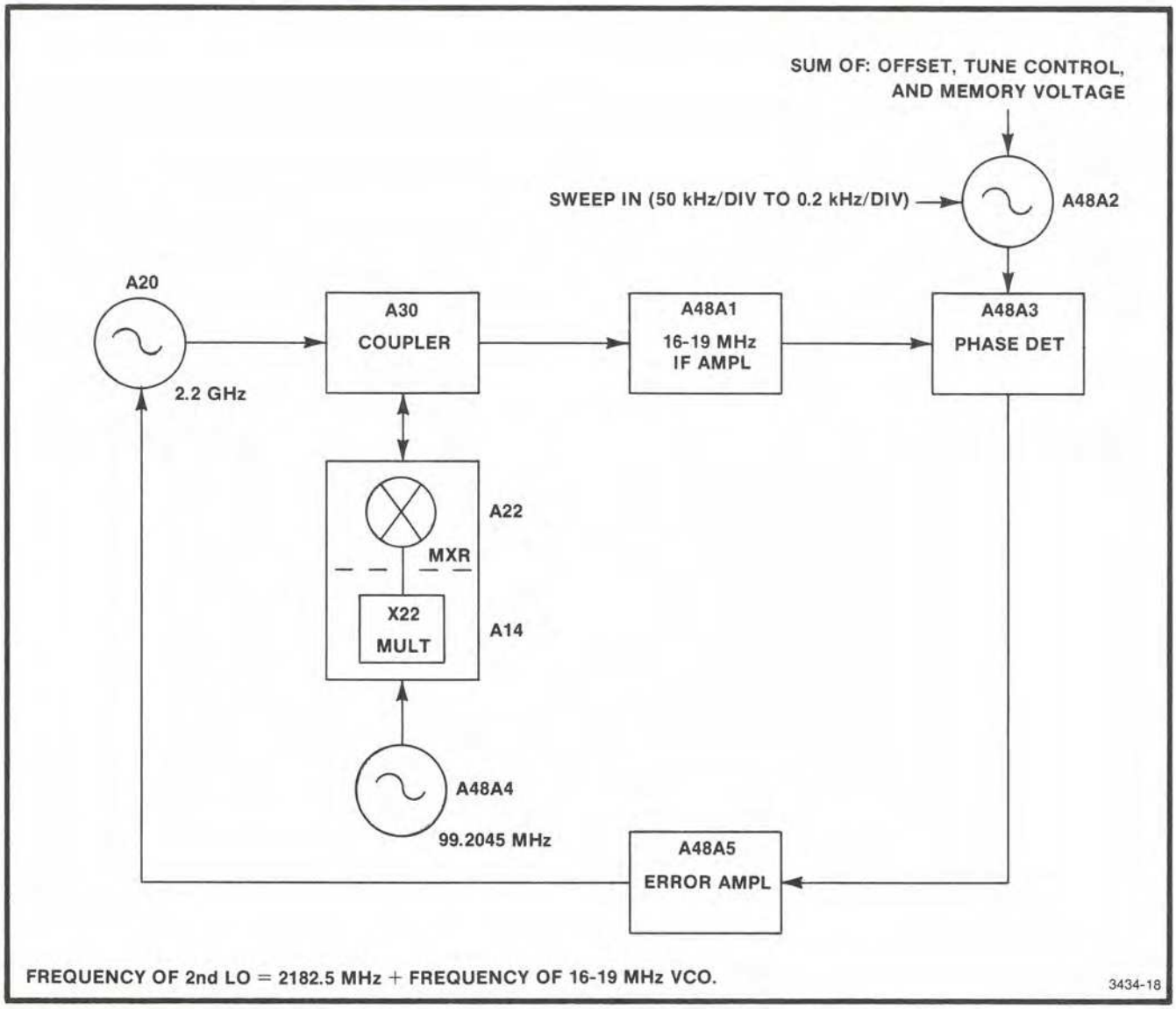


Fig. 3-1. Functional block diagram of 2nd LO phase lock circuit or frequency servo system.

voltage that establishes the center frequency of tuning, is supplied by VR1720 and a selectable resistor R1725. Select resistor R1735 sets the gain of U1735 and the response of the 16 to 19 MHz oscillator to the tune and memory voltage.

The output of the phase detector (A48A3) is amplified by the error amplifier U1715, Q1715, on A48A5. The amplifier output drives the collector of the 2.2 GHz oscillator to control its frequency.

The sampling generator and driver (A48A6) are part of the 1st LO phase lock loop. The output from a 2.1944 MHz crystal controlled oscillator is applied through Q1820 and Q1825 to a divide-by-two counter U1825. The 1.0972 MHz output, from the counter, triggers avalanche diode CR1832 to generate strobe pulses for the sampling gate in A24.

The error voltage from the phase detector is applied through J1900 and pin S to the input of U1755, which is the active component for a double-bounded conditionally stable search amplifier. The double bounding of this amplifier is achieved with diodes CR1748 and CR1749 (low leakage, temperature stable diodes) which limit the search amplitude; and CR1742, CR1744, CR1745, and CR1746 which limit the holding range of the loop within the stable gain response range of the phase detector.

The 5 volt regulator board contains a 5 volt regulated supply, phase lock enable relay K1955, sweep gain adjustment for the 16-19 MHz oscillator, and additional filtering for the sweep voltage line when the resolution is 30 Hz. The phase lock enable relay K1955 switches the 1st LO FM coil from the sweep voltage source to the output of compensating amplifier U1755 (in the phase lock circuit) when phase lock is set. Relay K1965 is energized when the resolution bandwidth is reduced to 30 Hz and adds additional filtering to the sweep line. Gain adjustment R1960 calibrates the 5 kHz/Div and less, frequency spans.

YIG Driver, Voltage Memory, Phase Lock Logic, and Marker Generator ◇5

The YIG driver consists of a main coil driver and an FM coil driver. The main coil driver contains an operational amplifier U1048, and a Darlington transistor Q1041. The FM coil driver contains amplifier U2042, driving transistors Q2041 and Q2039. Operation of these drivers is described under Frequency Tuning and Readout that follows this title.

The phase lock logic circuit locks the 1st local oscillator. When phase lock mode is set, the sequence of events is as follows: The 2nd LO tune control is engaged and the 1st LO tune control is disengaged. At the same time the sampling generator for the 1st LO phase lock loop is enabled. At the end of a delay period, the phase lock enable relay is energized and the search cycle of the loop begins. At the end of another delay period, the memory is activated and it looks at the shift the 1st LO made to reach a lock point. The memory stores this data, which is later applied to the 2nd LO and summed with other controlling voltages to shift the 2nd LO frequency an equivalent amount so it compensates for the shift of the 1st LO frequency when it locked.

Pin 1 of P2053 (input to U2059E) is grounded through the FREQ SPAN/DIV selector when the frequency span is 50 kHz/Div or less. The output of a set-reset flip-flop (U2052A U2052C) is low when the PHASE LOCK switch S1015 is ON. The two high inputs at U2052B produce a low-to-enable signal out, which is inverted by U2059A and applied through pin 4 of P2034 to switch the tuning logic from the 1st LO tuning potentiometer to the 2nd LO tuning potentiometer R20. This high is also applied through U2055A, Q2068 and Q2061 to enable the sampling generator for the 1st LO phase lock loop.

The low-to-enable signal out of the NAND gate U2052B also triggers a mono-stable multivibrator, U2048. At the end of some delay period, the output of U2048 goes high. This is compared by NAND gate U2052D, to the high at the output of U2059A.

The delayed low out of U2052D is applied through buffer amplifier U2055D and energizes phase lock enable relay K1955, on the 5 V regulator board on diagram 3. The delayed low signal is also inverted by U2059B and applied through buffer amplifier U2055B as a high for the TRACK GEN connector J70, and through a second buffer, U2055C, to another delay circuit in the voltage memory.

At this time, the phase lock loop is closed and starts its search mode. Before one cycle is complete, the 1st LO should acquire lock. To provide the time necessary for the loop to lock, a second delay is inserted in the sequence path by a one shot mono-stable multivibrator U2033 and NAND gate U2032B. At the end of this delay, the output of U2032B goes high, which is inverted by U2032A and energizes L2025 to close S2025.

The closing of S2025 contacts allows the capacitor C2020 to charge to the input error voltage at pin 2 of U2034. This error voltage is indicative of the direction and amount the 1st LO traveled to reach a lock point. The contacts of S2025 open and the output of Q2021 goes to the voltage that was stored across C2020. Memory now sends this compensation voltage to the 2nd LO and the center frequency on the display remains stationary.

Frequency Tuning Control and Readout ◇4 ◇5

Three modes of operation are used to tune the center frequency: 1) Tune control voltage is summed with the sweep voltage at the driver input for the main coil of the YIG oscillator, over frequency spans of 100 MHz/div through 5 MHz/div. 2) The sweep voltage is removed from the main coil driver and applied to the FM coil driver for frequency spans of 2 MHz/div to 0.1 MHz/div. The tune control voltage is still applied to the main coil driver. 3) The sweep and tune control voltages are removed from the YIG oscillator driver circuits and applied to the 2nd LO driver, for frequency spans of 50 kHz/div or less. The 1st LO is phase locked, providing the front-panel PHASE LOCK switch is on.

Tune Control ◇4

The input to P2078-3 (U1068 pin 10) is high when the phase lock is set (PHASE LOCK switch S1015 on and FREQ SPAN/DIV selector 50 kHz or less). This condition energizes MP22, which engages the drive clutch to the tuning potentiometer R20 for the 2nd LO. MP20 engages when the input to P2078-3 is low, which is its state for frequency spans of .1 MHz/div (100 kHz/div) and higher. This drives the tuning potentiometer R22 for the 1st LO.

The voltage source for the tuning potentiometers is the outputs of operational amplifiers U1055B, Q2062, and U1055A, Q1048. Zener diode VR 2059 sets the non-

inverting input of U1055B at 6.3 volts, which establishes approximately +9.2 volts at the emitter of Q2062 and −9.2 volts at the emitter of Q1048.

The output of U3068 is a proportional to the position of the tuning potentiometer. This voltage is summed with the sweep voltage at the input to the search marker generator, then applied through cam 33 (100 MHz/Div or less) to the YIG driver. The center arm potential of the tuning potentiometer R20 is applied to the summing point at U1735, which drives the frequency determining circuits for the 2nd LO oscillator.

YIG Driver ◇5

The dc level, out of the center frequency tuning potentiometer R22, is summed with the sweep voltage at the inverting input to U1048. U1048 is an operational amplifier with a Darlington transistor Q1041 as the negative supply source. Increasing the voltage input to the amplifier increases the current demand from the negative supply. This forward biases Q1041 and increases the current output so the current through the YIG main coil increases until the voltage output of R22 balances the input voltage change to U1048. As the current increases through the YIG main coil, the frequency of the oscillator increases.

When the FREQ SPAN/DIV is reduced to 2 MHz or less, the sweep voltage is removed from the input to U1048 and applied to the FM coil driver (U2042, Q2041 and Q2039). Current through the main coil is now dependent on the dc level from the tune potentiometer R22, which sets the center frequency of the YIG oscillator. K1063 is energized to shunt the main coil with a filter network consisting of R1065, C1062, C1063 and C1059.

The FM coil driver is similar to the main coil driver, with the addition of Q2041 supplying positive current to the FM coil.

R1045 adjusts an offset voltage into the summing point of U1048 so the center frequency of the YIG oscillator can be calibrated. R1044 and R1052 set the gain of the operational amplifiers so the frequency span of the YIG oscillator is calibrated for spans of 100 kHz/div and higher.

Frequency Span ◇13 ◇5

The sweep ramp from either the sweep generator (U1170), the external sweep source, or the manual control circuit, is applied through R1254 to the inverting input of operational amplifier U1250A. This is a voltage ramp from 0 to about 9 volts, which is summed with a dc offset voltage set by R1255. The output sweep amplitude of U1250A, is set by R1250 (Swp Gain) so the ramp is a calibrated 20 V centered about 0 V. This voltage ramp drives both the search marker generator (U3015A and U3015B) and the frequency span attenuator circuit.

U1250B is the active component of an operational amplifier whose gain is a function of the input-to-feedback resistance ratio. This ratio is selected by the FREQ SPAN/DIV selector S108B. The output voltage ramp of U1250B is applied to the YIG oscillator main tuning coil driver U1048, for frequency spans of 5 MHz/Div or more, and to the FM coil for spans of 0.1 MHz/Div and 2 MHz/Div. When the FREQ SPAN/DIV is 50 kHz or less, this sweep is applied to the phase lock loop for the 2nd LO.

Marker Generator ◇5

Switching the FREQ SPAN/DIV selector to MAX SPAN, closes cam 34 and opens cams 33 and 32. This routes the tune control dc voltage and sweep voltage output from U1250A on diagram 13 to the input of amplifier U3015A. The YIG oscillator is now swept its full frequency span and a marker is generated that is commensurate to the dc potential out of the 1st LO tune control (R22).

The output of U3015A causes diodes CR3013 and CR3012 to switch as the sweep ramp crosses through the dc level setting of the tune control circuit, developing a positive ditch or marker at the output of U3015B. This marker is applied to the vertical output circuit to provide the center frequency marker on the display.

105 MHz IF Amplifier, 3rd Mixer and Oscillator ◇6

Signals within the 10 MHz bandwidth of the 105 MHz IF, are amplified by Q85. The output load for Q85 is a three sectional helical resonator that is tuned so the bandwidth is reduced to 3 MHz. The 3rd mixer converts the 105 MHz IF to 10 MHz IF, by mixing 105 MHz with the output of a crystal controlled 95 MHz oscillator.

Aperature coupling is used between each section of the helical resonator. The 3rd mixer is a balanced mixer. L85, and C95 are tuned to the sum of the two input frequencies (about 200 MHz). This reflects the upper sideband back into the mixer and reduces IM signals. C87, R87, L89, and R241 provide a constant impedance-matching circuit to the input of the 10 MHz IF amplifier.

10 MHz IF Pre-resolution Amplifier and Resolution Filter Circuits ◇6 ◇7

Three circuit blocks comprise the resolution circuit; the 10 MHz preamplifier, five selectable resolution filters, and

a post-resolution amplifier. As the resolution bandwidth is selected, gain compensation is provided to maintain a constant signal level input to the Function IF amplifier. The Function IF amplifier is then adjusted so a constant signal reference level is maintained on the display for changes of resolution or display modes.

The signal path through the resolution preamplifier depends on the position of relay K281.This relay is energized in all positions of the Gain selector except the first two (0 dB and 10 dB). When energized, the signal path is through Q280 and Q290, which has a gain of 20 dB. Gain of the operational amplifier, containing Q250 and Q260, is increased by 10 dB when the base of Q270 is grounded through the gain selector. This occurs every odd 10 dB step of the selector.

With the gain selector fully ccw (0 dB), the 10 MHz input signal to T240 is amplified by the IF amplifier Q240 and the operational amplifier that contains Q250 and Q260. The front panel AMPL (CAL) adjustment R80, sets the gain of Q240 so a −30 dBm, 50 MHz signal, at the RF INput provides full-screen signal amplitude.

Switching the Gain selector one position cw, grounds the base of Q270, turning the transistor on, and bypasses some of the feedback current of the operational amplifier Q250. The closed loop gain of the stage is therefore increased 10 dB. Gain is accurately calibrated by the 10 dB gain adjustment R267.

Increasing the Gain selector position an additional 10 dB, opens the base of Q270 and energizes relay K281. The output of T264 is now switched through Op Amp Q280-Q290, for 20 dB of additional gain.

Increasing the Gain position to 30 dB grounds the base of Q270, increasing the gain of the preamplifier an additional 10 dB for a total gain increase through the preamplifier of 30 dB. As previously described, the relay K281 remains energized through the remaining four positions of the Gain selector.

The resolution section contains four crystal filters (for 30 Hz to 30 kHz resolution) and a 300 kHz coupled-resonator filter. The 300 kHz filter consists of six resonant sections and an amplifier. Signal path through or around the filters, is directed and controlled by relays K300, K353, K354, K355, K356, and K357. (The 30 Hz filter is located on YIG Driver, Voltage Memory and 30 Hz filter board, Diagram 5). These relays are energized as the RESOLUTION cam switch S108A is switched to positions that connect the relay armature to the −15 V power source.

Amplitude adjustments for each filter section establish a signal output level as the resolution is changed, so the signal reference level on screen remains constant through the RESOLUTION range. It is important when aligning the filters, that their center frequency is centered on the others. This is done by switching in one of the crystal filters periodically to re-establish the center of the band-pass for the 300 kHz and 3 MHz filters.

The resolution output amplifier provides approximately 15 dB of gain. The gain compensates for loss in sensitivity through the microwave circuits. The response across the 1.8 GHz span remains relatively flat (within +1 dB, −2 dB).

The 10 MHz IF signal is routed (by K357) through either a wide filter (3 MHz) or a narrow filter, for additional shaping and noise reduction. Bandpass of the narrow filter is 300 kHz. K357 is de-energized when the RESOLUTION is switched from 3 MHz to 0.3 MHz.

30 Hz Filter ◇5

This filter contains an amplifier, crystal filter, and a 10 dB gain boost circuit. The 10 MHz IF is routed through the filter when K354 on diagram 7 is de-energized, and K3021 is energized. Q3024 and Q3022 are emitter coupled amplifiers. Gain of the amplifier is set by adjusting the amount of feedback from the output of T3021 to the base of Q3022. This adjustment is R3038.

The additional 10 dB of gain is provided when the 30 Hz filter is in the signal path and the gain selector is advanced to its cw position. This turns on Q3032 and decreases the negative feedback for the amplifier. Gain is calibrated by adjusting R3030.

50 MHz Calibrator ◇8

The calibrator is a crystal controlled oscillator configured with the crystal in the feedback loop of a multivibrator. Output of the oscillator is calibrated to a −30 dBm with adjustment R956. Output impedance is 50 Ω.

Function IF Amplifier ◇8

The Function IF consists of six cascode amplifier cells or blocks, connected in cascade. Each cell operates as a linear or logarithmic amplifier depending on the display mode selected to provide the gain characteristics required for the three display modes of 7L14. The gain of each cell is a function of the emitter resistance of the input transistor. In the Log mode, diodes in the emitter circuit of the amplifier reduce the gain at a logarithmic rate from 10 dB to 0 dB as the signal level increases.

When the operator depresses the 10 dB/DIV display button, +15 V is applied through S130A, pin 1 of P135 and pin 2 of P520 to the anodes of the log diodes; CR511-CR512, CR514-CR515, CR517-CR518, CR521-CR522, CR524-CR525, and CR531-CR532. These diodes are forward biased (with no signal input) and the amplifier cell operates at full gain. As the signal input level increases, the emitter voltage approaches the bias of the diodes to turn the diodes off. The amplifier gain therefore decreases to 0 dB.

The gain decreases to 0 dB progressively as the signal level increases, starting with Q720-Q710 and progresses toward the front end.

In the 2 dB/DIV mode, +15 V is applied to diodes CR527-CR528 and CR534-CR535 in the emitters of Q680 and Q720, and +15 V is removed from the anode of the 10 dB log diodes so they are now back biased.

CR534-CR535, in the emitter of Q720, and CR527-CR528 in the emitter of Q680, provide approximately 4 dB of log gain per amplifier cell. This provides two break points, at about 4 dB and 8 dB of the gain curve over the dynamic window. These two break points change the curve slope suffieiently to shape the curve for 2 dB/DIV. R737 and R697 set the slope of the curve after the break point.

The 10 dB and 2 dB/Div Ref Level adjustments R802 and R801, position the linear portion of the log gain curve (see Fig. 3-2) within the 8 division graticule window.

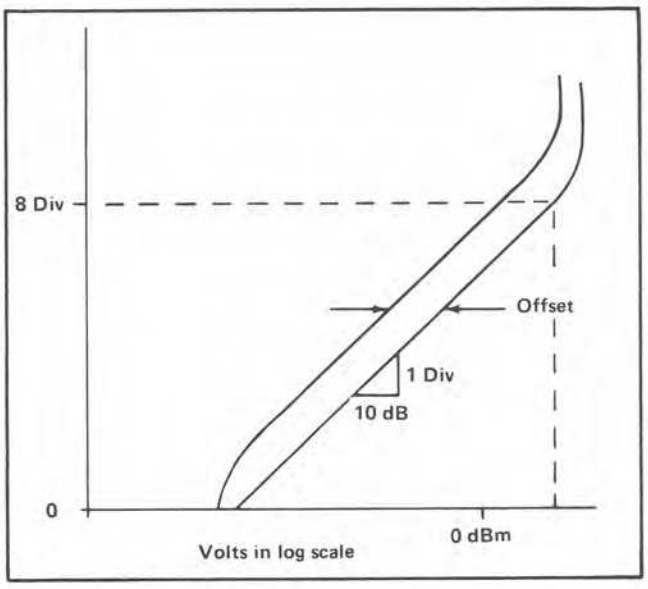


Fig. 3-2. Log converter curve.

The 2 dB/DIV and LIN mode displays require at least 70 dB of gain through the analyzer's IF; therefore, additional stages are switched in to increase the Function IF gain. S130A is disengaged then the 2 dB/DIV or LIN mode buttons are pressed. The base of transistors Q570 and Q600 now have a return path to ground, through U2890 in the 40 dB or 50 dB positions of the gain selector. Grounding the base of the transistors, turns them on and boosts the gain through these amplifier cells an additional 10 dB per cell. Transistors Q630 and Q660 are turned on when the gain selector is switched to the 60 or 70 dB positions.

Gain of the Function IF amplifier, in the LIN and 2 dB modes, is calibrated at the 40 dB and 60 dB steps by adjusting R603 and R663. Q730 is turned on when the LIN mode is selected and R733 (LIN Ref Lvl) sets the reference level of the display to the top line of the graticule.

The output signal of Q700 is coupled to a linear detector. The linear detector consists of Q740 driving the common emitter amplifier Q750-Q760 with feedback through C766, the detector diodes CR772-CR771, resistors R775-R776, and C776 to the input of the amplifier.

During the positive and negative excursion of the IF signal, feedback current is supplied through CR772 and CR771. This produces a circulating current through the diodes proportional to the average signal input level. The negative video output signal is developed across R772-R819 and R771. The video is then applied through a filter network to the vertical output stages.

Linear Baseline Offset adjustment R803, compensates for baseline shift when the display mode is switched from LOG to LIN.

Video Filter, Baseline Clipper and Vertical Output ◇9◇

Video signals from the detector are amplified by operational amplifier U820B. Its feedback resistance, R826, is shunted by baseline-clamping diodes and fast or slow video filter circuits that are switched in by U830 and U840.

Clamping diode CR825 maintains the video baseline reference by clamping the amplifiers input signal level. CR825 clamps the input of the amplifier from shifting positive.

The three sections of U840 are connected so they operate as OR gates to connect C840 in the feedback loop for U820B. Pulling pin 2 or 3 of P830 low, or activating the

30 kHz video filter, turns one section of U840 on, to connect C840 in the feedback loop. Pin 2 of P830 is pulled low when the front-panel RESOLUTION selector is switched to the 30 kHz position. Pin 3 of P830 is pulled low when the RESOLUTION is switched to 3 kHz or 300 Hz position.

The three sections of U830 and one section of U840 are connected to operate as an AND-OR gate. When the video filter selection switch is closed, one section of U830 is turned on to connect C830 in the feedback loop. Closing both S90A and S90C (300 Hz and 30 kHz) turns two sections of U830 and one section of U840 on. This connects C830, C832, and C840 in the feedback loop. The following logic describes the three filter combinations:

30 kHz = (30 kHz RESOLUTION) OR (3 kHz to 300 Hz RESOLUTION) OR (C90C closed).

300 Hz = (S90A closed).

10 Hz = (S90A) AND (S90C closed).

The output of U820B is isolated from summing amplifier U820C by Op Amp U820D. U820C sums the video signal with the dc level set by the vertical position control plus the search marker, when present. The output of U820C drives the positive output for the oscilloscope interface, the inverting amplifier U820A (which drives the negative output to the oscilloscope interface) and the Baseline Clipper circuit.

The Baseline Clipper circuit consists of a common emitter current switch (Q887-Q890) and a logic circuit (Q895-Q898) that modulates the Z Axis switching circuit. The Z Axis switching circuit consists of a current switch (Q2320-Q2330) that is controlled by an exclusive OR gate (Q2335 and CR2336). The output of the current switch drives the Z axis common (pin B17) and the Aux Z axis (pin A17).

Q2335 with CR2336, operate as an exclusive OR, to gate the state of either interface pin B7 (channel switch) or A16 (mode info) to the base transistor Q2330. When this state is high, Q2320 is switched on and positive current through the interface pin A17 (High) reduces or clips the crt beam intensity.

The CONTRAST control sets the quiescent current through CR898 which establishes the contrast between the clipped and unclipped portions of the display.

The amount of current through Q2320 or Q2330 is a function of the Baseline Clipper logic circuit. The common emitter current switch Q887-Q890, switches transistor Q898 off when Q887 is on. Composite video from U820C will cause the circuit to switch at some level set by the BASELINE CLIPPER control R96. When Q890 switches on, Q898 is switched on increasing the current through Q2320 to decrease the crt beam intensity.

The BASELINE CLIPPER control range is about 100% of the display amplitude.

Frequency Readout

The frequency readout system looks at the frequency tune control voltage and outputs both a standard readout signal for the mainframe, and a LED readout for the frequency indicator on the 7L14. The system consists of a digital voltmeter, drivers for multiplexing the LED readout, and an A to D converter to drive the mainframe readout circuits. Fig. 3-3 is a basic functional block diagram.

The DVM is a precision oscillator. An integrator is ramped up and down by switching its input currents. These input currents are switched by commands from a digital counter and an analog comparator. During one transition, the count is loaded into latches. This number is then displayed during the next transition.

The integrator generates an output ramp with a timing sequence proportional to the dc level set by the tuning potentiometer for the 1st LO. The comparator generates a step signal output when the ramp signal crosses a reference voltage which triggers the multivibrator.

The counter counts towards 20,000 during the run-up time of the ramp. When the output of the comparator steps positive, it triggers the flip-flop which loads the count into the latch and also shifts its number into decoders and drivers for the LED readout. The new state of the flip-flop also switches the reference current off and the output voltage of the integrator ramps down towards 0 volts.

Referring to the schematic diagram 20, the voltage output of the amplifier U2110 is proportional to the input voltages at pins 2 and 3. The voltage at pin 3 is from the tuning potentiometer, and ranges from about −9 volt to +9 volt. An offset voltage can be summed in with this tuning voltage, for calibration, by adjustment R2135.

Reference current for the integrator U2140, is supplied by a buffered operational amplifier U2120 and Q2120. An input reference voltage of 11.7 volts to U2120 is set by Zener diode VR2115. This sets the current output of Q2120 to a value that is independent of the signal voltages. The current from this source is steered either to the input of the integrator, or to the power supply by diodes CR2130, CR2132, and CR2134.

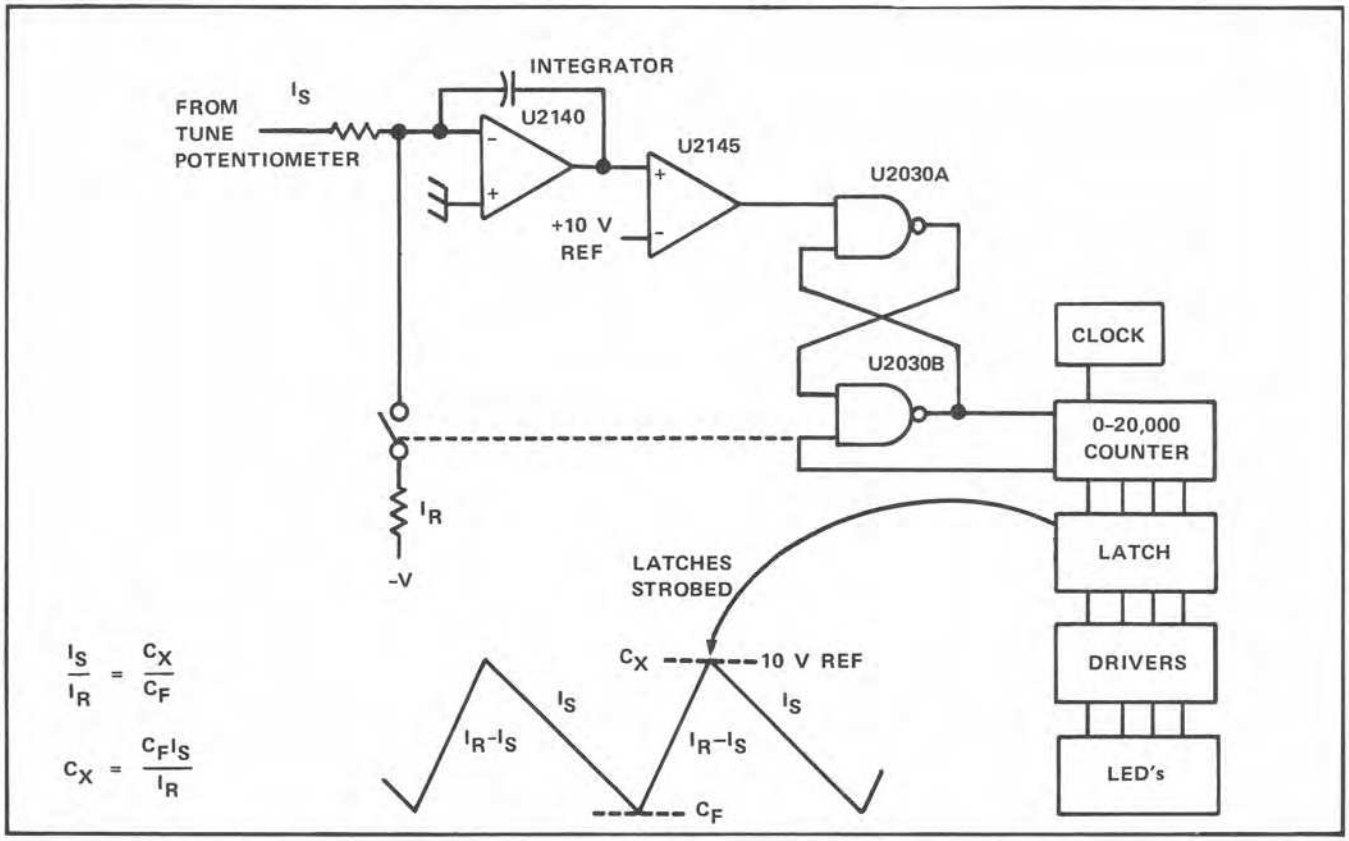


Fig. 3-3. Functional block diagram of the frequency readout circuit.

The voltage state of pin F is set by the multivibrator U2030A, U2030B in the digital section of the DVM. When the state is low, CR2132 and CR2134 are off and reference current is steered through CR2130 to the input of the integrator. When the state is high, the diodes are turned on to steer the reference current through R2147 to the power supply.

As indicated in Fig. 3-3, the reference current is larger than the signal current so the output of the integrator is a positive-going ramp when it is summed with the signal current. When the reference current is switched off, the output of the integrator is a negative-going ramp.

The reference voltage source for the comparator U2145, is the output of operational amplifier U2130. The 11.7 V Zener diode VR2115 sets this output at a very stable 11.7 V. This source provides the reference for the offset current through R2135 and the reference for the negative input of the comparator U2145.

As the positive-going ramp from U2110 crosses the reference voltage, the output of the comparator steps high. This triggers the multivibrator U2030A, U2030B and the voltage at pin F goes high to turn diodes CR2132 and CR2134 on. The output of the integrator swings past the reference voltage a slight amount before it starts negative. When it again crosses the reference potential, the output of the comparator switches low.

U2015, in the digital section of the DVM, is a 0 to 20,000 counter and latch. When it counts to 20,000 or 0, pin 18 goes high. This high is fed back through two inverters U20000B and U20000C to reset the flip-flop. The resultant low on pin F turns diodes CR2132 and CR2134 off. The reference current is again summed with the signal current and the cycle repeats. The slope of the positive-going ramp determines the time required for the voltage to reach the reference that determines the count of the counter.

The clock input to the counter U2015 is generated by oscillator Q2005-Q2010. The output of the oscillator is applied through emitter follower Q2015, to pin 1 of U2015. The digit output on pins 4,5,6, and 10 is in binary format. The count in the latch of U2015 is transferred, when the latch is strobed, to a BCD-to-7 segment decoder (U2020) and through inverter drivers (U2000A, U2000D, U2000E, and U2000F) to a digital-to-analog converter U2065. The converter sums the digital current input and provides column sense data (at pin 19) for the readout circuits of the mainframe.

The digits are displayed sequentially. The seven digit code for the LED's is applied from decoder U2070; however, only one digit lights at a time. The command to light each digit is sent out on pins 8, 7, 17, and 22 of U2015, to LED DS2075. The clock pulse that strobes the display command from one digit to the next is applied to pin 11 of U2015 from NAND gate U2030D. When a time slot goes low, the clock continues to strobe the counter from one digit to the next (1, 10, 100, 1000) until the corresponding digit display command is gated through AND-NOR gate U2040. At this time the clock signal through the NAND gate U2030D is blocked and the column sense signal current is sent from pin 19 of the D to A converter U2065, to the mainframe readout.

One unit of current differential exists between the LED readout and the mainframe. Resistors R2020, R2026, R2133, and R2137 are connected between the respective time slot line and the sense line to add an additional unit of current for the mainframe readout circuit.

Uncal Circuit ◈14◈

Reference level calibration of the display depends on the combination of frequency span, resolution bandwidth sweep rate, and video filter bandwidth. It was determined from the amplitude loss factor equation

$$\propto = \left[1 + 0.195 \left(\frac{D}{tB^2}\right)^2\right]^{-1/4}$$

that the display is calibrated when the combination of the above parameters cause the equations

$$\frac{\text{Freq Span}}{0.5\ (\text{min B, V})\ (B)\ (t)}$$

to equal or exceed 1, where

min B, V = minimum bandwidth of either the resolution or video filter

B = Resolution bandwidth

t = Sweep time

The multiplication and division of quantities in this equation can be done by summing the logarithm of the various parameters. The equation becomes:

$$\log(\text{freq apan}) - \log(0.5) - \log(\text{min B,V}) - \log(t) \geq 1$$

By normalizing these parameters so each term is equal to or greater than zero, the equation becomes:

$$-\log\left(\frac{200 \times 10^6}{\text{Freq Span}}\right) + \log\left[\max\left(\frac{10^6}{B} \text{ or } \frac{10^6}{V}\right)\right] +$$

$$\log\left(\frac{10^6}{B}\right) - \log\left(\frac{t}{5 \times 10^{-3}}\right) - 1.097 \geq 0$$

The logarithmic summation of these parameters is performed by an analog circuit and compared against ground or zero. The resultant indicates if the display is uncalibrated or calibrated. Fig. 3-4 illustrates the basic uncal circuit.

Sweep Triggering, Sweep Generator and Horizontal Amplifiers ◈11◈ ◈12◈ ◈13◈

The sweep ramp is generated by U1170 when it is gated on by a positive gate signal from U1180. U1180 can be triggered, or it will automatically recycle after an RC time interval (set at pin 12) to provide a constant baseline.

Triggering for the sweep generator circuit is supplied from one of three sources which are selected by S101. The selected trigger signal is applied to the input of an operational amplifier U1010B. The output of U1010B is summed with the dc level set by the LEVEL control R100. When the triggering signal amplitude exceeds this dc level, CR1038 is switched on to generate a positive trigger signal for the trigger input to U1180. The following occurs as each source is selected: 1) EXT connects the EXT IN HORIZ/TRIG connector to the input of operational amplifier U1010B. 2) INT selects the output of a differential amplifier U1010A, which receives its trigger signal from the mainframe interface. 3) LINE selects a sample of the line voltage from the mainframe interface and applies it to the input of U1010B. FREE RUN (a triggering mode) grounds the input of U1010B, which sets the output of U1010C to approximately 0 V and the input to pin 4 of U1180 low (approximately −0.7 V). The gate generator free runs when pin 4 is low.

The positive gate out of U1180 provides the signal for the sweep generator U1170. The negative gate is amplified and inverted by Q1230 to provide the unblanking gate for the crt. Pin 15 goes high at the end of the sweep gate and gates a holdoff pulse through U1160A, U1160B and Q1160 to the mainframe interface.

Current for the SWP indicator light DS1152, is supplied by transistor Q1150. During gate time, in the SGL SWP mode, the lamp drive from U1180 goes low. This gates a low out of U1160B to turn transistor Q1150 on. In the SGL SWP mode, pin 6 of U1180 is grounded so the gate generator will not run until it has been reset by pushing the Start button and gating a signal through the NAND gate

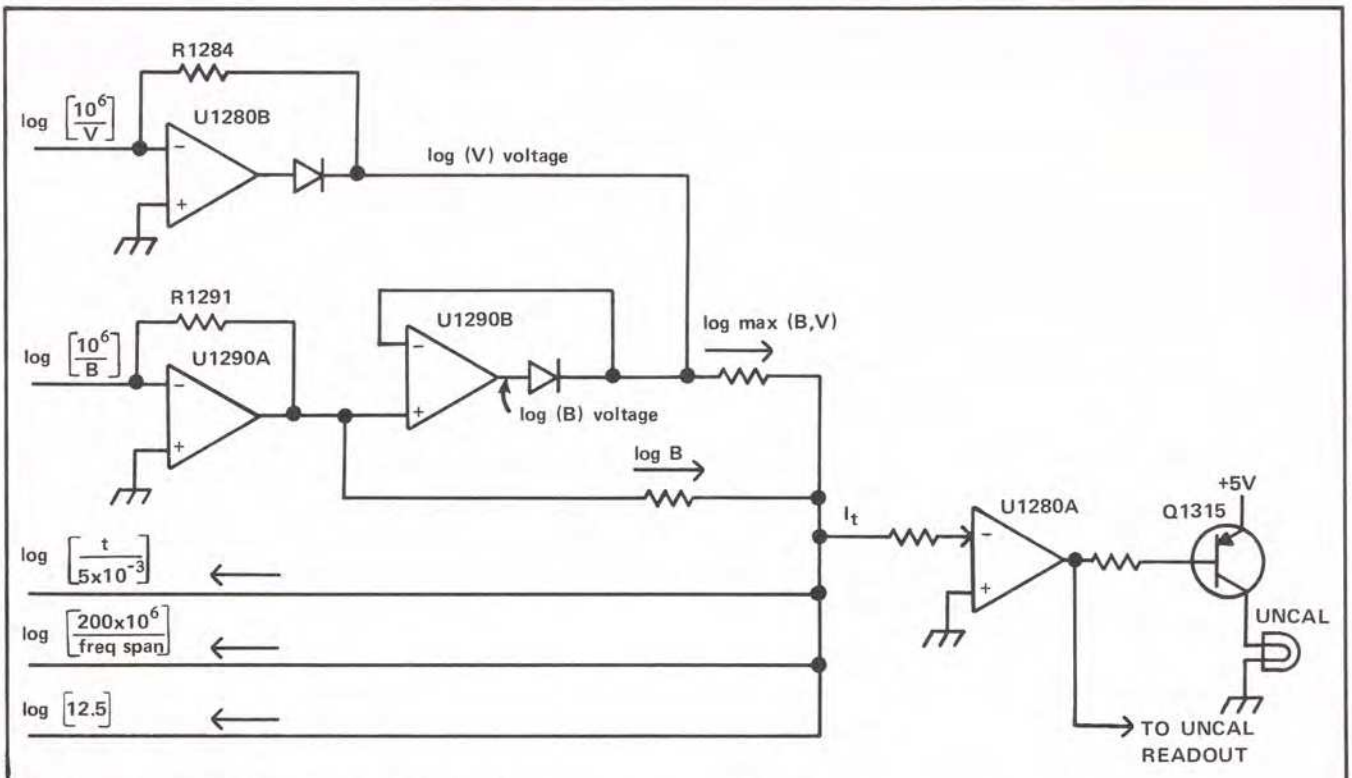


Fig. 3-4. Basic functional block diagram of the uncal circuit.

U1160C to trigger Q1120. This pulls pin 7 of U1180 high and resets the gate generator so it recycles.

U1170 generates a sweep ramp of 10 V, with a duration that depends on the timing current into the summing point at pin 9. The timing current for the capacitors C1173, C1174, and C1175 is supplied through timing resistors R1220, R1221, R1222, and R1224 by operational amplifier U1120A. Timing combinations are switched into the circuit by the TIME/DIV selector S104.

The dc level at the input to U1120A is adjusted by R1200 to compensate for offset of the IC U1170. The jumper across P1200 permits a step compensation when U1170 is replaced and the offset is outside the range of R1200.

Pin 6 of P1160 is an input from a tracking generator. When this input is high, Q1215 and Q1216 are turned on. Q1216 shunts the integrating current for U1170 from U1120A to ground. Q1215 sets the sweep output line to a dc level that represents center sweep. R1215 adjusts or calibrates this offset dc level of the sweep integrator in U1170 so the crt beam is centered during the input signal period from the tracking generator.

The sweep output of U1170 is connected through cam 29 of S104, to the output amplifier U1050A. U1050A drives U1040D and both amplifiers supply approximately 0.5 V of push-pull drive to the mainframe deflection circuit. Gain of U1050A is set by SWP CAL adjustment R107. U1050C provides a sweep to the mainframe for sweep logic, which provides the + Sawtooth Output at the front panel of the 7000-Series oscilloscope.

Digital Storage ◈15◈ ◈16◈

Digital Storage provides the operator with the capability of selecting the method for displaying and processing information contained in the digital storage memories. This allows operations such as determining the highest amplitude that occurred during a selected period (MAX HOLD mode), storing a signal for later examination (SAVE A mode), subtracting one signal from another (B−SAVE A mode), and comparing signals (DISPLAY A, DISPLAY B modes). Two memories are used independently in these operations to store two complete signals that are each digitized at 512 points across the sweep. Thus, two signals may be observed simultaneously or processed in various ways.

In MAX HOLD mode, the highest amplitude at each of the 1024 points in successive sweeps is stored and displayed. In SAVE A mode, a signal is stored in one memory for later examination, and is not updated. In the B–SAVE A mode, the A signal is stored and not updated, then arithmetically subtracted from the B signal, which is stored and continually updated. In the AVERAGING mode, the display area is divided by a horizontal cursor. Above the cursor, signals are peak detected and displayed; below the cursor signals are averaged. In the DISPLAY A and DISPLAY B modes, the contents of the selected memory or memories are displayed.

Graphical presentation of mathematic functions or experimental data is common today. One class of such graphs is those that have a single Y value for each X value. An alternate presentation of the data in this graph would be a table in which the X coordinate values were simply listed along with a corresponding Y value for each X value. In further simplification, if the first X value and the spacing between X values (assuming that all spacings are equal) were known, the two column table could be reduced to a single column with the X value implied by the position of the Y value in the column. This then is the essence of digital storage: to convert a vertical analog voltage (Y coordinate value) to a binary number and insert that number in a stored table. The location of the Y value in the table is determined by converting to binary the analog sweep voltage (X coordinate value). Once the table is created by storing a set of binary numbers respresenting values across a waveform, the waveform can be recreated at any time by converting the table values (Y) and positions (X) back to analog voltages representing amplitude and sweep position.

The digital storage system used in the 7L14 uses two tables: A and B. Table B is always updated on every sweep. Table A is changed unless SAVE A mode is selected. There are 512 A values and 512 B values. The spacing between values is the same throughout both tables, but the starting point for table B is shifted slightly so that, when both tables are being read, the read-out values are interlaced.

When the signals are recreated, the operator has the option of displaying either A or B, or both A and B. If both are to be displayed, and SAVE A mode is also selected, the contents of both table A and table B are drawn, each display in its own trace. If SAVE A mode is not selected, the contents of both table A and table B are displayed on one trace, with 1024 value positions across the screen. A third trace option is also available. In the B minus A mode, the displayed values are those resulting from an arithmetic operation and are the difference between the contents of table A and table B for each X value of analog sweep voltage.

Since a signal waveform is continuous and a table has discrete X values, an algorithm is used to determine the Y value to be stored for a particular X value. This allows the operator to select one of two methods for determining Y values: peak or average. The Y analog voltage is continually sampled, with the sampling rate dependent upon sweep speed. For each X value, there are always at least two samples and there may be as many as 2^{17} samples. From this set of samples then, the user may select either the largest sample value (peak value) or the mean of all of the samples (average value). Selection between peak and average is controlled by the front-panel PEAK/AVERAGE control, which sets a dc level that is compared with the analog vertical input to produce the PEAK/AVERAGE logic signal. When the input signal is below the level selected by the front panel control, the signal is averaged; when the input is above that level, the peak signal is displayed. The dc level appears on the display as a positionable horizontal line. This marker line is created by switching the dc level to the analog output line during the marker cycle to produce the MARKER logic control signal.

Superimposed on the marker line is an intensified spot called the UPDATE MARKER, which indicates the X value at which new Y values are being computed for display update. The update marker is formed by comparing the analog sweep input to the display analog X output. When the two are the same value, the sweep is forced to pause, thus increasing the marker intensity at that point.

Central to the 7L14 digital storage system are two specially designed and manufactured IC's; U2045 and U2020. Vertical section IC U2045 contains the vertical acquisition and display logic, peak detection, signal averaging, Z axis blanking, and special Y-value processing circuits. Horizontal section IC U2020 contains the horizontal acquisition address counter, horizontal display counter, 10-bit RAM address multiplexer, and a programmable logic array system control matrix. The remainder of the digital storage control circuits consists of two 8-bit digital-to-analog converters, two 10-bit digital-to-analog converters, one 10-bit latch, 8k bits of random access memory, and various ancilliary circuits.

Vertical Section

The input video signal is applied to input buffer U3084, which amplifies the video signal to the level necessary for proper operation of the digital storage. The buffered video signal is applied to sample and hold U4084, which is used as a peak detector. Whenever the input video signal exceeds the output of U4084, a sample pulse is generated for U4084 by comparator U3079B and gate U4032, thus performing a peak-detecting function. A sample pulse is also generated by the ST DIVIDE signal for U2020, which serves to reset the peak detector at the beginning of each sweep. The peak detector is disabled whenever the video signal is below the level set by the peak average/baseline clipper level.

The output of peak detector U4084 is applied to sample and hold U3092, which is controlled by flip-flop U1058A. Flip-flop U1058A generates the sample pulse, and is enabled during the clock cycle after the last sample, as indicated by the least significant bit from the successive approximation register in U2045. The sample is then applied to a summing junction, at which point the output current from the digital-to-analog converter, which is supplied from the successive approximation register, is subtracted from the sample current. The difference current is applied through comparator U2063 to pin 18 of U2045 as the UP/DOWN signal. Thus the combination of the successive approximation register, the digital-to-analog converter, and the sample and hold circuit effectively produces the binary equivalent of the input sample.

The peak average/baseline clipper from the front panel is scaled to 0-5 V by buffer U3086A. This voltage is then compared to the buffered video signal to determine the state of the peak-average line. The peak-average line is gated into peak register of U2045 by the valid data line. When the peak average input of U2045 is high, the M180 will store the peak data taken during this time. Flip-flop U3032 is used to determine when data is valid. U3032 is cleared at power-up and at the end of each sweep. It is set at the start of the sweep by the ST DIVIDE line, which originates from U2020.

The vertical analog voltage is converted to a Y binary value using an 8-bit successive approximation register. Nine clock cycles are required for each Y conversion. After the conversion has taken place, the successive approximation register produces the negative-going SYNC signal. Most functions on both the vertical and horizontal control IC's are synchronized by this signal. On the negative-going transition of SYNC, the successive approximation register is reset to 10 00 00 00 (binary) and the next conversion cycle begins. Incoming data bits are latched into the successive approximation register on the negative-going clock transition. From the register, the output data are applied to the peak and the averaging circuits.

The averaging circuit consists of three groups of circuits: those that accumulate the grand total of all of the Y values for a given X value (this total is called the numerator), those that count the number of samples that make up the numerator (this total is called the denominator), and those that subtract and shift to perform the division process.

As each new Y value is converted, it is added to the eight least significant bits of the numerator. Each carry from the most significant bit of this addition is counted by a 17-bit ripple counter. The contents of this counter and the 8-bit sum are cascaded to form a 25-bit grand total. Each time a new sample is added to the numerator, a second 17-bit ripple counter is incremented to produce the denominator.

A division cycle is initiated when the horizontal control IC U2020 detects a change in the X value. At that time, U2020 produces the ST DIV (start divide) signal. Upon receipt of this signal, and in synchronization with the SYNC signal, vertical control IC U2045 performs several functions: 1) It latches the current numerator in a 25-bit latch, and latches the denominator in a 17-bit latch. 2) It clears the numerator adder circuits. 3) It performs a 17-bit priority encode on the denominator and loads a 1 in the appropriate cell of the 25-bit shift register. 4) It loads the latched numerator and denominator serially into the divide circuit, using the contents of the 25-bit shift register as a mask. 5) It clears the denominator ripple counter to zero.

Ten clock periods are required to load the numerator and denominator into the divide circuit. The cycle starts on a SYNC pulse and the first bit of the quotient is available shortly after the first clock pulse following the next SYNC pulse. Division is performed by repeated subtract and shift operations. The quotient is arrived at serially with the most significant bit first. Only 8-bit accuracy is required, so, by using the priority encoder output as a mask, the divider circuit is loaded with the 8 most significant bits of the denominator and the 16 most significant bits of the numerator. (Ripple borrow for a 17 by 25 bit subtractor would be so long as to be impractical.)

The peak circuit consists of a peak detector and an 8-bit peak shift register. In operation, the previous peak Y value from the last set of samples is still stored in the peak shift register at the start of a conversion cycle. At that time, the peak detector, which is a serial compare circuit, is set to the state that will question whether the old or new number is larger. Each bit of the new value is then compared with the corresponding bit of the old value, most significant bit first. When one value is found to be larger, a flip-flop is set and the smaller number is gated out of the shift register. The start divide logic signal being true then forces the peak detector to select the new value and ignore the number in the shift register.

The peak/avg selector, a multiplexer, selects either the peak or average value to be routed to the memories under control of the PEAK/AVE signal. The selector output is routed through the max hold circuit, which functions in the same manner as the peak detector. When the MAX HOLD signal is high, the value that is routed to the output multiplexer is the larger of two values: the current memory value at the subject X coordinate or the previously selected peak or average value.

Timing for setting up the divide operation and cleaning the numerator, denominator, and peak circuit is controlled

by a 10-stage Johnson counter. NOR-gate taps are taken from appropriate stages to develop the necessary clear and latch timing pulses. Because the denominator is loaded into the divide circuit using a priority encoder, the most significant bit is always a 1. Space and power were saved by modifying the subtractor and not storing this 1.

All data enter and leave the memory serially. Data read from memory enter an 8-bit shift register, and timed by SYNC, are transferred to the vertical display output latch (display register on the block diagram). The same shift register is used for other purposes, so the DISPLAY ENABLE signal prevents non-display information from being transferred to the output latches. An example of data moving through this shift register is that during the B minus A display mode. The A value is first read from memory and stored in the shift register. As the B value is ready, the subtration is done serially and the answer is applied to the shift register. Since the subtraction must be performed least significant bit first, a set of exclusive-OR gates change the order of extracting B from memory. The direction of shift for the shift register is reversed also to present the most significant bit to the proper display latch. The shift register output is also applied to the output multiplexer.

In the subtraction, the operation performed by the serial calculator is not merely B minus A. The actual expression implemented if (B-A) + K, where K is a serial input external constant specified by the user. This permits zero to be placed anywhere on the screen. To avoid confusion, when (B−A) + K results in an off-screen position, the subtractor blanks the display. This is done by examining the carry bit and borrow bit when the most significant bit is calculated. If either bit is a 1, the screen is blanked.

When SAVE A mode is not selected and both A and B are being displayed, maximum resolution is obtained (1024 points across the display). If this display includes a very narrow pulse, it is possible that the top of the pulse is only as wide as a single X coordinate (2 to 2^{17} samples). If this maximum value were in the B table and SAVE A mode were selected and B turned off, there would be an apparent drop in amplitude. For this reason, when SAVE A mode is selected, a special set of circuits in U2045 compares all A and B values that have the same X value and stores the larger in table A. This is accomplished by first reading the B value and storing it in the display shift register. Then, as the A value is read, it is compared with the B value and the larger of the two is loaded into the display shift register. Finally, the number in the shift register is written into memory from the shift register. This operation is performed once each time that SAVE A mode is selected.

Vertical control IC U2045 also contains a 3-bit synchronous counter that identifies the specific bit of an 8-bit vertical value that is to be read from memory or written into memory. This is the only memory addressing that is performed by the vertical control IC. All other addressing is under control of the horizontal control IC (U2020).

Maximum Hold. As described previously, when MAX HOLD mode is selected, circuits in U2045 compare the binary equivalent of the input signal for a given X value with the information in memory for that same X value and cause the larger of the two to be stored in memory.

Constant Circuit. As described previously, in the B minus A operation, a constant is used. This constant is internally selectable with switch S1046. This switch, in combination with multiplexer U1028, supplies the constant to U2045. Multiplexer U1038 is in turn controlled by address bits 0, 1, and 2 to provide the proper switch signal to U2045.

Output Circuits. From the U2045 vertical display register, the parallel data output is applied to 8-bit digital-to-analog converter U2052. The converter output is then applied through a vector generator, consisting of an integrator (U2072 and C1086) with an associated feedback loop sample-and-hold circuit, to the output storage/cursor switch. Integrator U2072 has a time constant that provides a ramp lasting between the existing sample and the new sample (that is, between sync pulses). Sample and hold U2088 retains the last sample.

From U2088, the output current through resistor K1084 subtracts from the digital-to-analog converter output current to modify the slope of the output ramp. The output of the vector generator is then applied to switch Q3072 and Q2069 which selects between the stored data and the marker under control of the buffered PK/AVG LVL (peak/average level) control signal from U3052, and supplies the output to the horizontal circuits.

Horizontal Section

The horizontal analog voltage is converted to a current table value through the use of a 10-bit tracking analog-to-digital converter, which consists of a 10-bit up/down counter (U2020) and an external 10-bit digital-to-analog converter (U2012). As the sweep moves to the right, the counter increments; as the sweep retraces, the counter decrements. Each time the counter increments, a new X coordinate value is generated (the digital-to-analog converter output) and a ST DIV (start divide) signal is generated to start the storage cycle. The increment clock is the SYNC signal, the decrement clock is the basic 0.9 MHz clock divided by two. When SAVE A mode is selected, the counter skips every other binary number. Thus, only B coordinates appear as addresses.

Intelligence for the horizontal system is provided by a programmable logic array ROM state device (PLA). This PLA determines which trace is to be written on the screen, determines when to switch from read to write, generates the B-A coordination signals for vertical control IC U2045 and controls the incrementing of the 9-bit display counter.

The combination of the 10-bit up/down register, 9-bit display counter, and horizontal display multiplexer constitute the primary circuits that: 1) convert the sweep voltage to binary form to generate X values to be written into memory, or 2) read the X values from memory by counting sync cycles and causing the external logic to read stored data from memory and produce a vertical signal (Y value) for each corresponding X value. During acquisition cycles, the 10-bit up/down counter operates in a loop with the external 10-bit digital-to-analog converter to derive the equivalent (X value) of a sample section of the sweep voltage. From the counter, the 10-bit output is applied to the 10-bit up/down register. During display cycles, the 9-bit display counter counts sync pulses to derive the X value. Either the 10-bit up/down register output or the display register output is applied to the horizontal multiplexer under control of the SELECT signal from the PLA. From the multiplexer, the output is applied to the memories.

Tracking Analog-to-Digital Converter. As discussed previously, the 10-bit digital-to-analog converter operates as part of the loop that derives a binary equivalent of the SWP (sweep) input signal from the Sweep board. Converter U2012 accepts the output from the 10-bit up/down counter and converts that output to an analog current that is subtracted from the sweep signal, which is applied at connector pin K and through buffer U4024B. The result of this subtraction is then supplied to up comparator U4022B and down comparator U4022A to produce the UP or DOWN signal, as appropriate to control the direction of the count of the 10-bit up/down counter in U2020. The counter then counts in the appropriate direction, thereby changing the digital-to-analog converter output to reflect the proper value.

From buffer U4024B the sweep is inverted and added to the STORE HORIZ sweep (U2082). Comparator U3052A uses this to detect a zero crossing. This output triggers one-shot U3034. When the output of U3034A goes high, the the MARKER signal is also high, the 9-bit display counter in U2020 is stopped and the STORE HORIZ sweep terminates for the duration of the pulse out of U3034A. When the sweep is stopped, it generates an intensified spot on the display.

Fast Retrace Blanking. Between the display of the B memory contents and display of the A memory contents, a fast retrace occurs. This retrace, unlike that following the A memory display (cursor), is not required to be seen and is thus blanked. This is accomplished by blanking control one-shot U3034B which is controlled by the most significant bit of the memory address and the display enable signal during a marker cycle.

Memories. Integrated circuits U1010 and U1026 provide 8k bits of random access memory for storage of the 1024 data points used in the digital storage system. Addressing is controlled by horizontal control IC U2020.

Reference Level Readout

The Reference Level Readout circuit receives attenuator and gain setting information. With the gain information, it sets the gain of the instrument in steps of 10. It also calculates the reference level, depicts it on LEDs on the front panel, and provides appropriate current for the crt readout.

Nine discrete gain steps (0 to 80 dB) of the IF Gain selector generate a four-bit word for multiplexer U2880, which sets the four output lines according to the state of its control lines, or a predetermined condition. The predetermined condition is when U2880 pin 6 or 3 is high, and P84, pin 4 is high; this causes U2880 pin 1 to go low, giving a high output at pins 12 and 9 and a low output at pins 7 and 4. This condition occurs to prevent exceeding 30 dB of gain when in 10 dB/Div, which would permit invalid reference levels.

The four output lines from multiplexer U2880 control the gain and provide reference level information. Reference level ROM U2885 takes the attenuator information plus the gain information and selects the reference level. Gain control ROM U2890 takes the four gain control lines plus a fifth line with the status of the 30 Hz filter from P7-2 (line is −15 V when the filter is on) and controls the gain in the analyzer through P84 pins 1 and 5 and P83 pins 1 and 2. One of the lines is buffered by transistor Q2880. A line also goes to P7-1 to control the 110 dBm reference level step, which provides 80 dB gain (−15 V on the line tells an amplifier to add 10 dB of gain). This position is valid only when the 30 Hz filter is in, and the amplifier is at the 70 dB gain position.

The output of the reference level ROM U2885 is on lines B1 through B8, which go to the other two boards. Four of the lines (B1 through B4) control the third digit; the fourth digit is hard-wired (in U2800 and U2802) so that it is always zero. Integrated Circuits U2800, U2802, U2804, and U2808 multiplex the display; U2815B, U2815C, and U2815D form a clock oscillator. U2804 is a divide-by-four circuit whose two output lines Q1 and Q2 provide four logic states: 00, 01, 10, and 11. U2808 decodes these lines to sequentially turn on each digit. U2800 and U2802 decode the reference level lines to provide the inputs to the BCD-to-seven segment decoder/driver, U2806.

The reference level outputs of U2885 also control the crt readout by switching the appropriate currents through analog switches U2820 and U2830, via buffers Q2825 through Q2850. Q2895 and Q2896 function as a wired AND gate to turn off Q2855, and hence all current gates, when the reference level is 0 dBm. U2878 and CR2878 function as a −6 V regulated supply for Q2855.

CALIBRATION

INTRODUCTION

Calibration consists of a Performance Check and an Adjustment Procedure. The Performance Check describes procedures to verify that the instrument is performing properly and meets the electrical specifications listed in Section 1. All tests can be performed without access to the interior of the instrument. The Adjustment part provides instructional steps required to recalibrate the instrument circuits. After adjustment, the performance should be checked by the procedure described under the Performance Check part. We recommend adjusting only those circuits that do not meet performance criteria.

The limits, tolerances, and waveform illustrations are aids to calibrate the instrument and are not intended as performance specifications.

HISTORY INFORMATION

The instrument and manual are periodically evaluated and updated. If modifications require changes in the calibration procedure, history information applicable to earlier instruments is included as a deviation within a step or as a sub-part to a step.

EQUIPMENT REQUIRED

Table 4-1 lists the test equipment and calibration fixtures recommended for the Performance Check and Adjustment Procedure. The characteristics specified are the minimum required for the checks. Substitute equipment must meet or exceed these characteristics.

Table 4-1

EQUIPMENT REQUIRED

Equipment	Characteristics	Recommendation
Test Oscillator	10 Hz to 10 MHz with 50 Ω output	Hewlett-Packard Model 654A
Two Signal Generators	500 kHz to 1 GHz; output −10 dB to −100 dBm	Hewlett-Packard Model 8640B
Power Meter with Power Sensor	−60 dBm to −20 dBm full scale; 100 kHz to 18 GHz	Hewlett-Packard Model 435A with 8481A
Time Mark Generator	Marker output, 1 s to 1 μs; accuracy, 0.001%	TEKTRONIX TG 501 and TM 500 Series Power Module
Step Attenuators	Range 0—100 dB in 10 dB and 1 dB steps; accuracy ±0.1 dB.	Hewlett-Packard Model 355C and 355D
Sweep Oscillator	100 kHz to 2 GHz; frequency response ±1.0 dB	Hewlett-Packard Model 8620C
VSWR Bridge	10 MHz to 1 GHz, 50 Ω	Wiltron Model 62BF50
T connector (bnc)		Tektronix Part Number 103-0030-00
Resistive Bridge	See Fig. 4-9A	
Terminator	50 Ω, 2 W, end line	Tektronix Part Number 011-0123-00
Three coaxial cables	50 Ω	Tektronix Part Number 012-0057-01
Frequency counter	Frequency up to 80 MHz	TEKTRONIX DC 504
Test oscilloscope	100 MHz at 5 mV/Div	TEKTRONIX 465

PERFORMANCE CHECK PROCEDURE

INTRODUCTION

As stated in the section introduction, the following procedure checks the 7L14 operation and performance requirements listed under electrical characteristics in the Specification section. The tests do not include any internal adjustments or checks. The checks should be performed in the sequence given because some tests rely on the satisfactory performance of related circuits. They are also arranged to minimize test equipment setup. If a performance measurement is marginal or below specification, an adjustment procedure to optimize the circuit performance will be found under a similar heading in the Adjustment part of this section. If adjustment fails to return the circuit to specified performance, refer to the Maintenance section for troubleshooting and repair procedures. After adjustment, return to the Performance Check to continue with the calibration process.

CAUTION

Refer to the safety warning page at the front of the Service Instructions before performing any adjustments.

Incoming Inspection Test

The Operator's section of this manual contains a functional check that checks all functions of the 7L14. This check is recommended for incoming inspections because it provides a reliable indication that the instrument is performing properly. This Performance Check procedure checks all instrument specifications and requires sophisticated equipment as well as technical expertise to perform.

NOTE

Perform the initial calibration described under Operational Check in the Operator's section of the manual, before proceeding.

1. Check Center Frequency Readout Accuracy: (±5 MHz +20% of frequency span/div); **Center Frequency Readout Resolution:** within 1 MHz; **and Center Frequency Range:** 10 kHz to 1.8 GHz

NOTE

Due to residual magnetism buildup in the YIG oscillator tuning coils, accuracy of the frequency readout should be checked after the tuning coil has been degaussed by switching the FREQ SPAN/DIV to MAX and then turning to 2 MHz/Div.

a. Test equipment setup is shown in Fig. 4-1. Set the 7L14 front-panel controls as follows:

REFERENCE LEVEL	+10 dBm
Display Mode	10 dB/Div
TIME/DIV	5 ms
FREQ SPAN/DIV	2 MHz/Div
RESOLUTION	300 kHz
DISPLAY A	On
TRIGGERING SOURCE	FREE RUN
TRIGGERING MODE	NORM

b. Set Time Generator front-panel controls as follows:

MARKER	10 ns
VARIABLE TIMING	IN

c. Tune the 900 MHz marker to center screen. Set the FREQ SPAN/DIV to MAX, then return to 2 MHz/DIV, while keeping the signal on screen. Adjust the center frequency readout to 900 MHz with the CAL adjustment.

d. Tune the center frequency to 100 MHz. Tune the 100 MHz marker to center screen: the center frequency readout should be 100 MHz, ±2.2 divisions.

e. Check the center frequency readout every 100 MHz up to 1.8 GHz by aligning the time marks to center screen and noting the readout accuracy.

NOTE

At 1.8 GHz the REFERENCE LEVEL may be set to 0 dBm to better observe the time mark.

To Check the Center Frequency Range and Center Frequency Readout Resolution:

a. Dial the TUNING knob from 0 MHz to 1801 MHz.

b. Check that the frequency is readout in 1 MHz increments.

2. Check Frequency Span Accuracy and Linearity: within 5% of the span selected

a. Set up the test equipment as shown in Fig. 4-1. Set the 7L14 front-panel controls as follows:

REFERENCE LEVEL	+10 dBm
Display Mode	10 dB/DIV

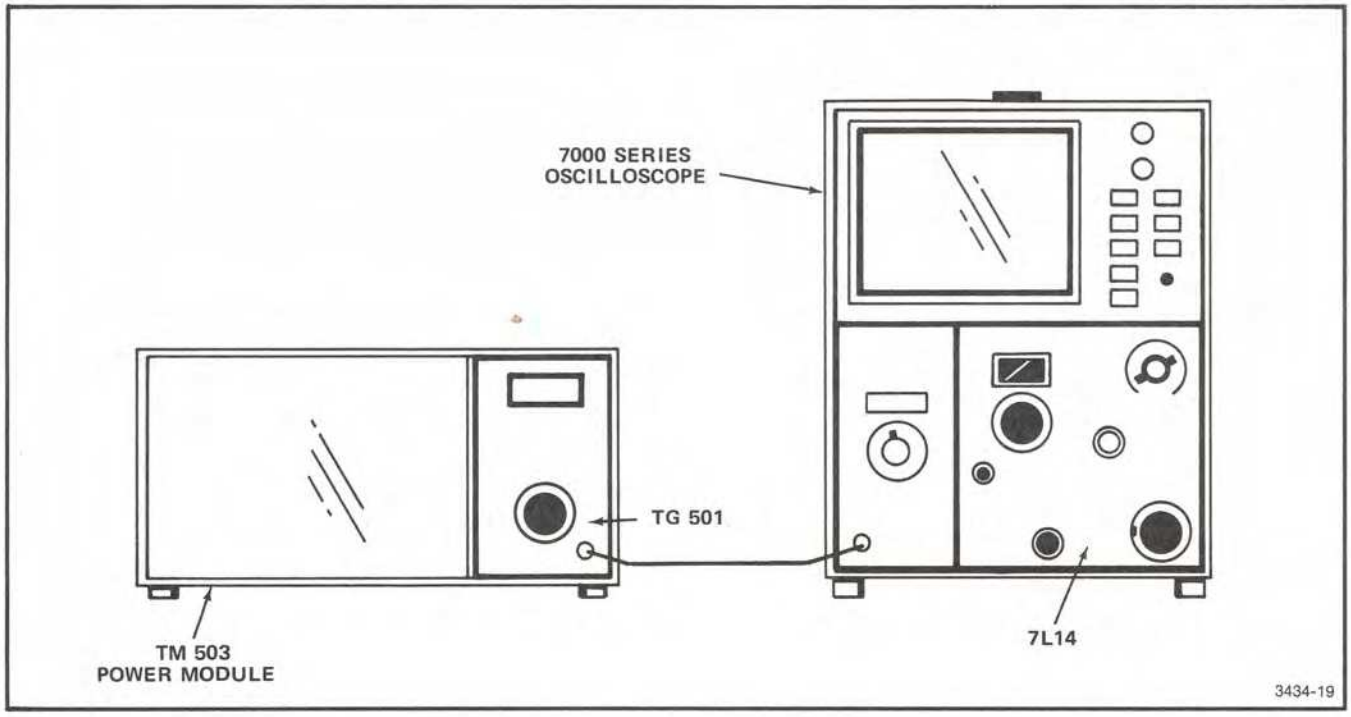


Fig. 4-1. Test equipment set up for checking accuracy of center frequency readout and frequency span.

TIME/DIV	5 ms
FREQ SPAN/DIV	100 MHz
RESOLUTION	3 MHz
DISPLAY A	ON
TRIGGERING SOURCE	FREE RUN
TRIGGERING MODE	NORM

NOTE

Be sure the sweep has been calibrated as stated in the Front-panel Calibration in Section 2.

b. Tune the 500 MHz marker to center screen.

c. Disconnect the cable from the time mark generator. Align the 0 MHz marker with the utmost left graticule.

d. Apply the Marker output from the time mark generator to the RF input of the 7L14 again. Note that there is a time mark on every vertical graticule line, and that displacement from the graticule line does not exceed 2 minor divisions (5% of span selected) over the center 8 divisions.

e. Increase the marker timing in increments as shown in Table 4-2. Decrease the Center Frequency, Frequency Span and Resolution Bandwidth as shown in the same table. Throughout this procedure the center 8 time marks should not deviate from the vertical graticule lines more than 2 minor divisions.

Table 4-2

FREQUENCY SPAN ACCURACY AND LINEARITY

Time Marker Generator Marker (seconds)	7L14 Center Frequency	7L14 Freq. Span/Div	7L14 Resolution	7L14 Time/Div
10 ns	500 MHz	100 MHz	3 MHz	5 ms
20 ns	250 MHz	50 MHz	3 MHz	5 ms
50 ns	100 MHz	20 MHz	3 MHz	5 ms
0.1 μs	50 MHz	10 MHz	300 kHz	5 ms
0.2 μs	25 MHz	5 MHz	300 kHz	5 ms
0.5 μs	10 MHz	2 MHz	300 kHz	5 ms
1 μs	5 MHz	1 MHz	30 kHz	20 ms
2 μs	2.5 MHz	500 kHz	30 kHz	20 ms
5 μs	1 MHz	200 kHz	30 kHz	20 ms
10 μs	0.5 MHz	100 kHz	3 kHz	0.1 sec
			activate AUTOPHASELOCKED	
20 μs	0 MHz	50 kHz	3 kHz	0.1 sec
50 μs	0 MHz	20 kHz	3 kHz	0.1 sec
0.1 ms	0 MHz	10 kHz	300 Hz	1 sec
0.2 ms	0 MHz	5 kHz	300 Hz	1 sec
0.5 ms	0 MHz	2 kHz	300 Hz	1 sec
1 ms	0 MHz	1 kHz	30 Hz	2 sec
			turn REFERENCE LEVEL to −10 dBm	
2 ms	0 MHz	500 Hz	30 Hz	2 sec
5 ms	0 MHz	200 Hz	30 Hz	2 sec

3. Check Display Mode Accuracy: Within 0.15 dB/dB to 2 dB max over 80 dB dynamic range for Log 10 dB/div; within ±0.4 dB to 1.0 dB max over 14 dB dynamic range for Log 2 dB/Div; within 10% over 8 divisions in LIN mode

NOTE

Calibrate the LOG CAL and AMPL CAL adjustments before proceeding. See the Operating Instructions.

a. Test equipment setup is shown in Fig. 4-2. Set the 7L14 front-panel controls as follows:

REFERENCE LEVEL	−30 dBm
Display Mode	10 dB/Div
TIME/DIV	50 ms
FREQ SPAN/DIV	2 MHz/Div
RESOLUTION	300 kHz
DISPLAY A	on
TRIGGERING SOURCE	FREE RUN
TRIGGERING MODE	NORM
CENTER FREQUENCY	50 MHz

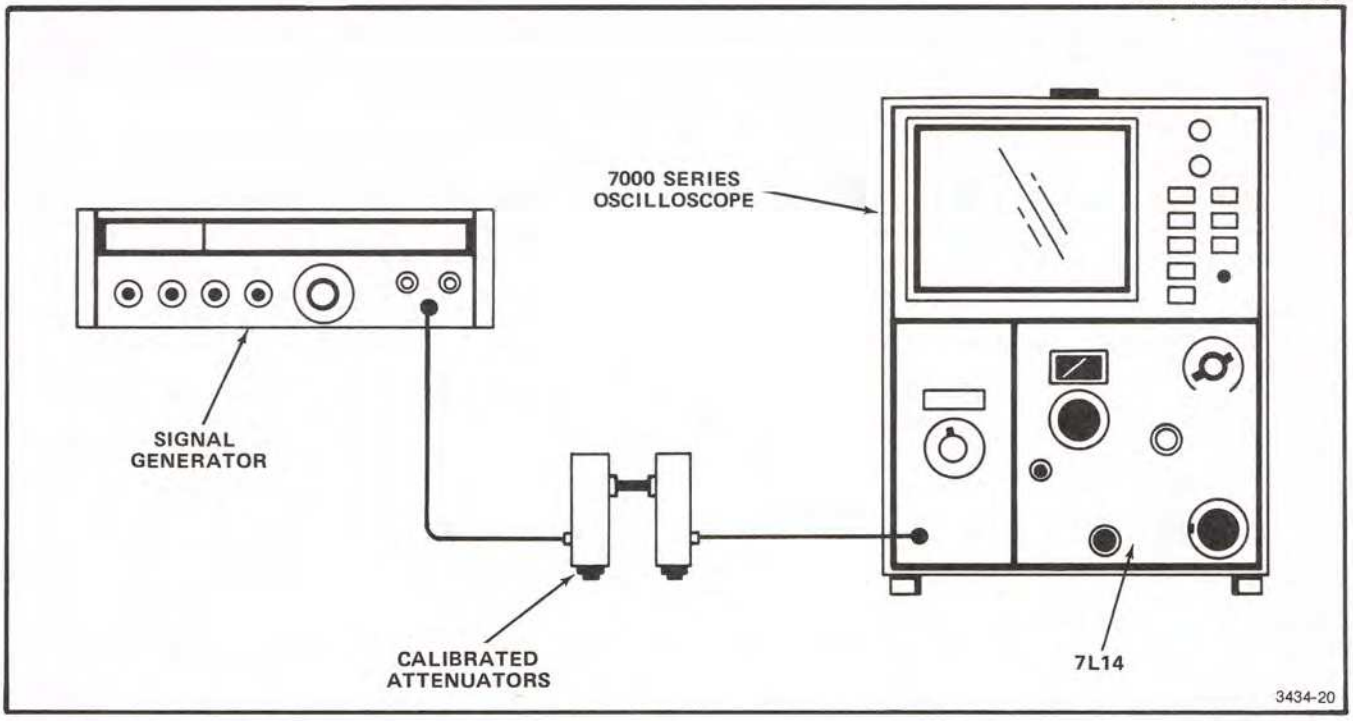


Fig. 4-2. Test equipment set up for checking display mode accuracy, calibrator power level and RF attenuator.

b. Tune the Signal Generator to 50 MHz and set the Output Level for −30 dBm. The attenuators should be at 0 dB.

c. Align the 50 MHz marker to the center graticule line. Reduce the FREQ SPAN/DIV to 5 kHz and the RESOLUTION to 3 kHz while keeping the marker centered, and activating AUTOPHASELOCKED.

d. Align the top of the signal and the top graticule line with the LOG CAL adjustment.

e. Increase the external attenuation in 10 dB steps and observe a decrease in the signal's amplitude that does not exceed 1.5 dB (±0.75 minor division) per 10 dB (1 major division).

f. Reset the attenuators to 0 dB. Change the Display Mode on the analyzer to 2 dB/Div.

g. Increase the external attenuation in 2 dB steps and observe a decrease in the signal's amplitude that does not exceed 0.4 dB (1 minor division) per 2 dB (1 major division).

h. Reset the attenuators to 0 dB. Change the Display Mode on the analyzer to LIN.

i. Increase the external attenuation in two 6 dB steps and observe a 50%, ±10% decrease in the signal's amplitude for each step.

4. Check the Calibration Frequency: 50 MHz, ±0.01%

a. Set the 7L14 front-panel controls as follows:

REFERENCE LEVEL	−30 dBm
Display Mode	10 dB/Div
TIME/DIV	50 ms
FREQ SPAN/DIV	2 MHz/DIV
RESOLUTION	300 kHz
DISPLAY A	on
TRIGGERING SOURCE	FREE RUN
TRIGGERING MODE	NORM
AUTOPHASELOCKED	on

b. Apply the CAL OUT signal to the RF IN via a coaxial cable and a T-connector.

c. Align the 50 MHz marker to the center graticule line. Reduce the FREQ SPAN/DIV to 500 Hz and the RESOLUTION to 300 Hz while keeping the marker centered.

d. Tune a signal generator (whose frequency accuracy has been checked with a Frequency Counter or Time Mark

Generator) to 50 MHz and set the Output Level for −30 dBm. Apply the generator's signal to the T-connector on the RF Input of the 7L14. See Fig. 4-3 for set up.

e. Two signals now appear on the crt. Adjust the frequency of the signal generator until the two signals overlap. Frequency readout on the signal generator should be 50 MHz ±0.01%.

5. Check the Calibrator Power Level: +30 dBm, ±0.2 dB

a. Connect a power meter to a signal generator whose output level is set for −20 dBm. Adjust the signal generator until the readout on the powermeter is −20 dBm.

b. Set up the test equipment as shown in Fig. 4-2. Set the 7L14 front-panel controls as follows:

REFERENCE LEVEL	−30 dBm
Display Mode	10 dB/Div
TIME/DIV	10 ms
FREQ SPAN/DIV	2 MHz
RESOLUTION	3 MHz
DISPLAY A	on
TRIGGERING SOURCE	FREE RUN
TRIGGERING MODE	NORM

c. Tune the signal generator to 50 MHz and add 10 dB of attenuation with the external attenuators. Tune the 50 MHz signal to center screen.

NOTE

Exact accuracy of the external attenuators must be known to make a precise measurement.

d. Activate the SAVE A button. Disconnect the 7L14 from the external attenuators and connect the RF Input to the CAL OUT connector.

e. Observe the difference in signal amplitude between the two signals. It should not exceed 0.3 dB (±0.75 minor division).

6. Check RF Attenuator Accuracy: ±0.25 dB or 1.2% of dB reading; whichever is greater

a. Set up the test equipment as shown in Fig. 4-2. Set the 7L14 front panel controls as follows:

REFERENCE LEVEL	+30 dBm
Display Mode	10 dB/Div
TIME/DIV	for a calibrated display
FREQ SPAN/DIV	1 MHz

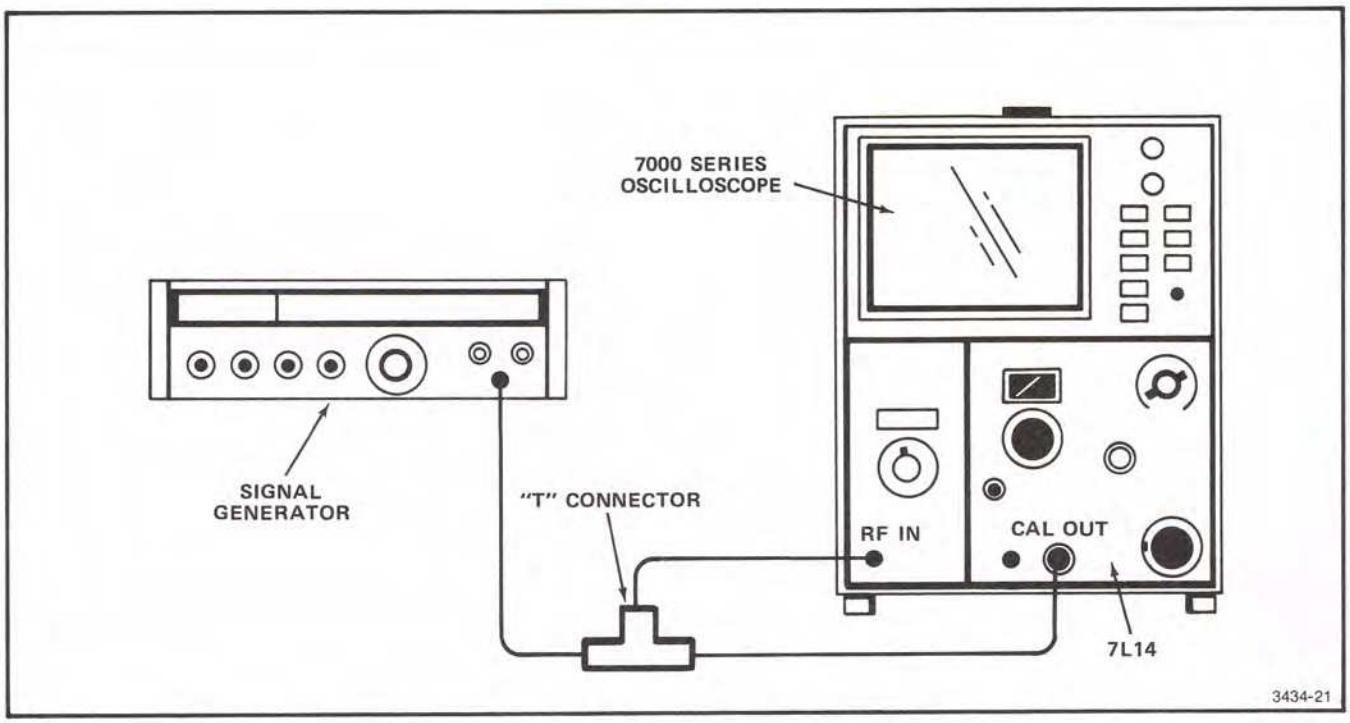


Fig. 4-3. Test equipment set up for checking calibrator frequency.

RESOLUTION	3 MHz
DISPLAY A	on
TRIGGERING SOURCE	FREE RUN
TRIGGERING MODE	NORM

b. Set the signal generator output level for +20 dBm and tune the frequency to 50 MHz. The external attenuator should be at 0 dB.

c. Tune the 50 MHz marker to center screen with the 7L14 TUNING control. Activate SAVE A.

d. Turn the external attenuator to 10 dB; decrease the attenuation in the 7L14 10 dB (REFERENCE LEVEL should read 20 dBm). Compare the new signal to the signal stored and note the difference.

e. Repeat step d of this procedure for each step of attenuation.

7. Check IF Gain Step Accuracy: ±1 dB per 10 dB step to ±2 dB max over the entire range

a. Set up test equipment as shown in Fig. 4-2. Set the front-panel controls as follows:

Signal Generator

Frequency	100 MHz
Output level	−30 dBm
All modulation	off

7L14

REFERENCE LEVEL	−30 dBm
Display Mode	2 dB/Div
TIME/DIV	20 ms
FREQ SPAN/DIV	1 MHz
RESOLUTION	3 MHz
DISPLAY A and B	on
TRIGGERING SOURCE	FREE RUN
TRIGGERING MODE	NORM
AUTOPHASELOCKED	off
VIDEO FILTER	on
EXTERNAL ATTENUATORS	at 0 dB

b. Tune the 7L14 Center Frequency to 100 MHz. Center the display on screen.

c. Adjust the output level of the signal generator so the top of the signal is on graticule line below the top of the screen.

d. Activate SAVE A. Add 10 dB of external attenuation and switch the reference level on the 7L14 to −40 dBm with the Gain switch. Compare the new signal to the saved signal: it must not deviate more than 1 dB. Also, the new signal must be within 2 dB of the reference.

e. Deactivate and reactivate SAVE A. Add 10 dB more of external attenuation and add 10 dB more of gain. Compare the two signals as described in step d.

f. Repeat step e until the reference level is −70 dBm.

g. Decrease the RESOLUTION to 300 kHz and the FREQUENCY SPAN/DIV to 100 kHz. Increase the REFERENCE LEVEL to −30 dBm and return the external attenuation to 0 dBm.

h. Repeat steps c through f, until the reference level is −80 dBm.

i. Switch AUTOPHASELOCKED on. Decrease the RESOLUTION to 30 kHz and the FREQUENCY SPAN/DIV to 10 kHz. Return the REFERENCE LEVEL setting to −30 dBm, external attenuation 0 dBm.

j. Repeat step c through f, until the REFERENCE LEVEL reads −90 dBm. The TIME/DIV may be reduced for optimum averaging.

k. Decrease the RESOLUTION to 3 kHz and the FREQUENCY SPAN/DIV to 1 kHz. Return the REFERENCE LEVEL setting to −30 dBm, external attenuation 0 dBm.

l. Repeat step c through f, until the REFERENCE LEVEL reads −100 dBm. The TIME/DIV may be reduced for optimum averaging.

m. Decrease the RESOLUTION to 300 Hz and the FREQUENCY SPAN/DIV to 200 Hz. Return the REFERENCE LEVEL setting to −30 dBm, external attenuation 0 dBm. Reduce the TIME/DIV to 0.2 seconds.

n. Repeat step c through f until the REFERENCE LEVEL reads −100 dBm.

o. Decrease the RESOLUTION to 30 Hz. Reduce the TIME/DIV to 0.5 seconds. Return the REFERENCE LEVEL setting to −30 dBm, external attenuation 0 dBm.

p. Repeat step c through f until the reference level reads −110 dBm.

8. Check Noise Sidebands: 70 dB down, 25 X the resolution bandwidth away from the carrier

a. Apply the RF Out signal from a Signal Generator to the RF Input of the 7L14.

b. Set the Signal Generator controls for a 50 MHz signal at −10 dBm. All modulation must be off.

c. Set the 7L14 front-panel controls as follows:

REFERENCE LEVEL	−30 dBm
Display Mode	10 dB/Div
TIME/DIV	10 ms
TRIGGERING SOURCE	FREE RUN
TRIGGERING MODE	NORM
FREQ SPAN/DIV	20 MHz
RESOLUTION	3 MHz
DISPLAY A and B	on
VIDEO FILTER	on
AUTOPHASELOCKED	on

d. Turn the CENTER FREQUENCY on the 7L14 to 50 MHz. Noise sidebands should be 5 or more divisions down from the top of the screen, 75 MHz away from the 50 MHz signal.

e. Change the output level on the Signal Generator to −20 dBm. Set the 7L14 RESOLUTION to 300 kHz and span down to 2 MHz/Div. Noise sidebands should be 6 divisions down, 7.5 MHz away from the 50 MHz signal.

f. Change the Output Level on the Signal Generator to −30 dBm. Set the 7L14 RESOLUTION to 30 kHz and span down to 200 kHz/Div. Noise sidebands should be at least 7 divisions down, 750 kHz away from the 50 MHz signal.

g. Set the 7L14 RESOLUTION to 3 kHz and set the FREQ SPAN/DIV to 20 kHz. Noise sidebands should be at least 7 divisions down, 75 kHz away from the 50 MHz signal.

h. Set the RESOLUTION to 300 Hz and span down to 2 kHz/Div. Reduce the sweep speed for a calibrated display. Noise sidebands should be at least 7 divisions down, 7.5 kHz away from the 50 kHz signal.

i. Turn the RESOLUTION to 30 Hz and span down to 200 Hz/Div. Reduce the sweep speed to 0.5 seconds. Noise sidebands should be at least 7 divisions down, 750 Hz away from the 50 MHz signal.

9. Check Sweep Accuracy: ±6% of selected TIME/DIV

a. Switch the RF Attenuator to 0 dB and the Gain selector fully ccw for a REFERENCE LEVEL of −30 dB.

b. Apply a 100 MHz, −40 dBm signal from the signal generator to the RF INput of the 7L14 and tune the CENTER FREQUENCY to the signal. Apply .1 ms time generators to the AM input of the signal generator (see Fig. 4-4) so the signal generator output can be modulated by time markers.

c. With the CENTER FREQUENCY tuned to the 100 MHz signal from the signal generator, uncouple the FREQ SPAN/DIV selector and reduce the span to 0, leaving the RESOLUTION at 3 MHz. Switch the display mode to 2 dB/DIV.

d. Switch the TRIGGERING SOURCE to INT, TRIGGERING MODE to NORM and the TIME/DIV to .1 ms. Adjust the signal generator output and modulation level for a display amplitude of approximately 2 divisions p-p. (See Fig. 4-5.)

e. Adjust the TRIGGERING LEVEL for a triggered display, then check the accuracy of the TIME/DIV selections by applying appropriate markers from the time mark generator and noting the displacement error between the graticule marks and the time markers. The error must not exceed ±6% (.48 div) over the center 8 divisions of a 10 division display.

NOTE

Use the HORIZ POSITION control to position a marker on the 1st graticule line, then note the error between each marker and its respective graticule line.

f. Disconnect the signal to the RF INput and return the 7L14 to normal spectrum operation.

10. Check Triggering Sensitivity: ≤0.5 divisions of internal signal (p-p) and/or ≤0.5 V (p-p) of external signal

a. Set up test equipment as shown in Fig. 4-6.

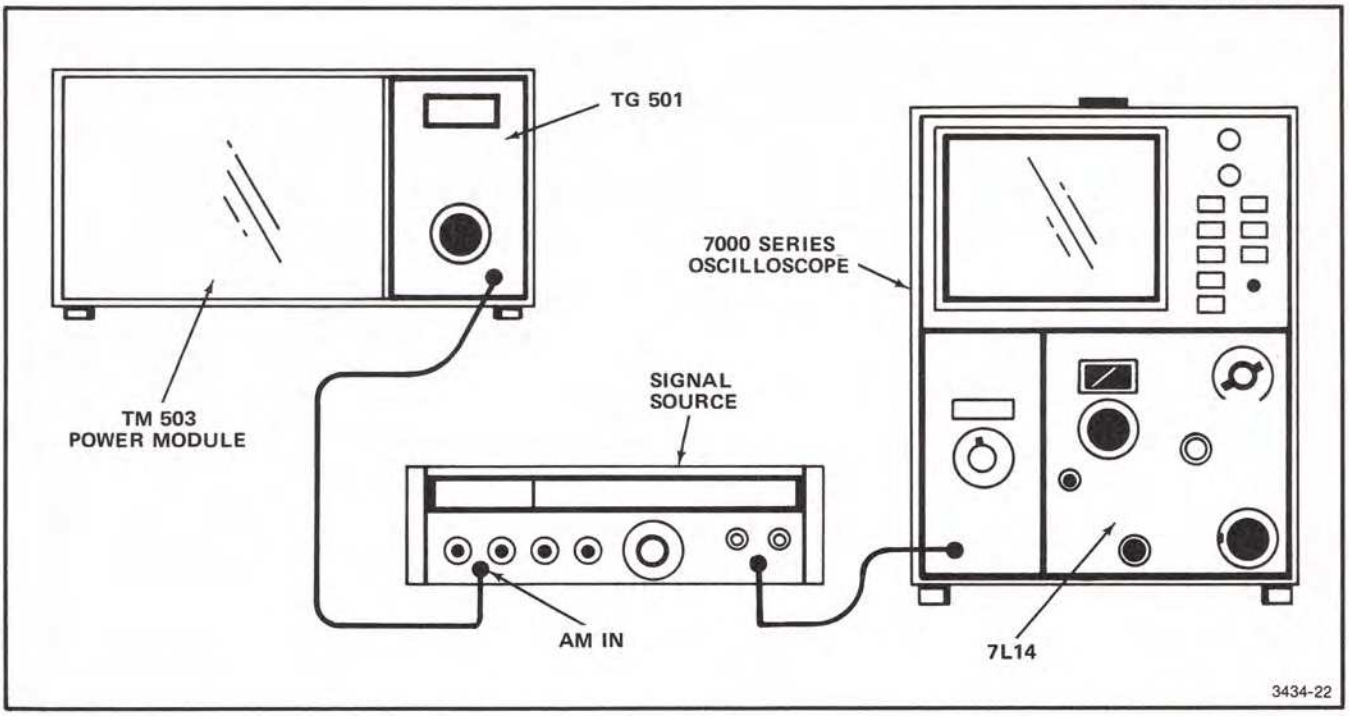


Fig. 4-4. Test equipment set up for checking sweep accuracy.

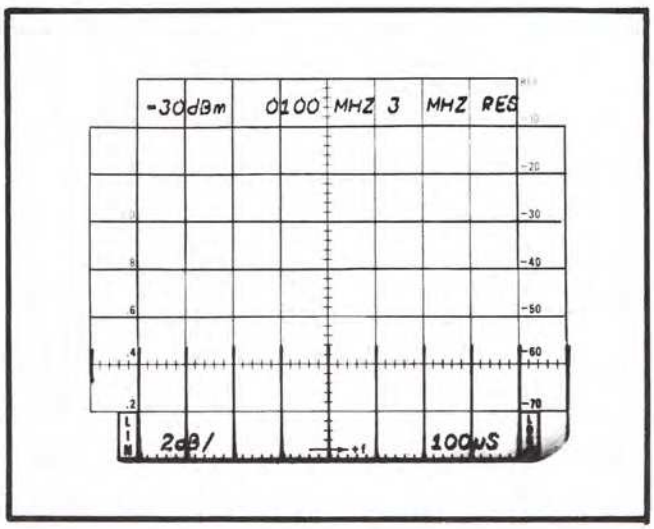


Fig. 4-5. Display showing time markers for checking sweep accuracy.

b. Set the Volts/Div control on a single-trace amplifier for a 0.5 V/Div signal. Adjust position for a center screen signal and turn to dc coupled.

c. Set the 7L14 TIME/DIV to 1 μs. TRIGGERING SOURCE should be INT, TRIGGERING MODE: NORM. DISPLAY A and B must be off.

d. Adjust the test-oscillator Frequency to 1 MHz; adjust the Output level for a signal that is 1 division high (p-p) (0.5 V).

e. Adjust Triggering Level on the 7L14 for a triggered display.

f. Reduce the test-oscillator Output Level for a 0.5 division (p-p) signal (0.25 V). Observe that the 7L14 is able to trigger on this signal.

g. Check triggering operation at 15 Hz, maintaining 0.5 division of display.

h. Switch the TRIGGERING SOURCE to EXT. Set the test oscillator Output Level for a 0.5 V signal (p-p) at 1 MHz.

i. Check triggering through the frequency range of 15 Hz to 1 MHz as described above. Ensure that the input level remains at 0.5 V (p-p).

j. Switch the TRIGGERING SOURCE to FREE RUN and note that the display will not trigger.

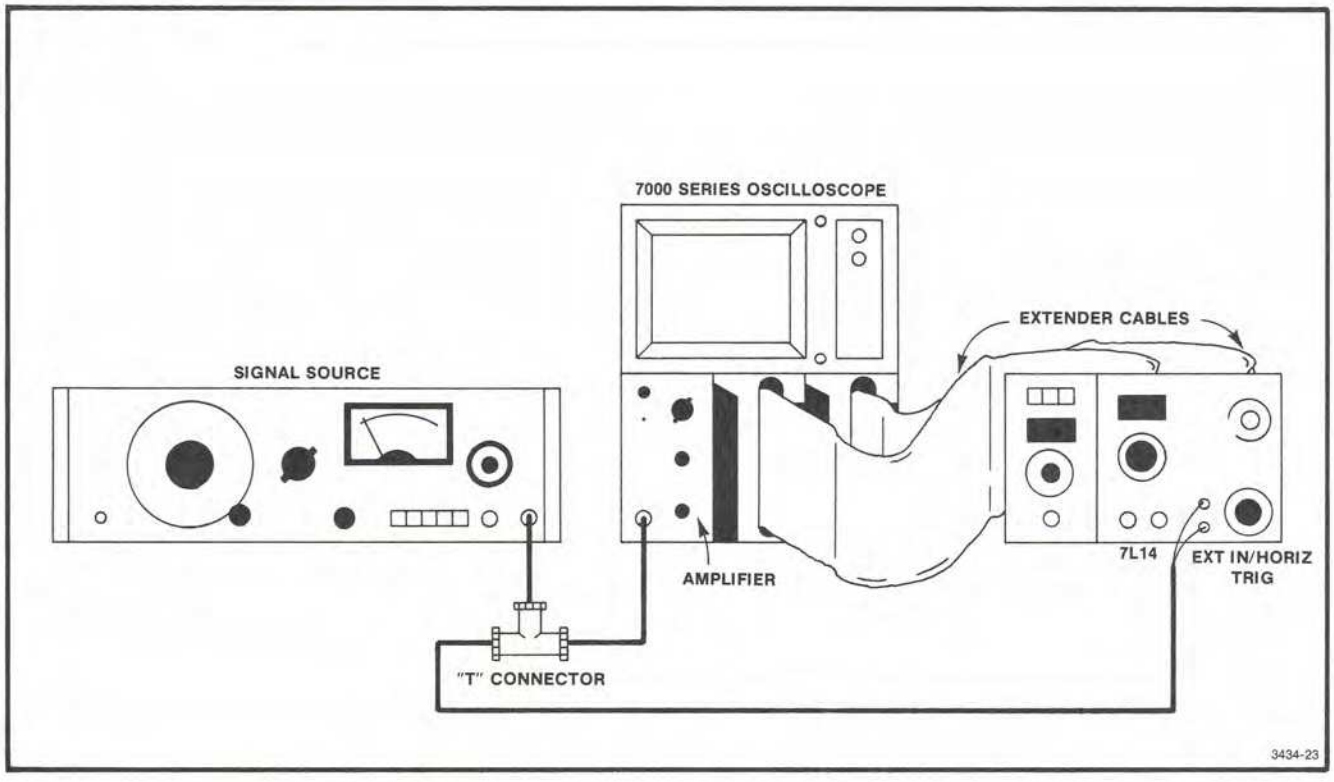


Fig. 4-6. Test equipment set up for checking triggering sensitivity.

k. Switch the TRIGGERING SOURCE to LINE and check that the display triggers at line frequency.

l. Switch the TRIGGERING MODE to SGL SWP and TIME/DIV to 1 s. Check for a single sweep each time the sweep button is pushed.

NOTE

The pushbutton should light during sweep time.

11. Check Display Flatness: ±1.5 dB, with respect to 50 MHz, over any selected frequency span

a. Set the 7L14 front-panel controls as follows:

Display Mode	2 dB/Div
REFERENCE LEVEL	−20 dBm (10 dB RF attenuation)
TIME/DIV	10 ms
TRIGGERING SOURCE	FREE RUN
TRIGGERING MODE	NORM
DISPLAY A, B	on
RESOLUTION	3 MHz
FREQ SPAN/DIV	MAX
CENTER FREQUENCY	000 (knob fully ccw)

b. Using a short cable, connect the CAL OUT and the RF IN connector on the 7L14. Tune the center frequency to 50 MHz. Note the amplitude of the marker.

c. Increase the reference level to 10 dBm (40 dB RF attenuation). Set the sweep oscillator's front-panel controls as follows:

Start Marker	0 GHz
Stop Marker	1.85 GHz
Trigger Time	100 sec
Power Level	+12 V

d. Connect the RF IN of the 7L14 and the RF OUT of the sweep oscillator. Line up the sweep generator signal to the 50 MHz marker, using the CW Marker control. Adjust for the same signal amplitude as the 50 MHz marker, using the Power Level control.

e. Push the MAX HOLD button on the 7L14, and push Marker Sweep on the sweep oscillator. Note that the display flatness is ±1.5 dB, with respect to the level at 50 MHz.

f. Set the Stop Marker on the sweep oscillator to 0.1 GHz.

g. Disconnect RF OUT on the sweep oscillator from RF IN on the analyzer; connect CAL OUT and RF IN on the 7L14. Reduce the reference level to −20 dBm (10 dB RF attenuation).

h. Tune the center frequency to 25 MHz; reduce the frequency span to 5 MHz/Div. Note the amplitude of the marker on the right graticule line. Save the display.

i. Return the reference level to 10 dBm (40 dB RF attenuation).

j. Connect the RF IN of the 7L14 and the RF OUT of the sweep oscillator. Using the CW Marker, line up the sweep oscillator signal to the 50 MHz marker on the analyzer. Adjust for the same signal amplitude as the 50 MHz marker, using the Power Level control.

k. Push MAX HOLD on the 7L14 and deactivate SAVE A.

l. Push Marker Sweep, save the display. Note display flatness. Disconnect RF OUT from the sweep oscillator.

m. Set the test oscillator front-panel controls as follows:

Frequency Range	10 MHz
Impedance	50 unbal
Output Level	0 dBm

n. Connect RF IN and the Unbal connector on the test oscillator.

o. Line up the left edge of the test oscillator signal to the left edge of the saved display and adjust for the same signal amplitude, using the test oscillator Amplitude control. Deactivate SAVE A.

p. Reduce the 7L14 frequency span to 1 MHz and the resolution to 300 kHz while keeping the 10 MHz signal on the screen. Move the signal to the right most graticule line.

q. Activate MAX HOLD and reduce the frequency of the test oscillator to 1 MHz. Save the display and deactivate MAX HOLD. Note display flatness.

r. Turn the Frequency Range selector to X100K and turn the frequency dial to 10.

s. Reduce the frequency span on the 7L14 to 100 kHz and reduce the resolution to 30 kHz, while keeping the signal on screen.

NOTE

When changing resolution bandwidth, ensure that the signal amplitude does not change. Compensation with the Amplitude Control of the test oscillator may be necessary.

Move the signal to the right-most graticule.

t. Deactivate SAVE A. Push MAX HOLD and reduce the test oscillator frequency to 100 kHz. Save the display, deactivate MAX HOLD. Note the display flatness.

u. Turn the Frequency Range selector to X10K and turn the frequency dial to 10.

v. Reduce the frequency span on the 7L14 to 10 kHz and reduce the resolution to 3 kHz, while keeping the signal on the screen. Activate AUTOPHASELOCKED. Reduce the TIME/DIV to 20 ms.

w. Tune the signal to the right-most graticule line. Deactivate SAVE A.

x. Activate MAX HOLD and reduce the frequency of the test oscillator to 10 kHz. Save the display; deactivate MAX HOLD and note the display flatness.

12. Check Resolution Bandwidth Accuracy and Shape Factor: bandwidth within 20% of resolution selected; shape factor 4:1 or better for 3 MHz or 0.3 kHz; 12:1 or better for 30 Hz resolution

a. Apply the Calibrator signal to the RF INput and set the RF Attenuator to 0 dB. Turn the Gain selector fully ccw for a REFERENCE LEVEL of −30 dBm.

b. Tune the 50 MHz marker to the center of the screen, set the FREQ SPAN/DIV to 1 MHz, and the RESOLUTION bandwidth to 3 MHz.

c. Switch the display mode to 2 dB/DIV and adjust the REF VARiable control, if necessary, for a full screen display.

NOTE

Ensure that the sweep rate is set so the UNCAL light is out and the baseline of the display is on the bottom graticule line.

d. Check the bandwidth of the signal at the 6 dB down level (see Fig. 4-7a). Bandwidth must equal 3 MHz ±600 kHz.

e. Switch the display mode to 10 dB/DIV and the VIDEO FILTER in. Switch the FREQ SPAN/DIV to 2 MHz and check the shaper factor (see Fig. 4-7b).

f. Return the display mode to 2 dB/DIV, decrease the FREQ SPAN/DIV to 100 kHz and the RESOLTUION bandwidth to 300 kHz. Keep the signal centered on screen with the TUNING control as the FREQ SPAN is decreased.

g. Check the bandwidth at the 6 dB down level. Bandwidth must equal 300 kHz ±60 kHz.

h. Switch the FREQ SPAN/DIV to 200 kHz, display mode to 10 dB/DIV, and check the shape factor as described in step e.

i. Reduce the FREQ SPAN/DIV to 10 kHz, the RESOLUTION bandwidth to 30 kHz, and the display mode to 2 dB/DIV. Center the display with the TUNING control if necessary.

j. Check the bandwidth. Bandwidth must equal 30 kHz ±6 kHz.

k. Reduce the FREQ SPAN/DIV to 200 Hz and the RESOLUTION bandwidth to 300 Hz. Center the display with the TUNING control if necessary. Adjust the REF VARiable control for a full screen display.

l. Check the bandwidth of the response at the −6 dB level. Bandwidth must equal 300 Hz ±60 Hz.

m. Switch the display mode to 10 dB/DIV. Reduce the sweep speed to 2 s/Div to maintain a calibrated display. Measure the response shape factor.

n. Reduce the RESOLUTION to 30 Hz and change the display mode to 2 dB/DIV. Check the bandwidth at the −6 dB level. Bandwidth must equal 30 Hz ±6 Hz.

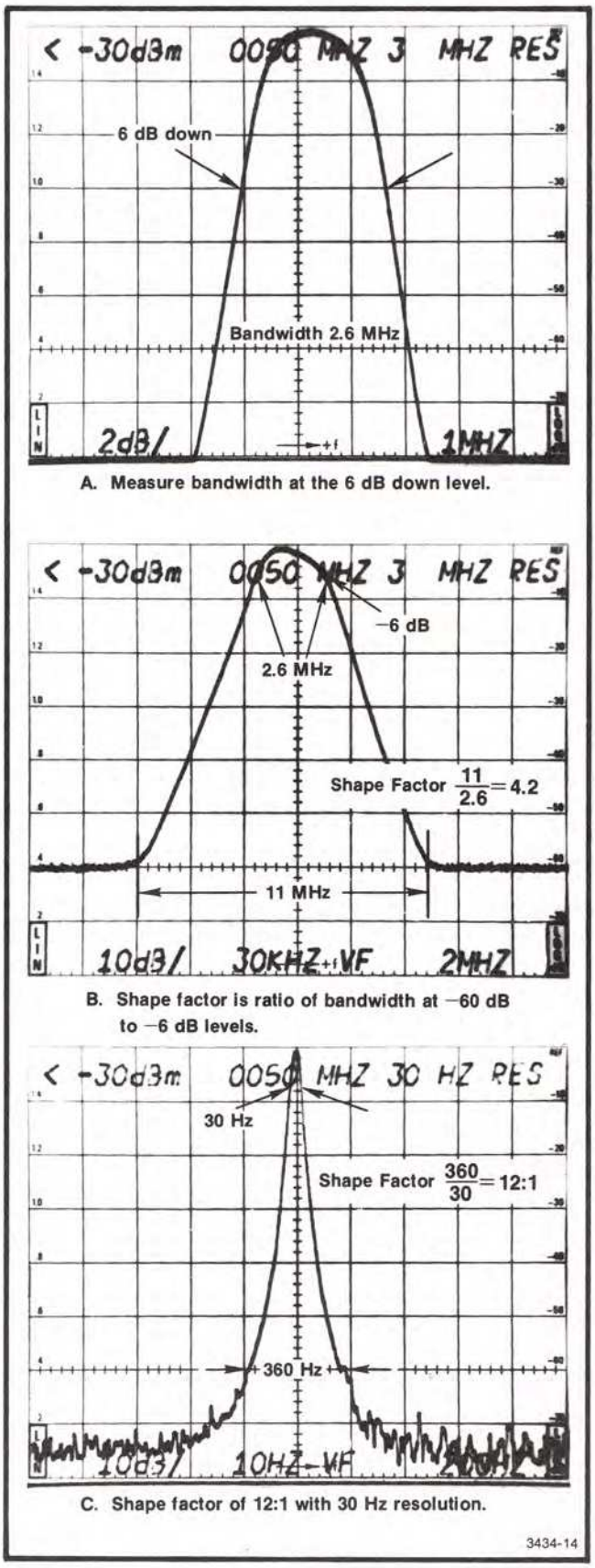


Fig. 4-7. Measuring bandwidth and shape factor.

o. Switch the display mode to 10 dB/DIV and measure the shape factor. Shape factor for 30 Hz resolution must equal 12:1 or better (see Fig. 4-7c).

13. Check Signal Level Change Between Any Two Bandwidths: ±0.5 dB at room temperature (0 RF attenuation, −30 dBm reference level): ±2.0 dB max over temperature

a. Set the 7L14 front-panel controls as follows:

Display Mode	2 dB/Div
REFERENCE LEVEL	−20 dBm
TIME/DIV	20 ms
TRIGGERING SOURCE	FREE RUN
TRIGGERING MODE	NORM
DISPLAY A	on
RESOLUTION	3 MHz
FREQ SPAN/DIV	2 MHz
AUTOPHASELOCKED	on

b. Apply the CAL OUT signal to the RF Input. Tune the center frequency to 50 MHz. Center the signal on screen.

c. Note the signal amplitude. Reduce the resolution bandwidth gradually through its entire range, while spanning down accordingly. Keep the signal on screen and reduce the sweep speed for a calibrated display.

d. The difference in amplitude between any two bandwidths should not exceed 1 dB (1 division) at room temperature.

NOTE

In other than room temperature environment, difference in amplitude may be as much as ±2.0 dB.

14. Check Residual (Incidental) FM: ≤10 kHz (p-p) for 20 ms when not phaselocked

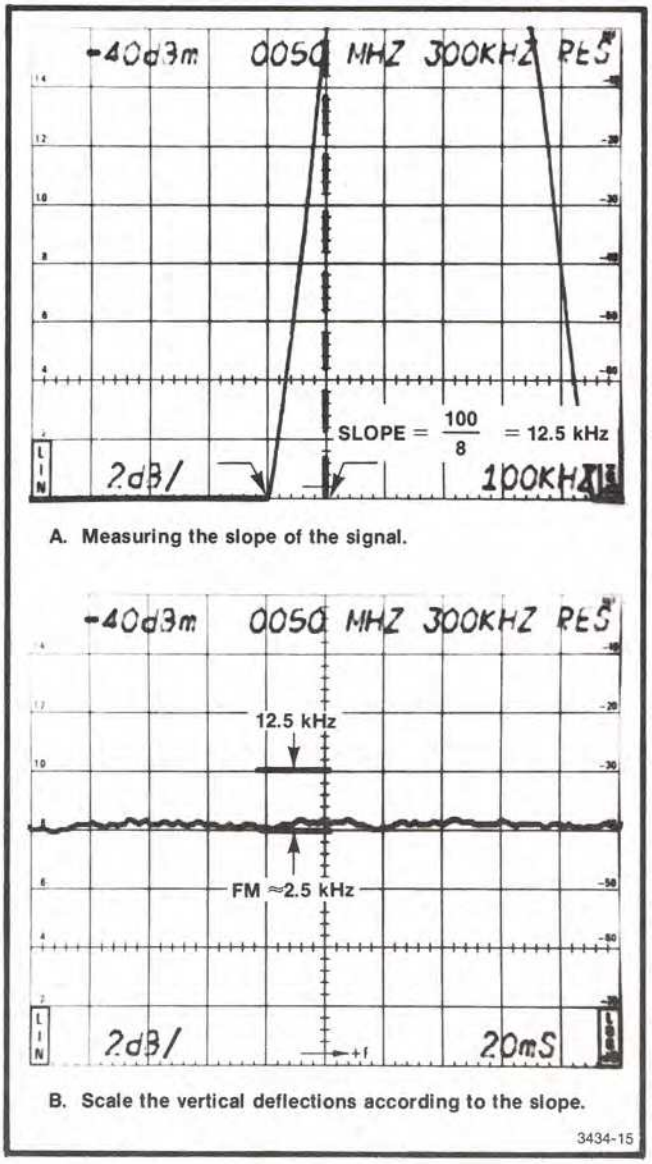
a. Set the 7L14 front-panel controls as follows:

Display Mode	2 dB/Div
REFERENCE LEVEL	−40 dBm (0 RF Attenuation, 10 dB gain)
TIME/DIV	20 ms
TRIGGERING SOURCE	FREE RUN
TRIGGERING MODE	NORM
DISPLAY A	on
RESOLUTION	300 kHz
FREQ SPAN/DIV	100 kHz
AUTOPHASELOCKED	off

b. Apply the CAL OUT signal to the RF Input. Tune the center frequency to 50 MHz. Center the signal on screen.

c. Position the marker signal with the CENTER FREQUENCY control so the slope (horizontal versus vertical excursion) of the response can be measured over 8 division of amplitude (see Fig. 4-8a). It may be advantageous to SAVE A to freeze the display. The slope must be calculated on the linear portion of the waveform.

d. Switch FREQ SPAN/DIV to 0 (time domain), keeping the signal centered with the CENTER FREQUENCY control. At 0 span, tune the display near mid-screen (see Fig. 4-8b). Note the peak-to-peak amplitude of the display within a horizontal division. Residual FM must not exceed 10 kHz per horizontal division, measured within the linear portion determined in step c.



A. Measuring the slope of the signal.

B. Scale the vertical deflections according to the slope.

Fig. 4-8. Measuring residual FM.

15. Check Residual (Incidental) FM: ≤13 Hz (p-p) for 20 ms when phaselocked

a. Set the 7L14 front-panel controls as follows:

Display Mode	2 dB/Div
REFERENCE LEVEL	−40 dBm (0 RF attenuation)
TIME/DIV	20 ms
TRIGGERING SOURCE	FREE RUN
TRIGGERING MODE	NORM
DISPLAY A	on
RESOLUTION	300 Hz
FREQ SPAN/DIV	200 Hz
AUTOPHASELOCKED	on

b. Apply the CAL OUT signal to the RF INput. Tune the CENTER FREQUENCY to 50 MHz. Center the signal on screen.

c. Calculate the slope as descriped in procedure 14, step c.

d. Switch FREQ SPAN/DIV to 0 (time domain). Measure residual FM using the same technique as described in procedure 14, step d. Residual FM must not exceed 13 Hz for a 20 ms period (horizontal division).

16. Check Stability: 2 kHz/Hr phaselocked; 50 kHz/Hr not phaselocked, at a fixed temperature after two hour warm-up

a. **Phaselocked.** Set the 7L14 front-panel controls as follows:

Display Mode	10 dB/Div
REFERENCE LEVEL	−30 dBm
TIME/DIV	.2 seconds
TRIGGERING SOURCE	FREE RUN
TRIGGERING MODE	NORM
DISPLAY A	on
RESOLUTION	300 Hz
FREQ SPAN/DIV	2 kHz
AUTOPHASELOCKED	on

b. Apply the CAL OUT signal to the RF Input. Center the 50 MHz signal on screen.

c. Push MAX HOLD and observe ≤2 kHz (1 division) drift in one hour.

d. **Unphaselocked.** Set 7L14 front-panel controls as in step a, but turn AUTOPHASELOCKED off, set FREQ SPAN/DIV to 100 kHz, RESOLUTION to 3 kHz and TIME/DIV to .1 seconds.

e. Apply the CAL OUT signal to the RF INput. Center the 50 MHz signal on screen.

f. Push MAX HOLD and observe ≤50 kHz (0.5 division) drift in one hour.

17. Check Sensitivity (Table 4-3)

NOTE

Sensitivity is specified according to the input of average noise level. The 7L14 calibrator is the reference used to calibrate the display.

a. Set the 7L14 front-panel controls as follows:

REFERENCE	−80 dBm
Display Mode	2 dB/Div
TIME/DIV	50 ms
FREQ SPAN/DIV	0
RESOLUTION	3 MHz
DISPLAY A	on
VIDEO FILTER	on
TRIGGERING SOURCE	FREE RUN
TRIGGERING MODE	NORM

b. Terminate the RF INput into 50 Ω. Note that the displayed noise level is below the top of the screen (−80 dBm).

c. Decrease the resolution to 300 kHz and the reference level to −90 dBm. Note that the displayed noise level is below the top of the screen (−90 dBm).

d. Decrease the resolution to 30 kHz and the reference level to −100 dBm. Decrease the TIME/DIV to .5 seconds. Note that the displayed noise level is below the top of the screen (−100 dBm).

e. Decrease the resolution to 3 kHz and switch the display mode to 10 dB/Div. Decrease the TIME/DIV to 1 second/div. Note that the displayed noise level is below the 5th graticule line from the top (−110 dBm).

f. Decrease the resolution to 300 Hz. Decrease the TIME/DIV to 2 seconds/div. Note that the displayed noise level is below the 6th graticule line from the top (−120 dBm).

g. Decrease the resolution to 30 Hz. Decrease the TIME/DIV to 5 seconds/div. Note that the displayed noise

level is below the 7th graticule line from the top (−130 dBm).

Table 4-3

7L14 SENSITIVITY

Resolution Bandwidth	Averaged Input Noise Level
3 MHz	−80 dBm
300 kHz	−90 dBm
30 kHz	−100 dBm
3 kHz	−110 dBm
300 Hz	−120 dBm
30 Hz	−130 dBm

18. Check for Spurious Signal From Internal Sources (Residual Responses): (≤ −100 dBm, referred to the RF INput)

a. Remove any signal connected to the RF INput. Switch the RF Attenuator to 30 dB to further isolate the 1st mixer from the input.

b. Switch out the VIDEO FILTER, turn the Gain selector fully ccw and ensure that the REF VARiable control is in its CAL detent. The REFERENCE LEVEL will now read 0 dBm. The signal level at the 1st mixer however represents −30 dBm, because the RF Attenuator subtracts an additional 30 dB.

c. Set the FREQ SPAN/DIV to 1 MHz and the RESOLUTION bandwidth to 30 kHz. Switch the TIME/DIV to 50 ms or less so the UNCAL indicator is not lighted.

d. Switch to the 2 dB/DIV display mode, verify that the trace is on the bottom graticule line, then switch the display mode to 10 dB/DIV. The dynamic range of the graticule is now a calibrated 10 dB/DIV, with the top line representing −30 dBm into the 1st mixer as described in step b.

e. Tune slowly across the frequency band (10 kHz to 1.8 GHz) checking for spurious signals. The amplitude of any spurious signal must not exceed −100 dBm (signals above the 7th graticule line from the top). NOTE: Subtract 2 dB for noise which will be riding on top of the signal. If the spur is marginal (within 3 dB of specifications) and you desire to check its amplitude more accurately, proceed as follows:

(1) Decrease the FREQ SPAN/DIV to 50 kHz or less and the RESOLUTION bandwidth to 3 kHz. (This will decrease the noise with respect to the signal amplitude). Keep the signal centered on screen with the TUNING control as the FREQ SPAN is decreased.

(2) Decrease the sweep speed if the UNCAL indicator lights. Note the spurious response amplitude and verify that it does not exceed specifications.

f. Return the FREQ SPAN/DIV and RESOLUTION selectors to their original settings (step c).

20. Check Second Order Intermodulation Products: down 70 dB or more from two −40 dBm signals

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

b. Set front-panel controls:

Test Oscillator

Frequency	50 kHz
Output level	−34 dBm

Signal Oscillator

Frequency	100 kHz
Output level	−34 dBm
All modulation	off

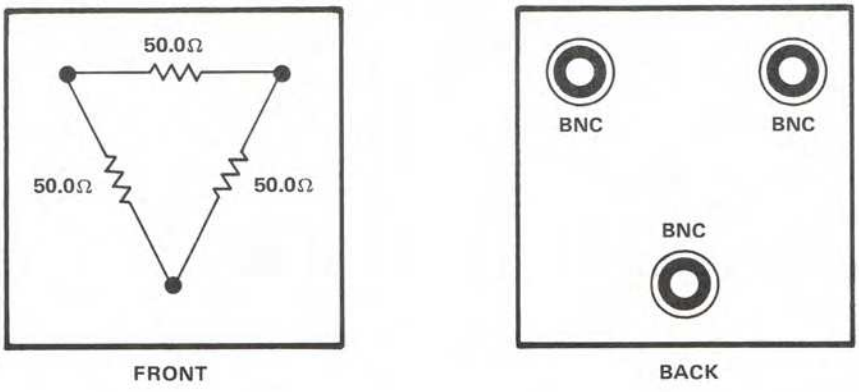
7L14

Display Mode	10 dB/Div
REFERENCE LEVEL	−40 dBm (0 RF attenuation)
TIME/DIV	20 ms
TRIGGERING SOURCE	FREE RUN
TRIGGERING MODE	NORM
DISPLAY A	on
FREQ SPAN/DIV	20 kHz/Div
RESOLUTION	3 kHz
AUTOPHASELOCKED	off

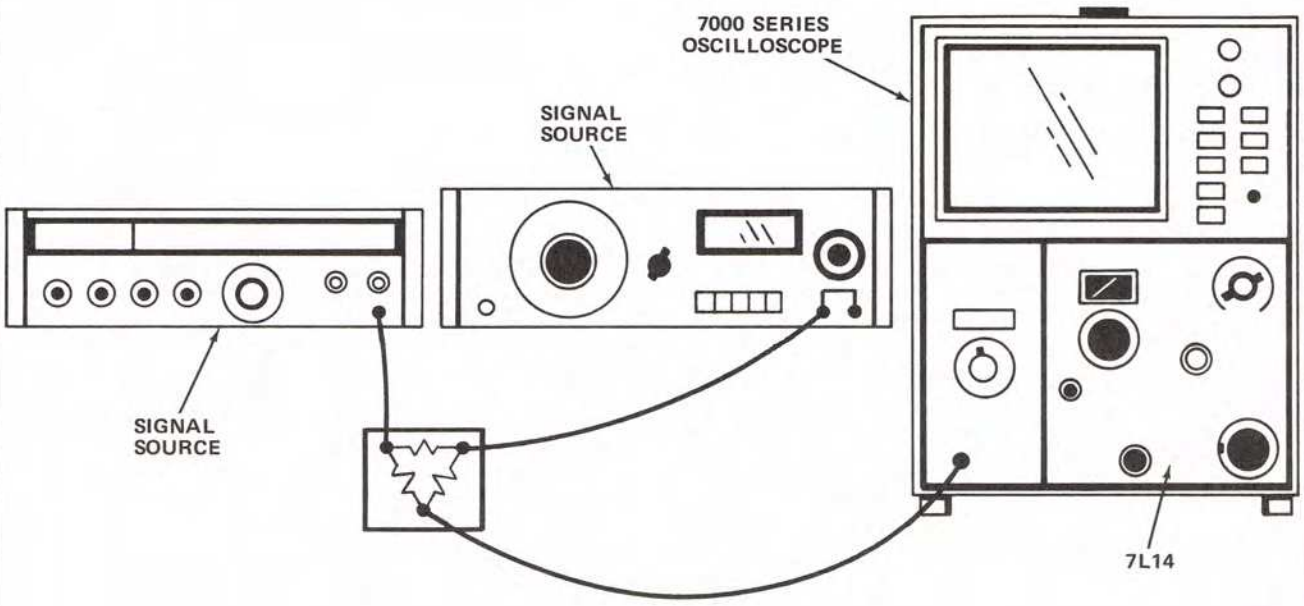
c. Tune the 7L14 center frequency to 100 MHz and center the signal on screen.

d. Switch AUTOPHASELOCKED on and decrease TIME/DIV to .5 sec.

e. Note that second order modulation products are 70 dB down or more.



A. Resistive Bridge used for checking second order IM products.



B. Test equipment set up for checking second order IM products.

3434-24

Fig. 4-9. Resistive bridge used for measuring 2nd order IM products.

20. Check Third Order Intermodulation Products: down 70 dB or more from two −30 dBm signal.

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

b. Set front-panel controls:

Signal Oscillators

Frequency	100 MHz
Output level	−24 dBm
All modulation	off

7L14

Display Mode	10 dB/Div
REFERENCE LEVEL	−30 dBm
TIME/DIV	20 ms
TRIGGERING SOURCE	FREE RUN
TRIGGERING MODE	NORM
DISPLAY A	on
FREQ SPAN/DIV	20 kHz/Div
RESOLUTION	3 kHz
AUTOPHASELOCKED	off

c. Tune the 7L14 center frequency to 100 MHz and position both signals on screen.

d. Switch AUTOPHASELOCKED on and decrease TIME/DIV to .5 sec.

e. Note that third order modulation products are 70 dB down or more.

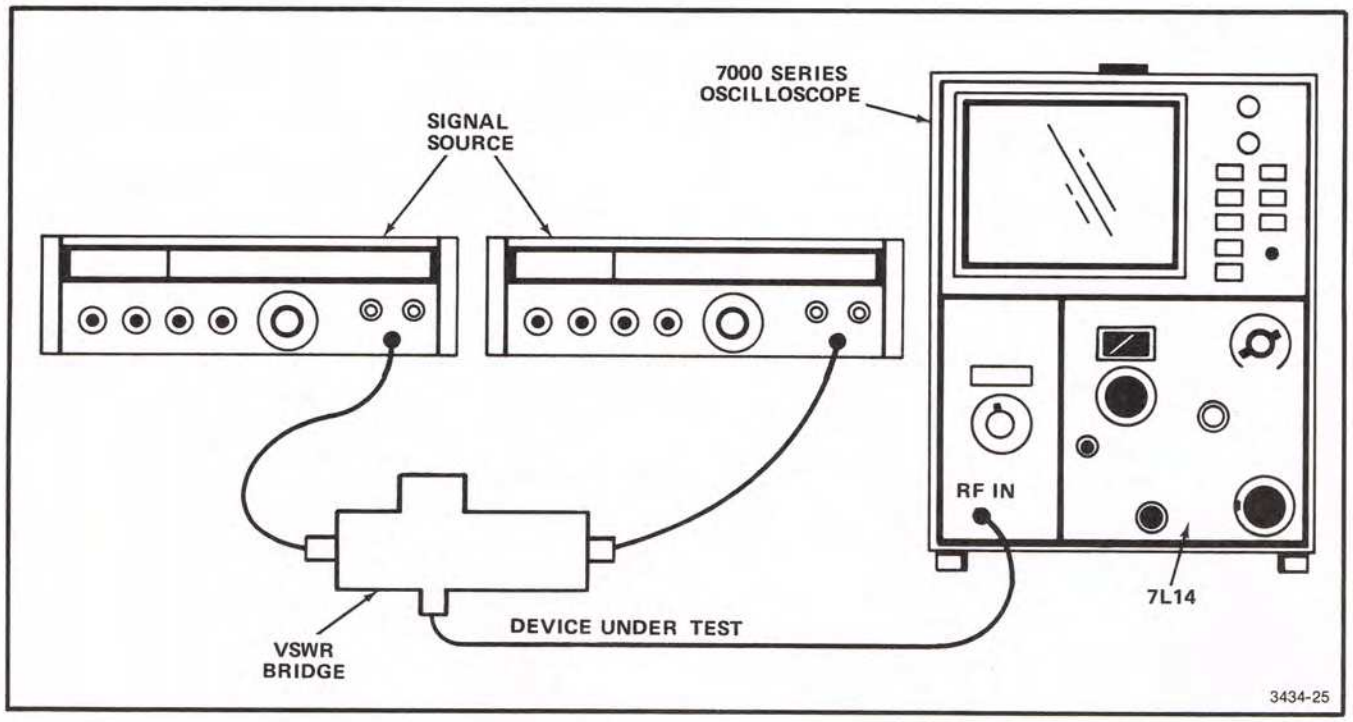


Fig. 4-10. Measuring 3rd order IM products.

ADJUSTMENT PROCEDURE

INTRODUCTION

If the 7L14 operation is out of tolerance for a particular specification, determine the cause, repair if necessary, then use the appropriate adjustment procedure to return the instrument operation to specification. After any adjustment, repeat that part of the Performance Check to verify operation.

Allow instrument to warm-up for at least 2 hours in ambient air of +20°C to +30°C before performing an adjustment.

Waveform illustrations used in these instructions may be idealized. They are not intended to be representative of specification tolerances.

Adjustment steps that interact are noted, and reference is made within the procedure to the affected circuit or steps.

CAUTION

STATIC DISCHARGE CAN DAMAGE MANY SEMICONDUCTOR COMPONENTS USED IN THIS INSTRUMENT.

Many semiconductor components, especially MOS types, can be damaged by static discharge. Damage may not be catastrophic, therefore, not immediately apparent. It usually appears as a "weakening" of the semiconductor characteristics. Devices that are particularly susceptible are: MOS, CMOS, JFETs, and high impedance operational amplifiers. Damage can be significantly reduced by observing the following precautions.

1. *Handle static-sensitive components or circuit assemblies at or on a static-free surface. Work station areas should contain a static-free bench cover or work plane such as conductive polyethylene sheeting and a grounding wrist strap. The work plane should be connected to earth ground.*
2. *All test equipment, accessories, and soldering tools should be connected to earth ground.*
3. *Minimize handling by keeping the components in their original containers until ready for use. Minimize the removal and installation of semiconductors from their critical boards.*
4. *Hold the IC devices by their body rather than the terminals.*
5. *Use containers made of conductive material or filled with conductive material for storage and transporation. Avoid using ordinary plastic containers. Any static sensitive part of assembly (circuit board) that is to be returned to Tektronix, Inc., should be packaged in its original container or one with anti-static packaging material.*

TIME BASE SECTION

1. Adjust Sweep Length, Offset, and Triggering

a. Set the front-panel controls and selectors as follows:

7L14

TIME/DIV	.5 ms
TRIGGERING SOURCE	FREE RUN
TRIGGERING MODE	NORM
FREQ SPAN/DIV	MAX
RESOLUTION	Coupled to the FREQ SPAN
Display Mode	2 dB/Div
DISPLAY A and B	off

Test Oscilloscope

Time/Div	.1 ms
Volts/div (Calibrated)	5 V
Input Coupling	dc

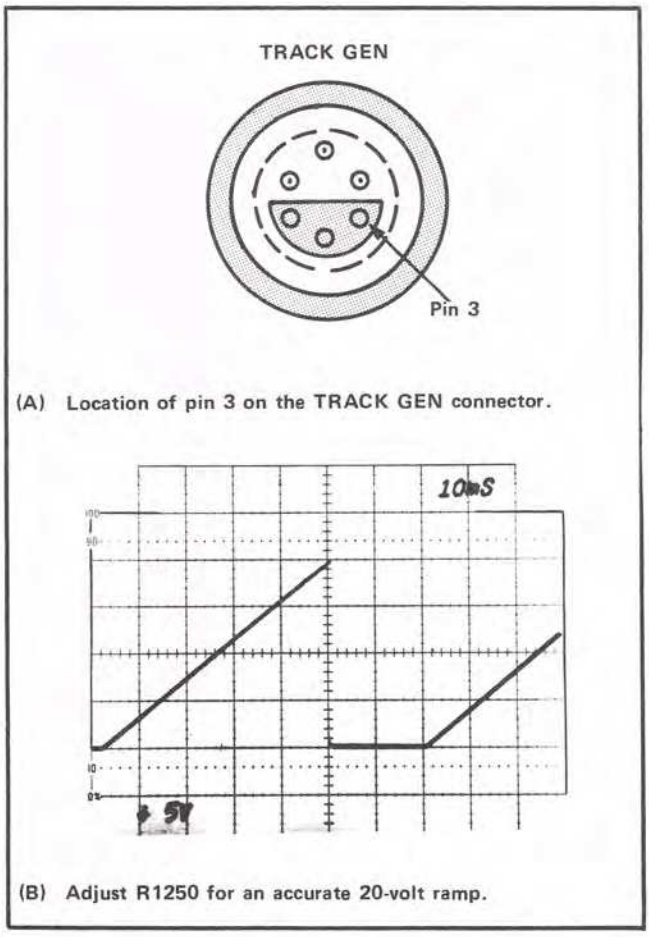
b. Connect the test oscilloscope probe to pin 3 of the TRACK GEN connector (Fig. 4-11a).

b. Adjust the Swp Gain with R1250 (Fig. 4-12) on the sweep board, for a 20 V sweep ramp (Fig. 4-11b). Adjust R1255 (Fig. 4-12) to center the ramp about 0 V.

NOTE

This sweep ramp should be an accurate 20 V ramp. If a differential comparator plug-in unit (e.g., 7A13) is available, use the comparator to measure the amplitude and offset of the sweep ramp.

The offset level should be adjusted to 0 V with R1255 (Swp Offset).



(A) Location of pin 3 on the TRACK GEN connector.

(B) Adjust R1250 for an accurate 20-volt ramp.

Fig. 4-11. Calibrating the sweep ramp.

d. Adjust the sweep length of the 7L14 to 10.25 divisions with the front panel SWP CAL, then center the trace within the graticule area, using the HORIZ POSITION control. Apply the CAL OUT signal to the RF INput and switch the display mode to 10 dB/DIV.

e. Change the FREQ SPAN/DIV to 10 MHz and tune the center frequency to one of the calibrator markers.

f. Decrease the FREQ SPAN/DIV to .1 MHz, keeping the marker centered with the CENTER FREQUENCY control.

g. Increase the FREQ SPAN/DIV to 100 MHz and adjust the Swp Offset with R1255 to bring the signal to the center of the screen. This will eliminate signal shift as the dispersion is changed.

h. Repeat steps f and g until the signal remains on screen as the frequency span is decreased from 100 MHz/Div to approximately 200 kHz.

NOTE

The hysteresis in the tune control system may shift the center frequency slightly when the frequency span is switched back through its positions.

i. Switch the display mode to 2 dB/DIV. Turn the BASELINE CLIPPER fully cw. Connect pin 6 of P1160 to pin 14 of U1160, using a jumper cable. See Fig. 4-12. This disables the sweep so a reference near center screen is provided.

j. Position the crt beam at the center line of the graticule with Integrator Offset Adjust R1215 (Fig. 4-12).

k. Remove the flexible extender plug from the right vertical compartment of the 7L14 mainframe oscilloscope and install a vertical amplifier unit (e.g., 7A16, 7A18).

l. Switch the mainframe trigger Source to Vert Mode and apply the 40 mV Calibrator signal to the amplifier input. Set the Volts/Div to .1 V.

m. Switch the 7L14 TRIGGERING SOURCE to INT and adjust the LEVEL control for a triggered display.

n. Check that the display triggers on either the + or − slope. If the index mark on the LEVEL control is off center, loosen the set screws and reposition the control.

o. Change the TRIGGERING MODE to SGL SWP and the TIME/DIV to .5 s.

p. Check that the sweep runs each time the sweep button is pushed and that the button lights while the sweep is running.

NOTE

The remaining triggering modes of operation can be checked if desired by referring to the Performance Check section of the manual.

q. Return the TRIGGERING MODE to NORM, the TIME/DIV to 1 ms and remove the signal from the Calibrator to the vertical amplifier plug-in unit. Apply 1 ms markers from a time mark generator, through a 50 Ω feedthrough termination, to the Input of the vertical amplifier unit. Set the Volts/Div to 0.5 V.

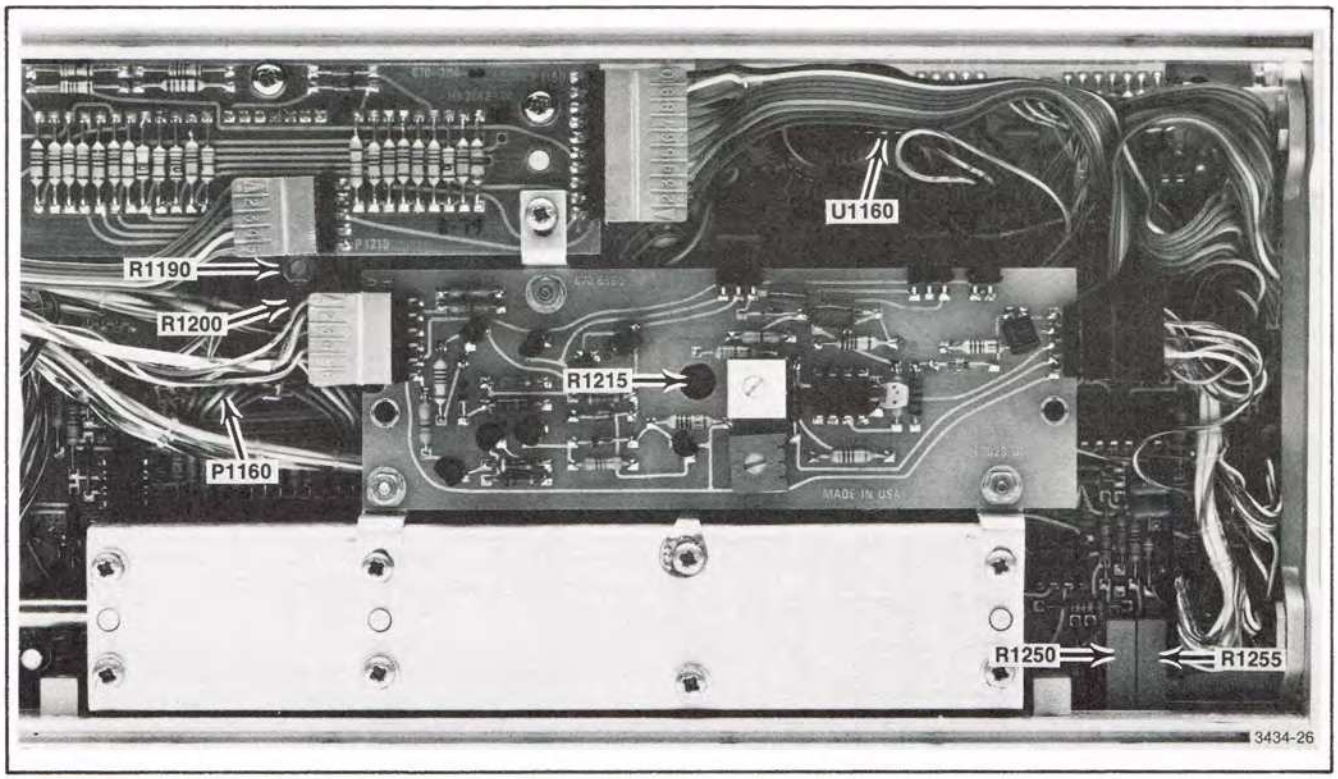


Fig. 4-12. Location of adjustments on the sweep board.

r. Adjust the 7L14 TRIGGERING LEVEL control for a triggered display.

s. Adjust the Time/Div Cal R1190 (Fig. 4-12) for 1 marker/division.

t. Check the timing accuracy for each TIME/DIV selection. Timing accuracy must be within 5%.

u. Change the TIME/DIV to 50 μs and apply 50 μs markers from the time mark generator.

v. Adjust Miller Offset R1200 (Fig. 4-12) for 1 marker/division.

w. Repeat 1 ms/DIV and 50 μs/DIV adjustments to compensate for interaction.

x. Disconnect the signal from the time mark generator, remove the vertical plug-in unit and reconnect the extender from the 7L14 interface to the right vertical interface connector.

FUNCTION IF ALIGNMENT

1. Preliminary

Pull the harmonica (multipin) connector P560, on the Function IF circuit board (Fig. 4-13).

Set the following controls to the positions indicated.

7L14

RF Attenuator	0 dB
Gain Selector	Fully ccw
REF VAR	CAL
Display Mode	LIN
TIME/DIV	20 ms
TRIGGERING	
MODE	NORM
SOURCE	FREE RUN
FREQ SPAN/DIV	50 MHz
RESOLUTION	3 MHz
DISPLAY A and B	off

Oscilloscope

Vertical Mode	Right
Horizontal Mode	A (if applicable)

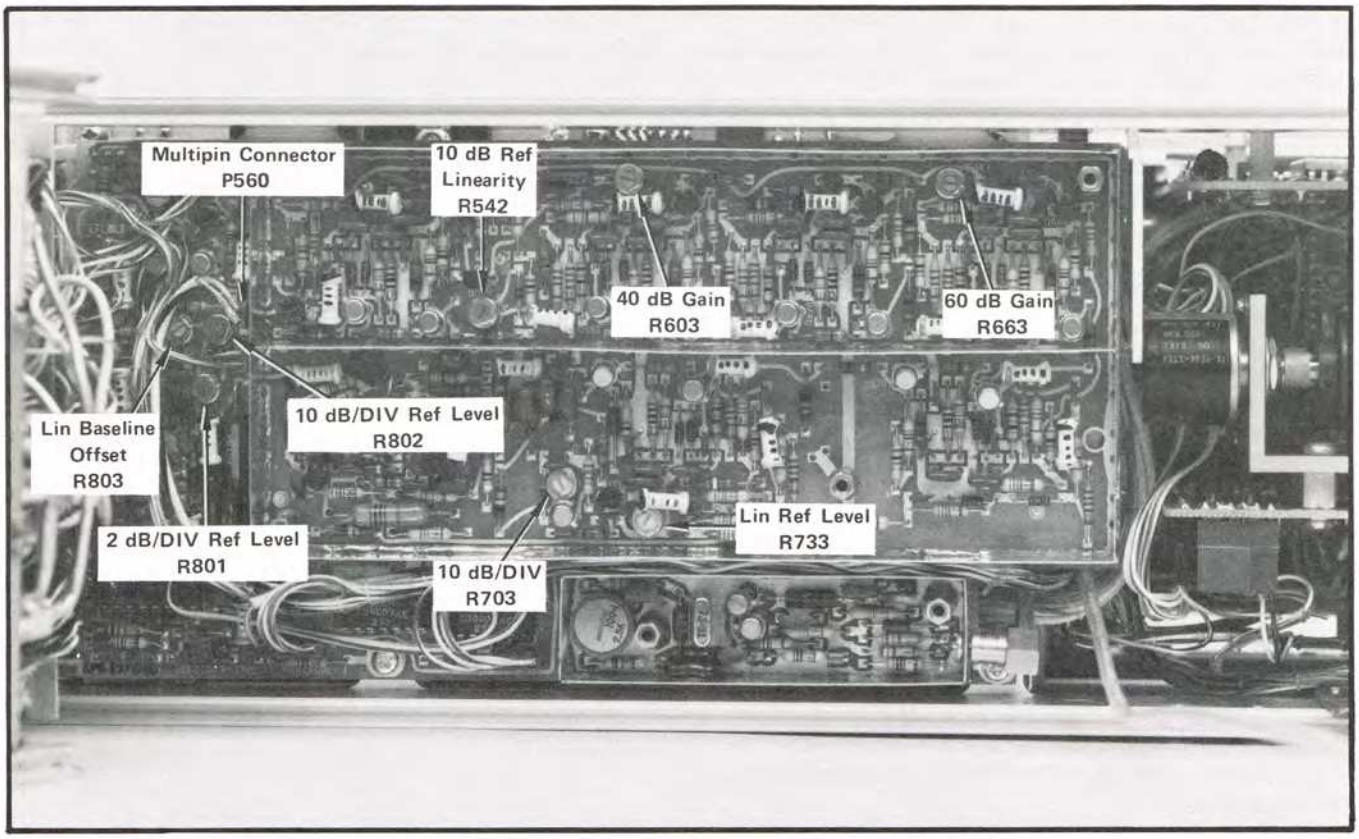


Fig. 4-13. Calibration adjustments and test points on the Function IF board.

2. Adjust the Lin Mode Baseline Offset

a. Position the trace to the lower area of the graticule with the VERTICAL POSITION control.

b. Adjust the Lin Baseline Offset R803 (Fig. 4-13) clockwise, from a fully ccw position to a point where the trace stops moving down. (Do not adjust past this point.)

c. Switch between LIN and LOG display modes, checking the baseline shift. Repeat the Offset adjustment if the baseline shifts.

d. Set Display Mode to LIN, and switch DISPLAY A on.

e. Adjust R1082 on the Digital Storage Board (see Fig. 4-21) to a point where the trace stops moving down. (Do not adjust past this point.)

f. Set Display Mode to 2 dB/DIV and switch DISPLAY A off.

3. Adjust the Gain Compensation and Calibrate the Reference Level

a. Switch the display mode to 2 dB/DIV and position the baseline of the display on the bottom graticule line if necessary.

b. Connect a calibrated 10 dB, 50 Ω step attenuator in series with a signal source. Connect the attenuator to P560 (see Fig. 4-13) using a 50 Ω coaxial cable (bnc to 2 pin harmonica).

c. Set the signal source for a 10 MHz, 0 dBm signal; set the attenuator to 0 dB attenuation.

d. Adjust the 2 dBm/DIV Ref Level R801 (Fig. 4-13) so the trace is at the top graticule line.

e. Set the calibrated step attenuator to 10 dB attenuation. Adjust the front-panel LOG CAL for a 5 division decrease in signal amplitude (trace is at the 5th graticule line).

f. Return the signal level to 0 dBm (step attenuator to 0 dB attenuation). Repeat steps d and e to null the interaction between the adjustments.

g. Switch in 10 dB of attenuation. Set the front-panel LOG CAL adjustment for 5 divisions of signal change.

h. Set the attenuators to 0 dB; adjust R801 for a full screen display.

NOTE

Because of some mainframe drift, it is advisable to periodically remove the signal and check that the display baseline returns to the bottom graticule line.

i. Switch the Display Mode to LIN and the step attenuator to 0 dB attenuation.

j. Adjust Lin Ref Level R733 (Fig. 4-13) so the trace is at the top graticule line.

k. Switch the Display Mode to 10 dB/DIV and set the step attenuator to 70 dB attenuation.

l. Adjust the 10 dB/DIV Ref Level R802 (Fig. 4-13) so the trace is 7 divisions down from the top graticule line.

m. Set the step attenuator to 10 dB attenuation. Adjust the trace so it is 1 division from the top graticule line with R703 (see Fig. 4-13).

n. Set the step attenuator to 0 dB attenuation; adjust the 10 dB Ref Linearity R542 (Fig. 4-13) so the trace is at the top graticule line. Since R703 and R542 interact additional adjustment between them may be necessary.

o. Increase the external attenuation in 10 dB steps, checking the display calibration for the 10 dB/DIV mode. Trace should move down 1, ±0.1 division per each 10 dB step, to a maximum of 1.5 dB over the 70 dB dynamic range. Repeat steps h through n until this accuracy is obtained.

p. Set the step attenuator to 20 dB attenuation and switch the Display Mode to 2 dB/DIV. If necessary, adjust the trace to the bottom graticule line with the VERTICAL POSITION control.

q. Increase the Gain Selector setting 40 dB so the REFERENCE LEVEL readout is −70 dBm.

r. Adjust the 40 dB Gain R603 (Fig. 4-14) so the trace is at the reference level.

s. Set the set attenuator to 40 dB attenuation. Position the trace on the bottom graticule line with the VERTICAL POSITION control.

t. Increase the Gain Selector setting 20 dB for a REFERENCE LEVEL readout of −90 dBm.

u. Adjust the 60 dB Gain R663 (Fig. 4-14) so the trace is at the reference level.

v. Remove the signal from P560 and replace the connector.

1st LO PHASE LOCK LOOP

Error Amplifier Offset Adjustment

a. Switch the 7L14 into phase locked mode by setting the FREQ SPAN/DIV to 50 kHz and switch the AUTO PHASE LOCKED switch on. Ground pin 1 of P1078 on the tune control circuit board, with a jumper strap (Fig. 4-14). Remove P69 (Fig. 4-15) from the hybrid assembly A24.

b. Set the test oscilloscope Time/Div to 10 ms and the vertical amplifier deflection sensitivity to 1 V/div. Connect the test oscilloscope probe to J69 and observe the beat signal from the error amplifier.

c. Adjust R51, (Fig. 4-15) so the dc reference level of the error signal is 0 V.

d. Check for a beat note amplitude that equals or exceeds 4 V p-p, with 2:1 relative amplitude, through the frequency range of the 7L14.

e. Reconnect P69 and remove the grounding strap to pin 1 of P1078.

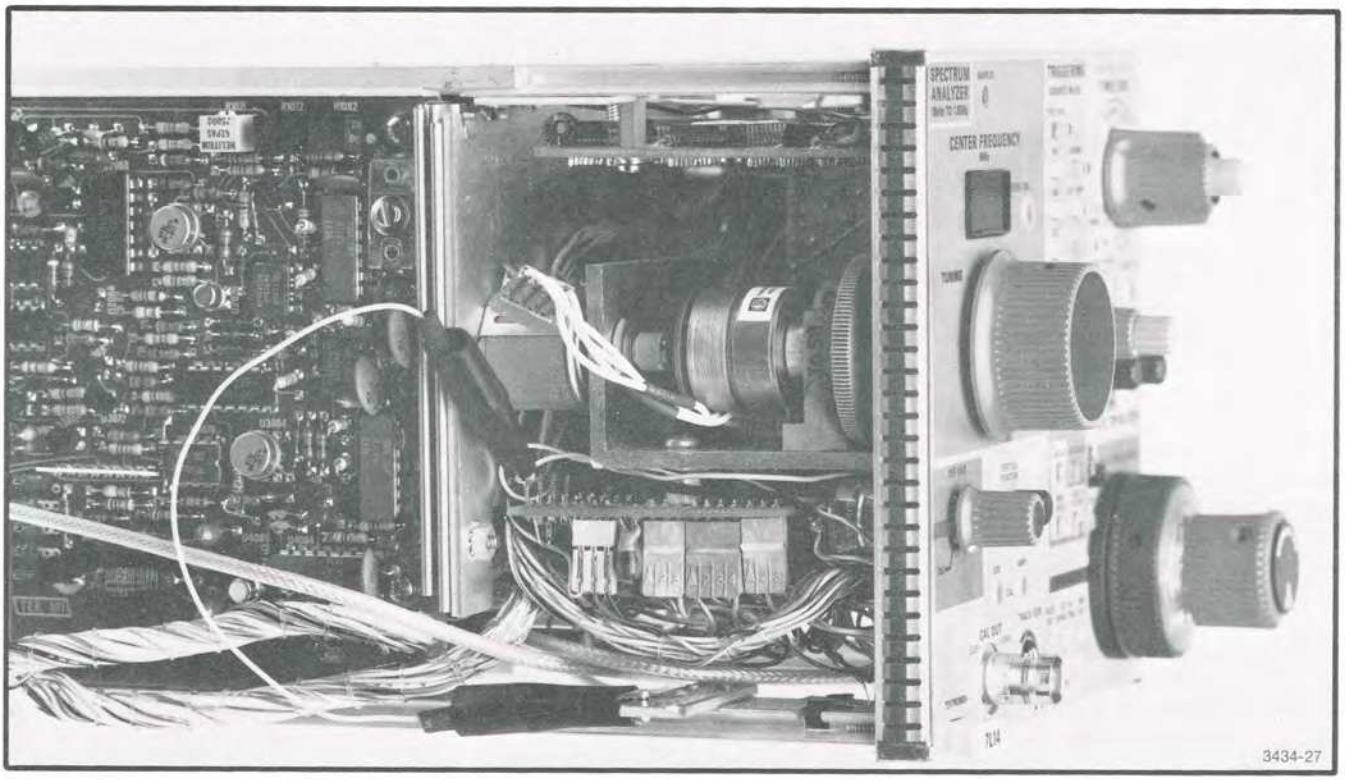


Fig. 4-14. Grounding strap connected to pin 1 of P1078.

FREQUENCY SPAN AND 1st LO CALIBRATION

Adjust the Frequency Span of the 1st LO and 16-19 MHz Oscillators

NOTE

If the gain and offset adjustments run out of range during this procedure, check the accuracy of the 20 V ramp as set in step 1.

a. Set the front-panel selectors as follows:

FREQ SPAN/DIV	100 MHz
RESOLUTION (Uncoupled)	3 MHz
TIME/DIV	10 ms
CENTER FREQUENCY	500 MHz
Display Mode	10 dB/DIV
REFERENCE LEVEL	Minimum sensitivity, then increase for full screen display.
VIDEO FILTER	30 kHz
SWP CAL	10 division trace
DISPLAY A and B	off
AUTOPHASELOCKED	on

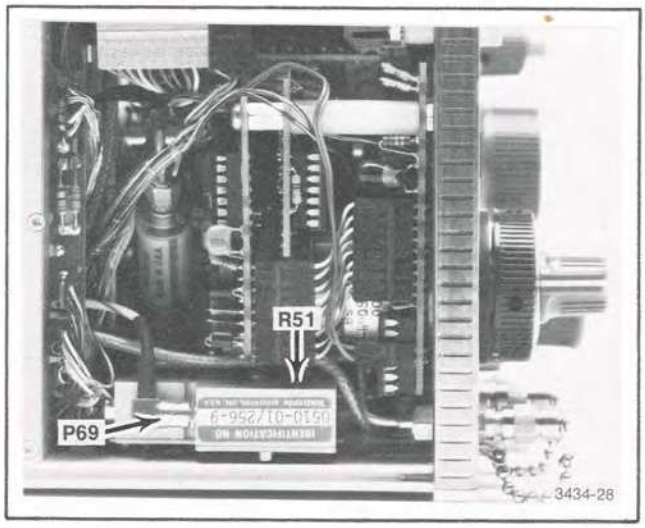


Fig. 4-15. Location of P69 and R51 on Hybrid Assembly A24.

b. Apply the marker and Trigger output of the time mark generator through the Harmonic Modulator (067-0640-00) to the RF INput of the 7L14. Switch on the 10 ns markers. This provides 100 MHz markers. If this equipment is not available the 50 MHz Calibrator signal can be used.

c. Adjust the YIG oscillator driver gain with R2510 (Fig. 4-16) to calibrate the 100 MHz/div frequency span at 1 marker/division (see Fig. 4-17).

NOTE

Adjusting the driver gain also adjusts the display offset. The gain should be adjusted for the correct marker interval and the offset should be adjusted last. It may be helpful to hold one marker at screen center while adjusting the gain so the markers fall on graticule lines each side of center.

d. Switch the FREQ SPAN/DIV to MAX and increase the RF Attenuator setting to 60 dB to attenuate the time markers. Adjust the offset to the YIG oscillator main coil with R2505 (Fig. 4-16) so the 0 Hz marker is at the left edge or start of the display.

e. Decrease the RF Attenuator setting to 0 dB, FREQ SPAN/DIV to 1 MHz, and the RESOLUTION bandwidth to 30 kHz. Apply 10 ns markers and 1 μs trigger signals from the time mark generator.

f. Adjust the FM coil driver gain with R2530 (Fig. 4-16) to calibrate the 1 MHz/div frequency span.

g. Decrease the FREQ SPAN/DIV to 50 kHz, RESOLUTION bandwidth to 3 kHz, and the TIME/DIV to 20 ms. Apply 10 μs trigger signals and 10 ns markers to the Input.

h. Adjust the 16-19 MHz sweep gain with R1960 (Fig. 4-18) for 1 marker/2 divisions.

i. Return the FREQ SPAN/DIV to MAX, RESOLUTION to 3 MHz, and the TIME/DIV to 10 ms.

j. Check the frequency span accuracy as per the procedure in the Performance Check Section.

Calibrate the Center Frequency and Frequency Readout

Couple the FREQ SPAN/DIV and RESOLUTION selectors together and switch the FREQ SPAN/DIV to 100 MHz. Tune the CENTER FREQUENCY for an LED readout of 0888.

b. Adjust the DVM reference current with R2065 (Fig. 4-19) so the mainframe readout matches the 7L14 readout. (This adjustment is not necessary if the 7L14 is operated in a non-readout mainframe.)

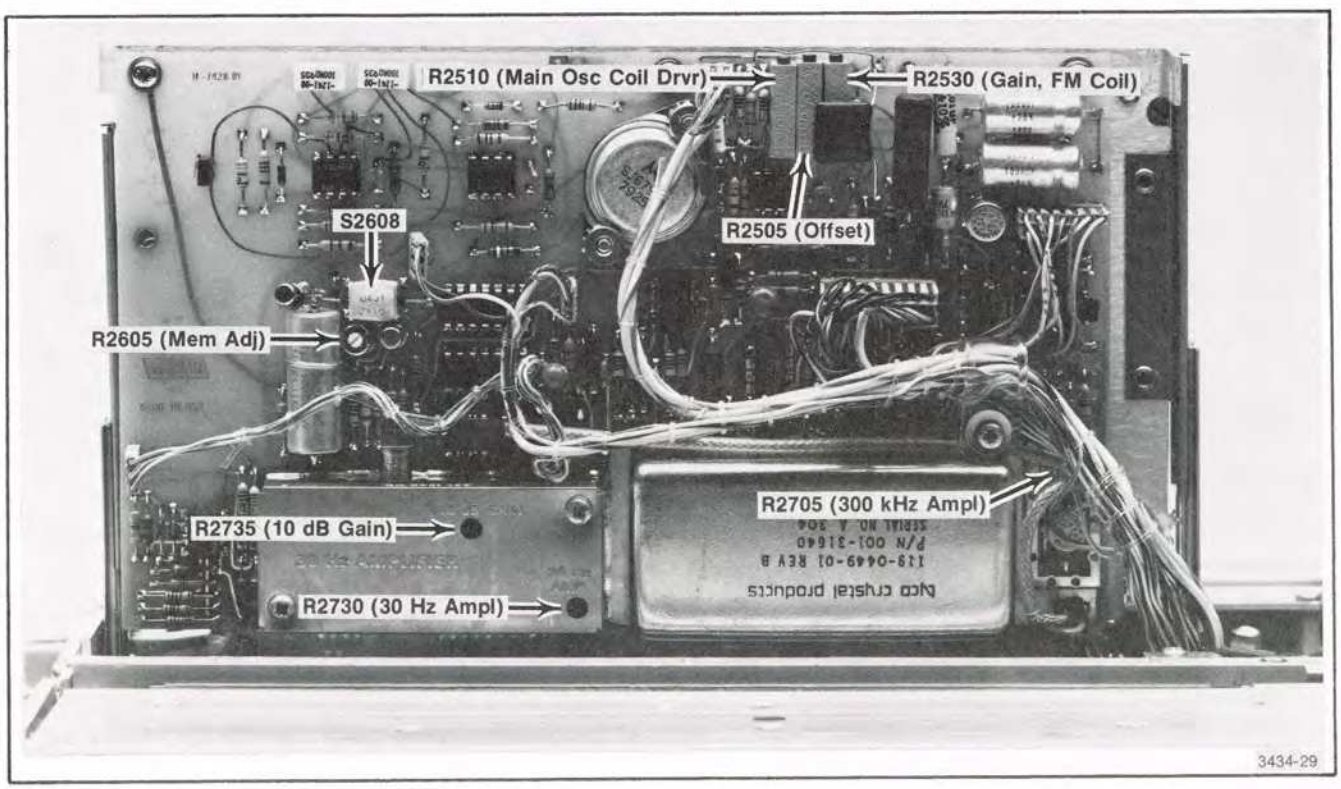


Fig. 4-16. Location of the YIG Driver and Voltage Memory adjustments.

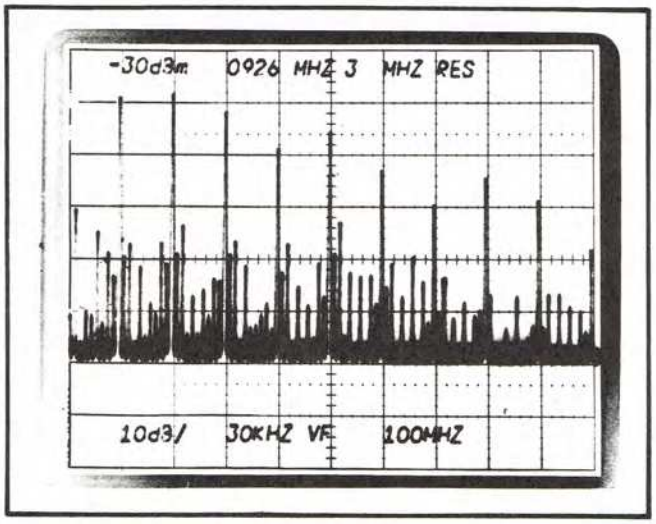


Fig. 4-17. 100 MHz markers on a 100 MHz/Div frequency span.

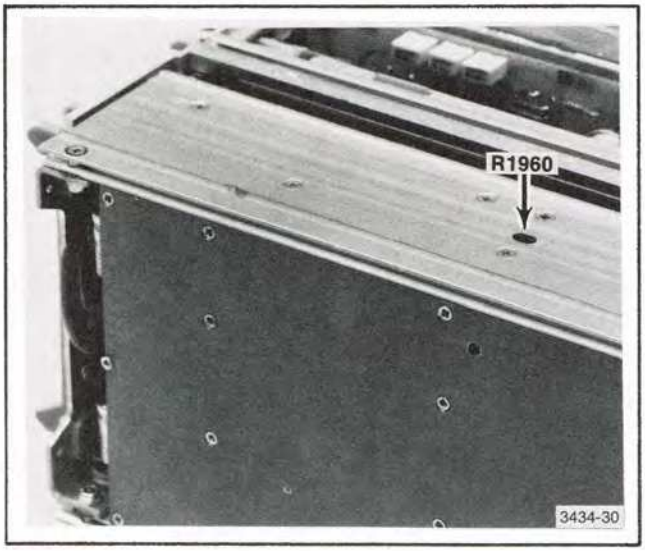


Fig. 4-18. Location of R1960, Sweep Driver adjustment for the 16-19 MHz oscillator.

c. Apply 10 ns markers from the time mark generator. Couple the FREQ SPAN/DIV to the RESOLUTION selector and switch the FREQ SPAN/DIV to 100 MHz. Tune the CENTER FREQUENCY to center the 900 MHz marker on screen as the FREQ SPAN/DIV is decreased to 1 MHz. (The 900 MHz marker is the 9th marker to the right of the 0 Hz marker.)

d. Adjust the DVM offset with R2135 (Fig. 4-19) so the LED readout is 900 MHz.

e. Return the FREQ SPAN/DIV to 100 MHz and tune the CENTER FREQUENCY to the 100 MHz marker.

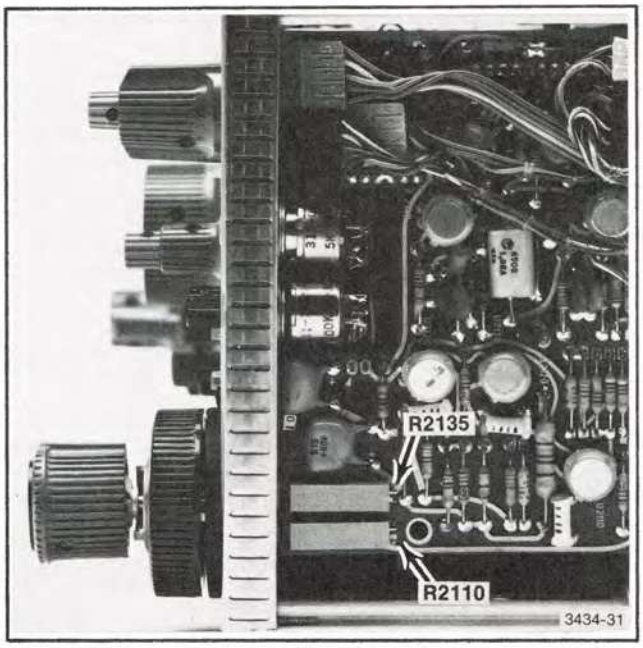


Fig. 4-19. Frequency readout circuit adjustments.

Reduce the FREQ SPAN/DIV to 1 MHz, so the 100 MHz signal can be accurately tuned to center screen.

f. Adjust the DVM gain with R2110, (Fig. 4-19) so the LED readout is 0100.

g. Repeat the offset and gain adjustments respectively, to compensate for any interaction.

h. Check the readout tracking accuracy from 0100 to 1800 MHz in 100 MHz increments, approach each check point from the low side. Accuracy must equal ±(5 MHz + 10% of the Freq Span/Div).

i. Switch the FREQ SPAN/DIV to MAX.

j. Check that the center frequency marker position corresponds to the CENTER FREQUENCY through the tuning range.

Adjust Marker Gain and Marker Offset

a. Set the 7L14 FREQ SPAN/DIV to MAX and RESOLUTION to 3 MHz, DISPLAY A and B off.

b. Apply the CAL OUT signal to the 7L14 RF INput and turn the TUNING control for a 900 MHz readout.

c. Adjust Marker Offset R2032 (Fig. 4-20) under the 900 MHz mark (center screen).

d. Tune the center frequency to 50 MHz and adjust Marker Gain R1033 (Fig. 4-20) under the 50 MHz marker.

e. Tune the center frequency from 0 Hz to 1800 MHz and check that the marker aligns with each 100 MHz mark.

CALIBRATION OF DIGITAL STORAGE

a. Connect a X10 probe from a frequency counter to TP1049 (Fig. 4-21) and adjust the clock frequency with C1061 (Fig. 4-21) for a readout of 950 kHz.

b. Apply a 50 MHz, −30 dBm signal from a signal generator to the RF INput of the 7L14.

c. Set the 7L14 front-panel controls as follows:

Display Mode	LIN
REFERENCE LEVEL	−30 dBm
TIME/DIV	10 ms
FREQ SPAN/DIV	1 MHz
RESOLUTION	3 MHz
DISPLAY A and B	off

d. Adjust the VERTICAL POSITION control to set the baseline on the bottom graticule line, and center to 50 MHz signal with the TUNING control. Adjust AMPL CAL for a full screen display.

e. Connect a X10 probe from a test oscilloscope to the VIDEO OUT connector on the 7L14 front panel. Adjust non-store vertical gain R1072 (Fig. 4-21) for a 4 V ±100 mV peak-to-peak output.

f. Change the 7L14 Display Mode to 2 dB/DIV and switch DISPLAY A on. Adjust R1071 (Fig. 4-21) to match the stored amplitude with the unstored amplitude.

g. Switch DISPLAY A off, change the Display Mode to 10 dB/DIV and the REFERENCE LEVEL to −30 dBm. Set the TIME/DIV to 5 ms.

h. Set the FREQ SPAN/DIV to 50 MHz/Div and RESOLUTION to 3 MHz. Apply the CAL OUT signal to the RF INput and set the CENTER FREQUENCY to 200 MHz.

i. Adjust the TUNING control to align the markers on the crt graticule lines. Activate DISPLAY A.

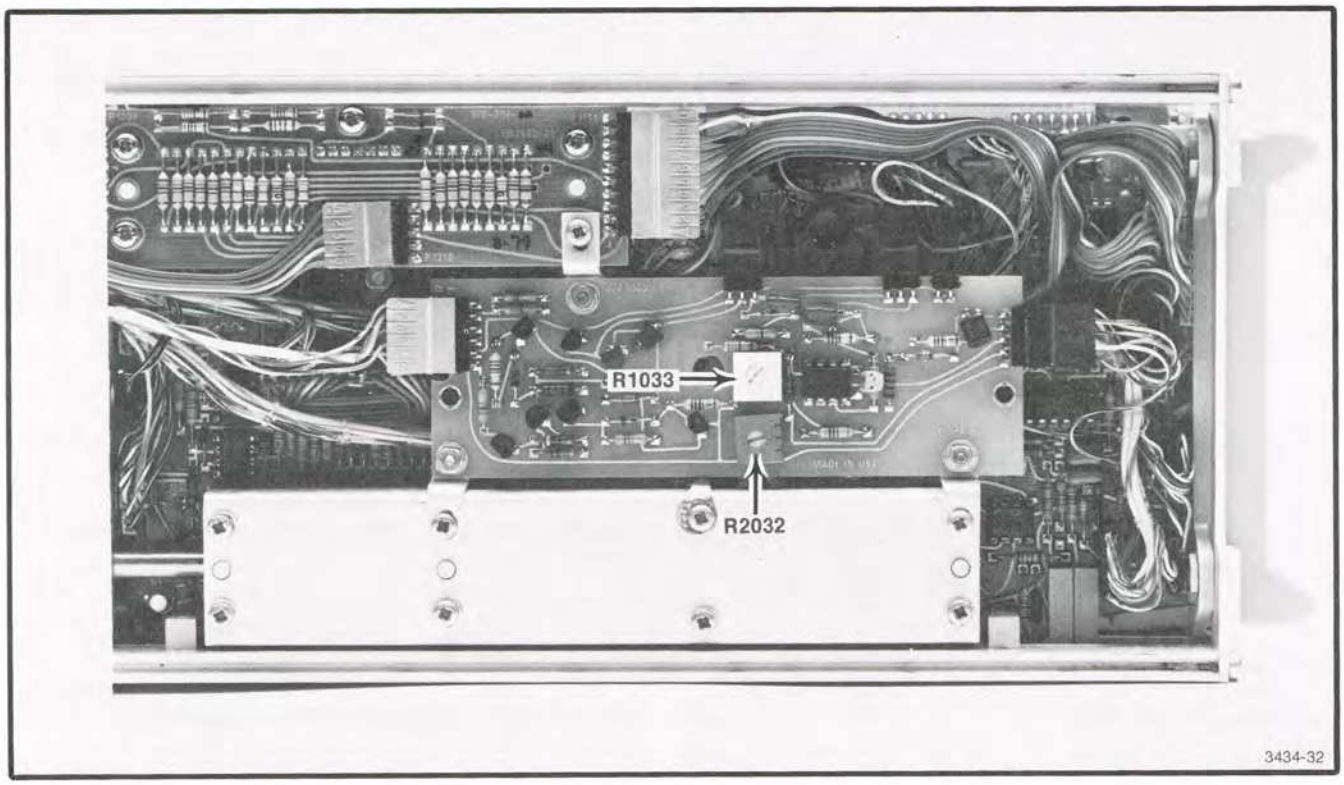


Fig. 4-20. Marker Gain and Marker Offset adjustments.

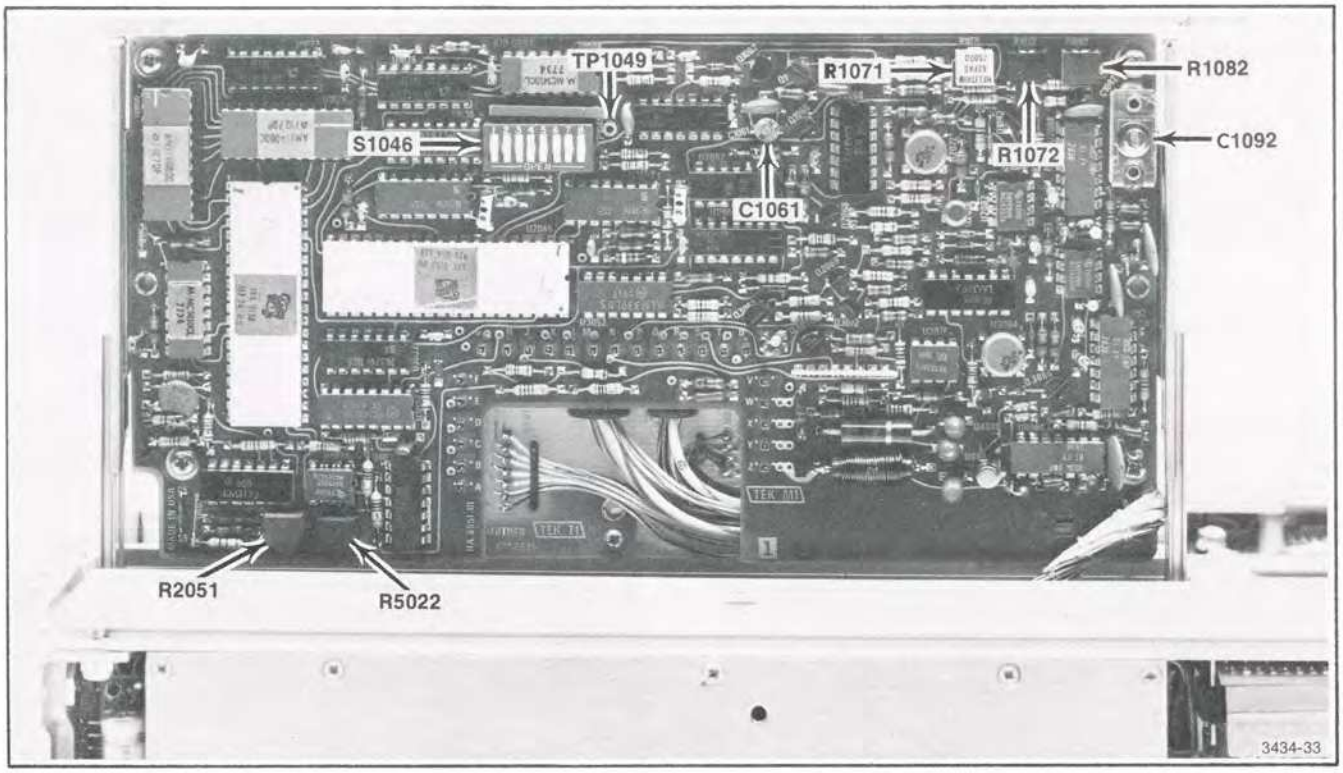


Fig. 4-21. Location of Digital Storage adjustments.

j. Adjust horizontal gain R5022 (Fig. 4-21) for a 1 marker/div display.

k. Deactivate DISPLAY A and adjust the TUNING control to align the unstored markers on the crt graticule lines.

l. Activate DISPLAY A and adjust horizontal offset R5021 (Fig. 4-21) to align the stored markers to the unstored markers.

Setting B—SAVE A Reference Level

When B—Save A is selected, the expression implemented is (B—Save A)+k, where k is a constant set by the input data for an 8-to-4 line encoder, U1038. Each bit will move the reference level about 0.2 minor division. Normally, the reference level is set at the center graticule line; however, it can be set anywhere within the graticule area by the setting of an 8-bit binary switch, S1046 (Fig. 4-21). The MSB (switch #8) shifts the display about five divisions, switch #7 half this amount, etc. The following procedure sets the reference level.

a. Estimate the amount and direction the reference level is to be shifted. Open and close the switches on S1046 (Fig. 4-21) to obtain the desired B—SAVE A reference level.

Adjust Digital Storage Compensation

a. Apply the 7L14 Cal Out signal to the RF INput. Set the 7L14 front-panel controls as follows:

Display Mode	2 dB/DIV
REFERENCE LEVEL	−30 dBm
TIME/DIV	5 ms
TRIGGERING SOURCE	FREE RUN
TRIGGERING MODE	NORM
DISPLAY A and B	on
AUTOPHASELOCKED	off
FREQ SPAN/DIV	0
RESOLUTION	3 MHz
CENTER FREQUENCY	50 MHz

b. Tune the 50 MHz signal off screen and set the baseline of the signal on the bottom graticule line with the front-panel VERTICAL POSITION control.

c. Activate SAVE A. Using the TUNING control bring the 50 MHz signal back on screen. Activate AUTOPHASELOCKED and adjust the front-panel AMPL CAL for a full screen display.

d. Set TRIGGERING MODE to SGL SWP and deactivate SAVE A.

e. Adjust C1092 (Fig. 4-21) for full screen of raster.

f. Return TRIGGERING MODE to NORM and remove the CAL OUT signal from the RF INput.

PHASE LOCK CALIBRATION ADJUSTMENTS

Adjust the Memory Gain

a. Couple the FREQ SPAN/DIV and RESOLUTION selectors together, then switch the FREQ SPAN/DIV and RESOLUTION to 10 MHz/300 kHz. Turn the error amplifier loop gain R1755 (Fig. 4-22B) fully cw. Connect a shorting strap across S2608 (Fig. 4-22A). Apply the CAL OUT signal to RF INput and tune the CENTER FREQUENCY to one of the calibrator markers.

b. Switch the front-panel AUTOPHASELOCKED switch off, decrease the FREQ SPAN/DIV and RESOLUTION to 50 kHz/30 kHz, keeping the signal within the display area with the CENTER FREQUENCY tuning.

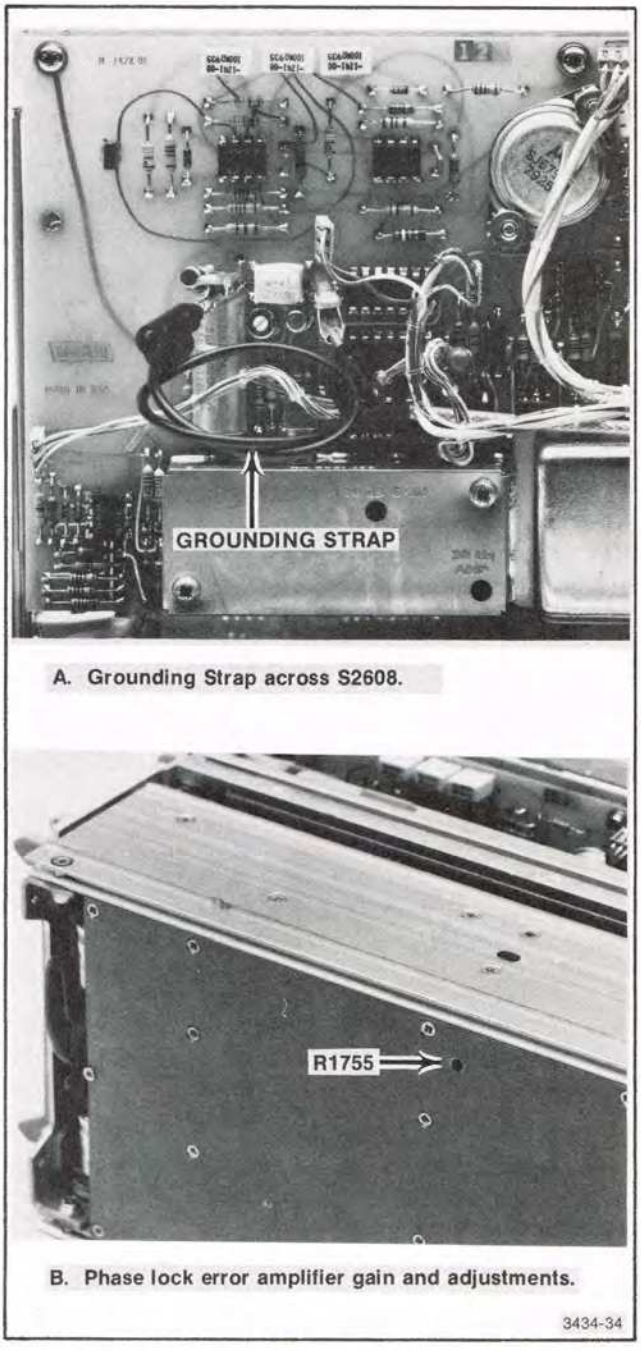
c. Tune the CENTER FREQUENCY so the signal is approximately two divisions to the right of center.

d. Switch the AUTOPHASELOCKED switch on and off while adjusting R2605 (Fig. 4-23) so the signal locks near the same position it was at with phase lock off. If it appears that R2605 does not have enough range, proceed with step e.

e. Switch the phase lock off and tune the signal two divisions to the left of center.

f. Switch the phase lock on and off and check that the signal locks remain near the same point.

g. Remove the shorting strap across S2608. Switch the AUTOPHASELOCKED switch on and center the signal on screen.



A. Grounding Strap across S2608.

B. Phase lock error amplifier gain and adjustments.

Fig. 4-22. Location of the Phase Lock calibration adjustments.

Adjust the Error Amplifier Gain

a. With the signal centered, decrease the FREQ SPAN/DIV and RESOLUTION to 200 Hz/30 Hz. Switch the display mode to 10 dB/DIV and decrease the sweep rate so the display remains calibrated. Switch DISPLAY A and B on so the full span can be observed.

b. Adjust R1755 (Fig. 4-22B) to obtain the best signal-to-noise ratio and still maintain phase lock. If phase lock is lost, turn R1755 cw and repeat the above procedure.

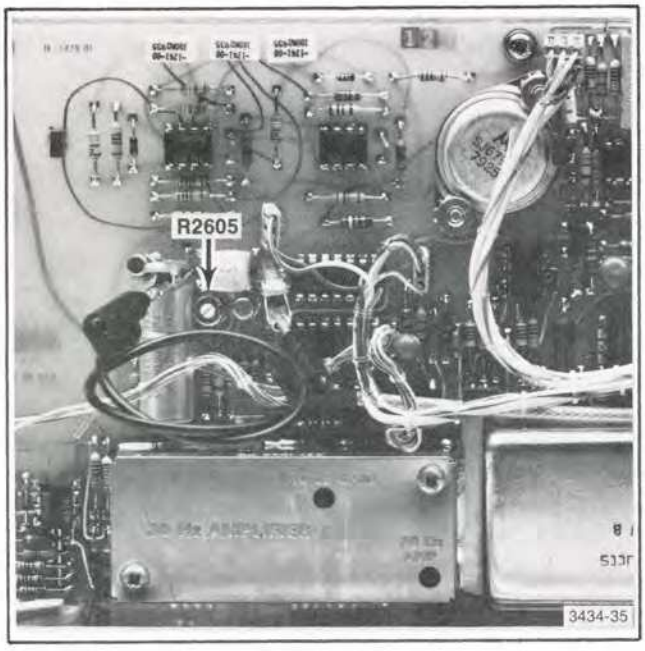


Fig. 4-23. Location of Memory Adjust R2605.

c. Switch the Display Mode from 10 dB/DIV to 2 dB/DIV. Phaselock should be maintained. Readust R1755, if necessary.

c. Switch FREQ SPAN/DIV to 5 kHz, RESOLUTION to 3 kHz. Check that the noise level, 25 kHz from center, is down at least 70 dB from the signal reference level.

RESOLUTION

Adjust the Bandpass of the 105 MHz IF Amplifier and 300 kHz Filter

a. Set the following front-panel selectors to the positions indicated:

CENTER FREQUENCY	50 MHz
FREQ SPAN/DIV	1 MHz
RESOLUTION	30 kHz (Uncoupled from the FREQ SPAN/DIV selector)
Display Mode	2 dB/DIV
Phase Lock	On
TIME/DIV	10 ms
VIDEO FILTER	Off
DISPLAY A and B	On

b. Apply either a 50 MHz signal from a signal generator, or the 50 MHz CAL OUT signal from the 7L14 calibrator to the RF INput. Adjust the generator output or the gain from the 7L14 until the 50 MHz signal is displayed on screen. Center the signal on screen with the tuning control.

c. Change the RESOLUTION to 3 MHz and establish a signal amplitude of approximately 7 divisions with the signal generator output control or the 7L14 front-panel AMPL CAL adjustment.

d. Adjust the response of the 105 MHz IF amplifier, and the wide filter bandpass, with C82, the 3 MHz helical resonator (Fig. 4-24) and C456, in the filter circuit (Fig. 4-15) so the response is similar to that illustrated in Fig. 4-26.

NOTE

Adjustment of C82 affects the flatness of the 2.2 GHz low-pass filter. See the Maintenance Section of this manual to readjust this filter's response.

NOTE

Keep the signal centered as the tuning adjustments are made. Switch back to 30 kHz or 3 kHz RESOLUTION periodically, to ensure that the signal is tuned to the graticule center. This locates the center of the 10 MHz IF. There is no recommended sequence of adjustments; however, the following is applicable for most instruments:

1) Adjust C82 so the response moves slightly to the left of center or the low frequency side of the display.

2) Adjust the input and center resonators to shape the display and the output resonator to keep the response centered.

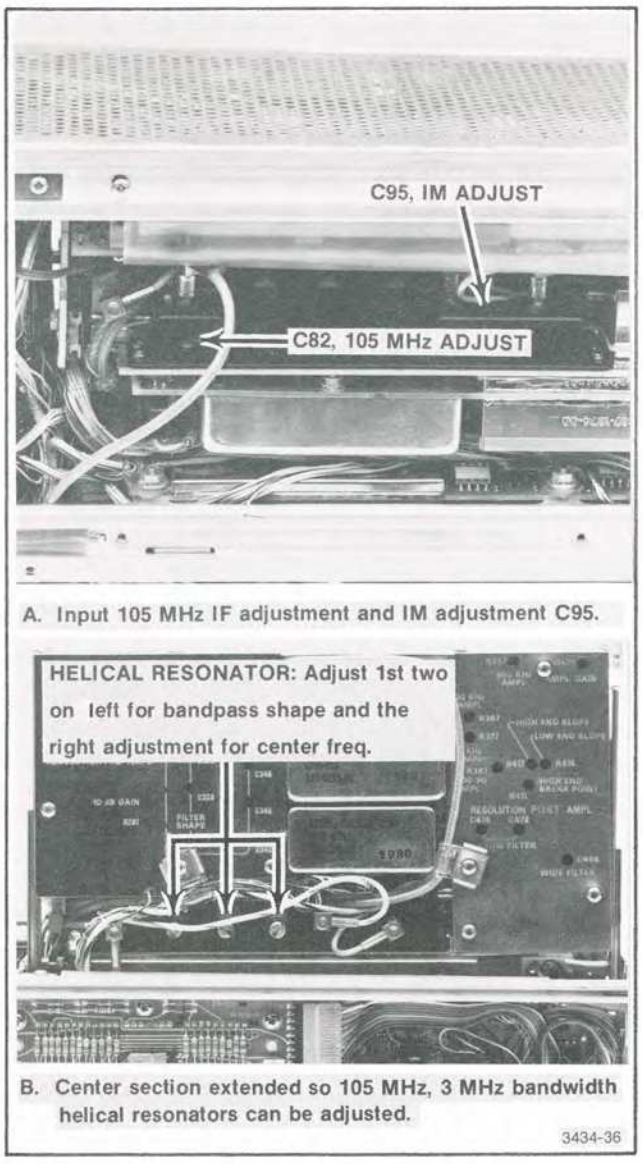
3) Adjust C456 (Fig. 4-25) for maximum bandwidth and amplitude.

Bandpass, at the −6 dBm down point, should equal 3 MHz ±10%; however, the bandwidth specification is within 20% of the resolution bandwidth selected. The response flatness can vary as much as 2 dB. Figure 4-27 illustrates this variation with dashed lines. The shape should resemble that of the illustration.

e. Set the FEEQ SPAN/DIV to .1 MHz and the RESOLUTION to 30 kHz. Carefully center the signal with the tuning controls.

NOTE

It is important to calibrate in the phase lock mode.



A. Input 105 MHz IF adjustment and IM adjustment C95.

B. Center section extended so 105 MHz, 3 MHz bandwidth helical resonators can be adjusted.

3434-36

Fig. 4-24. 105 MHz IF and 3 MHz bandwidth adjustments.

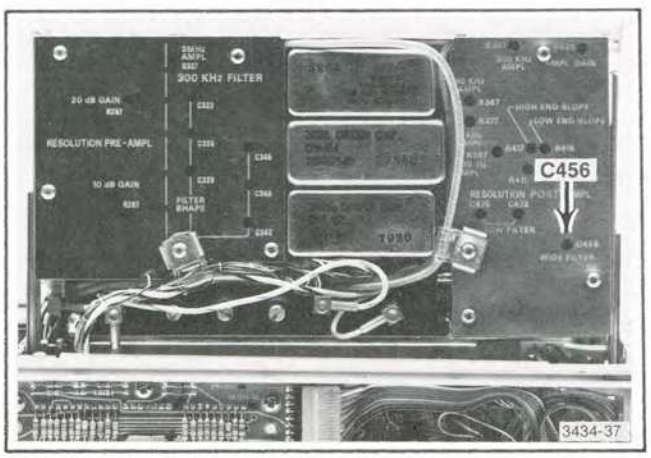
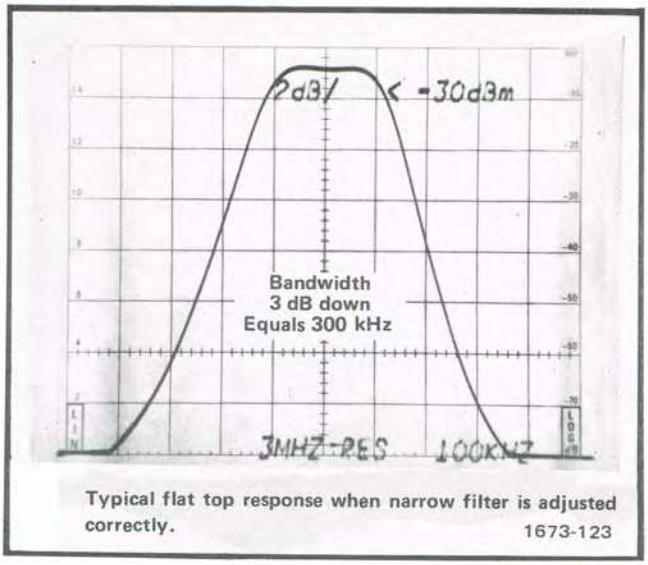


Fig. 4-25. Wide-band Filter Adjust C456.



Typical flat top response when narrow filter is adjusted correctly.

1673-123

Fig. 4-26. Typical flat-top response when narrow filter is adjusted correctly.

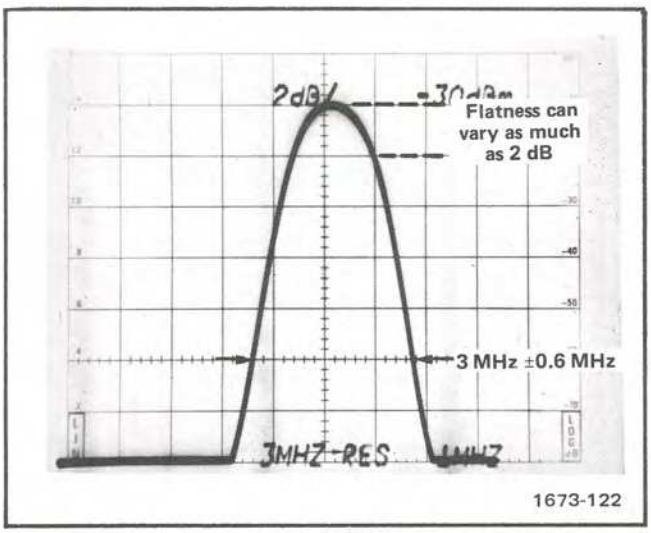


Fig. 4-27. Typical response characteristics for the 105 MHz IF through the wide filter.

Remove the shield cover over the post-resolution amplifier. Remove P304 (jumper for relay K357, see Fig. 4-28. Remove P301 and P303, of cables W307 and W356. Connect P301 of cable W307 to J303. Ensure that the signal lead, of P303, is connected to pin 1 of J303.

f. Change the RESOLUTION to 3 MHz. Adjust the narrow filter circuits with C472 and C475 (Fig. 4-28), for a flat-topped response that is similar to that illustrated in Fig. 4-26. Keep the response centered as these adjustments are made. Do not change the front panel tuning control setting or the frequency of the signal generator. Bandpass at the 3 dB down point, should range between 300 kHz.

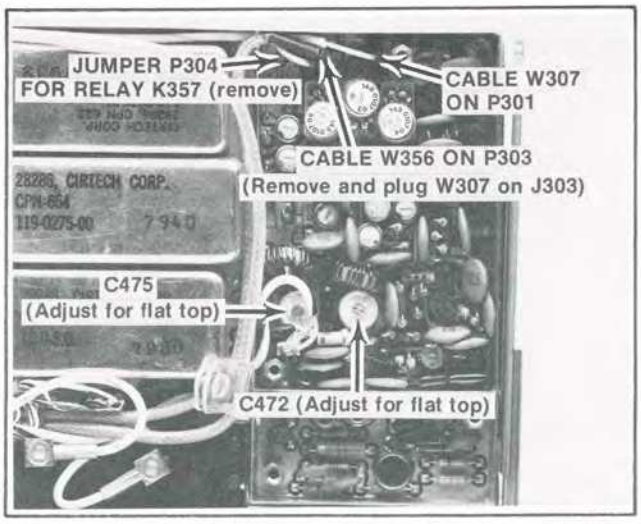


Fig. 4-28. Connections and adjustments for adjusting the narrow post amplifier filter.

g. Reconnect the plugs for cables W307 and W356 to their respective pins and replace the jumper plug for relay K357.

h. Switch the RESOLUTION to 30 kHz, FREQ SPAN/DIV to 100 kHz. Ensure that the signal is still centered on screen. If necessary, tune the signal to center then switch the RESOLUTION to 300 kHz.

i. Adjust the 300 kHz filter, with C322, C325, and C348 (Fig. 4-29A) for a response that is similar to that shown in Fig. 4-29B.

NOTE

If the response is similar to the illustration of Fig. 4-29, try tweaking each capacitor a slight amount. If the response is not centered or is asymmetrical, adjust the capacitors to center and peak the amplitude of the response, then adjust each filter until the response is symmetrical and 300 kHz ±20% wide. (The input and output resonators usually affect the centering and bandwidth of the display and the center resonators the display slope.)

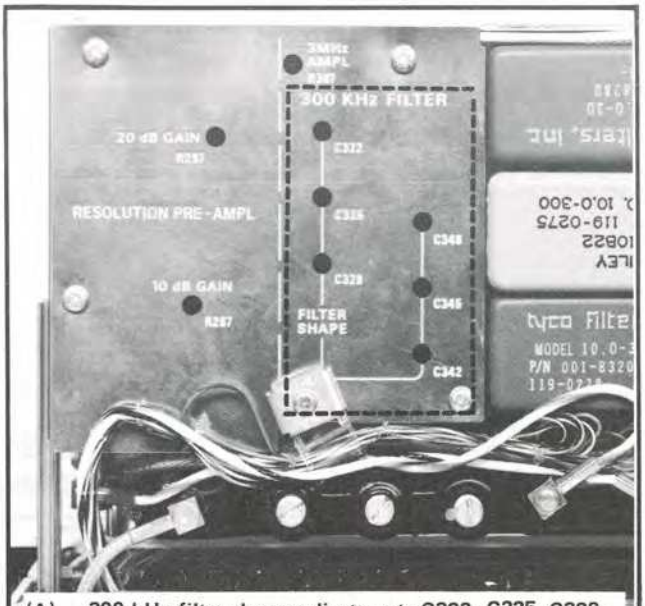
Adjust the Resolution Gain Leveling Compensation

a. With the signal phase locked, reduce the FREQ SPAN/DIV to 10 kHz and switch the RESOLUTION to 30 kHz. Center the signal on screen with the tuning control and set the signal amplitude to approximately 7 divisions with the front-panel AMPL CAL adjustment.

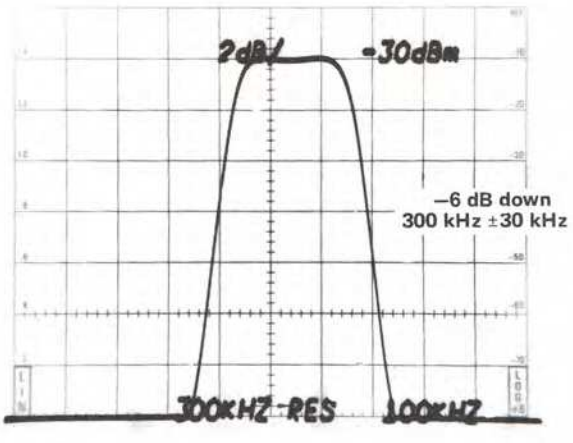
b. Preset R367 and R377 for maximum amplitude at 3 kHz and 30 kHz resolution.

c. Switch between 3 kHz and 30 kHz and adjust C345 and C421 for minimum inband ripple.

d. Switch the RESOLUTION between 30 kHz at 10 kHz/Div span and 3 kHz at 1 kHz/Div span. Select the RESOLUTION setting with the lowest signal amplitude and adjust the signal level to 7 divisions with the front-panel AMPL CAL adjustment.



(A) 300 kHz filter shaper adjustments C322, C325, C328.



(B) 300 kHz filter response. 1673-124

Fig. 4-29. 300 kHz filter adjustments and typical response characteristics.

e. Compensate the gain for each RESOLUTION setting, with the amplitude adjustments listed in Table 4-4 and illustrated in Fig. 4-30 so the signal amplitude remains constant through all resolution settings.

NOTE

Decrease the sweep speed to maximize the signal amplitude for the 300 Hz RESOLUTION setting.

Table 4-4

RESOLUTION GAIN ADJUSTMENTS

Resolution	Frequency Span/Div	Adjust
3 MHz	1 MHz	R307 (3 MHz Ampl)
.3 MHz	.1 MHz	R2705 (300 kHz Ampl)
30 kHz	10 kHz	R367 (30 kHz Ampl)
3 kHz	1 kHz	R377 (3 kHz Ampl)
300 Hz	.5 kHz	R387 (300 Hz Ampl)
30 Hz	200 Hz	R2730 (30 Hz Ampl)

f. Change the FREQ SPAN/DIV to 1 MHz, RESOLUTION to 3 MHz, RF Attenuation to 0 dB, and turn the Gain selector fully ccw. Position the baseline of the display on the bottom graticule line, then adjust the REF VARiable control for a signal level of 7 divisions. If you run out of range on the front-panel AMPL CAL adjustment, tune to a lower frequency signal.

g. Switch the RF Attenuator to 10 dB and increase the Gain Setting 10 dB (one position cw from the reference setting).

h. Adjust the 10 dB gain R267 (Fig. 4-30) so the signal amplitude equals the 7 division reference amplitude established in step e.

i. Increase the RF Attenuator setting to 20 dB and the Gain setting an additional 10 dB. Switch in VIDEO FILTER, and adjust the TIME/DIV control for a calibrated display.

j. Adjust the 20 dB Gain R297, (Fig. 4-30) so the signal amplitude is again 7 divisions.

k. Switch the RF Attenuator to 30 dB and increase the Gain setting 10 dB. Check that the signal amplitude equals 7 divisions ±0.5 division. Since there is no adjustment for 30 dB gain, it may be necessary to compromise between the 10 dB gain adjustment and the 20 dB gain adjustment.

l. Apply the CAL OUT signal through a 10 dB step attenuator (such as Hewlett Packard Model 355D) to the RF INput; or apply a 50 MHz signal from a signal generator with a calibrated variable attenuator, such as Hewlett Packard Model 608D, to the 7L14 RF INput.

m. Tune the signal to center screen. Decrease the FREQ SPAN/DIV and RESOLUTION bandwidth to 200 Hz/30 Hz while keeping the signal centered on screen with the tuning control. Switch in VIDEO FILTER.

n. Set the 7L14 TIME/DIV for calibrated display and adjust the front-panel AMPL CAL adjustment for 8 divisions of signal.

o. Switch in 80 dB of attenuation with the external step attenuator, and set the 7L14 for 80 dB of gain (−110 dBm reference level).

p. Adjust R2735 (Fig. 4-30) for 8 divisions of signal.

q. Disconnect and remove the test equipment cables. Set the Gain control to 0 and return the REFERENCE LEVEL to −30 dBm. Deactivate VIDEO FILTER.

Adjust the Post-Resolution Amplifier Gain

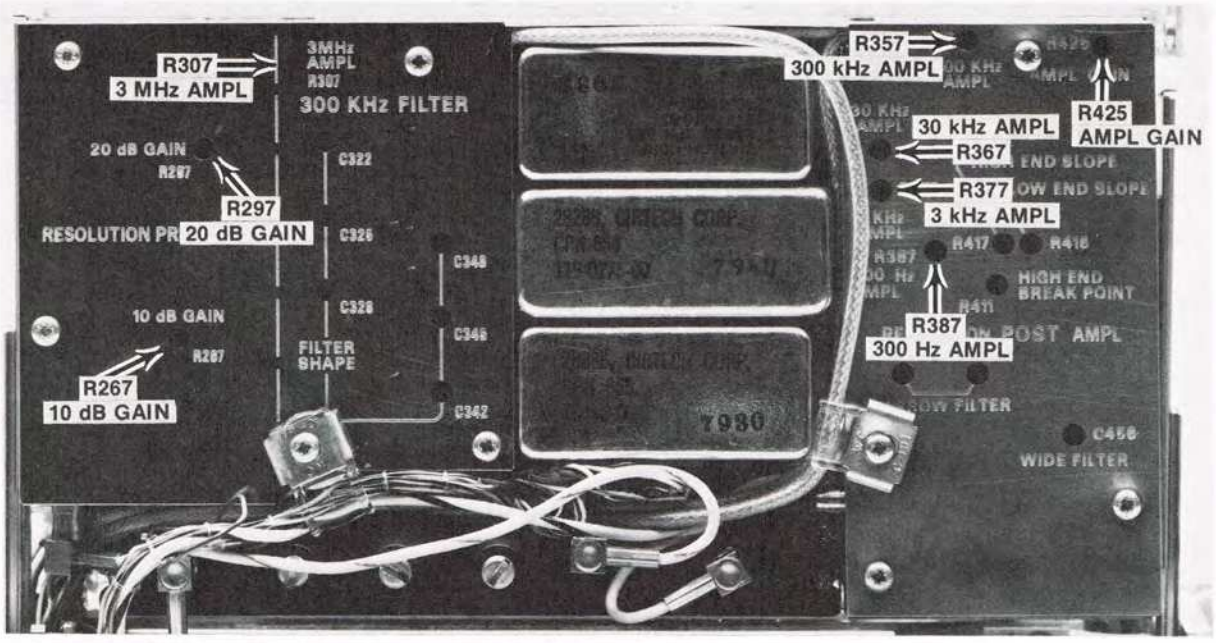
This adjustment sets the gain of the post-resolution amplifier so an input of −17 dBm will provide full screen deflection.

a. Switch the FREQ SPAN/DIV to .1 MHz (100 kHz) and the RESOLUTION to .3 MHz (300 kHz). Set the TIME/DIV to 10 ms. Switch the REF VARiable to CAL. Switch the display mode to 2 dB/DIV and position the trace at the bottom graticule line.

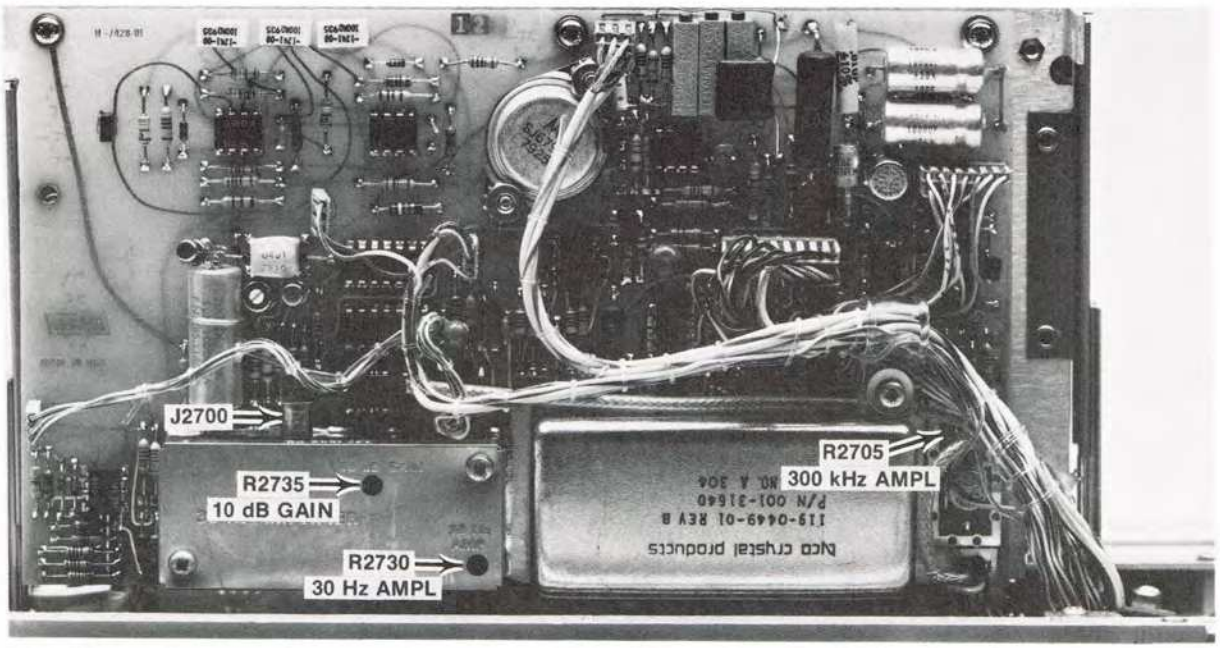
b. Apply a 10 MHz signal at −17 dBm, from the signal generator, through a bnc to subminiature (SEALECTRO) adaptor, to J2700 (Fig. 4-30B).

c. Adjust the post resolution amplifier gain with R425 (Fig. 4-30A) for a display reference level of 8 divisions.

d. Remove the cable from the signal generator to J2700 and replace P2700.



A. Resolution gain compensating adjustments on the Resolution Board.



B. Gain compensation adjustments on the Yig Driver, 30 Hz Filter circuit board.

3434-39

Fig. 4-30. Resolution gain compensating adjustments.

Minimize Intermodulation Products

a. Set the following front-panel controls as indicated:

FREQ SPAN/DIV	.5 MHz
RESOLUTION	30 kHz
Display Mode	10 dB/DIV
RF Attenuator	0 dB
Gain	Fully ccw
REFERENCE LEVEL	−30 dBm

b. Apply two signals, separated by 1 MHz, from two 50 Ω signal generators, through 10X attenuators (for isolation) then through a bnc "T" connector to the RF INput (Fig. 4-31).

c. Tune the 7L14 CENTER FREQUENCY midway between the two signals and adjust the output of the generators so the amplitude of both signals is at least full screen, or until sidebands can be observed on the display.

d. Adjust IM Adj C95 (Fig. 4-32) to minimize the amplitude of the sidebands.

e. Remove the signal generator hookup to the RF INput.

50 MHz CALIBRATOR

Adjust the Calibrator Output

NOTE

Since the output of the 7L14 Calibrator contains harmonics, direct power measurement is not possible.

a. Set the 7L14 front-panel controls as follows:

Display Mode	2 dB/DIV
REFERENCE LEVEL	−30 dBm
REF VAR	CAL
TIME/DIV	10 ms
TRIGGERING SOURCE	FREE RUN
TRIGGERING MODE	NORM
FREQ SPAN/DIV	5 MHz
RESOLUTION	300 kHz
AUTOPHASELOCKED	on
DISPLAY A and B	on

b. Apply a calibrated −30 dBm, 50 MHz signal to the RF INput of the 7L14 and tune the frequency to center the signal in the graticule window. Set the FREQ SPAN/DIV to 1 kHz/DIV and the RESOLUTION to 3 kHz.

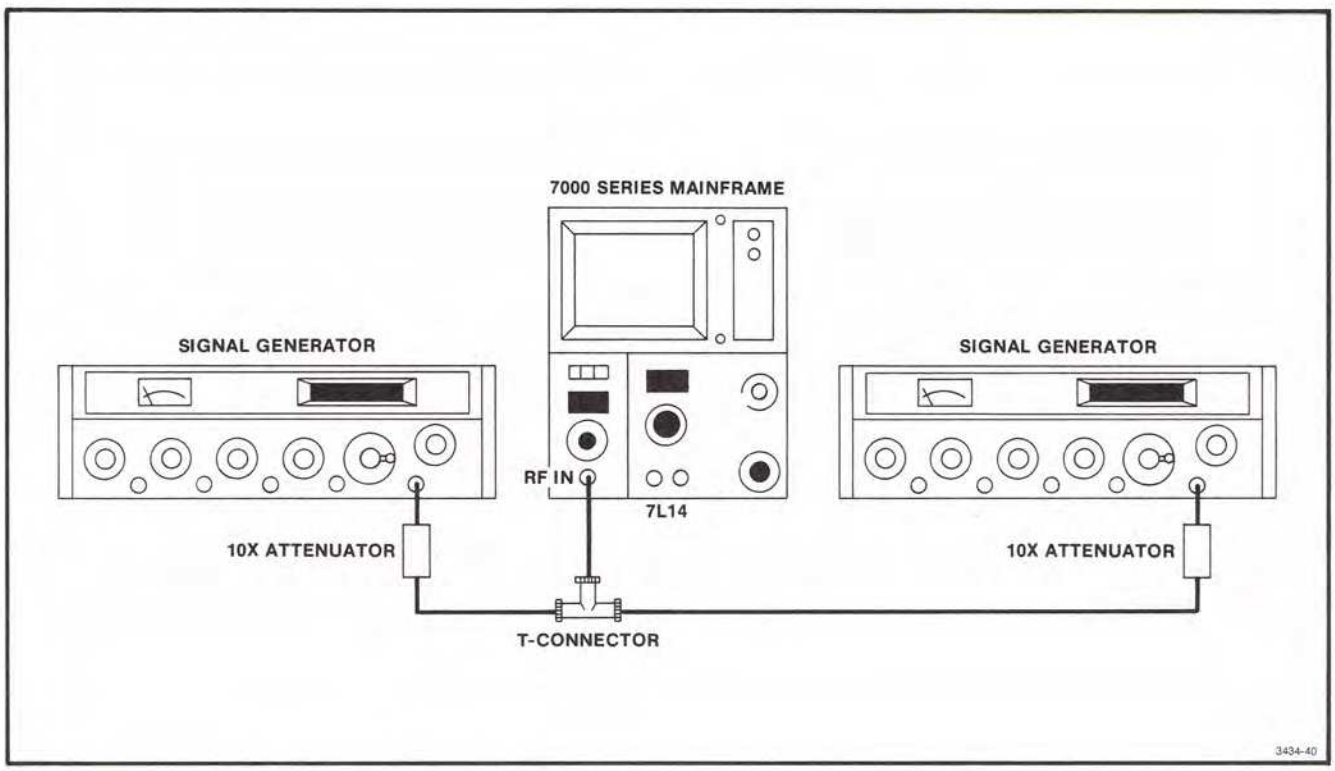


Fig. 4-31. Test equipment set up to measure IM distortion.

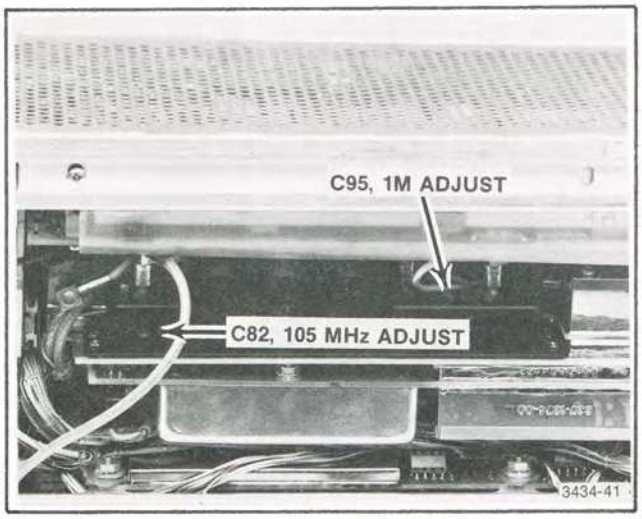


Fig. 4-32. Location of C95 in the 3rd Mixer assembly.

c. Adjust the front-panel AMPL CAL for 8 divisions of display. Activate SAVE A.

d. Disconnect the signal source from the RF INput and apply the 7L14 CAL OUT signal to the RF INput.

e. Adjust R956 (Fig. 4-33) to match the amplitude of the saved display.

f. Deactivate SAVE A and disconnect the CAL OUT from the RF INput.

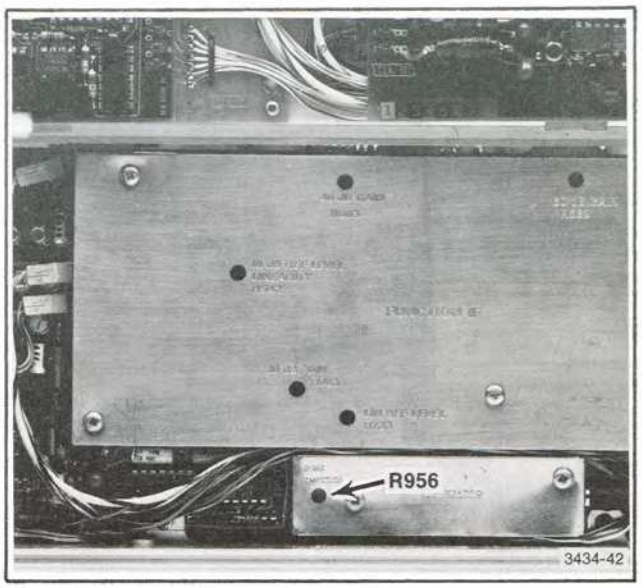


Fig. 4-33. Location of R956, Calibrator Output Level adjustment.

MAINTENANCE INSTRUCTIONS

Introduction

This section describes the procedure for preventing instrument malfunction, troubleshooting, and corrective maintenance. Preventive maintenance improves instrument reliability. Should the instrument fail to function properly, corrective measures should be taken immediately.

Access to the Interior of the 7L14

To gain access to the inside of the 7L14, remove the spectrum analyzer from the mainframe.

CAUTION

Power to the mainframe should be OFF when removing the 7L14.

Remove the top and bottom screw as shown in Fig. 5-1. The instrument can be separated into two sections now, identified in the following procedures as the Left Side and the Right Side.

To separate both sections, disconnect the cable from J28, and unplug all harmonica pins on the left of the Interface Board in the back.

Static-Sensitive Components

CAUTION

Static discharge can damage any semiconductor component in this instrument.

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

Observe the following precautions to avoid damage:

1. Minimize handling of static-sensitive components.
2. Transport and store static-sensitive components or assemblies in their original containers, on a metal rail, or on conductive foam. Label any package that contains static-sensitive assemblies or components.
3. Discharge the static voltage from your body by wearing a wrist strap while handling these components. Servicing static-sensitive assemblies or components should be performed only at a static-free work station by qualified service personnel.
4. Nothing capable of generating or holding a static charge should be allowed on the work station surface.
5. Keep the component leads shorted together whenever possible.
6. Pick up components by the body, never by the leads.
7. Do not slide the components over any surface.
8. Avoid handling components in areas that have a floor or work-surface covering capable of generating a static charge.
9. Use a soldering iron that is connected to earth ground.
10. Use only a vacuum desoldering station.

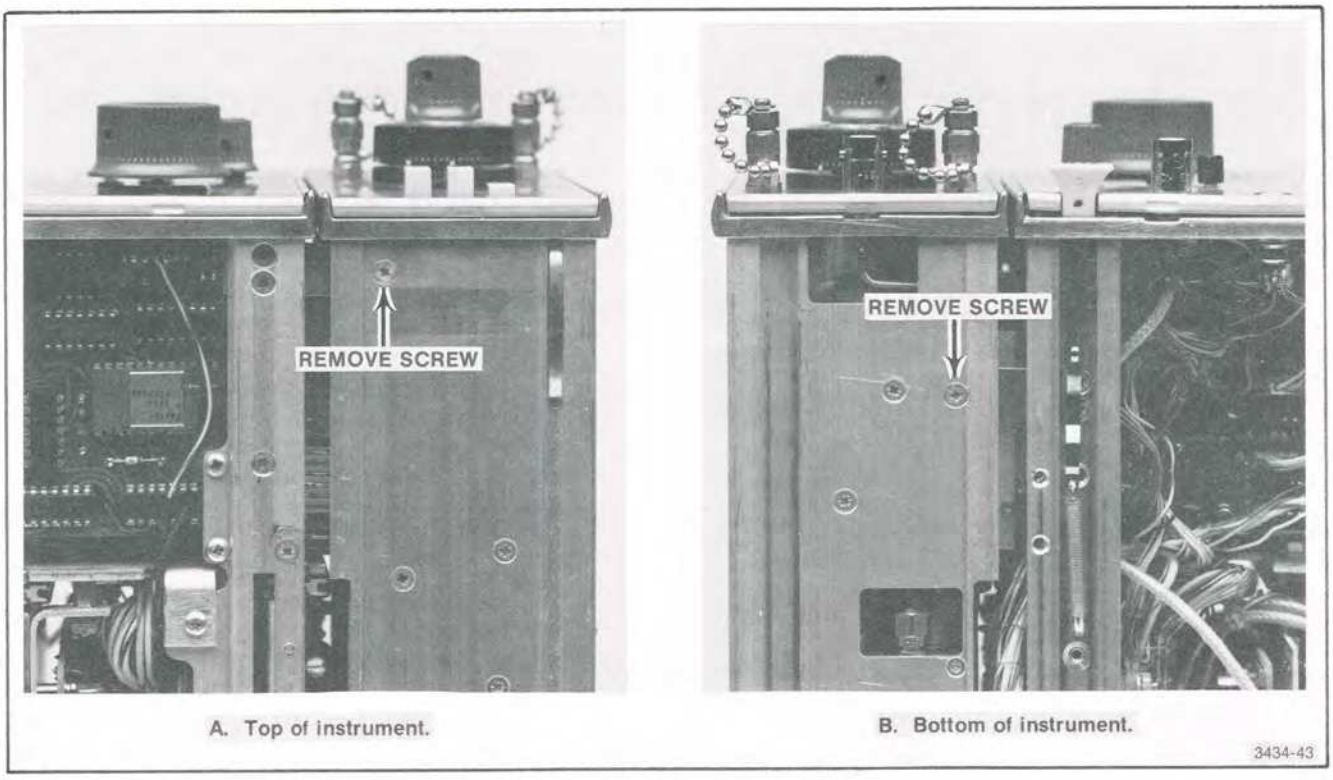


Fig. 5-1. Gaining access to the 7L14 interior.

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

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

PREVENTIVE MAINTENANCE

Preventive maintenance consists of cleaning, visual inspection, performance check, and recalibration, if necessary. The preventive maintenance schedule that is established for the instrument should be based on the environment in which the instrument is operated and on the amount of use. Under average conditions (laboratory situation) a preventive maintenance check should be performed every 1000 hours of instrument operation.

Cleaning

Cleaning 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 selector buttons. Hardened dirt may be removed with a cloth dampened in water that contains a mild detergent. Abrasive cleaners should not be used.

Interior. The interior of the instrument will not require cleaning unless it has been left out of the oscilloscope plug-in compartment. When needed, 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 clean. (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. Do not leave detergent on critical memory components. 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. Instructions for removing these assemblies are provided in the Corrective Maintenance section. Do not clean any plastic materials with organic cleaning solvents such as benzene, toluene, xylene or acetone because they may damage the plastic.

Lubrication

No components in this instrument require lubrication. The cam switches are lubricated for the life of the instrument.

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 overheating 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 recalibration, and any substandard transistors or integrated circuits will usually be detected at that time.

When handling MOS FET's, keep the shorting strap in place until the transistor is in its socket.

Performance Checks and Recalibration

The instrument performance should be checked after each 1000 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 calibrator 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.

Troubleshooting Aids

Diagrams. Block and circuit diagrams, on foldout pages in the diagrams section, contain waveform and voltage information. The condition and instrument control settings used to obtain these waveforms are described at the beginning of the diagram section and on the waveform illustration. Refer to the Electrical Part List section for a description of all assemblies and components.

NOTE

Corrections and modifications to the manual and instrument are described on inserts bound into the rear of this manual. Check this section for changes and corrections to the manual or the instrument.

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. This allows the troubleshooter to trace and check the operation of each circuit, and physically locate circuit components.

Wiring Color Code. Color coded wires are used to aid circuit tracing. Power supply dc voltage leads have either

a white background for positive voltage, or a violet background for negative voltage. Signal wires and coaxial cables use an identifying one-band or two-band color code.

Multiple Terminal (Harmonica) Connector Holders. Most intercircuit connections are made through pin connectors that may be mounted in a harmonica type holder. 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. 5-2). Some connectors contain more than one section. All connectors are identified on the schematic and board with "P" numbers.

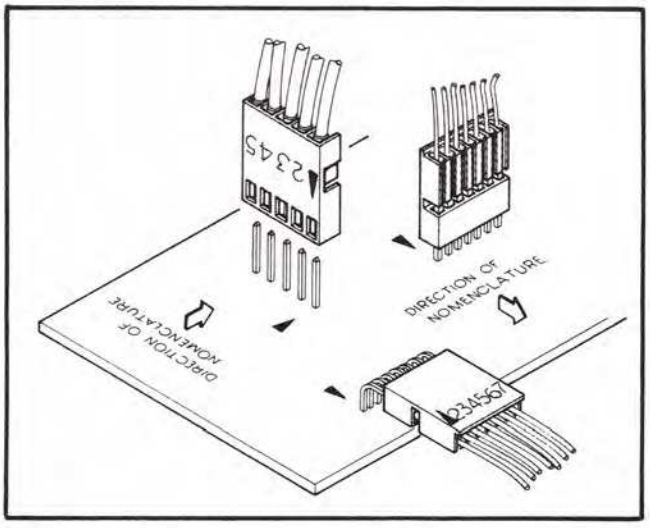


Fig. 5-2. Multipin (harmonica circuit board connectors).

Resistor Color Code. Brown composition resistors, metal-film resistors (identifiable by their gray body color) and some wire-wound resistors (usually light blue or grey-green) are used in the 7L14. The resistance value of a wire-wound resistor is printed on the body of the component. The resistance value of a composition resistor or metal-film resistor is color-coded on the component with EIA color-code (some metal-film resistors may have the value printed on the body).

Capacitor Marking. The capacitance value of common disc capacitors or small electrolytics are marked in microfarads on the side of the component body. The white ceramic capacitors are color coded in picofarads.

Diode Color Code. 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. Fig. 5-3 illustrates diode types and polarity markings that are used in this instrument.

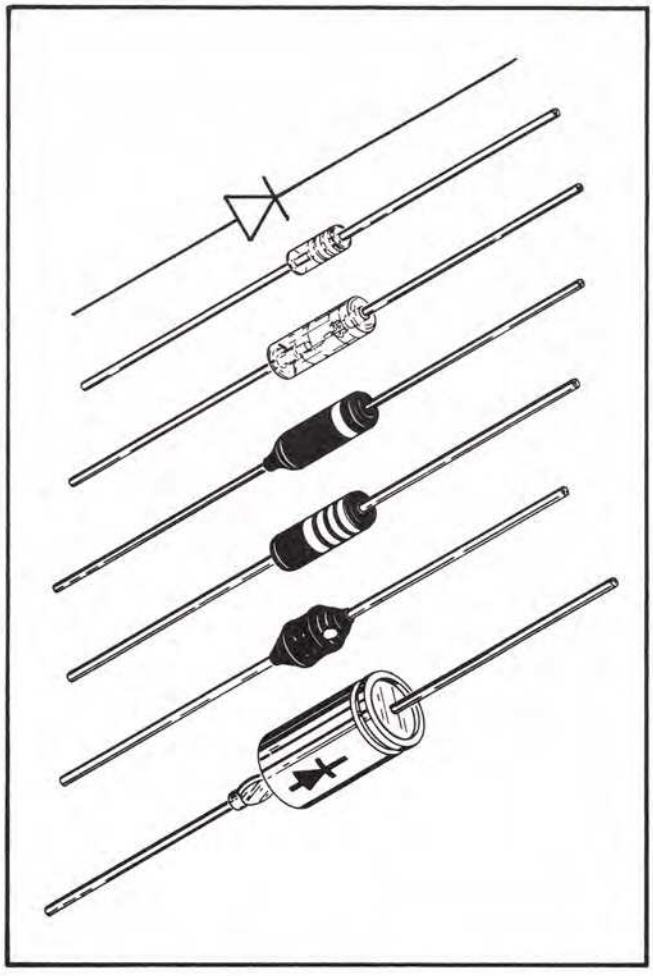


Fig. 5-3. Diode polarity markings.

Transistor and Integrated Circuit Electrode Configuration. Lead identification for the transistors and MOS FETs is shown in Fig. 5-4. IC pin out diagrams are shown on the back of the adjoining pullout schematic diagram.

Substitution is often the most practical means for checking these components' performance. Use the following guidelines for substitution:

a. First determine that circuit voltages are safe for the substituted component, so the replacement will not be damaged.

b. Use only good components for substitution.

c. Turn the power off before a component is substituted.

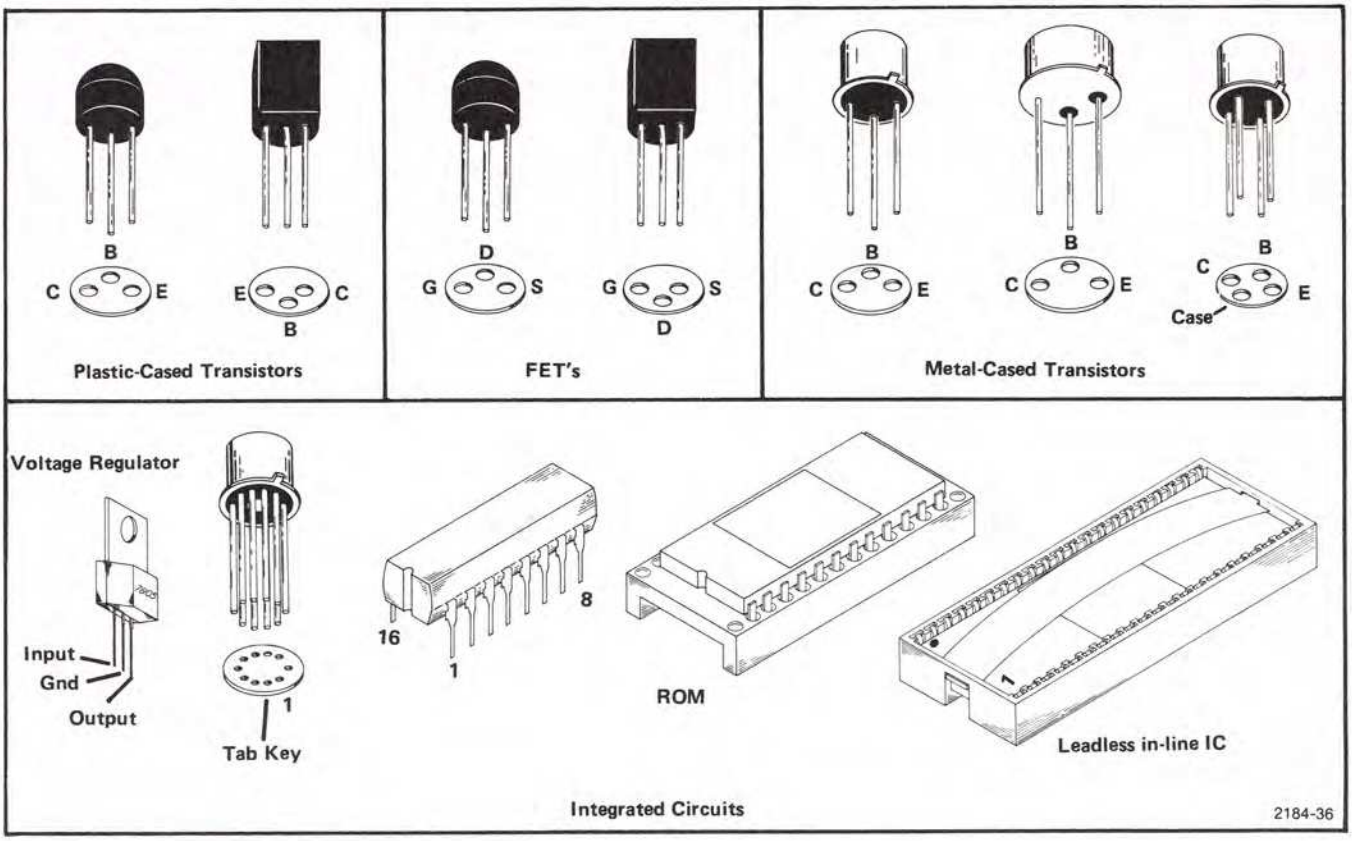


Fig. 5-4. Electrode configuration for semiconductor components.

d. Be sure the component (transistor or IC) is inserted properly in the socket (see Fig. 5-4 or the manufacturers data sheet).

e. After the operational check, return the good components to their original sockets to reduce calibration time and run-in period.

NOTE

If a substitute is not available, check the transistor or MOS FET with a dynamic tester such as the Tektronix Type 576 Curve Tracer. Static type testers, such as an ohmmeter, can be used to check the resistance ratio across some semiconductor junction if no other method is available. (Do not measure resistance across MOS FET's because they are very susceptible to static charges.) Use the high resistance ranges (R X 1 k 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 meterleads across the terminals, noting to reading, then reversing the leads and noting the second reading.

Diode Checks. 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. Do not check the forward-to-back resistance ratios of tunnel diodes or mixer diodes.

Integrated Circuit (IC) Checks. Integrated circuits are most easily checked by direct replacement. When substitution is not possible, check input and output signal states as described in the circuit description and on the diagram.

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 Spectrum Analyzer and not with the mainframe. Check the operation of associated equipment and the operating procedure of the 7L14 (see Operating Instructions).

2. Determine and evaluate all trouble symptoms. Try to isolate the problem to a circuit or assembly. For example: Absence of a frequency marker notch in MAX position, could indicate a malfunction in the video summing stage, the marker generator, or the switching circuitry. A test oscilloscope will check the input to the video summing stage and isolate the problem to one or the other of the two circuits. The block diagram in the diagrams section can aid in signal tracing and circuit isolation. It also shows the required signal level at different points to produce full screen deflection.

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 which 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. Repair or replace all obvious defects. In the case of overheated components, try to determine the cause of the overheated condition and correct before applying power.

5. By successive electrical checks, locate the problem. At this time an oscilloscope is a valuable test item 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 component replacement, see the Parts List for replacement information. Removal and replacement procedure of the assemblies and sub-assemblies is described under Corrective Maintenance.

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

All electrical and mechanical parts are available through your local Tektronix Field Office or representative. The Parts List section contains information on how to order these replacement parts. Many standard electronic components can be obtained locally in less time than that required to order from Tektronix, Inc. It is best to duplicate the original component as closely as possible. Parts orientation and lead dress should be duplicated because some components are oriented to reduce interaction or control circuit characteristics.

If a part you have ordered has been replaced with a new or improved part, your local Field Office or representative will contact you concerning any change in the part number. After repair, the circuits may need recalibration.

Parts Repair and Return Program

Assemblies containing hybrid circuits or substrates in a semi-sealed module, complex assemblies such as the YIG oscillator, can be returned to Tektronix for repair under the Repair and Return Program. Contact your local Field Office for return and repair rates.

Tektronix repair centers provide replacement or repair service on major assemblies as well as the unit. Return the instrument or assembly to your local Field Office for this service.

CAUTION

Do not ship the 7L14 by common carrier when it is installed in the mainframe, unless the 7L14 is bolted into the mainframe. A spectrum analyzer securing kit is available from Tektronix, Inc., for the following instruments: 7313/R, 7603/R, 7613/R, 7623/R, 7623A/R, and 7633/R. Order by Tektronix Part Number 016-0637-00.

Soldering Technique

CAUTION

Disconnect the instrument from its power source before replacing or soldering components.

Some of the circuit boards in this instrument are multilayer; therefore, extreme caution must be used when a soldered component is removed or replaced. Excess heat from the soldering iron and bent component leads may pull the plating out of the hold. We suggest clipping the old component free, leaving enough lead length to solder the new component leads to. If you desire to remove the component leads; use a 15 watt pencil type iron, straighten the leads on the back side of the board, then when the solder melts gently pull the soldered lead through the hole. Only a vacuum desoldering station should be used to remove the old solder.

Replacing the Square Pin for the Multi-pin Connectors

It is important not to damage or disturb the ferrule when removing the old stub of a broken pin. The ferrule is pressed into the circuit board and provides a base for soldering the pin connector.

If the broken stub is long enough, grasp it with a pair of needle-nose pliers, apply heat with a small soldering iron to the pin base of the ferrule and pull the old pin out. (The pin is pressed into the ferrule so a firm pull is required to pull it out.)

If the broken stub is too short to grasp with pliers, use a small dowel (0.028 inch in diameter) clamped in a vise to push the pin out of the ferrule after the solder has been heated.

The old ferrule can be cleaned by reheating the solder and placing a sharp object such as a toothpick or small dowel into the hole. A 0.031 drill mounted in a pin vise may also be used to ream the solder out of the old ferrule.

Use a pair of diagonal cutters to remove the ferrule from the new pin, then insert the pin into the old ferrule and solder the pin to both sides of the ferrule.

If it is necessary to bend the new pin, grasp the base of the pin with needle nose pliers and bend against the pressure of the pliers to avoid breaking the board around the ferrule.

Selected Components

Some components, such as microcircuits, are selected to meet Tektronix specifications. These components carry only Tektronix part numbers under the Mfr Part number column, in the Replaceable Parts list.

Some circuits require a selected component value to compensate for parameter differences between active components. These are identified on the circuit diagram and the Replaceable Parts list. The Replaceable Parts list description for the component gives either a nominal value or range of value. If the procedure for selection is not obvious or complex, such as setting the gain or response of a stage, the criteria for selection is explained in the Calibration or Maintenance section of the manual. Where the selection procedure is obvious, such as establishing the frequency of an oscillator, no procedure is given.

MAINTENANCE OF THE LEFT SIDE

REPLACING THE ASSEMBLIES

Maintenance Tools

Open-end offset wrenches are required to loosen the nuts for the semi-rigid coax cable connectors. A 15/64 wrench and a 5/16 inch wrench should be ground so they will fit into limited access spaces. The special 5/16 inch wrench may be ordered from Tektronix, Inc. (Part no. 003-0703-00).

Replacing the Differential Attenuator Assembly

1. Loosen and disconnect the input and output semi-rigid cables to the attenuator, and the semi-rigid cables to the front-panel 1st and 2nd LO output connectors.

CAUTION

Use two wrenches to loosen or tighten these connectors. When loosening the nut on the plug use one wrench to hold the rigid portion of the connector, so the cable does not bend or the connector at the jack does not twist, and loosen the connector with the other wrench.

2. Turn the gain and RF Attenuator selectors fully cw, then remove the Gain knob. Remobe the 2 screws holding on the skirt. Now remove the Attenuator knob.

3. Remove the front panel from the sub-panel.

4. Remove the screws holding the sub-panel to the top and bottom plates and remove the sub-panel, then remove the attenuator assembly.

5. Replacement procedure is the reverse of the removal. When the attenuator knob is replaced, align the skirt so the "0 dB" shows in its window. Ensure that the knobs index correctly; remember that they were positioned fully cw before removal.

CAUTION

Because of EMI requirements the Gain knob shift has been made of plastic. Deformation is possible with overtightening. Torque to 7 inch/lbs only.

6. Torque the nuts for the semi-rigid connectors until snub to eliminate RF leaks.

Replacing the 1st LO (YIG) Oscillator Assembly A12

1. Loosen the screw on the base of the oscillator.

2. Loosen the 1800 MHz pencil filter and slide the oscillator to the back.

3. Take the 4 screws that hold the cradle, out of the bottom.

4. Unsolder the wires and pull out the oscillator and its brackets.

5. Replace by reversing the procedure. Refer to Frequency Span and 1st LO Calibration Adjustments in the Calibration Section to calibrate the new oscillator.

Replacing the 2.095 GHz Filter Assembly A8, or the Multiplier, Bandpass Filter Assembly A14. See Fig. 5-5

NOTE

If replacement of these assemblies is necessary, we recommend returning the 7L14 to your local Field Office.

1. Loosen the semi-rigid coaxial lead connectors.

2. Take the 2 screws holding the assemblies out of the top (1).

3. Take the three screws out of the top, inboard of the filters (2).

4. Remove the two screws out of the guardrail (3).

5. Take out the hinge screw (4).

6. Lift the assemblies out.

7. To replace these assemblies reverse the removal instructions as stated above.

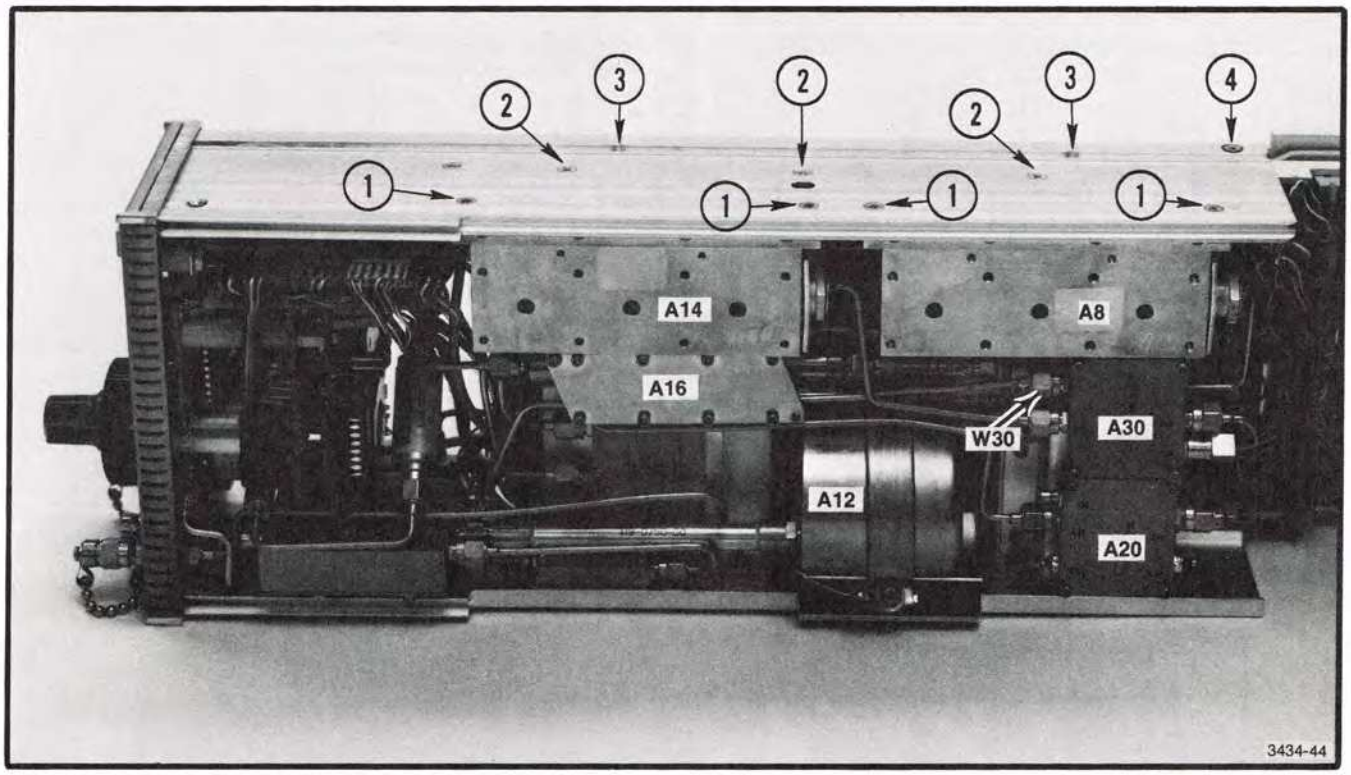


Fig. 5-5. Location of screws and assemblies of the left side.

CAUTION

The nuts that tighten the connectors for the semi-rigid cable plugs should be tightened so they are slightly more than finger tight. Use one wrench to hold the rigid portion of the connector while loosening the nut with a second wrench.

8. When the cables are replaced, torque the connector nuts to 7 oz./inch.

Calibration Procedure. The following test fixtures and equipment are required to calibrate these assemblies: a) A spectrum analyzer with a frequency range to 2.5 GHz and a dynamic range of 70 dB, such as the 7L12 Mod 139U. b) A second spectrum analyzer that covers the frequency spectrum to 60 MHz, such as the 7L12, 7L13 or 7L14. c) A 26 dB, 50 Ω tap as shown in Fig. 5-6. d) A subminiature (SEALECTRO) "T" connector to connect the low frequency spectrum analyzer into the output of the coupler.

1. Connect the test equipment as shown in Fig. 5-6.

2. While observing the 17.5 MHz spectrum analyzer display, adjust the bandpass filter with C20, C22, and C24 and the mixer coupling for maximum response to 17.5 MHz.

3. While observing the display of the 2.2 GHz spectrum analyzer, adjust the mixer orientation for minimum sideband amplitude of the 17.5 MHz IF, maintaining maximum amplitude of the 17.5 MHz signal on the low frequency spectrum analyzer display. Sideband amplitude must be down 60 dB or more from the 2.2 GHz signal.

4. Change the output level of the 99.2045 MHz oscillator by changing the value of select resistor R1620, so the 17.5 MHz IF amplitude is between −26 dBm and −30 dBm at the 26 dB divider tap.

Replacing the 2nd Mixer Assembly

The coupling of the 2nd mixer affects the response of the 2.095 GHz bandpass filter and mixer assemblies; therefore, replacement of either assembly requires readjustment of the filter tuning and mixer coupling. This adjustment requires the following equipment: a) A signal generator, 500 kHz to 1 GHz, such as Hewlett-Packard 8654A. b) A function generator, such as Tektronix FG 503 or a 9 V battery-box. c) A 50 Ω coaxial cable. d) A X1 probe.

The 2nd mixer orientation (rotation) affects the mixer balance and reduces the spurious response that is generated by products from the 1st LO and 1st mixer, and products from the 2nd LO and 2nd mixer. Two positions,

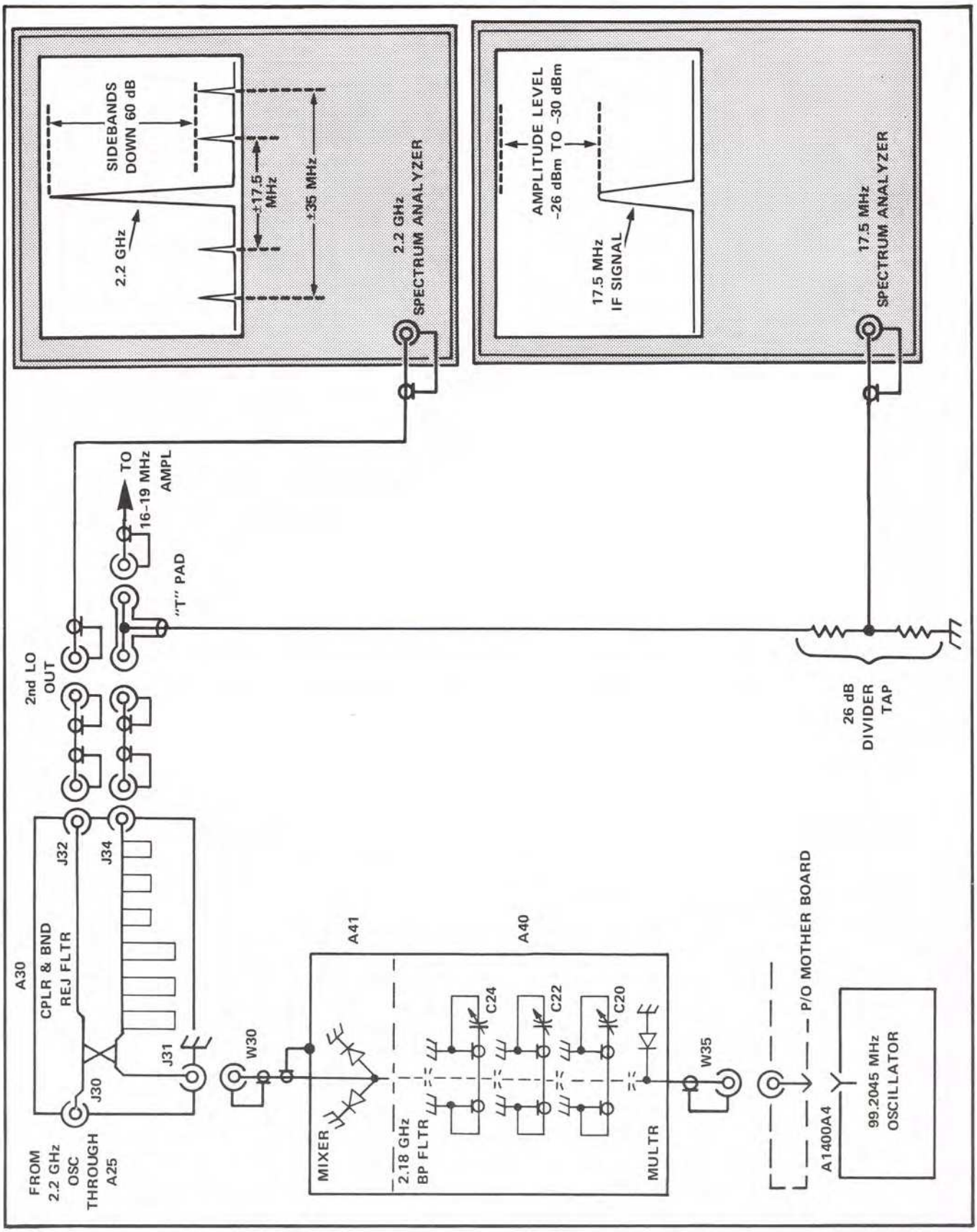


Fig. 5-6. Test equipment and illustrations to show the response when calibrating the multiplier, 2.18 GHz BP Filter, and Mixer Assembly for the 2nd LO frequency servo system.

180 degrees from each other, will balance the mixer; usually one of these positions provides the best balance.

Adjust the Response of the Filter and Mixer Assemblies

1. Set the 7L14 front-panel controls as indicated:

FREQUENCY	50 MHz
FREQ SPAN/DIV	50 MHz
RESOLUTION	300 kHz
Display Mode	10 dB/DIV
RF Atten	0 dB
Gain	Fully ccw

2. Apply a −30 dBm, 52.5 MHz signal from a signal generator to the RF INput. Tune the center frequency so the applied signal is centered on screen. It may be necessary to increase the signal generator output level to obtain a signal if the bandpass filter is detuned.

3. Remove the signal generator signal from the RF INput and look for a spurious signal near 52.5 MHz. Open up the display by decreasing the FREQ SPAN after the spur is located. Adjust the sweep rate to obtain maximum signal amplitude.

4. Loosen the mixer assembly locking screws (Fig. 5-7), then rotate the assembly to minimize the spurious signal amplitude. Tighten the locking screw, ensuring that the assembly position does not shift.

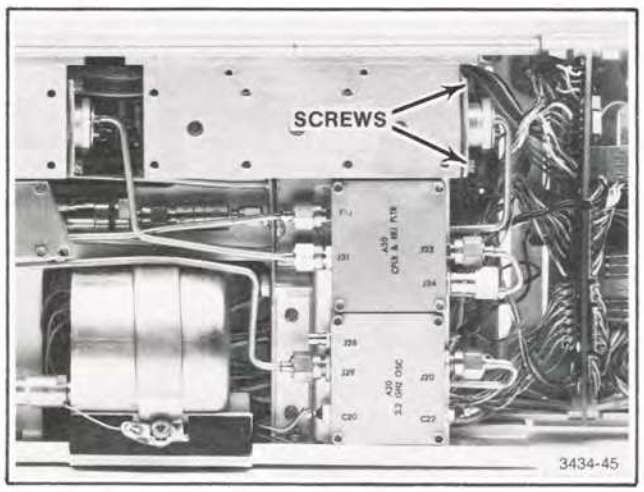


Fig. 5-7. Location of the mixer assembly locking screws.

5. Set the TIME/DIV to 5 ms, FREQ SPAN/DIV to 1 MHz, RESOLUTION to 300 kHz, and the Display Mode to 2 dB/DIV.

6. Apply a 50 MHz signal from the signal generator to the RF INput and tune the signal to center screen. Increase the Output Level of the generator for 7 divisions of display.

7. Set the FG 503 Function control to Sinewave, and 0 DC Offset; Frequency to 0.1 Hz.

8. Connect the Output of the Function Generator to the junctions of R1735 and R1729 on the summing-amplifier board, using a X1 probe.

9. Increase the Amplitude of the Function Generator until the signal is swept at least 4 divisions around center screen.

10. Adjust C15, C16, and C17 (see Fig. 5-8) for less than 0.5 dB change in signal amplitude.

REPLACING SWITCHES

Replacing the Display Mode LOG/LIN Switches

1. Disconnect the semi-rigid cable W30 from J31, of the Coupler and Band Reject Filter (A30). Loosen and remove the mounting screws for assembly A14 (No. 5 in Fig. 5-5). Remove the mounting screws and nut holding the switch mounting bracket (No. 6 in Fig. 5-5).

2. Gently lift the filter assembly out and down, so it does not obstruct the switch circuit board. NOTE: There are two spacer washers between the assembly and the top place.

3. Unplug the harmonica connectors to the switch assembly. Remove the two mounting stud nuts that hold the switch assembly on the front panel and slide the switch assembly back and out of the instrument.

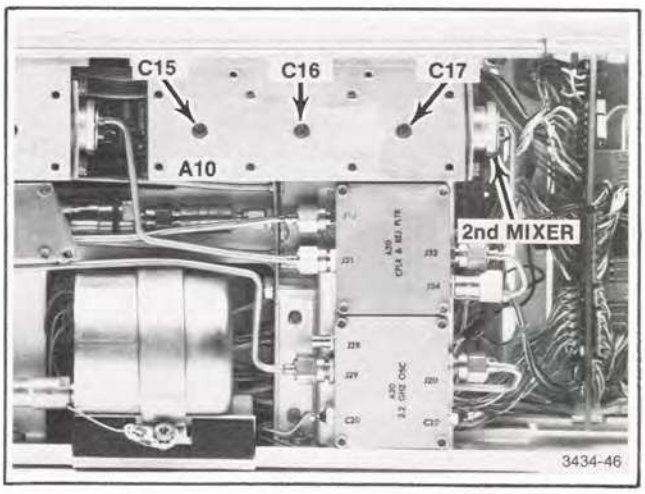


Fig. 5-8. Adjustments for filter response.

MAINTENANCE OF THE RIGHT SIDE

REPLACING ASSEMBLIES

Replacing the Frequency Tuning Assembly (A70)

1. Position the FREQ SPAN/DIV and Resolution knobs fully clockwise. Set the TIME/DIV selector in the OFF position. Turn the knobs that have no stops to some reference point.

2. Loosen the knob-locking screws with a 1/16 Allen wrench and remove the knobs. For replacing the FREQ SPAN/DIV knob, see instructions later in these instructions.

3. Remove the front panel by prying it from the bottom of the frame with a screwdriver.

4. Remove the subpanel retaining screws and pull the subpanel forward.

NOTE

Removal of the Analog and DVM Readout boards facilitates removal of the Tuning Frequency Control.

5. Remove the 2 screws below, and to the left and right of the center-frequency shaft.

6. Disconnect the necessary harmonica's on the circuit board, below the center-frequency tuning bracket, and slide the assembly out to the left.

7. Reverse this procedure to install the Frequency Tuning Assembly.

Replacing the Sweep Circuit Board (A42)

1. Position the FREQ SPAN/DIV and RESOLUTION selectors fully cw. Set the TIME/DIV selector in the OFF position. Loosen the knob locking screws with a 1/16 Allen wrench and remove the knobs.

2. Disconnect all harmonica (multipin) connectors to the sweep board.

3. Pull the center drawer (Resolution, YIG driver, Voltage Memory and 30 Hz Filter) assembly up. Uncouple the back rail assembly from the center drawer by pushing in on the spring clip (see Fig. 5-9a) and pulling up on the assembly.

CAUTION

Do not pull the center drawer too far up or let it fall free, because the forward rail may be bent or damaged.

4. Loosen and remove the back-panel screws shown in Fig. 5-9b. Pull the back panel and the plastic circuit board holder free from the sweep circuit board.

5. Loosen and remove the 5 sweep board mounting screws as shown in Fig. 5-9C and pull the board assembly back and out of the instrument.

NOTE

Refer to Cam Switch Replacement procedure if the cam switches are to be replaced.

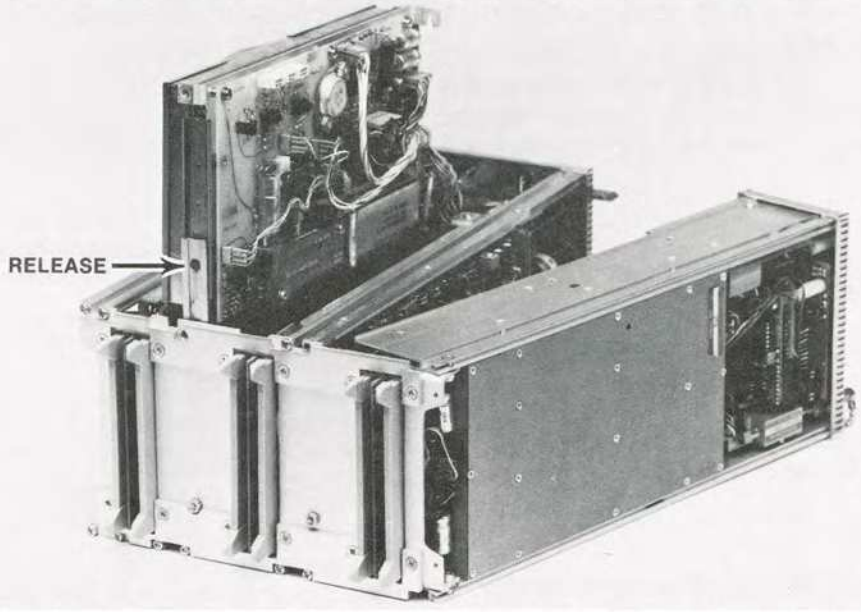
6. Replace the circuit board assembly by reversing the removal procedure. Remember to use the same knob reference point before tightening the setscrews, and check that the selectors index properly through their range.

Replacing the Function IF Circuit Board

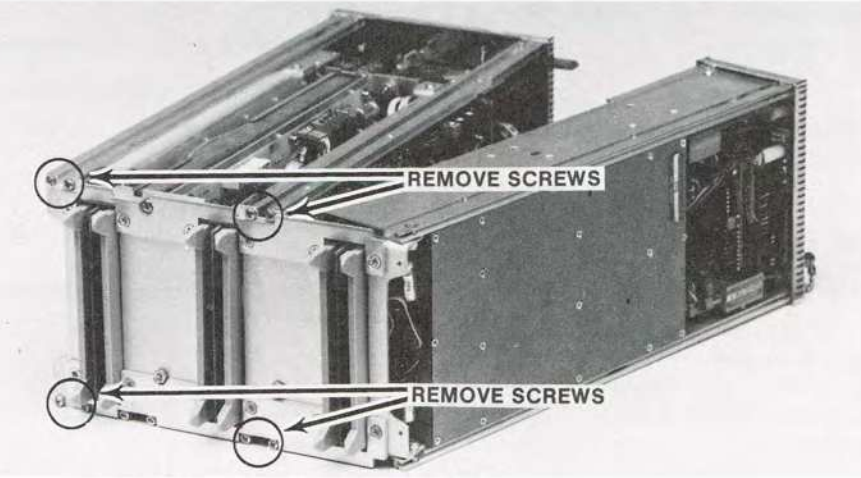
Remove or unplug the harmonica connectors and P900 (output of the calibrator) from the interface board. Remove the two mounting screws and lift the board assembly out of the instrument.

Replacing the Resolution Circuit Board Assembly

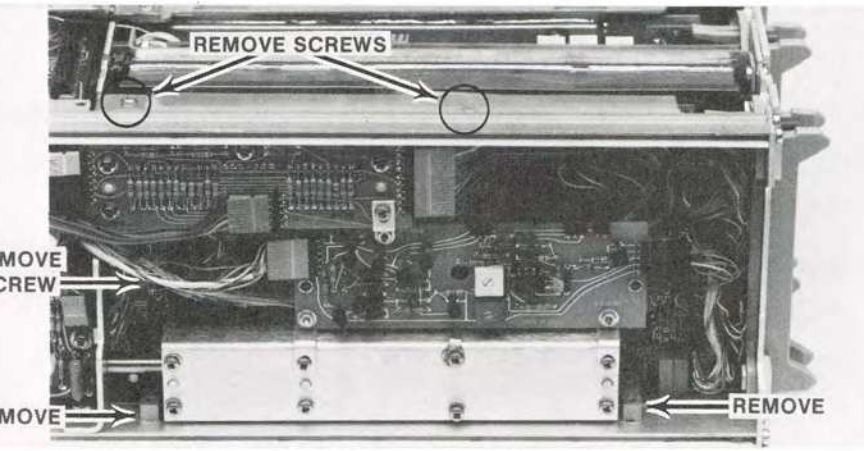
Unscrew and remove the 8 mounting posts that hold the board to the chassis (see Fig. 5-10). Lift the circuit board assembly off its chassis.



A. Uncouple the back support rail for the center drawer by pushing in the release catch.



B. Eight rear panel mounting screws to be removed.



C. Location of the five Sweep Board mounting screws.

3434-47

Fig. 5-9. Illustrations to show the procedures for removing the Sweep Board.

Replacing Circuit Boards in the Phase Lock Circuit (Honeycomb) Assembly

Remove the screws holding the shield cover on the honeycomb and remove the cover. Loosen and remove the respective Allen-head screws that hold the board and remove the boards.

Replacing the 5 Volt Regulator Board

This board is mounted behind the honeycomb assembly. Remove the four screws that go through the top and bottom plate to hold the honeycomb assembly in place. Slide the honeycomb assembly out and disconnect the required connectors to gain access to the mother board or the 5-volt regulator board.

Replacing the Digital Storage Drawer Assembly

1. Remove the set screw on the upper left handrail, 3 inches from the front panel.

2. Remove the screw at the back of the same rail, holding it to the back panel.

3. Pull the drawer assembly straight up.

4. Removal of the whole assembly can be accomplished by pushing in the spring clip on the slide guide with a screwdriver, in the same manner in which the Center Drawer Assembly (Sweep Circuit Board) was removed. See Fig. 5-9A.

5. Take off the Digital Storage Board by removing the 4 screws holding it onto the frame.

6. To remove the Digital Storage Mother Board, remove the connections from the other side of the Mother Board assembly.

7. To install these assemblies, reverse this procedure.

NOTE

When replacing the Sweep Board or the Digital Storage Drawer Assembly some GE 322L Versilube lubricant (Tektronix Part Number 13,811) may be applied to the side rails.

Removing the DVM Logic and Readout Circuit Board (A66)

1. Remove the mounting screws for the DVM (Analog) and DVM Logic Readout circuit boards (Fig. 5-10).

2. Unplug the MARKER light from its holder by pulling on the base off the holder, then unplug the five harmonica plugs.

3. Unplug the interconnect between the two boards. Move the Logic and Readout circuit board back and to the left, tipping the board so the right front corner clears the rail extrusion.

4. Move the board to the left until the right edge clears the mounting extrusion, then slip the board to the right and out the top of the instrument.

Replacement of the Left Interface Assembly A76

1. Remove the digital storage drawer assembly.

2. Remove the top-rail rear screw and the 2 screws at the front panel which hold on the rail.

3. Remove the top screw of the support that attaches to the rail.

4. Remove the 2 screws holding the assembly on the bottom.

5. After disconnecting the wires, the assembly will fall out.

6. To install the assembly, reverse the above procedure.

REPLACING KNOBS AND SWITCHES

Replacing the FREQ SPAN/DIV and RESOLUTION Knobs and Skirts

1. Turn the FREQ SPAN/DIV and RESOLUTION knobs fully cw. Push the RESOLUTION knob in the "lock" position.

2. Remove the 2 set-screws from the FREQ SPAN knob. Remove knob.

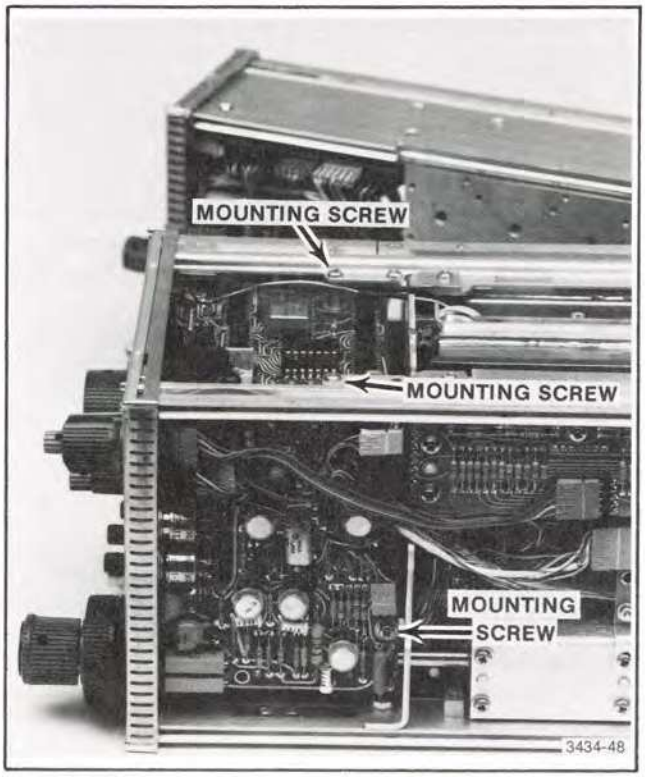


Fig. 5-10. Removing the Frequency Readout boards.

3. Remove the 2 screws holding the Frequency Span skirt, and remove the skirt.

4. Remove the 2 screws from the RESOLUTION knob and remove the knob.

5. To replace:

a. Place the new knob on the shaft.

b. Put the knob skirt on with 2 set-screws.

c. Align the FREQ SPAN knob with the skirt so "3M" shows through its window, near the fully cw position. Tighten set-screws.

d. Install RESOLUTION knob so the teeth engage and the mark on the knob lines up with "MAX SPAN". Tighten set-screws.

Replacing the Cam Switches

CAUTION

The alignment and spring tension of the cam switch contacts are critical and must be maintained for proper operation; therefore, replacing or repairing these switches should be performed only by experienced personnel. A repair kit that includes replacement contacts, alignment tools, and instructions for replacing the switch contacts, can be ordered from Tektronix, Inc. Order Part No. 040-0541-00. If assistance is desired, contact your local Tektronix Field Office or representative.

Preliminary. We recommend replacing the complete actuator assembly if any part of the actuator is defective. The following procedures describe how to replace the complete actuator for the FREQ SPAN/RESOLUTION selector and the TIME/DIV selector. Precise alignment and complex procedures are required to replace any section of these actuators.

NOTE

The 7L14 Time/Div and Freq Span/Div shafts are shorted to the front panel with special wiping springs. The removal of the 2 shafts and assemblies from the front panel is relatively easy, but replacement of the shafts into the bushing/spring assembly requires lifting each spring to allow insertion of the shaft.

Before the cam switch can be removed for repair or replacement, the Sweep Circuit board assembly must be removed. This procedure is described under Replacing Assemblies, which preceeds this description.

FREQ SPAN/RESOLUTION Selector Replacement

1. Turn the circuit board over and remove the eight (8) 4-40 screws that mount the actuator assembly to the board.

2. Lift the actuator assembly from the board to expose its related contacts.

3. Clean and replace any contacts if necessary, as per the instructions with the repair kit.

TIME/DIV Selector Replacement

1. Unsolder the connections to the MANUAL SCAN potentiometer switch assembly.

2. Turn the board over and remove four 4-40 screws that mount the actuator assembly to the circuit board.

3. Lift the actuator assembly from the board to expose the related contacts for cleaning and repair, if necessary.

4. Replace the MANUAL SCAN potentiometer switch assembly as follows:

a) Remove two 2-56 screws and lock washers from the mounting plate located at the rear of the actuator assembly.

b) Pull the potentiometer switch assembly, including the coupler and shaft, clear of the acutator assembly.

Replacing the Cam Actuator and Potentiometer Switch Assemblies

To re-assemble these assemblies, reverse the above removal procedure.

Removing the Front Panel Pushbutton Switches

NOTE

Before removing any of the switchable selectors, such as the FREQ SPAN/DIV, preset the selector either fully cw or ccw. This establishes a reference so the knobs can be correctly oriented when they are replaced.

Triggering Switches

1. Remove the knobs and front panel.

2. Loosen the screws that hold the switches to the sub-panel. Now loosen the screws that hold the sub-panel to the side rails and carefully pull the sub-panel forward until the switches can be removed.

Video Filter and Digital Storage Switches

1. Remove the knobs and front panel.

2. Loosen the screws that hold the switches to the sub-panel and slide the switch assembly out of the instrument.

REPLACEABLE ELECTRICAL PARTS

PARTS ORDERING INFORMATION

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

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

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

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

LIST OF ASSEMBLIES

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

CROSS INDEX-MFR. CODE NUMBER TO MANUFACTURER

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

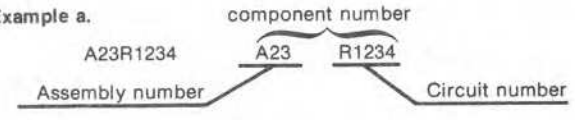
ABBREVIATIONS

Abbreviations conform to American National Standard Y1.1.

COMPONENT NUMBER (column one of the Electrical Parts List)

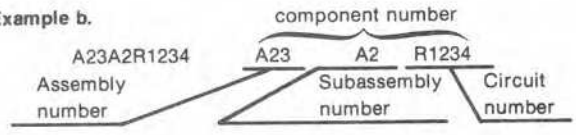
A numbering method has been used to identify assemblies, subassemblies and parts. Examples of this numbering method and typical expansions are illustrated by the following:

Example a.



Read: Resistor 1234 of Assembly 23

Example b.



Read: Resistor 1234 of Subassembly 2 of Assembly 23

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

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

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

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

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

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

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

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

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

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

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

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

Indicates actual manufacturers part number.

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
00213	NYTRONICS, COMPONENTS GROUP, INC., SUBSIDIARY OF NYTRONICS, INC.	ORANGE STREET	DARLINGTON, SC 29532
00779	AMP, INC.	P O BOX 3608	HARRISBURG, PA 17105
00853	SANGAMO ELECTRIC CO., S. CAROLINA DIV.	P O BOX 128	PICKENS, SC 29671
01121	ALLEN-BRADLEY COMPANY	1201 2ND STREET SOUTH	MILWAUKEE, WI 53204
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P O BOX 5012, 13500 N CENTRAL EXPRESSWAY	DALLAS, TX 75222
02111	SPECTROL ELECTRONICS CORPORATION	17070 EAST GALE AVENUE	CITY OF INDUSTRY, CA 91745
02114	FERROXCUBE CORPORATION	PO BOX 359, MARION ROAD	SAUGERTIES, NY 12477
02735	RCA CORPORATION, SOLID STATE DIVISION	ROUTE 202	SOMERVILLE, NY 08876
03508	GENERAL ELECTRIC COMPANY, SEMI-CONDUCTOR PRODUCTS DEPARTMENT	ELECTRONICS PARK	SYRACUSE, NY 13201
04222	AVX CERAMICS, DIVISION OF AVX CORP.	P O BOX 867, 19TH AVE. SOUTH	MYRTLE BEACH, SC 29577
04423	TELONIC INDUSTRIES, INC.	21282 LAGUNA CANYON ROAD	LAGUNA BEACH, CA 92652
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD,PO BOX 20923	PHOENIX, AZ 85036
05397	UNION CARBIDE CORPORATION, MATERIALS SYSTEMS DIVISION	11901 MADISON AVENUE	CLEVELAND, OH 44101
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS STREET	MOUNTAIN VIEW, CA 94042
08806	GENERAL ELECTRIC CO., MINIATURE LAMP PRODUCTS DEPARTMENT	NELA PARK	CLEVELAND, OH 44112
09023	CORNELL-DUBILIER ELECTRONIC DIVISION FEDERAL PACIFIC ELECTRIC CO.	2652 DALRYMPLE ST.	SANFORD, NC 27330
10389	CHICAGO SWITCH, INC.	2035 WABANSIA AVE.	CHICAGO, IL 60647
11532	TELEDYNE RELAYS	3155 W EL SEGUNDO BLVD.	HAWTHORNE, CA 90250
12697	CLAROSTAT MFG. CO., INC.	LOWER WASHINGTON STREET	DOVER, NH 03820
14433	ITT SEMICONDUCTORS	3301 ELECTRONICS WAY P O BOX 3049	WEST PALM BEACH, FL 33402
14752	ELECTRO CUBE INC.	1710 S. DEL MAR AVE.	SAN GABRIEL, CA 91776
16299	CORNING GLASS WORKS, ELECTRONIC COMPONENTS DIVISION	3900 ELECTRONICS DR.	RALEIGH, NC 27604
17856	SILICONIX, INC.	2201 LAURELWOOD DRIVE	SANTA CLARA, CA 95054
18203	ENGELMANN MICROWAVE CO.	SKYLINE DR.	MONTVILLE, NJ 07045
18324	SIGNETICS CORP.	811 E. ARQUES	SUNNYVALE, CA 94086
24355	ANALOG DEVICES INC.	RT 1 INDUSTRIAL PK,P O BOX 280	NORWOOD, MA 02062
24546	CORNING GLASS WORKS, ELECTRONIC COMPONENTS DIVISION	550 HIGH STREET	BRADFORD, PA 16701
27014	NATIONAL SEMICONDUCTOR CORP.	2900 SEMICONDUCTOR DR.	SANTA CLARA, CA 95051
28480	HEWLETT-PACKARD CO., CORPORATE HQ.	1501 PAGE MILL RD.	PALO ALTO, CA 94304
32159	WEST-CAP ARIZONA	2201 E. ELVIRA ROAD	TUCSON, AZ 85706
32997	BOURNS, INC., TRIMPOT PRODUCTS DIV.	1200 COLUMBIA AVE.	RIVERSIDE, CA 92507
33174	LARK ENGINEERING CO., INC.	866 W 16TH STREET	NEWPORT BEACH, CA 92660
34335	ADVANCED MICRO DEVICES	901 THOMPSON PL.	SUNNYVALE, CA 94086
34371	HARRIS SEMICONDUCTOR, DIV. OF HARRIS CORPORATION	P. O. BOX 883	MELBOURNE, FL 32901
34630	TYCO FILTERS DIV., INC.	3940 W. MONTECITO	PHOENIX, AZ 85019
50434	HEWLETT-PACKARD COMPANY	640 PAGE MILL ROAD	PALO ALTO, CA 94304
50579	LITRONIX INC.	19000 HOMESTEAD RD.	CUPERTINO, CA 95014
52769	SPRAGUE GOODMAN ELEC., INC.	134 FULTON AVENUE	GARDEN CITY PARK, NY 11040
54226	INERTIA DYNAMICS INC.	P O BOX 295	COLLINSVILLE, CT 06022
56289	SPRAGUE ELECTRIC CO.	87 MARSHALL ST.	NORTH ADAMS, MA 01247
71034	BLILEY ELECTRIC CO.	2545 W. GRANDVIEW BLVD.	ERIE, PA 16512
71590	CENTRALAB ELECTRONICS, DIV. OF GLOBE-UNION, INC.	P O BOX 858	FORT DODGE, IA 50501
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
73138	BECKMAN INSTRUMENTS, INC., HELIPOT DIV.	2500 HARBOR BLVD.	FULLERTON, CA 92634
73899	JFD ELECTRONICS COMPONENTS CORP.	PINETREE ROAD	OXFORD, NC 27565
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
78277	SIGMA INSTRUMENTS INC.	170 PEARL STREET	SOUTH BRAINTREE, MA 02185
78488	STACKPOLE CARBON CO.		ST. MARYS, PA 15857
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
84411	TRW ELECTRONIC COMPONENTS, TRW CAPACITORS	112 W. FIRST ST.	OGALLALA, NE 69153
90201	MALLORY CAPACITOR CO., DIV. OF P. R. MALLORY AND CO., INC.	3029 E. WASHINGTON STREET P. O. BOX 372	INDIANAPOLIS, IN 46206
91637	DALE ELECTRONICS, INC.	P. O. BOX 609	COLUMBUS, NE 68601
95348	GORDOS CORPORATION	250 GLENWOOD AVENUE	BLOOMFIELD, NJ 07003

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A1	670-6057-00			CKT BOARD ASSY:FRONT PANEL	80009	670-6057-00
A2	119-0462-00			MIXER UNIT,RF:D61 BALANCED	80009	119-0462-00
A3	175-3420-00			CABLE ASSY,RF:50 OHM COAX,W/LIMITER	80009	175-3420-00
A3A1	119-1061-00			LIMITER ASSY:2GHZ	80009	119-1061-00
A5	119-0507-00			HYBRID CKT ASSY:DIR CPLR & ATTEN	80009	119-0507-00
A6	119-0512-00			HYBRID CKT ASSY:TW DIR FLTR & PB FLTR	80009	119-0512-00
A8	119-0513-00			HYBRID CKT ASSY:2.2 GHZ,LP FLTR	80009	119-0513-00
A10	119-1328-00			BAL MIXER ASSY:	80009	119-1328-00
A12	119-1347-00			OSC,RF:2-4 GHZ	80009	119-1347-00
A14	119-0508-00			HYB CKT ASSY:MULTR AND 2.183 GHZ PB FLTR	80009	119-0508-00
A16	119-1308-00			FILTER,LOW PASS:	80009	119-1308-00
A18	670-3109-00			CKT BOARD ASSY:TRIGGER MODE SELECTOR	80009	670-3109-00
A20	119-0511-00			HYB CKT ASSY:2ND LO,DIR CPLR & BND FLTR	80009	119-0511-00
A22	119-1327-00			BAL MIXER ASSY:MIXER FOR 2ND PHASE LOCK	80009	119-1327-00
A24	119-0510-01			HYB CKT ASSY:DIR CPLR AND PH DET W/ERROR	80009	119-0510-01
A26	119-0334-01			IF MODULE ASSY:105 MHZ IF AMPL & 3RD MIXER	80009	119-0334-01
A28	670-3110-00			CKT BOARD ASSY:TRIGGER SOURCE SWITCH	80009	670-3110-00
A30	119-0509-00			HYB CKT ASSY:DIR CPLR AND BS STOP FLTR	80009	119-0509-00
A32	672-0429-01			CKT BOARD ASSY:DISPLAY MODE	80009	672-0429-01
A32A1	670-3112-01			CKT BOARD ASSY:DSPL MODE SWITCH CONNECTOR	80009	670-3112-01
A32A2	670-3113-00			CKT BOARD ASSY:DSPL MODE RESISTOR	80009	670-3113-00
A38	670-7003-00			CKT BOARD ASSY:RESOLUTION	80009	670-7003-00
A40	670-6923-00			CKT BOARD ASSY:FUNCTION IF	80009	670-6923-00
A42	672-0889-00			CKT BOARD ASSY:SWEEP	80009	672-0889-00
A42A1	670-6060-00			CKT BOARD ASSY:SWEEP,SPAN,UNCAL SENSE	80009	670-6060-00
A42A2	670-3114-00			CKT BOARD ASSY:SWP AND VID FLTR RDOUT	80009	670-3114-00
A48	644-0444-00			PHASE LOCK ASSY:	80009	644-0444-00
A48A1	670-3098-00			CKT BOARD ASSY:16-19 MHZ AMPL OSC	80009	670-3098-00
A48A2	670-3099-01			CKT BOARD ASSY:16-19 MHZ REF OSC	80009	670-3099-01
A48A3	670-3100-03			CKT BOARD ASSY:PHASE DETECTOR	80009	670-3100-03
A48A4	670-3102-01			CKT BOARD ASSY:99.2045 MHZ CRYSTAL OSC	80009	670-3102-01
A48A5	670-3103-01			CKT BOARD ASSY:SUM AMPL AND 2ND LO ERROR	80009	670-3103-01
A48A6	670-3108-01			CKT BOARD ASSY:SAMPLING GEN AND DRIVER	80009	670-3108-01
A48A7	670-3105-03			CKT BOARD ASSY:MOTHER	80009	670-3105-03
A48A8	670-3289-01			CKT BOARD ASSY:+5V REGULATED POWER SUPPLY	80009	670-3289-01
A66	670-3101-00			CKT BOARD ASSY:DVM,LOGIC AND RDOUT	80009	670-3101-00
A68	670-3116-01			CKT BOARD ASSY:DVM ANALOG	80009	670-3116-01
A70	119-1307-00			FREQ TUN ASSY:	80009	119-1307-00
A72	670-6055-00			CKT BOARD ASSY:TUNE CONTROL	80009	670-6055-00
A74	670-6935-00			CKT BOARD ASSY:CENTER INTERFACE	80009	670-6935-00
A76	670-6823-00			CKT BOARD ASSY:LEFT INTERFACE	80009	670-6823-00
A78	670-6061-00			CKT BOARD ASSY:YIG DRIVER	80009	670-6061-00
A80	670-4936-00			CKT BOARD ASSY:REF LEVEL READOUT	80009	670-4936-00
A82	670-4937-01			CKT BOARD ASSY:CRT READOUT	80009	670-4937-01
A84	670-4938-01			CKT BOARD ASSY:REF LEVEL CONTROL	80009	670-4938-01
A86	119-0479-00			ATTENUATOR,FXD:3DB,DC,6GHZ,50HM	18203	OBD
A88	670-6054-00			CKT BOARD ASSY:DIGITAL STORAGE,VERT INTFC	80009	670-6054-00
A90	670-6560-00			CKT BOARD ASSY:DIGITAL STORAGE HORIZ INTFC	80009	670-6560-00
A92	670-6561-00			CKT BOARD ASSY:DIGITAL STORAGE MONITOR	80009	670-6561-00
A96	----- -----			CKT BOARD ASSY:1ST LO INTERFACE		
	----- -----			(REPLACEABLE AS A UNIT WITH A12)		

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A1	----- -----			CKT BOARD ASSY:FRONT PANEL		
A1C3025	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A1C3026	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A1C3055	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A1C3056	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A1C4033	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A1C4052	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A1CR1029	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A1CR2016	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A1CR3015	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A1CR3016	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A1CR3030	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A1CR4036	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A1CR4039	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A1DS1035	150-1068-00			LT EMITTING DIO:RED	50434	HLMP-6320
A1DS1045	150-1068-00			LT EMITTING DIO:RED	50434	HLMP-6320
A1DS2035	150-1068-00			LT EMITTING DIO:RED	50434	HLMP-6320
A1DS2045	150-1068-00			LT EMITTING DIO:RED	50434	HLMP-6320
A1DS3035	150-1068-00			LT EMITTING DIO:RED	50434	HLMP-6320
A1DS3045	150-1068-00			LT EMITTING DIO:RED	50434	HLMP-6320
A1DS3047	263-0019-09			SWITCH PB ASSY:MOMENTARY	80009	263-0019-09
A1R2024	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
A1R2055	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
A1R2056	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
A1R3024	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
A1R4019	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
A1R4021	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
A1R4022	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
A1R4041	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
A1R4043	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
A1R4045	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
A1R4047	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
A1R4052	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
A1S1035	263-0019-09			SWITCH PB ASSY:MOMENTARY	80009	263-0019-09
A1S1047	263-0019-09			SWITCH PB ASSY:MOMENTARY	80009	263-0019-09
A1S2028	260-0960-01			SWITCH,SLIDE:0.5A,120VDC,CKT BD MT	10389	23-021-043
A1S2035	263-0019-09			SWITCH PB ASSY:MOMENTARY	80009	263-0019-09
A1S2047	263-0019-09			SWITCH PB ASSY:MOMENTARY	80009	263-0019-09
A1S3035	263-0019-09			SWITCH PB ASSY:MOMENTARY	80009	263-0019-09

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A18	----- -----			CKT BOARD ASSY:TRIGGER MODE SELECTOR		
A18C1152	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
A18DS1152	150-0048-01			LAMP,INCAND:5V,0.06A,SEL	08806	683AS15
A18DS1156	150-0048-01			LAMP,INCAND:5V,0.06A,SEL	08806	683AS15
A18Q1150	151-0301-00			TRANSISTOR:SILICON,PNP	27014	2N2907A
A18R1150	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
A18R1154	315-0911-00			RES.,FXD,CMPSN:910 OHM,5%,0.25W	01121	CB9115
A18S102	----- -----			(REPLACEABLE AS A UNIT WITH A18)		
A28	----- -----			CKT BOARD ASSY:TRIGGER SOURCE SWITCH		
A28DS101	150-0048-01			LAMP,INCAND:5V,0.06A,SEL	08806	683AS15
A28R110	321-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.125W	91637	MFF1816G49R90F
A28R111	321-0335-00			RES.,FXD,FILM:30.1K OHM,1%,0.125W	91637	MFF1816G30101F
A28R112	321-0199-00			RES.,FXD,FILM:1.15K OHM,1%,0.125W	91637	MFF1816G11500F
A28S101	----- -----			(REPLACEABLE AS A UNIT WITH A28)		

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A32	----- -----			CKT BOARD ASSY:DISPLAY MODE		
A32S130	260-1360-00			SWITCH,PUSH:1-10PDT,1-6PDT,1-6PDT	80009	260-1360-00
A32A1	----- -----			CKT BOARD ASSY:DSPL MODE SWITCH CONNECTOR		
A32A1R160	321-0373-00			RES.,FXD,FILM:75K OHM, 1%,0.125W	91637	MFF1816G7500
A32A1R162	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A32A1R163	321-0327-00			RES.,FXD,FILM:24.9K OHM,1%,0.125W	91637	MFF1816G24901F
A32A1R164	321-0321-00			RES.,FXD,FILM:21.5K OHM,1%,0.125W	91637	MFF1816G21501F
A32A1R165	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A32A1R166	321-0373-00			RES.,FXD,FILM:75K OHM, 1%,0.125W	91637	MFF1816G75001F
A32A1R167	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	91637	MFF1816G37401F
A32A1R168	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	91637	MFF1816G37401F
A32A1R169	321-0356-00			RES.,FXD,FILM:49.9K OHM,1%,0.125W	91637	MFF1816G49901F
A32A1R170	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A32A2	----- -----			CKT BOARD ASSY:DSPL MODE RESISTOR		
A32A2R130	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A32A2R131	321-0373-00			RES.,FXD,FILM:75K OHM, 1%,0.125W	91637	MFF1816G75001F
A32A2R132	321-0356-00			RES.,FXD,FILM:49.9K OHM,1%,0.125W	91637	MFF1816G49901F
A32A2R133	321-0356-00			RES.,FXD,FILM:49.9K OHM,1%,0.125W	91637	MFF1816G49901F
A32A2R134	321-0335-00			RES.,FXD,FILM:30.1K OHM,1%,0.125W	91637	MFF1816G30101F
A32A2R135	321-0327-00			RES.,FXD,FILM:24.9K OHM,1%,0.125W	91637	MFF1816G24901F
A32A2R136	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	91637	MFF1816G37401F
A32A2R137	321-0327-00			RES.,FXD,FILM:24.9K OHM,1%,0.125W	91637	MFF1816G24901F
A32A2R138	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	91637	MFF1816G37401F
A32A2R139	321-0356-00			RES.,FXD,FILM:49.9K OHM,1%,0.125W	91637	MFF1816G49901F
A32A2R140	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A32A2R141	321-0321-00			RES.,FXD,FILM:21.5K OHM,1%,0.125W	91637	MFF1816G21501F
A32A2R142	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	91637	MFF1816G37401F
A32A2R143	321-0321-00			RES.,FXD,FILM:21.5K OHM,1%,0.125W	91637	MFF1816G21501F
A32A2R144	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	91637	MFF1816G37401F
A32A2R145	321-0373-00			RES.,FXD,FILM:75K OHM, 1%,0.125W	91637	MFF1816G75001F
A32A2R146	321-0335-00			RES.,FXD,FILM:30.1K OHM,1%,0.125W	91637	MFF1816G30101F
A32A2R147	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	91637	MFF1816G37401F
A32A2R148	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A32A2R149	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	91637	MFF1816G37401F
A32A2R150	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A38	----- -----			CKT BOARD ASSY:RESOLUTION		
A38C201	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
A38C204	283-0642-00			CAP.,FXD,MICA D:33PF,+/-0.5PF,300V	00853	D10-5E330G
A38C207	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
A38C211	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
A38C212	281-0616-00			CAP.,FXD,CER DI:6.8PF,+/-0.5PF,200V	72982	374001C0H0689D
A38C230	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A38C231	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A38C232	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A38C241	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C242	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C244	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A38C248	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A38C250	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A38C253	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A38C258	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C260	281-0562-00			CAP.,FXD,CER DI:39PF,10%,500V	72982	301-000U2J0390K
A38C261	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A38C267	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C270	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C272	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A38C280	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C281	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C283	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A38C288	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C290	281-0562-00			CAP.,FXD,CER DI:39PF,10%,500V	72982	301-000U2J0390K
A38C292	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C294	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C296	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C300	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A38C320	283-0600-00			CAP.,FXD,MICA D:43PF,5%,500V	00853	D105E430J0
A38C321	283-0649-00			CAP.,FXD,MICA D:105PF,1%,300V	00853	D153F1050F0
A38C322	281-0092-00			CAP.,VAR,CER DI:9-35PF,200V	72982	538-011 D9-35
A38C323	281-0615-00			CAP.,FXD,CER DI:3.9PF,+/-0.5PF,200V	72982	374001C0J0399D
A38C324	283-0644-00			CAP.,FXD,MICA D:150PF,1%,500V	00853	D155E151F0
A38C325	281-0092-00			CAP.,VAR,CER DI:9-35PF,200V	72982	538-011 D9-35
A38C326	281-0615-00			CAP.,FXD,CER DI:3.9PF,+/-0.5PF,200V	72982	374001C0J0399D
A38C327	283-0618-00			CAP.,FXD,MICA D:130PF,2%,400V	00853	D155E131G0
A38C328	281-0092-00			CAP.,VAR,CER DI:9-35PF,200V	72982	538-011 D9-35
A38C329	281-0645-00			CAP.,FXD,CER DI:8.2PF,+/-0.25PF,500V	72982	374018C0H0829C
A38C333	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A38C338	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C340	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A38C344	283-0618-00			CAP.,FXD,MICA D:130PF,2%,400V	00853	D155E131G0
A38C345	281-0167-00			CAP.,VAR,CER DI:9-45PF,200V	72982	538-011-D 9-45
A38C353	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A38C354	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A38C383	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A38C385	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C388	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C390	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A38C391	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A38C392	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A38C415	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C421	281-0158-00			CAP.,VAR,CER D1:7-45PF,50V	73899	DVJ-5006
A38C422	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C424	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C428	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A38C430	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C432	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C438	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C440	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C442	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C444	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C445	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C448	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C450	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C452	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C455	283-0665-00			CAP.,FXD,MICA D:190PF,1%,100V	00853	D151F19F0
A38C456	281-0123-00			CAP.,VAR,CER DI:5-25PF,100V	72982	518-000A5-25
A38C457	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C458	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C462	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C468	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C470	281-0613-00			CAP.,FXD,CER DI:10PF,+/-1PF,200V	72982	374001C0G100F
A38C471	283-0644-00			CAP.,FXD,MICA D:150PF,1%,500V	00853	D155E151F0
A38C472	281-0092-00			CAP.,VAR,CER DI:9-35PF,200V	72982	538-011 D9-35
A38C473	281-0593-00			CAP.,FXD,CER DI:3.9PF,10%,500V	72982	301-000C0J0399C
A38C474	283-0618-00			CAP.,FXD,MICA D:130PF,2%,400V	00853	D155E131G0
A38C475	281-0092-00			CAP.,VAR,CER DI:9-35PF,200V	72982	538-011 D9-35
A38C476	283-0642-00			CAP.,FXD,MICA D:33PF,+/-0.5PF,300V	00853	D10-5E330G
A38C477	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38C479	283-0003-00			CAP.,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-558Z5U-103Z
A38CR242	152-0524-00			SEMICOND DEVICE:SILICON,100V,100MA	80009	152-0524-00
A38CR280	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A38CR355	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A38CR356	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A38CR357	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A38CR415	152-0524-00			SEMICOND DEVICE:SILICON,100V,100MA	80009	152-0524-00
A38CR444	152-0524-00			SEMICOND DEVICE:SILICON,100V,100MA	80009	152-0524-00
A38CR457	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A38CR478	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A38E382	276-0528-00			SHIELDING BEAD,:0.1UH	02114	56-0590-65C/3B
A38FL360	119-0276-01			FILTER,BANDPASS:30KHZ	34630	10.0-30-6
A38FL370	119-0278-01			FILTER,BANDPASS:3KHZ	34630	10.0-3.0
A38FL380	119-0275-00			FILTER,BANDPASS:CRYSTAL,10 MHZ	80009	119-0275-00
A38K281	148-0107-04			RELAY,ARMATURE:W/8 PIN HEADER	80009	148-0107-04
A38K300	148-0107-03			RELAY,ARMATURE:W/5 PIN HEADER	80009	148-0107-03
A38K353	148-0107-03			RELAY,ARMATURE:W/5 PIN HEADER	80009	148-0107-03
A38K354	148-0107-04			RELAY,ARMATURE:W/8 PIN HEADER	80009	148-0107-04
A38K355	148-0107-04			RELAY,ARMATURE:W/8 PIN HEADER	80009	148-0107-04
A38K356	148-0107-03			RELAY,ARMATURE:W/5 PIN HEADER	80009	148-0107-03
A38K357	148-0107-04			RELAY,ARMATURE:W/8 PIN HEADER	80009	148-0107-04
A38L202	108-0315-00			COIL,RF:0.22UH	32159	72203M
A38L204	108-0062-00			COIL,RF:0.45UH	80009	108-0062-00
A38L230	108-0395-00			COIL,RF:64UH	80009	108-0395-00
A38L231	108-0395-00			COIL,RF:64UH	80009	108-0395-00
A38L232	108-0395-00			COIL,RF:64UH	80009	108-0395-00
A38L254	108-0406-00			COIL,RF:80UH,TOROIDAL	80009	108-0406-00
A38L284	108-0406-00			COIL,RF:80UH,TOROIDAL	80009	108-0406-00
A38L292	108-0406-00			COIL,RF:80UH,TOROIDAL	80009	108-0406-00
A38L321	108-0701-00			COIL,RF:1.3UH	80009	108-0701-00
A38L324	108-0701-00			COIL,RF:1.3UH	80009	108-0701-00
A38L327	108-0701-00			COIL,RF:1.3UH	80009	108-0701-00
A38L390	108-0395-00			COIL,RF:64UH	80009	108-0395-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A38L391	108-0395-00			COIL,RF:64UH	80009	108-0395-00
A38L392	108-0395-00			COIL,RF:64UH	80009	108-0395-00
A38L455	108-0095-00			COIL,RF:1.4UH	80009	108-0095-00
A38L471	108-0701-00			COIL,RF:1.3UH	80009	108-0701-00
A38L474	108-0701-00			COIL,RF:1.3UH	80009	108-0701-00
A38Q204	151-0442-00			TRANSISTOR:SILICON,NPN	80009	151-0442-00
A38Q211	151-0442-00			TRANSISTOR:SILICON,NPN	80009	151-0442-00
A38Q240	151-0442-00			TRANSISTOR:SILICON,NPN	80009	151-0442-00
A38Q250	151-0442-00			TRANSISTOR:SILICON,NPN	80009	151-0442-00
A38Q260	151-0442-00			TRANSISTOR:SILICON,NPN	80009	151-0442-00
A38Q270	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
A38Q280	151-0442-00			TRANSISTOR:SILICON,NPN	80009	151-0442-00
A38Q290	151-0442-00			TRANSISTOR:SILICON,NPN	80009	151-0442-00
A38Q330	151-0442-00			TRANSISTOR:SILICON,NPN	80009	151-0442-00
A38Q380	151-0441-00			TRANSISTOR:SILICON,NPN	04713	SRF501
A38Q420	151-0221-00			TRANSISTOR:SILICON,PNP	04713	SPS246
A38Q430	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
A38Q440	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
A38Q450	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
A38Q460	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
A38R201	315-0242-00			RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	01121	CB2425
A38R202	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
A38R205	315-0272-00			RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	01121	CB2725
A38R207	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A38R210	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
A38R211	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A38R214	315-0181-00			RES.,FXD,CMPSN:180 OHM,5%,0.25W	01121	CB1815
A38R215	315-0622-00			RES.,FXD,CMPSN:6.2K OHM,5%,0.25W	01121	CB6225
A38R240	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
A38R241	315-0620-00			RES.,FXD,CMPSN:62 OHM,5%,0.25W	01121	CB6205
A38R242	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A38R244	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
A38R245	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A38R247	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A38R248	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
A38R250	321-0277-00			RES.,FXD,FILM:7.5K OHM,1%,0.125W	91637	MFF1816G75000F
A38R251	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
A38R253	315-0430-00			RES.,FXD,CMPSN:43 OHM,5%,0.25W	01121	CB4305
A38R254	321-0143-00			RES.,FXD,FILM:301 OHM,1%,0.125W	91637	MFF1816G301R0F
A38R255	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A38R257	321-0202-00			RES.,FXD,FILM:1.24K OHM,1%,0.125W	91637	MFF1816G12400F
A38R258	321-0158-00			RES.,FXD,FILM:432 OHM,1%,0.125W	91637	MFF1816G432R0F
A38R260	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
A38R261	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
A38R264	321-0072-00			RES.,FXD,FILM:54.9 OHM,1%,0.125W	91637	MFF1816G54R90F
A38R265	311-0622-00			RES.,VAR,NONWIR:100 OHM,10%,0.50W	32997	3329H-G48-101
A38R266	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A38R267	315-0203-00			RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
A38R268	315-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
A38R270	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A38R272	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A38R275	315-0390-00			RES.,FXD,CMPSN:39 OHM,5%,0.25W	01121	CB3905
A38R280	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
A38R281	321-0277-00			RES.,FXD,FILM:7.5K OHM,1%,0.125W	91637	MFF1816G75000F
A38R282	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
A38R283	315-0430-00			RES.,FXD,CMPSN:43 OHM,5%,0.25W	01121	CB4305
A38R284	321-0143-00			RES.,FXD,FILM:301 OHM,1%,0.125W	91637	MFF1816G301R0F

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A38R285	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A38R287	321-0202-00			RES.,FXD,FILM:1.24K OHM,1%,0.125W	91637	MFF1816G12400F
A38R288	321-0158-00			RES.,FXD,FILM:432 OHM,1%,0.125W	91637	MFF1816G432R0F
A38R290	315-0431-00			RES.,FXD,CMPSN:430 OHM,5%,0.25W	01121	CB4315
A38R291	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
A38R292	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
A38R293	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
A38R294	321-0072-00			RES.,FXD,FILM:54.9 OHM,1%,0.125W	91637	MFF1816G54R90F
A38R295	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A38R296	315-0680-00			RES.,FXD,CMPSN:68 OHM,5%,0.25W	01121	CB6805
A38R297	311-0605-00			RES.,VAR,NONWIR:TRMR,200 OHM,0.5W	73138	82-23-2
A38R298	315-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
A38R300	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
A38R306	321-0092-00			RES.,FXD,FILM:88.7 OHM,1%,0.125W	91637	MFF1816G88R70F
A38R307	311-0622-00			RES.,VAR,NONWIR:100 OHM,10%,0.50W	32997	3329H-G48-101
A38R308	315-0121-00			RES.,FXD,CMPSN:120 OHM,5%,0.25W	01121	CB1215
A38R330	321-0165-00			RES.,FXD,FILM:511 OHM,1%,0.125W	91637	MFF1816G511R0F
A38R331	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A38R333	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A38R334	321-0172-00			RES.,FXD,FILM:604 OHM,1%,0.125W	91637	MFF1816G604R0F
A38R337	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
A38R338	315-0911-00			RES.,FXD,CMPSN:910 OHM,5%,0.25W	01121	CB9115
A38R353	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
A38R354	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
A38R366	321-0092-00			RES.,FXD,FILM:88.7 OHM,1%,0.125W	91637	MFF1816G88R70F
A38R367	311-0622-00			RES.,VAR,NONWIR:100 OHM,10%,0.50W	32997	3329H-G48-101
A38R368	315-0121-00			RES.,FXD,CMPSN:120 OHM,5%,0.25W	01121	CB1215
A38R376	321-0092-00			RES.,FXD,FILM:88.7 OHM,1%,0.125W	91637	MFF1816G88R70F
A38R377	311-0622-00			RES.,VAR,NONWIR:100 OHM,10%,0.50W	32997	3329H-G48-101
A38R378	315-0121-00			RES.,FXD,CMPSN:120 OHM,5%,0.25W	01121	CB1215
A38R380	321-0075-00			RES.,FXD,FILM:59 OHM,1%,0.125W	91637	MFF1816G59R00F
A38R383	315-0112-00			RES.,FXD,CMPSN:1.1K OHM,5%,0.25W	01121	CB1125
A38R384	321-0136-00			RES.,FXD,FILM:255 OHM,1%,0.125W	91637	MFF1816G255R0F
A38R385	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A38R386	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
A38R387	311-0605-00			RES.,VAR,NONWIR:TRMR,200 OHM,0.5W	73138	82-23-2
A38R388	315-0242-00			RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	01121	CB2425
A38R415	321-0365-00			RES.,FXD,FILM:61.9K OHM,1%,0.125W	91637	MFF1816G61901F
A38R422	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A38R423	315-0151-00			RES.,FXD,CMPSN:150 OHM,5%,0.25W	01121	CB1515
A38R424	315-0750-00			RES.,FXD,CMPSN:75 OHM,5%,0.25W	01121	CB7505
A38R425	311-0605-00			RES.,VAR,NONWIR:TRMR,200 OHM,0.5W	73138	82-23-2
A38R427	315-0621-00			RES.,FXD,CMPSN:620 OHM,5%,0.25W	01121	CB6215
A38R428	315-0821-00			RES.,FXD,CMPSN:820 OHM,5%,0.25W	01121	CB8215
A38R430	315-0133-00			RES.,FXD,CMPSN:13K OHM,5%,0.25W	01121	CB1335
A38R432	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A38R433	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A38R437	315-0241-00			RES.,FXD,CMPSN:240 OHM,5%,0.25W	01121	CB2415
A38R438	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A38R440	315-0133-00			RES.,FXD,CMPSN:13K OHM,5%,0.25W	01121	CB1335
A38R442	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A38R443	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A38R445	315-0242-00			RES.,FXD,CMPSN:2.4K OHM,5%,0.25W	01121	CB2425
A38R447	315-0621-00			RES.,FXD,CMPSN:620 OHM,5%,0.25W	01121	CB6215
A38R448	315-0821-00			RES.,FXD,CMPSN:820 OHM,5%,0.25W	01121	CB8215
A38R450	315-0133-00			RES.,FXD,CMPSN:13K OHM,5%,0.25W	01121	CB1335
A38R451	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A38R452	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A38R453	315-0121-00			RES.,FXD,CMPSN:120 OHM,5%,0.25W	01121	CB1215
A38R455	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A38R456	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
A38R457	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A38R458	315-0821-00			RES.,FXD,CMPSN:820 OHM,5%,0.25W	01121	CB8215
A38R460	315-0133-00			RES.,FXD,CMPSN:13K OHM,5%,0.25W	01121	CB1335
A38R461	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A38R462	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A38R463	315-0121-00			RES.,FXD,CMPSN:120 OHM,5%,0.25W	01121	CB1215
A38R467	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A38R468	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A38R477	315-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
A38R478	315-0621-00			RES.,FXD,CMPSN:620 OHM,5%,0.25W	01121	CB6215
A38R479	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A38T211	120-0779-00			XFMR,TOROID:(2) 4 TURN WINDINGS	80009	120-0779-00
A38T240	120-0774-00			XFMR,TOROID:2 WINDINGS	80009	120-0774-00
A38T245	120-0774-00			XFMR,TOROID:2 WINDINGS	80009	120-0774-00
A38T264	120-0774-00			XFMR,TOROID:2 WINDINGS	80009	120-0774-00
A38T280	120-0772-00			XFMR,TOROID:2 WINDINGS	80009	120-0772-00
A38T294	120-0774-00			XFMR,TOROID:2 WINDINGS	80009	120-0774-00
A38T320	120-1283-00			TRANSFORMER,RF:TOROID,2 WINDINGS	80009	120-1283-00
A38T380	120-0773-00			XFMR,TOROID:2 WINDINGS	80009	120-0773-00
A38T420	120-1282-00			TRANSFORMER,RF:TOROID,2 WINDINGS	80009	120-1282-00
A38T457	120-0774-00			XFMR,TOROID:2 WINDINGS	80009	120-0774-00
A38Y204	158-0109-00			XTAL UNIT,QTZ:95 MHZ,0.0005%	71034	BK3118-1

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A40	----- -----			CKT BOARD ASSY:FUNCTION IF		
A40C500	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A40C501	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A40C502	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A40C511	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208Z5U0102Z
A40C514	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208Z5U0102Z
A40C517	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208Z5U0102Z
A40C521	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208Z5U0102Z
A40C523	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208Z5U0102Z
A40C524	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208Z5U0102Z
A40C527	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A40C531	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208Z5U0102Z
A40C534	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A40C538	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208Z5U0102Z
A40C546	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A40C547	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A40C551	283-0167-00			CAP.,FXD,CER DI:0.1UF,10%,100V	72982	8131N145X5R0104K
A40C554	281-0523-00			CAP.,FXD,CER DI:100PF,+/-20PF,500V	72982	301-000U2M0101M
A40C560	281-0504-00			CAP.,FXD,CER DI:10PF,+/-1PF,500V	72982	301-055C0G0100F
A40C562	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A40C566	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A40C567	283-0167-00			CAP.,FXD,CER DI:0.1UF,10%,100V	72982	8131N145X5R0104K
A40C571	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A40C572	283-0167-00			CAP.,FXD,CER DI:0.1UF,10%,100V	72982	8131N145X5R0104K
A40C574	281-0620-00			CAP.,FXD,CER DI:21PF,1%,500V	72982	301-000C0G0210F
A40C581	283-0167-00			CAP.,FXD,CER DI:0.1UF,10%,100V	72982	8131N145X5R0104K
A40C584	281-0523-00			CAP.,FXD,CER DI:100PF,+/-20PF,500V	72982	301-000U2M0101M
A40C596	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A40C597	283-0167-00			CAP.,FXD,CER DI:0.1UF,10%,100V	72982	8131N145X5R0104K
A40C601	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A40C602	283-0167-00			CAP.,FXD,CER DI:0.1UF,10%,100V	72982	8131N145X5R0104K
A40C604	281-0620-00			CAP.,FXD,CER DI:21PF,1%,500V	72982	301-000C0G0210F
A40C611	283-0167-00			CAP.,FXD,CER DI:0.1UF,10%,100V	72982	8131N145X5R0104K
A40C614	281-0523-00			CAP.,FXD,CER DI:100PF,+/-20PF,500V	72982	301-000U2M0101M
A40C626	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A40C627	283-0167-00			CAP.,FXD,CER DI:0.1UF,10%,100V	72982	8131N145X5R0104K
A40C631	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A40C632	283-0167-00			CAP.,FXD,CER DI:0.1UF,10%,100V	72982	8131N145X5R0104K
A40C634	281-0620-00			CAP.,FXD,CER DI:21PF,1%,500V	72982	301-000C0G0210F
A40C641	283-0167-00			CAP.,FXD,CER DI:0.1UF,10%,100V	72982	8131N145X5R0104K
A40C644	281-0523-00			CAP.,FXD,CER DI:100PF,+/-20PF,500V	72982	301-000U2M0101M
A40C656	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A40C657	283-0167-00			CAP.,FXD,CER DI:0.1UF,10%,100V	72982	8131N145X5R0104K
A40C661	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A40C662	283-0167-00			CAP.,FXD,CER DI:0.1UF,10%,100V	72982	8131N145X5R0104K
A40C664	281-0620-00			CAP.,FXD,CER DI:21PF,1%,500V	72982	301-000C0G0210F
A40C671	283-0167-00			CAP.,FXD,CER DI:0.1UF,10%,100V	72982	8131N145X5R0104K
A40C674	281-0523-00			CAP.,FXD,CER DI:100PF,+/-20PF,500V	72982	301-000U2M0101M
A40C686	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A40C687	283-0167-00			CAP.,FXD,CER DI:0.1UF,10%,100V	72982	8131N145X5R0104K
A40C697	281-0576-00			CAP.,FXD,CER DI:11PF,5%,500V	72982	301-000C0G0110J
A40C701	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A40C704	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A40C711	283-0167-00			CAP.,FXD,CER DI:0.1UF,10%,100V	72982	8131N145X5R0104K
A40C714	281-0580-00			CAP.,FXD,CER DI:470PF,10%,500V	04222	7001-1374
A40C725	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A40C726	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A40C727	283-0167-00			CAP.,FXD,CER DI:0.1UF,10%,100V	72982	8131N145X5R0104K

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A40C731	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A40C732	283-0167-00			CAP.,FXD,CER DI:0.1UF,10%,100V	72982	8131N145X5R0104K
A40C734	281-0577-00			CAP.,FXD,CER DI:14PF,5%,500V	72982	301-050C0G0140J
A40C737	281-0576-00			CAP.,FXD,CER DI:11PF,5%,500V	72982	301-000C0G0110J
A40C741	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A40C744	281-0629-00			CAP.,FXD,CER DI:33PF,5%,600V	72982	308-000C0G0330J
A40C748	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A40C751	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A40C757	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A40C766	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
A40C767	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A40C776	283-0167-00			CAP.,FXD,CER DI:0.1UF,10%,100V	72982	8131N145X5R0104K
A40C811	281-0550-00			CAP.,FXD,CER DI:120PF,10%,500V	04222	7001-1373
A40C813	281-0504-00			CAP.,FXD,CER DI:10PF,+/-1PF,500V	72982	301-055C0G0100F
A40C814	283-0641-00			CAP.,FXD,MICA D:180PF,1%,100V	00853	D151E181F0
A40C816	283-0639-00			CAP.,FXD,MICA D:56PF,1%,100V	00853	D151E560F0
A40C817	283-0599-00			CAP.,FXD,MICA D:98PF,5%,500V	00853	D105E980J0
A40C820	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A40C823	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A40C826	281-0504-00			CAP.,FXD,CER DI:10PF,+/-1PF,500V	72982	301-055C0G0100F
A40C830	285-0808-00			CAP.,FXD,PLSTC:0.1UF,10%,50V	56289	LP66A1A104K004
A40C832	290-0573-00			CAP.,FXD,ELCTLT:2.7UF,20%,50V	56289	196D275X0050JA1
A40C840	285-0659-00			CAP.,FXD,PLSTC:0.001UF,10%,100V	84411	TEK24-10291
A40C852	283-0159-00			CAP.,FXD,CER DI:18PF,5%,50V	72982	8111B065C0G0180J
A40C857	281-0523-00			CAP.,FXD,CER DI:100PF,+/-20PF,500V	72982	301-000U2M0101M
A40C890	281-0509-00			CAP.,FXD,CER DI:15PF,+/-1.5PF,500V	72982	301-000C0G0150K
A40C893	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A40C898	281-0518-00			CAP.,FXD,CER DI:47PF,+/-9.4PF,500V	72982	301-000U2J0470M
A40C950	283-0598-00			CAP.,FXD,MICA D:253PF,5%,300V	09023	CD15EC(253)J03
A40C951	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A40C952	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
A40C953	283-0005-00			CAP.,FXD,CER DI:0.01UF,+100-0%,250V	72982	8131N300Z5U0103P
A40C954	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
A40C962	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
A40CR511	152-0457-00			SEMICOND DEVICE:SILICON,25V	28480	5082-2068
A40CR512	152-0457-00			SEMICOND DEVICE:SILICON,25V	28480	5082-2068
A40CR514	152-0457-00			SEMICOND DEVICE:SILICON,25V	28480	5082-2068
A40CR515	152-0457-00			SEMICOND DEVICE:SILICON,25V	28480	5082-2068
A40CR517	152-0457-00			SEMICOND DEVICE:SILICON,25V	28480	5082-2068
A40CR518	152-0457-00			SEMICOND DEVICE:SILICON,25V	28480	5082-2068
A40CR521	152-0457-00			SEMICOND DEVICE:SILICON,25V	28480	5082-2068
A40CR522	152-0457-00			SEMICOND DEVICE:SILICON,25V	28480	5082-2068
A40CR524	152-0457-00			SEMICOND DEVICE:SILICON,25V	28480	5082-2068
A40CR525	152-0457-00			SEMICOND DEVICE:SILICON,25V	28480	5082-2068
A40CR527	152-0457-00			SEMICOND DEVICE:SILICON,25V	28480	5082-2068
A40CR528	152-0457-00			SEMICOND DEVICE:SILICON,25V	28480	5082-2068
A40CR531	152-0457-00			SEMICOND DEVICE:SILICON,25V	28480	5082-2068
A40CR532	152-0457-00			SEMICOND DEVICE:SILICON,25V	28480	5082-2068
A40CR534	152-0457-00			SEMICOND DEVICE:SILICON,25V	28480	5082-2068
A40CR535	152-0457-00			SEMICOND DEVICE:SILICON,25V	28480	5082-2068
A40CR540	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A40CR546	152-0457-00			SEMICOND DEVICE:SILICON,25V	28480	5082-2068
A40CR547	152-0457-00			SEMICOND DEVICE:SILICON,25V	28480	5082-2068
A40CR701	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A40CR771	152-0322-00			SEMICOND DEVICE:SILICON,15V,HOT CARRIER	50434	5082-2672
A40CR772	152-0322-00			SEMICOND DEVICE:SILICON,15V,HOT CARRIER	50434	5082-2672
A40CR801	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A40CR802	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A40CR825	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A40CR852	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A40CR854	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A40CR855	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A40CR887	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A40CR888	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A40CR898	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A40L533	108-0240-00			COIL,RF:FIXED,820UH	76493	B5147
A40L548	108-0443-00			COIL,RF:25UH	80009	108-0443-00
A40L813	108-0702-00			COIL,RF:36UH	80009	108-0702-00
A40L816	108-0443-00			COIL,RF:25UH	80009	108-0443-00
A40L950	108-0538-00			COIL,RF:2.7UH	76493	70F276A1
A40L951	108-0666-00			COIL,RF:900NH	80009	108-0666-00
A40L954	276-0507-00			SHIELDING BEAD,:FERRITE	78488	57-3443
A40L958	276-0507-00			SHIELDING BEAD,:FERRITE	78488	57-3443
A40Q540	151-0195-00			TRANSISTOR:SILICON,NPN	80009	151-0195-00
A40Q550	151-0441-00			TRANSISTOR:SILICON,NPN	04713	SRF501
A40Q560	151-0441-00			TRANSISTOR:SILICON,NPN	04713	SRF501
A40Q570	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
A40Q580	151-0441-00			TRANSISTOR:SILICON,NPN	04713	SRF501
A40Q590	151-0441-00			TRANSISTOR:SILICON,NPN	04713	SRF501
A40Q600	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
A40Q610	151-0441-00			TRANSISTOR:SILICON,NPN	04713	SRF501
A40Q620	151-0441-00			TRANSISTOR:SILICON,NPN	04713	SRF501
A40Q630	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
A40Q640	151-0441-00			TRANSISTOR:SILICON,NPN	04713	SRF501
A40Q650	151-0441-00			TRANSISTOR:SILICON,NPN	04713	SRF501
A40Q660	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
A40Q670	151-0441-00			TRANSISTOR:SILICON,NPN	04713	SRF501
A40Q680	151-0441-00			TRANSISTOR:SILICON,NPN	04713	SRF501
A40Q700	151-0441-00			TRANSISTOR:SILICON,NPN	04713	SRF501
A40Q710	151-0441-00			TRANSISTOR:SILICON,NPN	04713	SRF501
A40Q720	151-0441-00			TRANSISTOR:SILICON,NPN	04713	SRF501
A40Q730	151-0220-00			TRANSISTOR:SILICON,PNP	07263	S036228
A40Q740	151-0195-00			TRANSISTOR:SILICON,NPN	80009	151-0195-00
A40Q750	151-0221-00			TRANSISTOR:SILICON,PNP	04713	SPS246
A40Q760	151-0221-00			TRANSISTOR:SILICON,PNP	04713	SPS246
A40Q887	151-0195-00			TRANSISTOR:SILICON,NPN	80009	151-0195-00
A40Q890	151-0195-00			TRANSISTOR:SILICON,NPN	80009	151-0195-00
A40Q898	151-0441-00			TRANSISTOR:SILICON,NPN	04713	SRF501
A40Q950	151-0441-00			TRANSISTOR:SILICON,NPN	04713	SRF501
A40Q960	151-0441-00			TRANSISTOR:SILICON,NPN	04713	SRF501
A40R506	321-0337-00			RES.,FXD,FILM:31.6K OHM,1%,0.125W	91637	MFF1816G31601F
A40R511	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
A40R512	321-0315-00			RES.,FXD,FILM:18.7K OHM,1%,0.125W	91637	MFF1816G18701F
A40R514	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
A40R515	321-0315-00			RES.,FXD,FILM:18.7K OHM,1%,0.125W	91637	MFF1816G18701F
A40R517	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
A40R518	321-0315-00			RES.,FXD,FILM:18.7K OHM,1%,0.125W	91637	MFF1816G18701F
A40R521	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
A40R522	321-0315-00			RES.,FXD,FILM:18.7K OHM,1%,0.125W	91637	MFF1816G18701F
A40R524	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
A40R525	321-0315-00			RES.,FXD,FILM:18.7K OHM,1%,0.125W	91637	MFF1816G18701F
A40R527	321-0205-00			RES.,FXD,FILM:1.33K OHM,1%,0.125W	91637	MFF1816G13300F
A40R528	321-0261-00			RES.,FXD,FILM:5.11K OHM,1%,0.125W	91637	MFF1816G51100F
A40R531	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A40R532	321-0315-00			RES.,FXD,FILM:18.7K OHM,1%,0.125W	91637	MFF1816G18701F
A40R534	321-0205-00			RES.,FXD,FILM:1.33K OHM,1%,0.125W	91637	MFF1816G13300F
A40R535	321-0261-00			RES.,FXD,FILM:5.11K OHM,1%,0.125W	91637	MFF1816G51100F
A40R537	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A40R538	315-0204-00			RES.,FXD,CMPSN:200K OHM,5%,0.25W	01121	CB2045
A40R539	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
A40R540	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
A40R542	311-0633-00			RES.,VAR,NONWIR:5K OHM,10%,0.50W	73138	82-30-1
A40R543	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A40R544	321-0120-00			RES.,FXD,FILM:174 OHM,1%,0.125W	91637	MFF1816G174R0F
A40R546	321-0120-00			RES.,FXD,FILM:174 OHM,1%,0.125W	91637	MFF1816G174R0F
A40R547	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
A40R550	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A40R551	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
A40R552	321-0190-00			RES.,FXD,FILM:931 OHM,1%,0.125W	91637	MFF1816G931R0F
A40R554	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A40R556	315-0620-00			RES.,FXD,CMPSN:62 OHM,5%,0.25W	01121	CB6205
A40R560	321-0178-00			RES.,FXD,FILM:698 OHM,1%,0.125W	91637	MFF1816G698R0F
A40R562	321-0297-00			RES.,FXD,FILM:12.1K OHM,1%,0.125W	91637	MFF1816G12101F
A40R563	321-0350-00			RES.,FXD,FILM:43.2K OHM,1%,0.125W	91637	MFF1816G43201F
A40R564	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A40R566	321-0184-00			RES.,FXD,FILM:806 OHM,1%,0.125W	91637	MFF1816G806R0F
A40R567	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
A40R571	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A40R572	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A40R574	321-0148-00			RES.,FXD,FILM:340 OHM,1%,0.125W	91637	MFF1816G340R0F
A40R576	321-0337-00			RES.,FXD,FILM:31.6K OHM,1%,0.125W	91637	MFF1816G31601F
A40R580	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A40R581	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
A40R582	321-0190-00			RES.,FXD,FILM:931 OHM,1%,0.125W	91637	MFF1816G931R0F
A40R584	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A40R586	315-0620-00			RES.,FXD,CMPSN:62 OHM,5%,0.25W	01121	CB6205
A40R590	321-0297-00			RES.,FXD,FILM:12.1K OHM,1%,0.125W	91637	MFF1816G12101F
A40R591	321-0350-00			RES.,FXD,FILM:43.2K OHM,1%,0.125W	91637	MFF1816G43201F
A40R596	321-0184-00			RES.,FXD,FILM:806 OHM,1%,0.125W	91637	MFF1816G806R0F
A40R600	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A40R601	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A40R602	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A40R603	311-0605-00			RES.,VAR,NONWIR:TRMR,200 OHM,0.5W	73138	82-23-2
A40R604	321-0134-00			RES.,FXD,FILM:243 OHM,1%,0.125W	91637	MFF1816G243R0F
A40R610	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A40R611	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
A40R612	321-0190-00			RES.,FXD,FILM:931 OHM,1%,0.125W	91637	MFF1816G931R0F
A40R614	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A40R616	315-0620-00			RES.,FXD,CMPSN:62 OHM,5%,0.25W	01121	CB6205
A40R620	321-0297-00			RES.,FXD,FILM:12.1K OHM,1%,0.125W	91637	MFF1816G12101F
A40R621	321-0350-00			RES.,FXD,FILM:43.2K OHM,1%,0.125W	91637	MFF1816G43201F
A40R626	321-0184-00			RES.,FXD,FILM:806 OHM,1%,0.125W	91637	MFF1816G806R0F
A40R627	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
A40R631	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A40R632	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A40R634	321-0148-00			RES.,FXD,FILM:340 OHM,1%,0.125W	91637	MFF1816G340R0F
A40R636	321-0337-00			RES.,FXD,FILM:31.6K OHM,1%,0.125W	91637	MFF1816G31601F
A40R640	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A40R641	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
A40R642	321-0190-00			RES.,FXD,FILM:931 OHM,1%,0.125W	91637	MFF1816G931R0F
A40R644	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
A40R646	315-0620-00			RES.,FXD,CMPSN:62 OHM,5%,0.25W	01121	CB6205
A40R650	321-0297-00			RES.,FXD,FILM:12.1K OHM,1%,0.125W	91637	MFF1816G12101F
A40R651	321-0350-00			RES.,FXD,FILM:43.2K OHM,1%,0.125W	91637	MFF1816G43201F
A40R656	321-0184-00			RES.,FXD,FILM:806 OHM,1%,0.125W	91637	MFF1816G806R0F
A40R657	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
A40R660	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A40R661	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A40R662	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A40R663	311-0605-00			RES.,VAR,NONWIR:TRMR,200 OHM,0.5W	73138	82-23-2
A40R664	321-0134-00			RES.,FXD,FILM:243 OHM,1%,0.125W	91637	MFF1816G243R0F
A40R666	321-0337-00			RES.,FXD,FILM:31.6K OHM,1%,0.125W	91637	MFF1816G31601F
A40R670	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A40R671	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
A40R672	321-0190-00			RES.,FXD,FILM:931 OHM,1%,0.125W	91637	MFF1816G931R0F
A40R674	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A40R676	315-0620-00			RES.,FXD,CMPSN:62 OHM,5%,0.25W	01121	CB6205
A40R680	321-0297-00			RES.,FXD,FILM:12.1K OHM,1%,0.125W	91637	MFF1816G12101F
A40R681	321-0350-00			RES.,FXD,FILM:43.2K OHM,1%,0.125W	91637	MFF1816G43201F
A40R686	321-0184-00			RES.,FXD,FILM:806 OHM,1%,0.125W	91637	MFF1816G806R0F
A40R687	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
A40R696	321-0337-00			RES.,FXD,FILM:31.6K OHM,1%,0.125W	91637	MFF1816G31601F
A40R697	321-0152-00			RES.,FXD,FILM:374 OHM,1%,0.125W	91637	MFF1816G374R0F
A40R698	321-0297-00			RES.,FXD,FILM:12.1K OHM,1%,0.125W	91637	MFF1816G12101F
A40R701	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A40R702	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A40R703	311-0609-00			RES.,VAR,NONWIR:2K OHM,10%,0.50W	73138	82-26-1
A40R704	315-0131-00			RES.,FXD,CMPSN:130 OHM,5%,0.25W	01121	CB1315
A40R710	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A40R711	315-0821-00			RES.,FXD,CMPSN:820 OHM,5%,0.25W	01121	CB8215
A40R712	321-0132-00			RES.,FXD,FILM:232 OHM,1%,0.125W	91637	MFF1816G232R0F
A40R714	321-0120-00			RES.,FXD,FILM:174 OHM,1%,0.125W	91637	MFF1816G174R0F
A40R716	315-0620-00			RES.,FXD,CMPSN:62 OHM,5%,0.25W	01121	CB6205
A40R720	321-0297-00			RES.,FXD,FILM:12.1K OHM,1%,0.125W	91637	MFF1816G12101F
A40R721	321-0350-00			RES.,FXD,FILM:43.2K OHM,1%,0.125W	91637	MFF1816G43201F
A40R726	321-0184-00			RES.,FXD,FILM:806 OHM,1%,0.125W	91637	MFF1816G806R0F
A40R727	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
A40R731	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A40R732	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A40R733	311-0634-00			RES.,VAR,NONWIR:TRMR,500 OHM,0.5W	32997	3326H-G48-501
A40R734	315-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
A40R736	321-0337-00			RES.,FXD,FILM:31.6K OHM,1%,0.125W	91637	MFF1816G31601F
A40R737	321-0152-00			RES.,FXD,FILM:374 OHM,1%,0.125W	91637	MFF1816G374R0F
A40R738	321-0297-00			RES.,FXD,FILM:12.1K OHM,1%,0.125W	91637	MFF1816G12101F
A40R741	315-0910-00			RES.,FXD,CMPSN:91 OHM,5%,0.25W	01121	CB9105
A40R742	315-0751-00			RES.,FXD,CMPSN:750 OHM,5%,0.25W	01121	CB7515
A40R744	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A40R745	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
A40R746	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
A40R747	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
A40R748	321-0268-00			RES.,FXD,FILM:6.04K OHM,1%,0.125W	91637	MFF1816G60400F
A40R750	315-0300-00			RES.,FXD,CMPSN:30 OHM,5%,0.25W	01121	CB3005
A40R751	321-0041-00			RES.,FXD,FILM:26.1 OHM,1%,0.125W	91637	MFF1816G26R10F
A40R752	323-0126-00			RES.,FXD,FILM:200 OHM,1%,0.50W	75042	CECT0-2000F
A40R755	321-0235-00			RES.,FXD,FILM:2.74K OHM,1%,0.125W	91637	MFF1816G27400F
A40R756	321-0223-00			RES.,FXD,FILM:2.05K OHM,1%,0.125W	91637	MFF1816G20500F
A40R757	315-0300-00			RES.,FXD,CMPSN:30 OHM,5%,0.25W	01121	CB3005
A40R762	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A40R766	301-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.50W	01121	EB1025
A40R767	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A40R771	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
A40R772	321-0164-00			RES.,FXD,FILM:499 OHM,1%,0.125W	91637	MFF1816G499R0F
A40R775	321-0126-00			RES.,FXD,FILM:200 OHM,1%,0.125W	91637	MFF1816G200R0F
A40R776	321-0126-00			RES.,FXD,FILM:200 OHM,1%,0.125W	91637	MFF1816G200R0F
A40R801	311-0613-00			RES.,VAR,NONWIR:100K OHM,10%,0.50W	73138	82-27-2
A40R802	311-0613-00			RES.,VAR,NONWIR:100K OHM,10%,0.50W	73138	82-27-2
A40R803	311-0613-00			RES.,VAR,NONWIR:100K OHM,10%,0.50W	73138	82-27-2
A40R806	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A40R807	315-0204-00			RES.,FXD,CMPSN:200K OHM,5%,0.25W	01121	CB2045
A40R808	315-0275-00			RES.,FXD,CMPSN:2.7M OHM,5%,0.25W	01121	CB2755
A40R819	321-0164-00			RES.,FXD,FILM:499 OHM,1%,0.125W	91637	MFF1816G499R0F
A40R820	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A40R821	315-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
A40R822	315-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
A40R823	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A40R824	315-0821-00			RES.,FXD,CMPSN:820 OHM,5%,0.25W	01121	CB8215
A40R825	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
A40R826	321-0261-00			RES.,FXD,FILM:5.11K OHM,1%,0.125W	91637	MFF1816G51100F
A40R829	321-0181-00			RES.,FXD,FILM:750 OHM,1%,0.125W	91637	MFF1816G750R0F
A40R830	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A40R833	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A40R840	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A40R850	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
A40R851	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
A40R852	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A40R853	315-0911-00			RES.,FXD,CMPSN:910 OHM,5%,0.25W	01121	CB9115
A40R854	315-0134-00			RES.,FXD,CMPSN:130K OHM,5%,0.25W	01121	CB1345
A40R855	315-0333-00			RES.,FXD,CMPSN:33K OHM,5%,0.25W	01121	CB3335
A40R856	315-0433-00			RES.,FXD,CMPSN:43K OHM,5%,0.25W	01121	CB4335
A40R857	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A40R858	315-0431-00			RES.,FXD,CMPSN:430 OHM,5%,0.25W	01121	CB4315
A40R860	315-0391-00			RES.,FXD,CMPSN:390 OHM,5%,0.25W	01121	CB3915
A40R861	315-0431-00			RES.,FXD,CMPSN:430 OHM,5%,0.25W	01121	CB4315
A40R863	315-0181-00			RES.,FXD,CMPSN:180 OHM,5%,0.25W	01121	CB1815
A40R864	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
A40R865	321-0195-00			RES.,FXD,FILM:1.05K OHM,1%,0.125W	91637	MFF1816G10500F
A40R866	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A40R867	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A40R868	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A40R882	321-0276-00			RES.,FXD,FILM:7.32K OHM,1%,0.125W	91637	MFF1816G73200F
A40R884	321-0277-00			RES.,FXD,FILM:7.5K OHM,1%,0.125W	91637	MFF1816G75000F
A40R886	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A40R887	321-0259-00			RES.,FXD,FILM:4.87K OHM,1%,0.125W	91637	MFF1816G48700F
A40R889	321-0198-00			RES.,FXD,FILM:1.13K OHM,1%,0.125W	91637	MFF1816G11300F
A40R890	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
A40R891	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
A40R892	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A40R896	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A40R898	315-0332-00			RES.,FXD,CMPSN:3.3K OHM,5%,0.25W	01121	CB3325
A40R951	316-0101-00			RES.,FXD,CMPSN:100 OHM,10%,0.25W	01121	CB1011
A40R952	321-0268-00			RES.,FXD,FILM:6.04K OHM,1%,0.125W	91637	MFF1816G60400F
A40R954	321-0001-00			RES.,FXD,FILM:10 OHM,1%,0.125W	75042	CEAT0-10R00F
A40R955	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
A40R956	311-0835-00			RES.,VAR,WW:7.5K OHM,5%,1W	75042	100-0000-752
A40R958	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A40R959	321-0066-00			RES.,FXD,FILM:47.5 OHM,1%,0.125W	91637	MFF1816G47R50F
A40R960	321-0268-00			RES.,FXD,FILM:6.04K OHM,1%,0.125W	91637	MFF1816G60400F
A40R962	321-0066-00			RES.,FXD,FILM:47.5 OHM,1%,0.125W	91637	MFF1816G47R50F
A40R964	321-0104-00			RES.,FXD,FILM:118 OHM,1%,0.125W	91637	MFF1816G118R0F
A40R966	321-1664-03			RES.,FXD,FILM:68.8 OHM,0.25%,0.125W	91637	MFF1816D68R80C
A40R967	321-1664-03			RES.,FXD,FILM:68.8 OHM,0.25%,0.125W	91637	MFF1816D68R80C
A40T560	120-0780-00			XFMR,TOROID:2 WINDINGS	80009	120-0780-00
A40U820	155-0035-00			MICROCIRCUIT,LI:QUAD OPERATIONAL AMPL	80009	155-0035-00
A40U830	156-0352-00			MICROCIRCUIT,DI:DUAL COMPL PAIR PLUS INVER	02735	CD4007AE
A40U840	156-0352-00			MICROCIRCUIT,DI:DUAL COMPL PAIR PLUS INVER	02735	CD4007AE
A40Y950	158-0221-00			XTAL UNIT,QTZ:50MHZ,0.01%	71034	BK-3

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A42	----- -----			CKT BOARD ASSY:SWEEP		
A42R1140	311-0959-00			RES.,VAR,WW:10K OHM,5%,1.5W	71590	BA02510010
A42S104	263-1179-00			SW CAM ACTR AS:SWEEP	80009	263-1179-00
A42S108	263-1180-00			SW CAM ACTR AS:FREQ SPAN/RESOLUTION	80009	263-1180-00
A42A1	----- -----			CKT BOARD ASSY:SWEEP,SPAN,UNCAL SENSE		
A42A1C1004	283-0004-00			CAP.,FXD,CER DI:0.02UF,+80-20%,150V	72982	855-558Z5V0203Z
A42A1C1020	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A42A1C1028	281-0592-00			CAP.,FXD,CER DI:4.7PF,+/-0.5PF,500V	72982	301-023C0H04
A42A1C1048	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A42A1C1049	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A42A1C1050	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A42A1C1051	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A42A1C1053	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A42A1C1060	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A42A1C1088	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
A42A1C1100	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A42A1C1105	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A42A1C1112	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A42A1C1125	283-0198-00			CAP.,FXD,CER DI:0.22UF,20%,50V	72982	8121N083Z5U0224M
A42A1C1126	283-0198-00			CAP.,FXD,CER DI:0.22UF,20%,50V	72982	8121N083Z5U0224M
A42A1C1128	283-0198-00			CAP.,FXD,CER DI:0.22UF,20%,50V	72982	8121N083Z5U0224M
A42A1C1138	281-0523-00			CAP.,FXD,CER DI:100PF,+/-20PF,500V	72982	301-000U2M0101M
A42A1C1164	283-0198-00			CAP.,FXD,CER DI:0.22UF,20%,50V	72982	8121N083Z5U0224M
A42A1C1167	281-0513-00			CAP.,FXD,CER DI:27PF,+/-5.4PF,500V	72982	301-000P2G0270M
A42A1C1168	283-0114-00			CAP.,FXD,CER DI:0.0015UF,5%,200V	72982	805-509B152J
A42A1C1172	283-0198-00			CAP.,FXD,CER DI:0.22UF,20%,50V	72982	8121N083Z5U0224M
A42A1C1173	295-0171-00			CAP.,SET,MTCHD:510PF,0.05UF,5UF	84411	TEK-140-000-51
A42A1C1174	295-0171-00			CAP.,SET,MTCHD:510PF,0.05UF,5UF	84411	TEK-140-000-51
A42A1C1175	295-0171-00			CAP.,SET,MTCHD:510PF,0.05UF,5UF	84411	TEK-140-000-51
A42A1C1176	281-0509-00			CAP.,FXD,CER DI:15PF,+/-1.5PF,500V	72982	301-000C0G0150K
A42A1C1178	283-0668-00			CAP.,FXD,MICA D:184PF,1%,500V	00853	D155F1840F0
A42A1C1186	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
A42A1C1188	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M020FL
A42A1C1210	283-0644-00			CAP.,FXD,MICA D:150PF,1%,500V	00853	D155E151F0
A42A1C1230	290-0525-00			CAP.,FXD,ELCTLT:4.7UF,20%,50V	56289	196D475X0050KA1
A42A1C1235	283-0198-00			CAP.,FXD,CER DI:0.22UF,20%,50V	72982	8121N083Z5U0224M
A42A1C1238	283-0198-00			CAP.,FXD,CER DI:0.22UF,20%,50V	72982	8121N083Z5U0224M
A42A1C1297	283-0203-00			CAP.,FXD,CER DI:0.47UF,20%,50V	72982	8131N075E474M
A42A1C1941	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M020FL
A42A1CR1038	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A42A1CR1040	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A42A1CR1237	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A42A1CR1283	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A42A1CR1284	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A42A1CR1315	152-0075-00			SEMICOND DEVICE:GE,25V,40MA	14433	G866
A42A1CR1331	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A42A1CR1332	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A42A1Q1110	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A42A1Q1120	151-0503-00			SCR:SILICON,TO-92	04713	SCR5138
A42A1Q1160	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A42A1Q1210	151-0216-00			TRANSISTOR:SILICON,PNP	04713	SPS8803
A42A1Q1215	151-1078-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	17856	J2133
A42A1Q1216	151-1078-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	17856	J2133
A42A1Q1315	151-0301-00			TRANSISTOR:SILICON,PNP	27014	2N2907A
A42A1R1000	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
A42A1R1001	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
A42A1R1002	321-0246-00			RES.,FXD,FILM:3.57K OHM,1%,0.125W	91637	MFF1816G35700F
A42A1R1003	321-0246-00			RES.,FXD,FILM:3.57K OHM,1%,0.125W	91637	MFF1816G35700F
A42A1R1006	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
A42A1R1008	321-0070-00			RES.,FXD,FILM:52.3 OHM,1%,0.125W	16299	NA55D52R3F
A42A1R1010	321-0191-00			RES.,FXD,FILM:953 OHM,1%,0.125W	91637	MFF1816G953R0F
A42A1R1012	321-0191-00			RES.,FXD,FILM:953 OHM,1%,0.125W	91637	MFF1816G953R0F
A42A1R1014	321-0275-00			RES.,FXD,FILM:7.15K OHM,1%,0.125W	91637	MFF1816G71500F
A42A1R1016	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A42A1R1018	321-0327-00			RES.,FXD,FILM:24.9K OHM,1%,0.125W	91637	MFF1816G24901F
A42A1R1020	321-0318-00			RES.,FXD,FILM:20K OHM,1%,0.125W	91637	MFF1816G20001F
A42A1R1022	321-0385-00			RES.,FXD,FILM:100K OHM,1%,0.125W	91637	MFF1816G10002F
A42A1R1024	321-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.125W	91637	MFF1816G49R90F
A42A1R1026	321-0356-00			RES.,FXD,FILM:49.9K OHM,1%,0.125W	91637	MFF1816G49901F
A42A1R1028	321-0318-00			RES.,FXD,FILM:20K OHM,1%,0.125W	91637	MFF1816G20001F
A42A1R1030	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A42A1R1032	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A42A1R1034	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A42A1R1036	321-0318-00			RES.,FXD,FILM:20K OHM,1%,0.125W	91637	MFF1816G20001F
A42A1R1038	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A42A1R1040	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
A42A1R1042	315-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
A42A1R1044	321-0318-00			RES.,FXD,FILM:20K OHM,1%,0.125W	91637	MFF1816G20001F
A42A1R1046	321-0253-00			RES.,FXD,FILM:4.22K OHM,1%,0.125W	91637	MFF1816G42200F
A42A1R1048	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A42A1R1049	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A42A1R1050	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A42A1R1051	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A42A1R1052	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
A42A1R1053	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A42A1R1054	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
A42A1R1060	321-0380-00			RES.,FXD,FILM:88.7K OHM,1%,0.125W	91637	MFF1816G88701F
A42A1R1062	321-0333-00			RES.,FXD,FILM:28.7K OHM,1%,0.125W	91637	MFF1816G28701F
A42A1R1064	321-0384-00			RES.,FXD,FILM:97.6K OHM,1%,0.125W	91637	MFF1816G97601F
A42A1R1066	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
A42A1R1068	315-0911-00			RES.,FXD,CMPSN:910 OHM,5%,0.25W	01121	CB9115
A42A1R1070	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
A42A1R1072	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
A42A1R1074	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
A42A1R1076	315-0911-00			RES.,FXD,CMPSN:910 OHM,5%,0.25W	01121	CB9115
A42A1R1078	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
A42A1R1080	321-0271-00			RES.,FXD,FILM:6.49K OHM,1%,0.125W	91637	MFF1816G64900F
A42A1R1082	321-0286-00			RES.,FXD,FILM:9.31K OHM,1%,0.125W	91637	MFF1816G93100F
A42A1R1084	321-0313-00			RES.,FXD,FILM:17.8K OHM,1%,0.125W	91637	MFF1816G17801F
A42A1R1086	321-0286-00			RES.,FXD,FILM:9.31K OHM,1%,0.125W	91637	MFF1816G93100F
A42A1R1087	317-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.125W	01121	BB1015
A42A1R1088	315-0821-00			RES.,FXD,CMPSN:820 OHM,5%,0.25W	01121	CB8215
A42A1R1090	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A42A1R1092	321-0209-00			RES.,FXD,FILM:1.47K OHM,1%,0.125W	91637	MFF1816G14700F
A42A1R1100	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A42A1R1105	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A42A1R1110	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A42A1R1112	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A42A1R1114	315-0132-00			RES.,FXD,CMPSN:1.3K OHM,5%,0.25W	01121	CB1325
A42A1R1116	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A42A1R1118	315-0132-00			RES.,FXD,CMPSN:1.3K OHM,5%,0.25W	01121	CB1325
A42A1R1120	315-0122-00			RES.,FXD,CMPSN:1.2K OHM,5%,0.25W	01121	CB1225
A42A1R1122	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A42A1R1124	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
A42A1R1125	315-0200-00			RES.,FXD,CMPSN:20 OHM,5%,0.25W	01121	CB2005
A42A1R1126	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A42A1R1127	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A42A1R1128	315-0200-00			RES.,FXD,CMPSN:20 OHM,5%,0.25W	01121	CB2005
A42A1R1129	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A42A1R1130	321-0038-00			RES.,FXD,FILM:24.3 OHM,1%,0.125W	91637	MFF1816G24R30F
A42A1R1131	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A42A1R1132	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A42A1R1134	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A42A1R1136	321-0038-00			RES.,FXD,FILM:24.3 OHM,1%,0.125W	91637	MFF1816G24R30F
A42A1R1138	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A42A1R1142	321-0347-00			RES.,FXD,FILM:40.2K OHM,1%,0.125W	91637	MFF1816G40201F
A42A1R1144	321-0306-00			RES.,FXD,FILM:15K OHM,1%,0.125W	91637	MFF1816G15001F
A42A1R1145	321-0443-00			RES.,FXD,FILM:402K OHM,1%,0.125W	91637	MFF1816G40202F
A42A1R1146	321-0339-00			RES.,FXD,FILM:33.2K OHM,1%,0.125W	91637	MFF1816G33201F
A42A1R1160	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A42A1R1162	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A42A1R1164	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A42A1R1166	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
A42A1R1167	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
A42A1R1170	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
A42A1R1171	321-0445-00			RES.,FXD,FILM:422K OHM,1%,0.125W	91637	MFF1816G42202F
A42A1R1172	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A42A1R1178	315-0131-00			RES.,FXD,CMPSN:130 OHM,5%,0.25W	01121	CB1315
A42A1R1180	321-0268-00			RES.,FXD,FILM:6.04K OHM,1%,0.125W	91637	MFF1816G60400F
A42A1R1182	321-0285-00			RES.,FXD,FILM:9.09K OHM,1%,0.125W	91637	MFF1816G90900F
A42A1R1184	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A42A1R1186	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A42A1R1188	315-0511-00			RES.,FXD,CMPSN:510 OHM,5%,0.25W	01121	CB5115
A42A1R1190	311-1265-00			RES.,VAR,NONWIR:2K OHM,10%,0.50W	32997	3329P-L58-202
A42A1R1192	321-0753-06			RES.,FXD,FILM:9K OHM,0.25%,0.125W	91637	MFF1816C90000C
A42A1R1194	321-0318-02			RES.,FXD,FILM:20K OHM,0.5%,0.125W	91637	MFF1816D20001D
A42A1R1196	321-0720-02			RES.,FXD,FILM:60K OHM,0.5%,0.125W	91637	MFF1816D60001D
A42A1R1199	321-0318-03			RES.,FXD,FILM:20K OHM,0.25%,0.125W	24546	NC55C2002C
A42A1R1200	311-1272-00			RES.,VAR,NONWIR:100K OHM,10%,0.50W	32997	3329P-L58-104
A42A1R1202	321-0452-00			RES.,FXD,FILM:499K OHM,1%,0.125W	91637	MFF1816G49902F
A42A1R1203	321-0510-00			RES.,FXD,FILM:2M OHM,1%,0.125W	91637	HFF188G20003F
A42A1R1204	321-0285-00			RES.,FXD,FILM:9.09K OHM,1%,0.125W	91637	MFF1816G90900F
A42A1R1208	321-1618-02			RES.,FXD,FILM:6.5K OHM,0.5%,0.125W	91637	MFF1816D65000D
A42A1R1210	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
A42A1R1212	315-0433-00			RES.,FXD,CMPSN:43K OHM,5%,0.25W	01121	CB4335
A42A1R1214	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A42A1R1215	311-1265-00			RES.,VAR,NONWIR:2K OHM,10%,0.50W	32997	3329P-L58-202
A42A1R1216	315-0913-00			RES.,FXD,CMPSN:91K OHM,5%,0.25W	01121	CB9135
A42A1R1217	321-0303-00			RES.,FXD,FILM:14K OHM,1%,0.125W	91637	MFF1816G14001F
A42A1R1218	321-0306-00			RES.,FXD,FILM:15K OHM,1%,0.125W	91637	MFF1816G15001F
A42A1R1219	321-0256-00			RES.,FXD,FILM:4.53K OHM,1%,0.125W	91637	MFF1816G45300F
A42A1R1220	321-1628-02			RES.,FXD,FILM:1.644M OHM,0.5%,0.125W	91637	HFF188D16443D
A42A1R1221	321-0502-02			RES.,FXD,FILM:1.65M OHM,0.5%,0.125W	91637	HFF188D16503D
A42A1R1222	321-1626-02			RES.,FXD,FILM:175.4K OHM,0.5%,0.125W	91637	MFF1816D17542D
A42A1R1224	321-0736-02			RES.,FXD,FILM:10.06K OHM,0.5%,0.125W	91637	MFF1816D10061D
A42A1R1226	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A42A1R1230	321-0315-00			RES.,FXD,FILM:18.7K OHM,1%,0.125W	91637	MFF1816G18701F
A42A1R1232	315-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
A42A1R1235	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A42A1R1236	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A42A1R1237	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A42A1R1238	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A42A1R1250	311-1319-00			RES.,VAR,NONWIR:10K OHM,10%,0.75W	73138	89-126-1

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A42A1R1252	321-0290-00			RES.,FXD,FILM:10.2K OHM,1%,0.125W	91637	MFF1816G10201F
A42A1R1254	321-1313-08			RES.,FXD,FILM:18K OHM,1%,0.125W	91637	MFF1816D18001F
A42A1R1255	311-1338-00			RES.,VAR,NONWIR:20K OHM,10%,0.50W	73138	89-130-1
A42A1R1256	321-0756-03			RES.,FXD,FILM:50K OHM,0.25%,0.125W	91637	MFF1816D50001C
A42A1R1258	321-0341-08			RES.,FXD,FILM:34.8K OHM,1%,0.125W	91637	MFF1816D34801F
A42A1R1260	321-0648-02			RES.,FXD,FILM:500K OHM,0.5%,0.125W	24546	NC55C5003D
A42A1R1262	321-1623-02			RES.,FXD,FILM:55.5K OHM,0.5%,0.125W	91637	MFF1816D55501D
A42A1R1264	321-1615-02			RES.,FXD,FILM:5.55K OHM,0.5%,0.125W	91637	MFF1816D55500D
A42A1R1266	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A42A1R1270	321-0928-02			RES.,FXD,FILM:250 OHM,0.5%,0.125W	91637	MFF1816D250R0D
A42A1R1272	321-0181-02			RES.,FXD,FILM:750 OHM,0.5%,0.125W	91637	MFF1816D750R0D
A42A1R1274	321-1613-02			RES.,FXD,FILM:1.75K OHM,0.5%,0.125W	91637	MFF1816D17500D
A42A1R1276	321-1616-02			RES.,FXD,FILM:2.25K OHM,0.5%,0.125W	91637	MFF1816D22500D
A42A1R1278	321-0928-02			RES.,FXD,FILM:250 OHM,0.5%,0.125W	91637	MFF1816D250R0D
A42A1R1279	315-0622-00			RES.,FXD,CMPSN:6.2K OHM,5%,0.25W	01121	CB6225
A42A1R1280	321-1330-03			RES.,FXD,FILM:27.1K OHM,0.25%,0.125W	91637	MFF1816D27101C
A42A1R1282	321-1631-07			RES.,FXD,FILM:12.11K OHM,0.1%,0.125W	91637	MFF1816C12111B
A42A1R1283	315-0514-00			RES.,FXD,CMPSN:510K OHM,5%,0.25W	01121	CB5145
A42A1R1284	321-0256-07			RES.,FXD,FILM:4.53K OHM,0.1%,0.125W	91637	MFF1816C45300B
A42A1R1286	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A42A1R1288	321-1614-07			RES.,FXD,FILM:2.056K OHM,0.1%,0.125W	91637	MFF1816C20560B
A42A1R1290	321-1619-07			RES.,FXD,FILM:8.334K OHM,0.1%,0.125W	91637	MFF1816C83340B
A42A1R1291	321-0256-07			RES.,FXD,FILM:4.53K OHM,0.1%,0.125W	91637	MFF1816C45300B
A42A1R1292	321-0622-00			RES.,FXD,FILM:37.96K OHM,0.25%,0.125W	91637	MFF1816D37961C
A42A1R1294	321-0318-02			RES.,FXD,FILM:20K OHM,0.5%,0.125W	91637	MFF1816D20001D
A42A1R1296	321-0256-07			RES.,FXD,FILM:4.53K OHM,0.1%,0.125W	91637	MFF1816C45300B
A42A1R1297	321-0256-07			RES.,FXD,FILM:4.53K OHM,0.1%,0.125W	91637	MFF1816C45300B
A42A1R1298	321-0318-03			RES.,FXD,FILM:20K OHM,0.25%,0.125W	24546	NC55C2002C
A42A1R1299	321-0924-02			RES.,FXD,FILM:40K OHM,0.5%,0.125W	24546	NC55C4002D
A42A1R1300	321-0368-00			RES.,FXD,FILM:66.5K OHM,1%,0.125W	91637	MFF1816G66501F
A42A1R1302	321-0397-00			RES.,FXD,FILM:133K OHM,1%,0.125W	91637	MFF1816G13302F
A42A1R1303	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
A42A1R1304	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A42A1R1305	321-0289-07			RES.,FXD,FILM:10K OHM,0.1%,0.125W	91637	MFF1816C10001B
A42A1R1306	321-0318-03			RES.,FXD,FILM:20K OHM,0.25%,0.125W	24546	NC55C2002C
A42A1R1308	321-0924-02			RES.,FXD,FILM:40K OHM,0.5%,0.125W	24546	NC55C4002D
A42A1R1310	321-0368-00			RES.,FXD,FILM:66.5K OHM,1%,0.125W	91637	MFF1816G66501F
A42A1R1312	321-0397-00			RES.,FXD,FILM:133K OHM,1%,0.125W	91637	MFF1816G13302F
A42A1R1314	321-1621-03			RES.,FXD,FILM:36.47K OHM,0.25%,0.125W	91637	MFF1816D36471C
A42A1R1315	315-0432-00			RES.,FXD,CMPSN:4.3K OHM,5%,0.25W	01121	CB4325
A42A1R1320	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A42A1R1321	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A42A1R1322	321-0373-00			RES.,FXD,FILM:75K OHM, 1%,0.125W	91637	MFF1816G75001F
A42A1R1323	321-0356-00			RES.,FXD,FILM:49.9K OHM,1%,0.125W	91637	MFF1816G49901F
A42A1R1324	321-0327-00			RES.,FXD,FILM:24.9K OHM,1%,0.125W	91637	MFF1816G24901F
A42A1R1325	321-0327-00			RES.,FXD,FILM:24.9K OHM,1%,0.125W	91637	MFF1816G24901F
A42A1R1326	321-0321-00			RES.,FXD,FILM:21.5K OHM,1%,0.125W	91637	MFF1816G21501F
A42A1R1327	321-0373-00			RES.,FXD,FILM:75K OHM, 1%,0.125W	91637	MFF1816G75001F
A42A1R1330	321-0355-00			RES.,FXD,FILM:48.7K OHM,1%,0.125W	91637	MFF1816G48701F
A42A1R1331	321-0343-00			RES.,FXD,FILM:36.5K OHM,1%,0.125W	91637	MFF1816G36501F
A42A1R1332	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A42A1R1333	321-0373-00			RES.,FXD,FILM:75K OHM, 1%,0.125W	91637	MFF1816G75001F
A42A1R1335	321-0373-00			RES.,FXD,FILM:75K OHM, 1%,0.125W	91637	MFF1816G75001F
A42A1R1336	321-0356-00			RES.,FXD,FILM:49.9K OHM,1%,0.125W	91637	MFF1816G49901F
A42A1R1337	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	91637	MFF1816G37401F
A42A1R1338	321-0356-00			RES.,FXD,FILM:49.9K OHM,1%,0.125W	91637	MFF1816G49901F
A42A1R1340	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	91637	MFF1816G37401F

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A42A1R1341	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A42A1R1342	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A42A1R1343	321-0327-00			RES.,FXD,FILM:24.9K OHM,1%,0.125W	91637	MFF1816G24901F
A42A1R1344	321-0321-00			RES.,FXD,FILM:21.5K OHM,1%,0.125W	91637	MFF1816G21501F
A42A1R1345	321-0356-00			RES.,FXD,FILM:49.9K OHM,1%,0.125W	91637	MFF1816G49901F
A42A1R1346	321-0335-00			RES.,FXD,FILM:30.1K OHM,1%,0.125W	91637	MFF1816G30101F
A42A1R1347	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	91637	MFF1816G37401F
A42A1R1348	321-0310-00			RES.,FXD,FILM:16.5K OHM,1%,0.125W	91637	MFF1816G16501F
A42A1R1350	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	91637	MFF1816G37401F
A42A1R1352	321-0335-00			RES.,FXD,FILM:30.1K OHM,1%,0.125W	91637	MFF1816G30101F
A42A1R1354	321-0306-00			RES.,FXD,FILM:15K OHM,1%,0.125W	91637	MFF1816G15001F
A42A1R1355	321-0356-00			RES.,FXD,FILM:49.9K OHM,1%,0.125W	91637	MFF1816G49901F
A42A1R1356	321-0306-00			RES.,FXD,FILM:15K OHM,1%,0.125W	91637	MFF1816G15001F
A42A1R1357	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	91637	MFF1816G37401F
A42A1R1358	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A42A1R1359	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	91637	MFF1816G37401F
A42A1R1941	307-0106-00			RES.,FXD,CMPSN:4.7 OHM,5%,0.25W	01121	CB47G5
A42A1U1010	155-0035-00			MICROCIRCUIT,LI:QUAD OPERATIONAL AMPL	80009	155-0035-00
A42A1U1050	155-0035-00			MICROCIRCUIT,LI:QUAD OPERATIONAL AMPL	80009	155-0035-00
A42A1U1160	156-0030-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	01295	SN7400(N OR J)
A42A1U1170	155-0028-00			MICROCIRCUIT,LI:ML,MILLER INTEGRATOR	80009	155-0028-00
A42A1U1180	155-0056-00			MICROCIRCUIT,DI:SWEEP CONTROL	80009	155-0056-00
A42A1U1250	156-0158-04			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	01295	MC1458JG
A42A1U1280	156-0158-04			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	01295	MC1458JG
A42A1U1290	156-0158-04			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	01295	MC1458JG

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A42A2	----- -----			CKT BOARD ASSY:SWP AND VID FLTR RDOUT		
A42A2CR1372	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A42A2CR1374	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A42A2R1360	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A42A2R1362	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A42A2R1364	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A42A2R1366	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	91637	MFF1816G37401F
A42A2R1368	321-0372-00			RES.,FXD,FILM:73.2K OHM,1%,0.125W	91637	MFF1816G73201F
A42A2R1370	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A42A2R1372	321-0373-00			RES.,FXD,FILM:75K OHM, 1%,0.125W	91637	MFF1816G75001F
A42A2R1374	321-0401-00			RES.,FXD,FILM:147K OHM,1%,0.125W	91637	MFF1816G14702F
A42A2R1376	321-0327-00			RES.,FXD,FILM:24.9K OHM,1%,0.125W	91637	MFF1816G24901F
A42A2R1377	321-0373-00			RES.,FXD,FILM:75K OHM, 1%,0.125W	91637	MFF1816G75001F
A42A2R1378	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A42A2R1379	321-0373-00			RES.,FXD,FILM:75K OHM, 1%,0.125W	91637	MFF1816G75001F
A42A2R1382	321-0321-00			RES.,FXD,FILM:21.5K OHM,1%,0.125W	91637	MFF1816G21501F
A42A2R1383	321-0373-00			RES.,FXD,FILM:75K OHM, 1%,0.125W	91637	MFF1816G75001F
A42A2R1384	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	91637	MFF1816G37401F
A42A2R1386	321-0335-00			RES.,FXD,FILM:30.1K OHM,1%,0.125W	91637	MFF1816G30101F
A42A2R1387	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A42A2R1389	321-0373-00			RES.,FXD,FILM:75K OHM, 1%,0.125W	91637	MFF1816G75001F
A42A2R1392	321-0335-00			RES.,FXD,FILM:30.1K OHM,1%,0.125W	91637	MFF1816G30101F
A42A2R1393	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	91637	MFF1816G37401F
A42A2R1394	321-0310-00			RES.,FXD,FILM:16.5K OHM,1%,0.125W	91637	MFF1816G16501F
A42A2R1396	321-0335-00			RES.,FXD,FILM:30.1K OHM,1%,0.125W	91637	MFF1816G30101F
A42A2R1397	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	91637	MFF1816G37401F
A42A2R1398	321-0356-00			RES.,FXD,FILM:49.9K OHM,1%,0.125W	91637	MFF1816G49901F
A42A2R1399	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A48A1	----- -----			CKT BOARD ASSY:16-19 MHZ AMPL		
A48A1C1400	283-0256-00			CAP.,FXD,CER DI:130PF,5%,100V	72982	8131B143P3K0131J
A48A1C1402	283-0256-00			CAP.,FXD,CER DI:130PF,5%,100V	72982	8131B143P3K00131
A48A1C1405	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A48A1C1406	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A48A1C1408	283-0256-00			CAP.,FXD,CER DI:130PF,5%,100V	72982	8131B143P3K0131J
A48A1C1410	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A48A1C1414	283-0256-00			CAP.,FXD,CER DI:130PF,5%,100V	72982	8131B143P3K0131J
A48A1L1400	108-0062-00			COIL,RF:0.45UH	80009	108-0062-00
A48A1L1408	108-0062-00			COIL,RF:0.45UH	80009	108-0062-00
A48A1Q1402	151-0402-00			TRANSISTOR:SILICON,NPN,SEL FROM 3571TP	80009	151-0402-00
A48A1R1402	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
A48A1R1405	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A48A1R1408	315-0201-00			RES.,FXD,CMPSN:200 OHM,5%,0.25W	01121	CB2015
A48A1R1410	307-0113-00			RES.,FXD,CMPSN:5.1 OHM,5%,0.25W	01121	CB51G5
A48A1R1412	301-0392-00			RES.,FXD,CMPSN:3.9K OHM,5%,0.50W	01121	EB3925
A48A1T1405	120-0904-00			XFMR,TOROID:2 WINDINGS,BIFILAR	80009	120-0904-00
A48A2	----- -----			CKT BOARD ASSY:16-19 MHZ CONTROLLED OSC		
A48A2C1550	290-0441-00			CAP.,FXD,ELCTLT:20UF,10%,10V	56289	109D206X9010C2
A48A2C1552	283-0198-00			CAP.,FXD,CER DI:0.22UF,20%,50V	72982	8121N083Z5U0224M
A48A2C1554	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A48A2C1556	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A48A2C1562	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A48A2C1563	281-0789-00			CAP.,FXD,CER DI:9PF,+/-0.1PF,500V	72982	374005C0H0909B
A48A2C1564	283-0249-00			CAP.,FXD,CER DI:0.068UF,10%,50V	72982	8131N075 C 683K
A48A2C1573	290-0513-00			CAP.,FXD,ELCTLT:510UF,+75-10%,25V	56289	109D575
A48A2C1574	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A48A2C1576	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A48A2CR1564	152-0578-00			SEMICOND DEVICE:VARACTOR,200PF	80009	152-0578-00
A48A2L1552	108-0551-00			COIL,RF:14UH	80009	108-0551-00
A48A2L1562	108-0551-00			COIL,RF:14UH	80009	108-0551-00
A48A2L1564	108-0474-00			COIL,RF:2UH	80009	108-0474-00
A48A2R1550	307-0103-00			RES.,FXD,CMPSN:2.7 OHM,5%,0.25W	01121	CB27G5
A48A2R1554	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
A48A2R1556	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
A48A2R1560	321-0666-08			RES.,FXD,FILM:3.04K OHM,1%,0.125W	91637	MFF1816D30400F
A48A2R1562	321-0097-09			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816C100R0F
A48A2R1570	321-0097-09			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816C100R0F
A48A2R1572	321-0001-00			RES.,FXD,FILM:10 OHM,1%,0.125W	75042	CEAT0-10R00F
A48A2T1564	120-0901-00			XFMR,TOROID:2 WINDINGS	80009	120-0901-00
A48A2U1555	156-0266-00			MICROCIRCUIT,LI:EMITTER COUPLED OSCILLATOR	80009	156-0266-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A48A3	----- -----			CKT BOARD ASSY:PHASE DETECTOR		
A48A3C1521	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A48A3C1522	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208Z5U0102Z
A48A3C1523	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208Z5U0102Z
A48A3C1525	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208Z5U0102Z
A48A3C1528	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208Z5U0102Z
A48A3C1529	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208Z5U0102Z
A48A3L1520	108-0440-00			COIL,RF:8UH,TOROIDAL INDUCTOR	80009	108-0440-00
A48A3L1525	108-0440-00			COIL,RF:8UH,TOROIDAL INDUCTOR	80009	108-0440-00
A48A3L1529	108-0440-00			COIL,RF:8UH,TOROIDAL INDUCTOR	80009	108-0440-00
A48A3R1521	315-0510-00			RES.,FXD,CMPSN:51 OHM,5%,0.25W	01121	CB5105
A48A3R1522	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A48A3R1523	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A48A3R1524	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A48A3R1525	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
A48A3R1526	315-0821-00			RES.,FXD,CMPSN:820 OHM,5%,0.25W	01121	CB8215
A48A3R1527	321-0164-00			RES.,FXD,FILM:499 OHM,1%,0.125W	91637	MFF1816G499ROF
A48A3R1528	321-0164-00			RES.,FXD,FILM:499 OHM,1%,0.125W	91637	MFF1816G499ROF
A48A3R1529	315-0821-00			RES.,FXD,CMPSN:820 OHM,5%,0.25W	01121	CB8215
A48A3U1520	156-0369-00			MICROCIRCUIT,DI:TRIPLE LINE RECEIVER	80009	156-0369-00
A48A3U1525	156-0518-00			MICROCIRCUIT,DI:PHASE-FREQ DETECTOR	04713	MC12040L

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A48A4	----- -----			CKT BOARD ASSY:99.2045 MHZ CRYSTAL OSC		
A48A4C1600	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
A48A4C1602	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A48A4C1604	290-0158-00			CAP.,FXD,ELCTLT:50UF,+75-15%,25V	56289	109D506C7025F2
A48A4C1607	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A48A4C1610	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A48A4C1612	281-0536-00			CAP.,FXD,CER DI:1000PF,10%,500V	72982	301000 X5P0 102K
A48A4C1614	281-0592-00			CAP.,FXD,CER DI:4.7PF,+/-0.5PF,500V	72982	301-023C0H0479D
A48A4C1615	281-0629-00			CAP.,FXD,CER DI:33PF,5%,600V	72982	308-000C0G0330J
A48A4C1617	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
A48A4L1602	108-0311-00			COIL,RF:0.18UH	80009	108-0311-00
A48A4Q1605	151-0367-00			TRANSISTOR:SILICON,NPN,SEL FROM 3571TP	01295	SKA6516
A48A4Q1615	151-0367-00			TRANSISTOR:SILICON,NPN,SEL FROM 3571TP	01295	SKA6516
A48A4R1600	321-0229-00			RES.,FXD,FILM:2.37K OHM,1%,0.125W	91637	MFF1816G23700F
A48A4R1602	321-0130-00			RES.,FXD,FILM:221 OHM,1%,0.125W	91637	MFF1816G221R0F
A48A4R1605	321-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.125W	91637	MFF1816G49R90F
A48A4R1607	321-0234-00			RES.,FXD,FILM:2.67K OHM,1%,0.125W	91637	MFF1816G26700F
A48A4R1610	321-0001-00			RES.,FXD,FILM:10 OHM,1%,0.125W	75042	CEAT0-10R00F
A48A4R1616	321-0121-00			RES.,FXD,FILM:178 OHM,1%,0.125W	91637	MFF1816G178R0F
A48A4R1617	321-0269-00			RES.,FXD,FILM:6.19K OHM,1%,0.125W	91637	MFF1816G61900F
A48A4R1618	321-0001-00			RES.,FXD,FILM:10 OHM,1%,0.125W	75042	CEAT0-10R00F
A48A4R1619	321-0612-00			RES.,FXD,FILM:500 OHM,1%,0.125W	91637	MFF1816G500R0F
A48A4R1620	321-0078-00			RES.,FXD,FILM:63.4 OHM,1%,0.125W	91637	MFF1816G63R40F
	----- -----			(NOMINAL VALUE, SELECTED)		
A48A4T1612	120-0779-00			XFMR,TOROID:(2) 4 TURN WINDINGS	80009	120-0779-00
A48A4Y1605	158-0091-00			XTAL UNIT,QTZ:99.2045 MHZ,0.0005%	80009	158-0091-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A48A5	----- -----			CKT BOARD ASSY:SUM AMPL AND 2ND LO ERROR		
A48A5C1712	285-0901-00			CAP.,FXD,PLSTC:0.047UF,5%,50V	56289	LP88A1A473J
A48A5C1717	285-0901-00			CAP.,FXD,PLSTC:0.047UF,5%,50V	56289	LP88A1A473J
A48A5C1730	285-1143-00			CAP.,FXD,PLSTC:3UF,50V	14752	650B1A305J
A48A5C1732	285-0905-00			CAP.,FXD,PLSTC:0.33UF,5%,50V	56289	LP66A1A334J002
A48A5C1735	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A48A5C1736	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A48A5C1737	281-0536-00			CAP.,FXD,CER DI:1000PF,10%,500V	72982	301000 X5P0 102K
A48A5C1740	285-0808-00			CAP.,FXD,PLSTC:0.1UF,10%,50V	56289	LP66A1A104K004
A48A5C1742	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A48A5C1754	281-0523-00			CAP.,FXD,CER DI:100PF,+/-20PF,500V	72982	301-000U2M0101M
A48A5C1755	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A48A5C1756	285-1056-00			CAP.,FXD,PLSTC:1UF,2%,50V	14752	650B1A105G
A48A5C1757	285-1056-00			CAP.,FXD,PLSTC:1UF,2%,50V	14752	650B1A105G
A48A5CR1730	152-0246-00			SEMICOND DEVICE:SW,SI,40V,200MA	03508	DE140
A48A5CR1742	152-0242-00			SEMICOND DEVICE:SILICON,225V,200MA	07263	FDH5004
A48A5CR1744	152-0242-00			SEMICOND DEVICE:SILICON,225V,200MA	07263	FDH5004
A48A5CR1745	152-0242-00			SEMICOND DEVICE:SILICON,225V,200MA	07263	FDH5004
A48A5CR1746	152-0242-00			SEMICOND DEVICE:SILICON,225V,200MA	07263	FDH5004
A48A5CR1748	152-0246-00			SEMICOND DEVICE:SW,SI,40V,200MA	03508	DE140
A48A5CR1749	152-0246-00			SEMICOND DEVICE:SW,SI,40V,200MA	03508	DE140
A48A5Q1715	151-0169-00			TRANSISTOR:SILICON,NPN	80009	151-0169-00
A48A5R1700	315-0392-00			RES.,FXD,CMPSN:3.9K OHM,5%,0.25W	01121	CB3925
A48A5R1705	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
A48A5R1710	321-0285-00			RES.,FXD,FILM:9.09K OHM,1%,0.125W	91637	MFF1816G90900F
A48A5R1712	321-0228-00			RES.,FXD,FILM:2.32K OHM,1%,0.125W	91637	MFF1816G23200F
A48A5R1714	321-0285-00			RES.,FXD,FILM:9.09K OHM,1%,0.125W	91637	MFF1816G90900F
A48A5R1716	315-0181-00			RES.,FXD,CMPSN:180 OHM,5%,0.25W	01121	CB1815
A48A5R1717	321-0228-00			RES.,FXD,FILM:2.32K OHM,1%,0.125W	91637	MFF1816G23200F
A48A5R1719	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A48A5R1724	321-0199-00			RES.,FXD,FILM:1.15K OHM,1%,0.125W	91637	MFF1816G11500F
A48A5R1725	321-0220-00			RES.,FXD,FILM:1.91K OHM,1%,0.125W	91637	MFF1816G19100F
A48A5R1726	321-0338-09			RES.,FXD,FILM:32.4K OHM,1%,0.125W	91637	MFF1816C32401F
A48A5R1727	321-0385-07			RES.,FXD,FILM:100K OHM,0.1%,0.125W	91637	MFF1816C10002B
A48A5R1728	321-0347-09			RES.,FXD,FILM:40.2K OHM,1%,0.125W	91637	MFF1816C40201F
A48A5R1729	321-0402-09			RES.,FXD,FILM:150K OHM,1%,0.125W	91637	MFF1816C15002F
A48A5R1730	321-0347-09			RES.,FXD,FILM:40.2K OHM,1%,0.125W	91637	MFF1816C40201F
A48A5R1732	321-0376-09			RES.,FXD,FILM:80.6K OHM,1%,0.125W	91637	MFF1816C80601F
A48A5R1735	321-0361-00			RES.,FXD,FILM:56.2K OHM,1%,0.125W	91637	MFF1816G56201F
	----- -----			(NOMINAL VALUE, SELECTED)		
A48A5R1737	321-0311-00			RES.,FXD,FILM:16.9K OHM,1%,0.125W	91637	MFF1816G16901F
A48A5R1742	321-0323-00			RES.,FXD,FILM:22.6K OHM,1%,0.125W	91637	MFF1816G22601F
A48A5R1750	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
A48A5R1752	321-0362-00			RES.,FXD,FILM:57.6K OHM,1%,0.125W	91637	MFF1816G57601F
A48A5R1754	321-0264-00			RES.,FXD,FILM:5.49K OHM,1%,0.125W	91637	MFF1816G54900F
A48A5R1755	311-1266-00			RES.,VAR,NONWIR:2.5K OHM,10%,0.50W	32997	3329P-L58-252
A48A5R1756	321-0264-00			RES.,FXD,FILM:5.49K OHM,1%,0.125W	91637	MFF1816G54900F
A48A5R1757	321-0114-00			RES.,FXD,FILM:150 OHM,1%,0.125W	91637	MFF1816G150R0F
A48A5R1758	321-0335-00			RES.,FXD,FILM:30.1K OHM,1%,0.125W	91637	MFF1816G30101F
A48A5U1715	156-0067-12			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	04713	MC1741CU
A48A5U1735	156-0223-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	27014	LM308H
A48A5U1755	156-0067-12			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	04713	MC1741CU
A48A5VR1700	152-0147-00			SEMICOND DEVICE:ZENER,0.4W,27V,5%	04713	SZ50622KRL
A48A5VR1705	152-0127-00			SEMICOND DEVICE:ZENER,0.4W,7.5V,5%	04713	SZG35009K2
A48A5VR1720	152-0456-00			SEMICOND DEVICE:ZENER,0.4W,6.2V,5%	04713	1N827

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A48A6	----- -----			CKT BOARD ASSY:SAMPLING GEN AND DRIVER		
A48A6C1800	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A48A6C1802	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A48A6C1804	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A48A6C1806	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A48A6C1808	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A48A6C1810	281-0513-00			CAP.,FXD,CER DI:27PF,+/-5.4PF,500V	72982	301-000P2G0270M
A48A6C1812	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A48A6C1820	281-0523-00			CAP.,FXD,CER DI:100PF,+/-20PF,500V	72982	301-000U2M0101M
A48A6C1822	281-0523-00			CAP.,FXD,CER DI:100PF,+/-20PF,500V	72982	301-000U2M0101M
A48A6C1830	281-0523-00			CAP.,FXD,CER DI:100PF,+/-20PF,500V	72982	301-000U2M0101M
A48A6C1832	281-0523-00			CAP.,FXD,CER DI:100PF,+/-20PF,500V	72982	301-000U2M0101M
A48A6C1834	281-0523-00			CAP.,FXD,CER DI:100PF,+/-20PF,500V	72982	301-000U2M0101M
A48A6C1836	283-0346-00			CAP.,FXD,CER DI:0.47UF,+80-20%,100V	72982	8131-M100F474Z
A48A6C1838	283-0346-00			CAP.,FXD,CER DI:0.47UF,+80-20%,100V	72982	8131-M100F474Z
A48A6CR1820	152-0322-00			SEMICOND DEVICE:SILICON,15V,HOT CARRIER	50434	5082-2672
A48A6CR1822	152-0322-00			SEMICOND DEVICE:SILICON,15V,HOT CARRIER	50434	5082-2672
A48A6CR1830	152-0322-00			SEMICOND DEVICE:SILICON,15V,HOT CARRIER	50434	5082-2672
A48A6CR1832	152-0322-00			SEMICOND DEVICE:SILICON,15V,HOT CARRIER	50434	5082-2672
A48A6E1814	276-0507-00			SHIELDING BEAD,:FERRITE	78488	57-3443
A48A6L1800	108-0551-00			COIL,RF:14UH	80009	108-0551-00
A48A6L1832	108-0395-00			COIL,RF:64UH	80009	108-0395-00
A48A6L1835	108-0395-00			COIL,RF:64UH	80009	108-0395-00
A48A6Q1810	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A48A6Q1815	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A48A6Q1820	151-0327-00			TRANSISTOR:SILICON,PNP	80009	151-0327-00
A48A6Q1825	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A48A6Q1830	151-0327-00			TRANSISTOR:SILICON,PNP	80009	151-0327-00
A48A6Q1835	151-0288-00			TRANSISTOR:SILICON,NPN	80009	151-0288-00
A48A6R1800	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A48A6R1804	321-0001-00			RES.,FXD,FILM:10 OHM,1%,0.125W	75042	CEAT0-10R00F
A48A6R1808	315-0200-00			RES.,FXD,CMPSN:20 OHM,5%,0.25W	01121	CB2005
A48A6R1810	321-0234-00			RES.,FXD,FILM:2.67K OHM,1%,0.125W	91637	MFF1816G26700F
A48A6R1812	321-0250-00			RES.,FXD,FILM:3.92K OHM,1%,0.125W	91637	MFF1816G39200F
A48A6R1814	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
A48A6R1815	321-0234-00			RES.,FXD,FILM:2.67K OHM,1%,0.125W	91637	MFF1816G26700F
A48A6R1817	321-0250-00			RES.,FXD,FILM:3.92K OHM,1%,0.125W	91637	MFF1816G39200F
A48A6R1820	321-0247-00			RES.,FXD,FILM:3.65K OHM,1%,0.125W	91637	MFF1816G36500F
A48A6R1832	321-0231-00			RES.,FXD,FILM:2.49K OHM,1%,0.125W	91637	MFF1816G24900F
A48A6R1834	308-0319-00			RES.,FXD,WW:4.5K OHM,1%,3W	91637	RS2B-B45000F
A48A6R1835	308-0298-00			RES.,FXD,WW:560 OHM,5%,3W	91637	CW2B-B560R0J
A48A6U1825	156-0038-00			MICROCIRCUIT,DI:J-K MASTER SLAVE FLIP-FLOP	80009	156-0038-00
A48A6Y1815	158-0092-00			XTAL UNIT,QTZ:2.210 MHZ 0.005%	71034	BH6WB

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A48A7	----- -----			CKT BOARD ASSY:MOTHER		
A48A7C1534	281-0752-00			CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
A48A7C1538	281-0752-00			CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
A48A7C1561	281-0752-00			CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
A48A7C1571	281-0752-00			CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
A48A7C1900	290-0513-00			CAP.,FXD,ELCTLT:510UF,+75-10%,25V	56289	109D575
A48A7C1902	290-0513-00			CAP.,FXD,ELCTLT:510UF,+75-10%,25V	56289	109D575
A48A7C1904	290-0340-00			CAP.,FXD,ELCTLT:10UF,10%,50V	56289	109D106X9050C2
A48A7C1906	281-0752-00			CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
A48A7C1908	281-0752-00			CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
A48A7C1912	285-1069-00			CAP.,FXD,PLSTC:0.047UF,200V	14752	C2319
A48A7C1914	281-0752-00			CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
A48A7C1916	281-0752-00			CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
A48A7C1920	281-0752-00			CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
A48A7C1922	281-0752-00			CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
A48A7C1924	281-0752-00			CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
A48A7C1926	281-0752-00			CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
A48A7C1928	281-0752-00			CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
A48A7C1930	281-0752-00			CAP.,FXD,CER DI:0.00175UF,10A	72982	1214-007
A48A7R1900	301-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.50W	01121	EB1005
A48A7R1902	301-0390-00			RES.,FXD,CMPSN:39 OHM,5%,0.50W	01121	EB3905
A48A7R1904	321-0145-00			RES.,FXD,FILM:316 OHM,1%,0.125W	91637	MFF1816G316R0F
A48A7R1906	321-0139-00			RES.,FXD,FILM:274 OHM,1%,0.125W	91637	MFF1816G274R0F
A48A7R1912	305-0821-00			RES.,FXD,CMPSN:820 OHM,5%,2W	01121	HB8215
A48A7R1924	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
A48A8	----- -----			CKT BOARD ASSY:+5V REGULATED POWER SUPPLY		
A48A8C1960	290-0134-00			CAP.,FXD,ELCTLT:22UF,20%,15V	56289	150D226X0015B2
A48A8C1962	290-0134-00			CAP.,FXD,ELCTLT:22UF,20%,15V	56289	150D226X0015B2
A48A8C1966	283-0116-00			CAP.,FXD,CER DI:820PF,5%,500V	72982	801-547B821J
A48A8C1967	283-0178-00			CAP.,FXD,CER DI:0.1UF,+80-20%,100V	72982	8131N145651 104Z
A48A8C1968	290-0340-00			CAP.,FXD,ELCTLT:10UF,10%,50V	56289	109D106X9050C2
A48A8CR1955	152-0242-00			SEMICOND DEVICE:SILICON,225V,200MA	07263	FDH5004
A48A8CR1965	152-0242-00			SEMICOND DEVICE:SILICON,225V,200MA	07263	FDH5004
A48A8K1955	148-0086-00			RELAY,REED:SPDT,COIL 5V,150 OHM	78277	191TE1C15G
A48A8K1965	148-0076-00			RELAY,REED:1 FORM A,5V,0.25A,100V	95348	F81-1447
A48A8R1960	311-1339-00			RES.,VAR,NONWIR:5K OHM,10%,0.50W	73138	89-131-1
A48A8R1962	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A48A8R1964	321-0349-00			RES.,FXD,FILM:42.2K OHM,1%,0.125W	91637	MFF1816G42201F
A48A8R1965	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A48A8R1966	321-0199-00			RES.,FXD,FILM:1.15K OHM,1%,0.125W	91637	MFF1816G11500F
A48A8R1967	308-0223-00			RES.,FXD,WW:35 OHM,5%,3W	91637	RS2B-K35R00J
A48A8R1968	321-0280-00			RES.,FXD,FILM:8.06K OHM,1%,0.125W	91637	MFF1816G80600F
A48A8R1969	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A48A8U1965	156-0105-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	27014	LM301AN
A48A8VR1960	152-0456-00			SEMICOND DEVICE:ZENER,0.4W,6.2V,5%	04713	1N827

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A66	----- -----			CKT BOARD ASSY:DVM,LOGIC AND RDOUT		
A66C2000	290-0530-00			CAP.,FXD,ELCTLT:68UF,20%,6V	90201	TDC686M006NLF
A66C2005	283-0666-00			CAP.,FXD,MICA D:890PF,2%,100V	00853	D151F891G0
A66C2010	290-0527-00			CAP.,FXD,ELCTLT:15UF,20%,20V	90201	TDC156M020FL
A66C2012	283-0198-00			CAP.,FXD,CER DI:0.22UF,20%,50V	72982	8121N083Z5U0224M
A66C2060	283-0005-00			CAP.,FXD,CER DI:0.01UF,+100-0%,250V	72982	8131N300Z5U0103P
A66CR2060	152-0322-00			SEMICOND DEVICE:SILICON,15V,HOT CARRIER	50434	5082-2672
A66L2000	108-0598-00			COIL,RF:200UH	80009	108-0598-00
A66Q2005	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A66Q2010	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A66Q2015	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
A66R2002	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A66R2004	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A66R2005	321-0236-00			RES.,FXD,FILM:2.8K OHM,1%,0.125W	91637	MFF1816G28000F
A66R2006	321-0271-00			RES.,FXD,FILM:6.49K OHM,1%,0.125W	91637	MFF1816G64900F
A66R2008	321-0342-00			RES.,FXD,FILM:35.7K OHM,1%,0.125W	91637	MFF1816G35701F
A66R2010	315-0182-00			RES.,FXD,CMPSN:1.8K OHM,5%,0.25W	01121	CB1825
A66R2012	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A66R2014	321-0271-00			RES.,FXD,FILM:6.49K OHM,1%,0.125W	91637	MFF1816G64900F
A66R2016	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A66R2018	315-0432-00			RES.,FXD,CMPSN:4.3K OHM,5%,0.25W	01121	CB4325
A66R2020	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A66R2022	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
A66R2024	315-0243-00			RES.,FXD,CMPSN:24K OHM,5%,0.25W	01121	CB2435
A66R2026	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A66R2028	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
A66R2030	315-0243-00			RES.,FXD,CMPSN:24K OHM,5%,0.25W	01121	CB2435
A66R2032	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A66R2034	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
A66R2036	315-0243-00			RES.,FXD,CMPSN:24K OHM,5%,0.25W	01121	CB2435
A66R2038	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A66R2040	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
A66R2042	315-0243-00			RES.,FXD,CMPSN:24K OHM,5%,0.25W	01121	CB2435
A66R2044	315-0362-00			RES.,FXD,CMPSN:3.6K OHM,5%,0.25W	01121	CB3625
A66R2046	315-0273-00			RES.,FXD,CMPSN:27K OHM,5%,0.25W	01121	CB2735
A66R2060	321-0341-00			RES.,FXD,FILM:34.8K OHM,1%,0.125W	91637	MFF1816G34801F
A66R2062	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A66R2064	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A66R2065	311-1267-00			RES.,VAR,NONWIR:5K OHM,10%,0.50W	32997	3329P-L58-502
A66R2066	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A66R2068	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A66R2070	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A66R2072	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A66R2074	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A66U2000	156-0292-00			MICROCIRCUIT,DI:HEX INVERTER	80009	156-0292-00
A66U2010	156-0292-00			MICROCIRCUIT,DI:HEX INVERTER	80009	156-0292-00
A66U2015	156-0306-00			MICROCIRCUIT,DI:4.5 DECADE COUNTER	07263	A7R381R19X
A66U2020	156-0411-00			MICROCIRCUIT,LI:QUAD-COMP,SGL SUPPLY	27014	LM339N
A66U2030	156-0030-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	01295	SN7400(N OR J)
A66U2040	156-0452-00			MICROCIRCUIT,DI:4-WIDE 2-INP AND-OR-INVERT	80009	156-0452-00
A66U2050	156-0094-00			MICROCIRCUIT,DI:DUAL PERIPHERAL DRIVER	01295	SN75451P
A66U2060	156-0094-00			MICROCIRCUIT,DI:DUAL PERIPHERAL DRIVER	01295	SN75451P
A66U2065	155-0088-00			MICROCIRCUIT,DI:ML,LEGEND GENERATOR "C2"	80009	155-0088-00
A66U2070	156-0379-00			MICROCIRCUIT,DI:BCD TO 7-SEGMENT DCDR/DRVR	80009	156-0379-00
A66VR2014	152-0278-00			SEMICOND DEVICE:ZENER,0.4W,3V,5%	04713	SZG35009K20

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A68	----- -----			CKT BOARD ASSY:DVM,ANALOG		
A68C2110	281-0523-00			CAP.,FXD,CER DI:100PF,+/-20PF,500V	72982	301-000U2M0101M
A68C2114	290-0528-00			CAP.,FXD,ELCTLT:15UF,20%,50V	90201	TDC156M050WLC
A68C2120	281-0523-00			CAP.,FXD,CER DI:100PF,+/-20PF,500V	72982	301-000U2M0101M
A68C2130	281-0523-00			CAP.,FXD,CER DI:100PF,+/-20PF,500V	72982	301-000U2M0101M
A68C2138	283-0103-00			CAP.,FXD,CER DI:180PF,5%,500V	56289	40C638
A68C2140	283-0670-00			CAP.,FXD,MICA D:375PF,1%,500V	00853	D155F3750F0
A68C2142	283-0047-00			CAP.,FXD,CER DI:270PF,5%,500V	72982	083152Z5D00271J
A68C2144	285-0809-00			CAP.,FXD,PLSTC:1UF,10%,50V	56289	LP66A1A105K
A68C2146	290-0525-00			CAP.,FXD,ELCTLT:4.7UF,20%,50V	56289	196D475X0050KA1
A68C2148	283-0080-00			CAP.,FXD,CER DI:0.022UF,+80-20%,25V	56289	19C611
A68C2150	290-0529-00			CAP.,FXD,ELCTLT:47UF,20%,20V	05397	T368C476M020AZ
A68C2152	290-0530-00			CAP.,FXD,ELCTLT:68UF,20%,6V	90201	TDC686M006NLF
A68C2154	290-0529-00			CAP.,FXD,ELCTLT:47UF,20%,20V	05397	T368C476M020AZ
A68C2156	290-0529-00			CAP.,FXD,ELCTLT:47UF,20%,20V	05397	T368C476M020AZ
A68CR2130	152-0246-00			SEMICOND DEVICE:SW,SI,40V,200MA	03508	DE140
A68CR2132	152-0246-00			SEMICOND DEVICE:SW,SI,40V,200MA	03508	DE140
A68CR2134	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A68CR2142	152-0246-00			SEMICOND DEVICE:SW,SI,40V,200MA	03508	DE140
A68L2150	108-0537-00			COIL,RF:200UH	80009	108-0537-00
A68L2152	108-0597-00			COIL,RF:TOROIDAL,425UH	80009	108-0597-00
A68L2154	108-0537-00			COIL,RF:200UH	80009	108-0537-00
A68Q2120	151-1005-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	80009	151-1005-00
A68Q2140	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A68R2102	321-0753-06			RES.,FXD,FILM:9K OHM,0.25%,0.125W	91637	MFF1816C90000C
A68R2104	321-0753-06			RES.,FXD,FILM:9K OHM,0.25%,0.125W	91637	MFF1816C90000C
A68R2106	321-0289-06			RES.,FXD,FILM:10K OHM,0.25%,0.125W	91637	MFF1816C10001C
A68R2108	321-0289-06			RES.,FXD,FILM:10K OHM,0.25%,0.125W	91637	MFF1816C10001C
A68R2109	323-0760-00			RES.,FXD,FILM:792 MEG OHM,1%,0.50W	91637	HFF129G72003F
A68R2110	311-1337-00			RES.,VAR,NONWIR:25K OHM,10%,0.50W	73138	89-129-1
A68R2111	321-1622-06			RES.,FXD,FILM:61.73K OHM,0.25%,0.125W	91637	MFF1816C61730C
A68R2112	321-1625-06			RES.,FXD,FILM:277.8K OHM,0.25%,0.125W	91637	MFF1816C27780C
A68R2113	323-0230-00			RES.,FXD,FILM:2.43K OHM,1%,0.50W	75042	CECT0-2431F
A68R2118	321-0264-00			RES.,FXD,FILM:5.49K OHM,1%,0.125W	91637	MFF1816G54900F
A68R2122	321-1617-06			RES.,FXD,FILM:5.85K OHM,0.25%,0.125W	91637	MFF1816C58500C
A68R2126	321-0332-07			RES.,FXD,FILM:28K OHM,0.1%,0.125W	91637	MFF1816C28001B
A68R2128	321-0332-07			RES.,FXD,FILM:28K OHM,0.1%,0.125W	91637	MFF1816C28001B
A68R2130	321-0332-07			RES.,FXD,FILM:28K OHM,0.1%,0.125W	91637	MFF1816C28001B
A68R2131	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A68R2132	321-0332-07			RES.,FXD,FILM:28K OHM,0.1%,0.125W	91637	MFF1816C28001B
A68R2133	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A68R2134	321-1627-06			RES.,FXD,FILM:731.3K OHM,0.25%,0.125W	91637	MFF1816C73132C
A68R2135	311-1337-00			RES.,VAR,NONWIR:25K OHM,10%,0.50W	73138	89-129-1
A68R2136	321-1624-06			RES.,FXD,FILM:45.2K OHM,0.25%,0.125W	91637	MFF1816C45201C
A68R2137	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A68R2138	321-0332-07			RES.,FXD,FILM:28K OHM,0.1%,0.125W	91637	MFF1816C28001B
A68R2139	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A68R2140	321-0728-06			RES.,FXD,FILM:136K OHM,0.25%,0.125W	91637	MFF1816C13602C
A68R2141	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
A68R2142	321-0612-00			RES.,FXD,FILM:500 OHM,1%,0.125W	91637	MFF1816G500R0F
A68R2144	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
A68R2146	321-0385-00			RES.,FXD,FILM:100K OHM,1%,0.125W	91637	MFF1816G10002F
A68R2147	321-0261-00			RES.,FXD,FILM:5.11K OHM,1%,0.125W	91637	MFF1816G51100F
A68R2148	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
A68R2149	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A68R2151	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
A68R2153	315-0331-00			RES.,FXD,CMPSN:330 OHM,5%,0.25W	01121	CB3315
A68R2154	315-0200-00			RES.,FXD,CMPSN:20 OHM,5%,0.25W	01121	CB2005

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A68R2156	315-0622-00			RES.,FXD,CMPSN:6.2K OHM,5%,0.25W	01121	CB6225
A68R2158	321-0612-00			RES.,FXD,FILM:500 OHM,1%,0.125W	91637	MFF1816G500R0F
A68U2110	156-0223-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	27014	LM308H
A68U2120	156-0223-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	27014	LM308H
A68U2130	156-0223-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	27014	LM308H
A68U2140	156-0223-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	27014	LM308H
A68U2145	156-0096-00			MICROCIRCUIT,LI:VOLTAGE COMPARATOR	27014	LM311H
A68VR2115	152-0171-00			SEMICOND DEVICE:ZENER,0.5W,11.7V,5%	80009	152-0171-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A72	----- -----			CKT BOARD ASSY:TUNE CONTROL		
A72C1048	283-0010-00			CAP.,FXD,CER DI:0.05UF,+100-20%,50V	56289	273C20
A72C1055	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A72C1061	283-0026-00			CAP.,FXD,CER DI:0.2UF,+80-20%,25V	56289	274C3
A72C2069	283-0201-00			CAP.,FXD,CER DI:27PF,10%,200V	72982	8101B210X7R0270K
A72C2022	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A72C2054	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A72C2059	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A72C2076	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
A72C3061	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A72C3062	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A72C3071	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A72CR1071	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A72CR1072	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A72CR2018	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A72CR2021	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A72CR2022	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A72CR2023	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A72CR2055	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A72CR3021	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A72Q1048	151-0301-00			TRANSISTOR:SILICON,PNP	27014	2N2907A
A72Q2018	151-1006-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	80009	151-1006-00
A72Q2031	151-0301-00			TRANSISTOR:SILICON,PNP	27014	2N2907A
A72Q2062	151-0302-00			TRANSISTOR:SILICON,NPN	07263	S038487
A72Q3016	151-1006-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	80009	151-1006-00
A72Q3018	151-1006-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	80009	151-1006-00
A72R1011	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A72R1012	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A72R1013	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A72R1014	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A72R1015	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A72R1026	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A72R1048	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A72R1051	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A72R1059	321-0270-00			RES.,FXD,FILM:6.34K OHM,1%,0.125W	91637	MFF1816G63400F
A72R1062	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A72R1063	321-0234-00			RES.,FXD,FILM:2.67K OHM,1%,0.125W	91637	MFF1816G26700F
A72R2015	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A72R2016	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A72R2022	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A72R2023	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A72R2035	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A72R2036	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A72R2037	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A72R2041	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A72R2042	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A72R2043	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A72R2044	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A72R2052	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A72R2053	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A72R2054	321-0150-00			RES.,FXD,FILM:357 OHM,1%,0.125W	91637	MFF1816G357R0F
A72R2055	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A72R2071	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A72R3021	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A72R3022	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A72R3069	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A72R3071	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A72U1035	156-0876-00			MICROCIRCUIT,DI:HEX SCMITT TRIGGER	80009	156-0876-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A72U1055	156-1272-00			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	NE5532 FE-IIB
A72U1068	156-0888-00			MICROCIRCUIT,DI:HEX DIGIT DRIVER	80009	156-0888-00
A72U2024	156-0869-00			MICROCIRCUIT,DI:8 CHANNEL DGTL MUXER	80009	156-0869-00
A72U3028	156-0869-00			MICROCIRCUIT,DI:8 CHANNEL DGTL MUXER	80009	156-0869-00
A72U3045	156-0385-02			MICROCIRCUIT,DI:HEX INVERTER	01295	SN74LS04N3
A72U3059	156-0382-02			MICROCIRCUIT,DI:QUAD 2-INP NAND GATE	01295	SN74LS00
A72U3068	156-1338-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	18324	NE5534N
A72VR2059	152-0526-00			SEMICOND DEVICE:ZENER,6.35V,1%,7.5MA	80009	152-0526-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A74	----- -----			CKT BOARD ASSY:CENTER INTERFACE		
A74C2302	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A74C2304	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A74C2306	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A74C2308	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A74CR2318	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A74CR2332	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A74CR2336	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A74Q2320	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
A74Q2330	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
A74Q2335	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A74Q2345	151-1039-00			TRANSISTOR:SILICON,JFE,P-CHANNEL	80009	151-1039-00
A74R2310	321-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.125W	91637	MFF1816G49R90F
A74R2314	321-0068-00			RES.,FXD,FILM:49.9 OHM,1%,0.125W	91637	MFF1816G49R90F
A74R2317	315-0513-00			RES.,FXD,CMPSN:51K OHM,5%,0.25W	01121	CB5135
A74R2319	321-0305-00			RES.,FXD,FILM:14.7K OHM,1%,0.125W	91637	MFF1816G14701F
A74R2320	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
A74R2322	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
A74R2324	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A74R2330	315-0432-00			RES.,FXD,CMPSN:4.3K OHM,5%,0.25W	01121	CB4325
A74R2332	315-0432-00			RES.,FXD,CMPSN:4.3K OHM,5%,0.25W	01121	CB4325
A74R2336	315-0823-00			RES.,FXD,CMPSN:82K OHM,5%,0.25W	01121	CB8235
A74R2337	315-0623-00			RES.,FXD,CMPSN:62K OHM,5%,0.25W	01121	CB6235
A74R2338	315-0823-00			RES.,FXD,CMPSN:82K OHM,5%,0.25W	01121	CB8235
A74R2341	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	91637	MFF1816G37401F
A74R2342	321-0335-00			RES.,FXD,FILM:30.1K OHM,1%,0.125W	91637	MFF1816G30101F
A74R2343	321-0321-00			RES.,FXD,FILM:21.5K OHM,1%,0.125W	91637	MFF1816G21501F
A74R2344	321-0335-00			RES.,FXD,FILM:30.1K OHM,1%,0.125W	91637	MFF1816G30101F
A74R2346	321-0344-00			RES.,FXD,FILM:37.4K OHM,1%,0.125W	91637	MFF1816G37401F
A74R2347	321-0356-00			RES.,FXD,FILM:49.9K OHM,1%,0.125W	91637	MFF1816G49901F
A74R2348	321-0310-00			RES.,FXD,FILM:16.5K OHM,1%,0.125W	91637	MFF1816G16501F
A74R2349	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A78	----- -----			CKT BOARD ASSY:YIG DRIVER		
A78C1025	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A78C1034	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A78C1043	283-0032-00			CAP.,FXD,CER DI:470PF,5%,500V	72982	0831085Z5E00471J
A78C1044	283-0198-00			CAP.,FXD,CER DI:0.22UF,20%,50V	72982	8121N083Z5U0224M
A78C1046	281-0612-00			CAP.,FXD,CER DI:5.6PF,+/-0.5PF,500V	72982	374-001C0H0569D
A78C1051	283-0198-00			CAP.,FXD,CER DI:0.22UF,20%,50V	72982	8121N083Z5U0224M
A78C1054	285-0555-00			CAP.,FXD,PLSTC:0.1UF,20%,100V	56289	410P10401M245
A78C1059	285-0695-00			CAP.,FXD,PLSTC:0.01UF,10%,200V	56289	292P10392
A78C1062	290-0650-00			CAP.,FXD,ELCTLT:1000UF,20%,10V	56289	109D108X0010T2
A78C1063	290-0650-00			CAP.,FXD,ELCTLT:1000UF,20%,10V	56289	109D108X0010T2
A78C2020	285-1160-00			CAP.,FXD,PLSTC:0.5UF 20%,100V	80009	285-1160-00
A78C2034	290-0512-00			CAP.,FXD,ELCTLT:22UF,20%,15V	56289	196D226X0015KA1
A78C2041	283-0198-00			CAP.,FXD,CER DI:0.22UF,20%,50V	72982	8121N083Z5U0224M
A78C2044	283-0210-00			CAP.,FXD,CER DI:5600PF,10%,100V	72982	8131N145W5R562M
A78C2047	290-0722-00			CAP.,FXD,ELCTLT:100UF,20%,10V	56289	196D107X0010PE3
A78C2049	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A78C2062	283-0129-00			CAP.,FXD,CER DI:0.56UF,20%,100V	56289	725C7
A78C2064	283-0129-00			CAP.,FXD,CER DI:0.56UF,20%,100V	56289	725C7
A78C3021	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A78C3022	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A78C3023	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A78C3024	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A78C3032	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A78C3034	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A78CR1019	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A78CR1031	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A78CR1059	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A78CR2021	152-0242-00			SEMICOND DEVICE:SILICON,225V,200MA	07263	FDH5004
A78CR2035	152-0242-00			SEMICOND DEVICE:SILICON,225V,200MA	07263	FDH5004
A78CR2057	152-0400-00			SEMICOND DEVICE:SILICON,400V,1A	80009	152-0400-00
A78CR2064	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A78CR3012	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A78CR3013	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A78CR3031	152-0153-00			SEMICOND DEVICE:SILICON,15V,50MA	07263	FD7003
A78CR3032	152-0153-00			SEMICOND DEVICE:SILICON,15V,50MA	07263	FD7003
A78CR3033	152-0153-00			SEMICOND DEVICE:SILICON,15V,50MA	07263	FD7003
A78CR3034	152-0153-00			SEMICOND DEVICE:SILICON,15V,50MA	07263	FD7003
A78E3024	276-0528-00			SHIELDING BEAD,:0.1UH	02114	56-0590-65C/3B
A78FL3052	119-0449-01			FILTER,BANDPASS:XTAL,CTR FREQ,10MH,6DB	80009	119-0449-01
A78K1063	148-0107-00			RELAY,ARMATURE:2 FORM C,18V COIL,1A AT 28V	11532	412-6841
A78K2034	148-0076-00			RELAY,REED:1 FORM A,5V,0.25A,100V	95348	F81-1447
A78K3021	148-0107-00			RELAY,ARMATURE:2 FORM C,18V COIL,1A AT 28V	11532	412-6841
A78K3065	148-0107-00			RELAY,ARMATURE:2 FORM C,18V COIL,1A AT 28V	11532	412-6841
A78L2025	108-0431-00			COIL,REED SW:REED DRIVE	80009	108-0431-00
A78L3023	108-0395-00			COIL,RF:64UH	80009	108-0395-00
A78L3031	108-0395-00			COIL,RF:64UH	80009	108-0395-00
A78Q1041	151-0454-00			TRANSISTOR:SILICON,NPN	80009	151-0454-00
A78Q2021	151-1002-00			TRANSISTOR:SILICON,FE,N-CHANNEL MOS	04713	SS3598
A78Q2024	151-0301-00			TRANSISTOR:SILICON,PNP	27014	2N2907A
A78Q2039	151-0334-00			TRANSISTOR:SILICON,NPN	80009	151-0334-00
A78Q2041	151-0335-00			TRANSISTOR:SILICON,PNP	04713	SJE917
A78Q2061	151-0250-00			TRANSISTOR:SILICON,NPN	80009	151-0250-00
A78Q2068	151-0228-00			TRANSISTOR:SILICON,PNP,SEL FROM 2N4888	80009	151-0228-00
A78Q3022	151-0288-00			TRANSISTOR:SILICON,NPN	80009	151-0288-00
A78Q3024	151-0288-00			TRANSISTOR:SILICON,NPN	80009	151-0288-00
A78Q3032	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
A78R1016	321-0356-00			RES.,FXD,FILM:49.9K OHM,1%,0.125W	91637	MFF1816G49901F
A78R1017	321-0382-00			RES.,FXD,FILM:93.1K OHM,1%,0.125W	91637	MFF1816G93101F

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A78R1020	311-1241-00			RES.,VAR,NONWIR:100K OHM,10%,0.5W	32997	3386X-T07-104
A78R1021	311-1241-00			RES.,VAR,NONWIR:100K OHM,10%,0.5W	32997	3386X-T07-104
A78R1022	311-1241-00			RES.,VAR,NONWIR:100K OHM,10%,0.5W	32997	3386X-T07-104
A78R1023	321-0356-00			RES.,FXD,FILM:49.9K OHM,1%,0.125W	91637	MFF1816G49901F
A78R1024	321-0356-00			RES.,FXD,FILM:49.9K OHM,1%,0.125W	91637	MFF1816G49901F
A78R1025	321-0318-00			RES.,FXD,FILM:20K OHM,1%,0.125W	91637	MFF1816G20001F
A78R1026	321-0396-00			RES.,FXD,FILM:130K OHM,1%,0.125W	91637	MFF1816G13002F
A78R1027	321-0364-00			RES.,FXD,FILM:60.4K OHM,1%,0.125W	91637	MFF1816G60401F
A78R1028	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A78R1029	321-0356-00			RES.,FXD,FILM:49.9K OHM,1%,0.125W	91637	MFF1816G49901F
A78R1030	321-0385-00			RES.,FXD,FILM:100K OHM,1%,0.125W	91637	MFF1816G10002F
A78R1031	321-0357-00			RES.,FXD,FILM:51.1K OHM,1%,0.125W	91637	MFF1816G51101F
A78R1032	321-0303-00			RES.,FXD,FILM:14K OHM,1%,0.125W	91637	MFF1816G14001F
A78R1034	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A78R1035	321-0412-00			RES.,FXD,FILM:191K OHM,1%,0.125W	91637	MFF1816G19102F
A78R1036	307-0105-00			RES.,FXD,CMPSN:3.9 OHM,5%,0.25W	01121	CB39G5
A78R1041	321-0318-06			RES.,FXD,FILM:20K OHM,0.25%,0.125W	24546	NE55E2002C
A78R1042	321-0407-00			RES.,FXD,FILM:169K OHM,1%,0.125W	91637	MFF1816G16902F
A78R1043	321-0318-06			RES.,FXD,FILM:20K OHM,0.25%,0.125W	24546	NE55E2002C
A78R1044	311-1680-00			RES.,VAR,NONWIR:250 OHM,10%,0.75W	73138	89-161-1
A78R1045	311-1340-00			RES.,VAR,NONWIR:1K OHM,10%,0.50W	02111	43P102T621
A78R1046	321-0150-00			RES.,FXD,FILM:357 OHM,1%,0.125W	91637	MFF1816G357R0F
A78R1047	321-0169-00			RES.,FXD,FILM:562 OHM,1%,0.125W	91637	MFF1816G562R0F
A78R1048	321-0194-00			RES.,FXD,FILM:1.02K OHM,1%,0.125W	91637	MFF1816G10200F
A78R1052	311-1339-00			RES.,VAR,NONWIR:5K OHM,10%,0.50W	73138	89-131-1
A78R1053	321-0222-00			RES.,FXD,FILM:2K OHM,1%,0.125W	91637	MFF1816G20000F
A78R1054	321-0260-00			RES.,FXD,FILM:4.99K OHM,1%,0.125W	91637	MFF1816G49900F
A78R1055	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
A78R1056	321-0267-00			RES.,FXD,FILM:5.9K OHM,1%,0.125W	91637	MFF1816G59000F
A78R1057	308-0584-00			RES.,FXD,WW:20 OHM,0.5%,5W	91637	RS5-K20R00D
A78R1065	321-0001-00			RES.,FXD,FILM:10 OHM,1%,0.125W	75042	CEAT0-10R00F
A78R2019	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A78R2021	311-1271-00			RES.,VAR,NONWIR:50K OHM,10%,0.50W	32997	3329P-L58-503
A78R2022	321-0318-00			RES.,FXD,FILM:20K OHM,1%,0.125W	91637	MFF1816G20001F
A78R2023	321-0807-00			RES.,FXD,FILM:900K OHM,1%,0.125W	91637	HFF1104F90002F
A78R2024	321-0385-00			RES.,FXD,FILM:100K OHM,1%,0.125W	91637	MFF1816G10002F
A78R2025	321-0335-00			RES.,FXD,FILM:30.1K OHM,1%,0.125W	91637	MFF1816G30101F
A78R2026	321-0373-00			RES.,FXD,FILM:75K OHM, 1%,0.125W	91637	MFF1816G75001F
A78R2027	321-0369-00			RES.,FXD,FILM:68.1K OHM,1%,0.125W	91637	MFF1816G68101F
A78R2034	321-0323-00			RES.,FXD,FILM:22.6K OHM,1%,0.125W	91637	MFF1816G22601F
A78R2035	321-0364-00			RES.,FXD,FILM:60.4K OHM,1%,0.125W	91637	MFF1816G60401F
A78R2036	315-0203-00			RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
A78R2037	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
A78R2038	321-0001-00			RES.,FXD,FILM:10 OHM,1%,0.125W	75042	CEAT0-10R00F
A78R2041	321-0256-00			RES.,FXD,FILM:4.53K OHM,1%,0.125W	91637	MFF1816G45300F
A78R2042	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
A78R2043	321-0001-00			RES.,FXD,FILM:10 OHM,1%,0.125W	75042	CEAT0-10R00F
A78R2044	308-0443-00			RES.,FXD,WW:330 OHM,1%,2.5W	00213	1240S-330 OHM 1%
A78R2045	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A78R2046	321-0267-00			RES.,FXD,FILM:5.9K OHM,1%,0.125W	91637	MFF1816G59000F
A78R2047	321-0066-00			RES.,FXD,FILM:47.5 OHM,1%,0.125W	91637	MFF1816G47R50F
A78R2048	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A78R2049	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A78R2050	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A78R2051	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A78R2052	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A78R2053	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
A78R2060	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A78R2061	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A78R2062	315-0101-00			RES.,FXD,CMPSN:100 OHM,5%,0.25W	01121	CB1015
A78R2063	315-0273-00			RES.,FXD,CMPSN:27K OHM,5%,0.25W	01121	CB2735
A78R2064	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A78R2066	321-0092-00			RES.,FXD,FILM:88.7 OHM,1%,0.125W	91637	MFF1816G88R70F
A78R2067	315-0220-00			RES.,FXD,CMPSN:22 OHM,5%,0.25W	01121	CB2205
A78R2068	321-0105-00			RES.,FXD,FILM:121 OHM,1%,0.125W	91637	MFF1816G121R0F
A78R3010	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A78R3011	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A78R3012	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A78R3013	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A78R3014	321-0318-00			RES.,FXD,FILM:20K OHM,1%,0.125W	91637	MFF1816G20001F
A78R3015	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
A78R3016	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A78R3017	321-0289-02			RES.,FXD,FILM:10K OHM,0.5%,0.125W	91637	MFF1816D10001D
A78R3018	321-1293-02			RES.,FXD,FILM:11.1K OHM,0.5%,0.125W	91637	MFF1816D11100D
A78R3019	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A78R3020	315-0512-00			RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
A78R3022	303-0561-00			RES.,FXD,CMPSN:560 OHM,5%,1W	01121	GB5615
A78R3024	303-0561-00			RES.,FXD,CMPSN:560 OHM,5%,1W	01121	GB5615
A78R3026	321-0131-00			RES.,FXD,FILM:226 OHM,1%,0.125W	91637	MFF1816G226R0F
A78R3030	311-1259-00			RES.,VAR,NONWIR:100 OHM,10%,0.50W	32997	3329P-L58-101
A78R3031	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A78R3032	315-0432-00			RES.,FXD,CMPSN:4.3K OHM,5%,0.25W	01121	CB4325
A78R3033	315-0622-00			RES.,FXD,CMPSN:6.2K OHM,5%,0.25W	01121	CB6225
A78R3034	321-0067-00			RES.,FXD,FILM:48.7 OHM,1%,0.125W	91637	MFF1816G48R70F
A78R3035	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A78R3036	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
A78R3037	321-0155-00			RES.,FXD,FILM:402 OHM,1%,0.125W	91637	MFF1816G402R0F
A78R3038	311-1262-00			RES.,VAR,NONWIR:750 OHM,10%,0.50W	32997	3329P-L58-751
A78R3065	321-0069-00			RES.,FXD,FILM:51.1 OHM,1%,0.125W	91637	MFF1816G51R10F
A78R3066	311-1259-00			RES.,VAR,NONWIR:100 OHM,10%,0.50W	32997	3329P-L58-101
A78S2025	260-1237-00			SWITCH,REED:SPST	95348	MR-455-MODIFIED
A78T3021	120-0902-00			XFMR,TOROID:5 TURNS,BIFILAR	80009	120-0902-00
A78T3029	120-0903-00			XFMR,TOROID:3 WINDINGS,TRIFILAR	80009	120-0903-00
A78U1022	156-0158-04			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	01295	MC1458JG
A78U1032	156-0158-04			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	01295	MC1458JG
A78U1048	156-0067-12			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	04713	MC1741CU
A78U2032	156-0382-02			MICROCIRCUIT,DI:QUAD 2-INP NAND GATE	01295	SN74LS00
A78U2033	156-0072-02			MICROCIRCUIT,DI:MONOSTABLE MV,BURN-IN	01295	SN74121
A78U2034	156-0067-12			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	04713	MC1741CU
A78U2042	156-0067-12			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	04713	MC1741CU
A78U2048	156-0072-02			MICROCIRCUIT,DI:MONOSTABLE MV,BURN-IN	01295	SN74121
A78U2052	156-0382-02			MICROCIRCUIT,DI:QUAD 2-INP NAND GATE	01295	SN74LS00
A78U2055	156-0140-02			MICROCIRCUIT,DI:HEX BUFFERS W/OC HV OUT	27014	DM8017NA+/JA+
A78U2059	156-0093-00			MICROCIRCUIT,DI:HEX.INVERTER	80009	156-0093-00
A78U3015	156-0158-04			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	01295	MC1458JG
A78VR2058	152-0087-00			SEMICOND DEVICE:ZENER,1W,100V,5%	04713	SZ1627

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A80	----- -----			CKT BOARD ASSY:REF LEVEL READOUT		
A80C2802	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A80C2808	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A80C2816	283-0191-00			CAP.,FXD,CER DI:0.022UF,20%,50V	72982	8121N075Z5U0223M
A80C2818	290-0722-00			CAP.,FXD,ELCTLT:100UF,20%,10V	56289	196D107X0010PE3
A80DS2808	150-1012-06			LAMP,LED RDOUT:RED,7 SEG,4.0 DIGIT W/FR	80009	150-1012-06
A80R2802	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A80R2804	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A80R2806	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A80R2808	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A80R2810	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A80R2812	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A80R2814	315-0301-00			RES.,FXD,CMPSN:300 OHM,5%,0.25W	01121	CB3015
A80R2816	315-0823-00			RES.,FXD,CMPSN:82K OHM,5%,0.25W	01121	CB8235
A80R2815	315-0393-00			RES.,FXD,CMPSN:39K OHM,5%,0.25W	01121	CB3935
A80R2818	307-0115-00			RES.,FXD,CMPSN:7.5 OHM,5%,0.25W	01121	CB75G5
A80U2800	156-0798-00			MICROCIRCUIT,DI:DUAL 4 LINE TO 1 LINE	01295	SN74LS153N
A80U2802	156-0798-00			MICROCIRCUIT,DI:DUAL 4 LINE TO 1 LINE	01295	SN74LS153N
A80U2804	156-0387-00			MICROCIRCUIT,DI:DUAL J-K NEG EDGE TRIG	80009	156-0387-00
A80U2806	156-0379-00			MICROCIRCUIT,DI:BCD TO 7-SEGMENT DCDR/DRVR	80009	156-0379-00
A80U2808	156-0111-00			MICROCIRCUIT,DI:SGL BCD-TO-DEC DEC/DRIVER	80009	156-0111-00
A80U2815	156-0350-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	80009	156-0350-00

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A82	----- -----			CKT BOARD ASSY:CRT READOUT		
A82C2820	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A82C2876	283-0238-00			CAP.,FXD,CER DI:0.01UF,10%,50V	72982	8121N075X7R0103K
A82C2878	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A82CR2856	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A82CR2859	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A82CR2862	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A82CR2866	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A82CR2869	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A82CR2873	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A82CR2874	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A82CR2877	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A82CR2878	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A82Q2820	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
A82Q2825	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A82Q2830	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A82Q2835	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A82Q2840	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A82Q2845	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A82Q2850	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A82Q2855	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A82R2820	315-0433-00			RES.,FXD,CMPSN:43K OHM,5%,0.25W	01121	CB4335
A82R2822	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A82R2824	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A82R2826	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A82R2828	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A82R2830	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A82R2832	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A82R2834	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A82R2836	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A82R2838	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A82R2840	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A82R2842	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A82R2844	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A82R2846	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A82R2850	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A82R2852	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A82R2854	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A82R2856	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A82R2857	321-0325-00			RES.,FXD,FILM:23.7K OHM,1%,0.125W	91637	MFF1816G23701F
A82R2858	321-0371-00			RES.,FXD,FILM:71.5K OHM,1%,0.125W	91637	MFF1816G71501F
A82R2860	321-0400-00			RES.,FXD,FILM:143K OHM,1%,0.125W	91637	MFF1816G14302F
A82R2862	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A82R2864	321-0325-00			RES.,FXD,FILM:23.7K OHM,1%,0.125W	91637	MFF1816G23701F
A82R2866	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A82R2868	321-0313-00			RES.,FXD,FILM:17.8K OHM,1%,0.125W	91637	MFF1816G17801F
A82R2869	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A82R2870	321-0342-00			RES.,FXD,FILM:35.7K OHM,1%,0.125W	91637	MFF1816G35701F
A82R2871	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A82R2872	321-0371-00			RES.,FXD,FILM:71.5K OHM,1%,0.125W	91637	MFF1816G71501F
A82R2874	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A82R2876	321-0400-00			RES.,FXD,FILM:143K OHM,1%,0.125W	91637	MFF1816G14302F
A82R2877	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A82R2879	321-0400-00			RES.,FXD,FILM:143K OHM,1%,0.125W	91637	MFF1816G14302F
A82U2820	156-0644-01			MICROCIRCUIT,DI:QUAD BILATERAL SW,CAK	80009	156-0644-01
A82U2830	156-0644-01			MICROCIRCUIT,DI:QUAD BILATERAL SW,CAK	80009	156-0644-01
A82U2878	156-1150-00			MICROCIRCUIT,LI:VOLTAGE REGULATOR,NEGATIVE	04713	MC79L05ACP
A82VR2848	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
A84	----- -----			CKT BOARD ASSY:REF LEVEL CONTROL		
A84C2886	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A84C2897	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A84C2898	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A84C2899	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A84CR2880	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A84CR2882	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A84L2898	108-0598-00			COIL,RF:200UH	80009	108-0598-00
A84Q2880	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
A84Q2885	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
A84Q2890	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A84Q2895	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A84Q2896	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A84R2872	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A84R2875	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A84R2878	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A84R2880	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A84R2881	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A84R2882	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A84R2883	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A84R2884	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A84R2885	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A84R2886	315-0302-00			RES.,FXD,CMPSN:3K OHM,5%,0.25W	01121	CB3025
A84R2887	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A84R2890	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A84R2892	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
A84R2894	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A84R2895	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A84R2896	315-0202-00			RES.,FXD,CMPSN:2K OHM,5%,0.25W	01121	CB2025
A84R2897	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A84R2898	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A84R2899	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A84S2880	----- -----			(SEE A84 FIG. 3 RMPL FOR REPLACEABLE PARTS)		
A84S2885	----- -----			(SEE A84 FIG. 3 RMPL FOR REPLACEABLE PARTS)		
A84U2880	156-0547-00			MICROCIRCUIT,DI:QUAD TOW-INPUT MULTIPLEXER	80009	156-0547-00
A84U2885	156-1087-00			MICROCIRCUIT,DI:256 X 8 ROM,CUSTOM MASK	80009	156-1087-00
A84U2890	156-0785-10			MICROCIRCUIT,DI:256 BIT PROM,PROGRAMMED	80009	156-0785-10
A84VR2886	152-0055-00			SEMICOND DEVICE:ZENER,0.4W,11V,5%	04713	SZG35009K1
A84VR2888	152-0278-00			SEMICOND DEVICE:ZENER,0.4W,3V,5%	04713	SZG35009K20

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A88	----- -----			CKT BOARD ASSY:DIGITAL STORAGE,VERT INTFC		
A88C1011	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A88C1021	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A88C1022	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A88C1031	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A88C1038	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A88C1051	283-0032-00			CAP.,FXD,CER DI:470PF,5%,500V	72982	0831085Z5E00471J
A88C1052	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A88C1059	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A88C1061	281-0158-00			CAP.,VAR,CER DI:7-45PF,50V	73899	DVJ-5006
A88C1062	283-0331-00			CAP.,FXD,CER DI:43PF,2%,100V	72982	805-505A430G
A88C1063	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A88C1069	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A88C1086	283-0114-00			CAP.,FXD,CER DI:0.0015UF,5%,200V	72982	805-509B152J
A88C1092	281-0125-00			CAP.,VAR,MICA D:90-400PF,175V	52769	GMC30900
A88C2012	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A88C2029	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A88C2038	281-0656-00			CAP.,FXD,CER DI:22PF,5%,500V	72982	374005C0G0220J
A88C2039	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A88C2040	290-0530-00			CAP.,FXD,ELCTLT:68UF,20%,6V	90201	TDC686M006NLF
A88C2052	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A88C2053	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A88C2054	281-0656-00			CAP.,FXD,CER DI:22PF,5%,500V	72982	374005C0G0220J
A88C2062	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A88C2079	283-0069-00			CAP.,FXD,CER DI:15PF,20%,50V	72982	811-059C0G0150M
A88C2082	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208Z5U0102Z
A88C2083	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A88C2090	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A88C2091	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A88C2093	283-0142-00			CAP.,FXD,CER DI:0.0027UF,5%,200V	72982	875-571-Y5E0272J
A88C3012	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A88C3032	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A88C3033	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208Z5U0102Z
A88C3082	283-0069-00			CAP.,FXD,CER DI:15PF,20%,50V	72982	811-059C0G0150M
A88C3091	283-0142-00			CAP.,FXD,CER DI:0.0027UF,5%,200V	72982	875-571-Y5E0272J
A88C3092	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A88C4012	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A88C4014	283-0197-00			CAP.,FXD,CER DI:470PF,5%,100V	72982	8121N075C0G0471J
A88C4032	283-0156-00			CAP.,FXD,CER DI:1000PF,+100-0%,200V	72982	8111A208Z5U0102Z
A88C4080	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
A88C4081	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
A88C4082	290-0536-00			CAP.,FXD,ELCTLT:10UF,20%,25V	90201	TDC106M025FL
A88C4083	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A88C4084	283-0204-00			CAP.,FXD,CER DI:0.01UF,20%,50V	72982	8121N061Z5U0103M
A88C4085	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A88C4086	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A88C4093	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A88C4094	283-0142-00			CAP.,FXD,CER DI:0.0027UF,5%,200V	72982	875-571-Y5E0272J
A88CR1056	152-0322-00			SEMICOND DEVICE:SILICON,15V,HOT CARRIER	50434	5082-2672
A88CR1073	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A88CR2075	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A88CR3080	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A88CR3081	152-0460-00			SEMICOND DEVICE:SILICON,25V,1MA	04713	1N5299
A88CR4083	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A88CR5011	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A88L1062	108-0226-00			COIL,RF:100UH	76493	DWG B4257
A88L4068	108-0422-00			COIL,RF:FIXED,82UH	80009	108-0422-00
A88Q1062	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A88Q1064	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
A88Q1066	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A88Q1082	151-1097-00			TRANSISTOR:SILICON,FE	80009	151-1097-00
A88Q2068	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A88Q2069	151-1006-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	80009	151-1006-00
A88Q2076	151-0301-00			TRANSISTOR:SILICON,PNP	27014	2N2907A
A88Q3052	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A88Q3062	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A88Q3064	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A88Q3072	151-1006-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	80009	151-1006-00
A88Q3086	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A88R1030	315-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
A88R1034	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A88R1042	307-0446-00			RES,NTWK,FXD FI:10K OHM,20%,(9) RES	91637	MSP10A01-103M
A88R1051	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A88R1052	321-0202-00			RES.,FXD,FILM:1.24K OHM,1%,0.125W	91637	MFF1816G12400F
A88R1053	321-0202-00			RES.,FXD,FILM:1.24K OHM,1%,0.125W	91637	MFF1816G12400F
A88R1054	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
A88R1055	321-0202-00			RES.,FXD,FILM:1.24K OHM,1%,0.125W	91637	MFF1816G12400F
A88R1056	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A88R1061	315-0912-00			RES.,FXD,CMPSN:9.1K OHM,5%,0.25W	01121	CB9125
A88R1062	315-0681-00			RES.,FXD,CMPSN:680 OHM,5%,0.25W	01121	CB6815
A88R1063	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A88R1064	315-0272-00			RES.,FXD,CMPSN:2.7K OHM,5%,0.25W	01121	CB2725
A88R1065	315-0912-00			RES.,FXD,CMPSN:9.1K OHM,5%,0.25W	01121	CB9125
A88R1066	315-0125-00			RES.,FXD,CMPSN:1.2M OHM,5%,0.25W	01121	CB1255
A88R1069	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
A88R1071	311-1281-00			RES.,VAR,NONWIR:2.5K OHM,10%,0.5W	32997	3329W-L58-252
A88R1072	311-1280-00			RES.,VAR,NONWIR:1K OHM,10%,0.50W	32997	3329W-L58-102
A88R1073	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A88R1074	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A88R1075	321-0210-00			RES.,FXD,FILM:1.5K OHM,1%,0.125W	91637	MFF1816G15000F
A88R1076	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A88R1077	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A88R1079	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A88R1082	311-1287-00			RES.,VAR,NONWIR:TRMR,100K OHM,0.50W	32997	3329W-L58-104
A88R1083	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A88R1084	321-0260-00			RES.,FXD,FILM:4.99K OHM,1%,0.125W	91637	MFF1816G49900F
A88R1085	321-0385-00			RES.,FXD,FILM:100K OHM,1%,0.125W	91637	MFF1816G10002F
A88R2012	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A88R2028	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A88R2038	321-0202-00			RES.,FXD,FILM:1.24K OHM,1%,0.125W	91637	MFF1816G12400F
A88R2039	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A88R2052	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A88R2053	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A88R2054	321-0231-00			RES.,FXD,FILM:2.49K OHM,1%,0.125W	91637	MFF1816G24900F
A88R2055	315-0396-00			RES.,FXD,CMPSN:39M OHM,5%,0.25W	01121	CB3965
A88R2062	315-0912-00			RES.,FXD,CMPSN:9.1K OHM,5%,0.25W	01121	CB9125
A88R2063	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A88R2064	321-0097-00			RES.,FXD,FILM:100 OHM,1%,0.125W	91637	MFF1816G100R0F
A88R2065	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A88R2072	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A88R2073	321-0373-00			RES.,FXD,FILM:75K OHM, 1%,0.125W	91637	MFF1816G75001F
A88R2075	321-0231-00			RES.,FXD,FILM:2.49K OHM,1%,0.125W	91637	MFF1816G24900F
A88R2076	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A88R2077	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
A88R2084	321-0231-00			RES.,FXD,FILM:2.49K OHM,1%,0.125W	91637	MFF1816G24900F
A88R2085	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A88R2086	321-0365-00			RES.,FXD,FILM:61.9K OHM,1%,0.125W	91637	MFF1816G61901F

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A88R2091	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A88R3012	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A88R3013	321-0202-00			RES.,FXD,FILM:1.24K OHM,1%,0.125W	91637	MFF1816G12400F
A88R3014	321-0202-00			RES.,FXD,FILM:1.24K OHM,1%,0.125W	91637	MFF1816G12400F
A88R3033	321-0385-00			RES.,FXD,FILM:100K OHM,1%,0.125W	91637	MFF1816G10002F
A88R3041	321-0306-00			RES.,FXD,FILM:15K OHM,1%,0.125W	91637	MFF1816G15001F
A88R3042	321-1289-07			RES.,FXD,FILM:10.1K OHM,0.1%,0.125W	91637	MFF1816C10101B
A88R3043	321-0260-00			RES.,FXD,FILM:4.99K OHM,1%,0.125W	91637	MFF1816G49900F
A88R3044	321-0289-07			RES.,FXD,FILM:10K OHM,0.1%,0.125W	91637	MFF1816C10001B
A88R3051	315-0152-00			RES.,FXD,CMPSN:1.5K OHM,5%,0.25W	01121	CB1525
A88R3052	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A88R3053	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A88R3054	315-0203-00			RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
A88R3055	315-0333-00			RES.,FXD,CMPSN:33K OHM,5%,0.25W	01121	CB3335
A88R3056	321-0381-00			RES.,FXD,FILM:90.9K OHM,1%,0.125W	91637	MFF1816G90901F
A88R3060	**321-0114-00**			**RES.,FXD,FILM:150 OHM,1%,0.125W**	91637	MFF1816G150R0F
A88R3061	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A88R3062	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A88R3063	315-0203-00			RES.,FXD,CMPSN:20K OHM,5%,0.25W	01121	CB2035
A88R3064	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
A88R3065	307-0442-00			RES.,FXD,FILM:BIAS OF 8	80009	307-0442-00
A88R3071	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A88R3072	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A88R3073	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A88R3074	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A88R3075	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A88R3076	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A88R3077	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A88R3078	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
A88R3080	321-0411-00			RES.,FXD,FILM:187K OHM,1%,0.125W	91637	MFF1816G18702F
A88R3082	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A88R3083	315-0114-00			RES.,FXD,CMPSN:110K OHM,5%,0.25W	01121	CB1145
A88R3084	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A88R3085	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A88R3086	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A88R3087	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A88R3088	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A88R3089	321-0260-00			RES.,FXD,FILM:4.99K OHM,1%,0.125W	91637	MFF1816G49900F
A88R3092	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A88R4011	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A88R4012	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A88R4013	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A88R4014	321-0222-00			RES.,FXD,FILM:2K OHM,1%,0.125W	91637	MFF1816G20000F
A88R4021	321-0402-00			RES.,FXD,FILM:150K OHM,1%,0.125W	24546	NA55D1503F
A88R4022	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A88R4023	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
A88R4024	321-0385-00			RES.,FXD,FILM:100K OHM,1%,0.125W	91637	MFF1816G10002F
A88R4032	321-0289-07			RES.,FXD,FILM:10K OHM,0.1%,0.125W	91637	MFF1816C10001B
A88R4033	321-0289-07			RES.,FXD,FILM:10K OHM,0.1%,0.125W	91637	MFF1816C10001B
A88R4065	307-0103-00			RES.,FXD,CMPSN:2.7 OHM,5%,0.25W	01121	CB27G5
A88R4066	321-0260-00			RES.,FXD,FILM:4.99K OHM,1%,0.125W	91637	MFF1816G49900F
A88R4067	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	91637	MFF1816G10001F
A88R4068	307-0103-00			RES.,FXD,CMPSN:2.7 OHM,5%,0.25W	01121	CB27G5
A88R4069	304-0101-00			RES.,FXD,CMPSN:100 OHM,10%,1W	01121	GB1011
A88R4072	321-0280-00			RES.,FXD,FILM:8.06K OHM,1%,0.125W	91637	MFF1816G80600F

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A88R4073	321-0193-00			RES.,FXD,FILM:1K OHM,1%,0.125W	91637	MFF1816G10000F
A88R4080	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A88R4081	321-0201-00			RES.,FXD,FILM:1.21K OHM,1%,0.125W	91637	MFF1816G12100F
A88R4082	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A88R4083	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A88R4086	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005
A88R4089	315-0180-00			RES.,FXD,CMPSN:18 OHM,5%,0.25W	01121	CB1805
A88R4094	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
A88R5011	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A88R5012	321-0364-00			RES.,FXD,FILM:60.4K OHM,1%,0.125W	91637	MFF1816G60401F
A88R5021	311-1287-00			RES.,VAR,NONWIR:TRMR,100K OHM,0.50W	32997	3329W-L58-104
A88R5022	311-1280-00			RES.,VAR,NONWIR:1K OHM,10%,0.50W	32997	3329W-L58-102
A88S1046	260-1721-00			SWITCH,ROCKER:8,SPST,125MA,30VDC	00779	435166-5
A88U1010	156-0987-00			MICROCIRCUIT,DI:4096 X 1 STATIC R/W RAM	80009	156-0987-00
A88U1022	156-0391-02			MICROCIRCUIT,DI:HEX LATCH W/CLEAR	80009	156-0391-02
A88U1026	156-0987-00			MICROCIRCUIT,DI:4096 X 1 STATIC R/W RAM	80009	156-0987-00
A88U1036	156-0391-02			MICROCIRCUIT,DI:HEX LATCH W/CLEAR	80009	156-0391-02
A88U1038	156-0994-02			MICROCIRCUIT,DI:8 INPUT DATA SEL/MUX	01295	SN74LS151NP3
A88U1046	156-0927-00			MICROCIRCUIT,LI:DIGITAL TO ANALOG CONVERTER	80009	156-0927-00
A88U1058	156-0387-02			MICROCIRCUIT,DI:DUAL J-K FF,BURN IN	80009	156-0387-02
A88U2012	156-0927-00			MICROCIRCUIT,LI:DIGITAL TO ANALOG CONVERTER	80009	156-0927-00
A88U2020	155-0158-00			MICROCIRCUIT,DI:DIGITAL STORAGE HORIZONTAL	80009	155-0158-00
A88U2036	156-1255-00			MICROCIRCUIT,LI:D/A CONVERTER	80009	156-1255-00
A88U2045	155-0157-00			MICROCIRCUIT,DI:DIGITAL STORAGE VERTICAL	80009	155-0157-00
A88U2052	156-1255-00			MICROCIRCUIT,LI:D/A CONVERTER	80009	156-1255-00
A88U2062	156-0480-02			MICROCIRCUIT,DI:QUAD 2 INP & GATE	01295	SN74LS08NP3
A88U2064	156-0382-02			MICROCIRCUIT,DI:QUAD 2-INP NAND GATE	01295	SN74LS00
A88U2068	156-1226-00			MICROCIRCUIT,LI:DUAL COMPARATOR	34335	AM3190
A88U2072	156-0317-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	34371	HA2-2625-5
A88U2082	156-0158-04			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	01295	MC1458JG
A88U2088	156-1312-00			MICROCIRCUIT,LI:SAMPLE/HOLD AMPLIFIER	80009	156-1312-00
A88U3032	156-0388-03			MICROCIRCUIT,DI:DUAL D FLIP-FLOP	07263	74LS74D
A88U3034	156-0578-02			MICROCIRCUIT,DI:DUAL ONE-SHOTMV,SEL	04713	MC14528BCLDS
A88U3052	156-0411-02			MICROCIRCUIT,LI:QUAD COMPARATOR,SEL	04713	MLM339LDS
A88U3078	156-1272-00			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	18324	NE5532 FE-IIB
A88U3079	156-1226-00			MICROCIRCUIT,LI:DUAL COMPARATOR	34335	AM3190
A88U3084	156-0317-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	34371	HA2-2625-5
A88U3086	156-0158-04			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	01295	MC1458JG
A88U3092	156-1312-00			MICROCIRCUIT,LI:SAMPLE/HOLD AMPLIFIER	80009	156-1312-00
A88U4022	156-1226-00			MICROCIRCUIT,LI:DUAL COMPARATOR	34335	AM3190
A88U4024	156-0158-04			MICROCIRCUIT,LI:DUAL OPERATIONAL AMPLIFIER	01295	MC1458JG
A88U4032	156-0718-03			MICROCIRCUIT,DI:TRIPLE 3-INP NOR GATE	80009	156-0718-03
A88U4081	156-1150-00			MICROCIRCUIT,LI:VOLTAGE REGULATOR,NEGATIVE	04713	MC79L05ACP
A88U4082	156-0937-00			MICROCIRCUIT,LI:VOLTAGE REFERENCE	24355	AD580LH
A88U4084	156-1312-00			MICROCIRCUIT,LI:SAMPLE/HOLD AMPLIFIER	80009	156-1312-00
A88W2093	----- -----			WIRE STRAP:		
A88W3091	----- -----			WIRE STRAP:		

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A90	----- -----			CKT BOARD ASSY:DIGITAL STORAGE,HORIZ INTFC		
A90C1035	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A90C1041	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	56289	273C5
A90C1042	283-0186-00			CAP.,FXD,CER DI:27PF,5%,50V	72982	8121B070A270J
A90CR1015	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A90CR1022	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A90CR1032	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A90CR1041	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A90CR1046	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A90CR2021	152-0141-02			SEMICOND DEVICE:SILICON,30V,150MA	01295	1N4152R
A90Q1015	151-1006-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	80009	151-1006-00
A90Q1021	151-0427-00			TRANSISTOR:SILICON,NPN	80009	151-0427-00
A90Q1023	151-0427-00			TRANSISTOR:SILICON,NPN	80009	151-0427-00
A90Q1025	151-0427-00			TRANSISTOR:SILICON,NPN	80009	151-0427-00
A90Q1055	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A90Q2013	151-0188-00			TRANSISTOR:SILICON,PNP	04713	SPS6868K
A90Q2015	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A90Q2021	151-0190-00			TRANSISTOR:SILICON,NPN	07263	S032677
A90Q2028	151-1006-00			TRANSISTOR:SILICON,JFE,N-CHANNEL	80009	151-1006-00
A90R1011	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A90R1012	321-0385-00			RES.,FXD,FILM:100K OHM,1%,0.125W	91637	MFF1816G10002F
A90R1013	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
A90R1014	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
A90R1015	315-0752-00			RES.,FXD,CMPSN:7.5K OHM,5%,0.25W	01121	CB7525
A90R1016	315-0333-00			RES.,FXD,CMPSN:33K OHM,5%,0.25W	01121	CB3335
A90R1022	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
A90R1031	321-0341-00			RES.,FXD,FILM:34.8K OHM,1%,0.125W	91637	MFF1816G34801F
A90R1032	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A90R1033	311-1228-00			RES.,VAR,NONWIR:10K OHM,20%,0.50W	32997	3386F-T04-103
A90R1041	321-0290-00			RES.,FXD,FILM:10.2K OHM,1%,0.125W	91637	MFF1816G10201F
A90R1042	315-0470-00			RES.,FXD,CMPSN:47 OHM,5%,0.25W	01121	CB4705
A90R1044	315-0333-00			RES.,FXD,CMPSN:33K OHM,5%,0.25W	01121	CB3335
A90R1048	321-0385-00			RES.,FXD,FILM:100K OHM,1%,0.125W	91637	MFF1816G10002F
A90R2014	315-0912-00			RES.,FXD,CMPSN:9.1K OHM,5%,0.25W	01121	CB9125
A90R2015	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
A90R2021	315-0153-00			RES.,FXD,CMPSN:15K OHM,5%,0.25W	01121	CB1535
A90R2025	321-0385-00			RES.,FXD,FILM:100K OHM,1%,0.125W	91637	MFF1816G10002F
A90R2031	321-0314-00			RES.,FXD,FILM:18.2K OHM,1%,0.125W	91637	MFF1816G18201F
A90R2032	311-1230-00			RES.,VAR,NONWIR:20K OHM,20%,0.50W	32997	3386F-T04-203
A90R2033	321-0756-00			RES.,FXD,FILM:50K OHM,1%,0.125W	24546	NA55D5002F
A90U1039	156-0105-00			MICROCIRCUIT,LI:OPERATIONAL AMPLIFIER	27014	LM301AN
A96	----- ----- ----- -----			**CKT BOARD ASSY:1ST LO INTERFACE (REPLACEABLE AS A UNIT WITH A12)**		
A96C1012	283-0111-00			CAP.,FXD,CER DI:0.1UF,20%,50V	72982	8121-N088Z5U104M
A96C1015	290-0513-00			CAP.,FXD,ELCTLT:510UF,+75-10%,25V	56289	109D575
A96R1014	315-0100-00			RES.,FXD,CMPSN:10 OHM,5%,0.25W	01121	CB1005

Component No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
				CHASSIS PARTS		
AT1	119-0871-00			ATTENUATOR,VAR:0.60 DB IN 10 DB STEPS	04423	8104
DS130	150-0048-01			LAMP,INCAND:5V,0.06A,SEL	08806	683AS15
DS132	150-0048-01			LAMP,INCAND:5V,0.06A,SEL	08806	683AS15
DS2075	150-1012-02			NUM DISPLAY:4 DIGITS,7 SEG LED,RED	50579	DATA-LIT 3YM
FL2	119-0472-01			FILTER,LOW PASS:1800 MHZ	33174	LSF 1800-10 AA
FL4	119-0750-00			FILTER,LOW PASS:3.95 GHZ	33174	LRM 3650-6BB
MP20	119-0514-00			CLUTCH,MAGNETIC:12VDC,0.25 ARM HUB&ROT	54226	S008-43-301
MP22	119-0514-01			CLUTCH,MAGNETIC:CU NI PLATED	80009	119-0514-01
R20	311-1683-00			RES.,VAR,WW:2K OHM,5%	73138	7266-377-1
R22	311-1673-00			RES.,VAR,WW:10K OHM,10%	73138	8146-24-0
R80	311-0328-00			RES.,VAR,NONWIR:1K OHM,20%	01121	W7365
R82	311-0771-00			RES.,VAR,NONWIR:PNL,1K OHM,0.5W/SW	12697	381-CM39686
R95	311-0328-00			RES.,VAR,NONWIR:1K OHM,20%	01121	W7365
R96	311-1095-00			RES.,VAR,NONWIR:10K OHM,20%,0.50W	12697	382-CM40386
R97	311-0326-00			RES.,VAR,NONWIR:10K OHM,20%,0.50W	01121	W7683
R98	311-1095-00			RES.,VAR,NONWIR:10K OHM,20%,0.50W	12697	382-CM40386
R100	311-1192-00			RES.,VAR,NONWIR:10K OHM,20%,1W,W/SW	71590	BA-232-001
R102	311-1099-00			RES.,VAR,NONWIR:100K OHM,0.5W	01121	WAIG04S104AZ
R107	311-0387-00			RES.,VAR,NONWIR:5K OHM,20%	01121	W7565A
R115	311-1971-00			RES.,VAR,NONWIR:PNL,50K OHM,10%,1.0W	01121	SPSG024S503U
S82	311-0771-00			RES.,VAR,NONWIR:PNL,1K OHM,0.5W/SW	12697	381-CM39686
S100	311-1192-00			RES.,VAR,NONWIR:10K OHM,20%,1W,W/SW	71590	BA-232-001
W1	175-2027-00			CABLE ASSY,RF:50 OHM COAX,3.541 INCH LONG	80009	175-2027-00
W2	175-3408-00			CABLE ASSY,RF:50 OHM COAX,1.75 L,SEMI RDG	80009	175-3408-00
W3	175-3407-00			CABLE ASSY,RF:50 OHM COAX,2.12 L,SEMI RDG	80009	175-3407-00
W6	175-1449-00			CABLE ASSY,RF:50 OHM COAX,7.62 INCH LONG	80009	175-1449-00
W7	175-1442-00			CABLE ASSY,RF:50 OHM COAX,11.0 INCH LONG	80009	175-1442-00
W20	175-3119-00			CABLE ASSY,RF:50 OHM COAX,7.323 L,SEMI RDG	80009	175-3119-00
W25	175-1431-00			CABLE ASSY,RF:50 OHM COAX,8.25 INCH LONG	80009	175-1431-00
W28	175-1476-00			CABLE ASSY,RF:50 OHM COAX,14.0 INCH LONG	80009	175-1476-00
W30	175-3118-00			CABLE ASSY,RF:50 OHM COAX,4.21 L,SEMI RDG	80009	175-3118-00
W32	175-3116-00			CABLE ASSY,RF:50 OHM COAX,13.377 L,SEMI RG	80009	175-3116-00
W38	175-1447-00			CABLE ASSY,RF:50 OHM COAX,4.5 INCH LONG	80009	175-1447-00
W39	175-1444-00			CABLE ASSY,RF:50 OHM COAX,7.87 INCH LONG	80009	175-1444-00
W92	175-1374-00			CABLE ASSY,RF:50 OHM COAX,3.0 INCH LONG	80009	175-1374-00
W95	175-1372-00			CABLE ASSY,RF:50 OHM COAX,6.5 INCH LONG	80009	175-1372-00
W302	175-1505-00			CABLE ASSY,RF:50 OHM COAX,19.25 INCH LONG	80009	175-1505-00
W303	175-1501-00			CABLE ASSY,RF:50 OHM COAX,13.75 INCH LONG	80009	175-1501-00
W900	175-3130-00			CABLE ASSY,RF:50 OHM COAX,8.5 INCH LONG	80009	175-3130-00

DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

Symbols

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

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

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

Abbreviations are based on ANSI Y1.1-1972.

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

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

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

Component Values

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

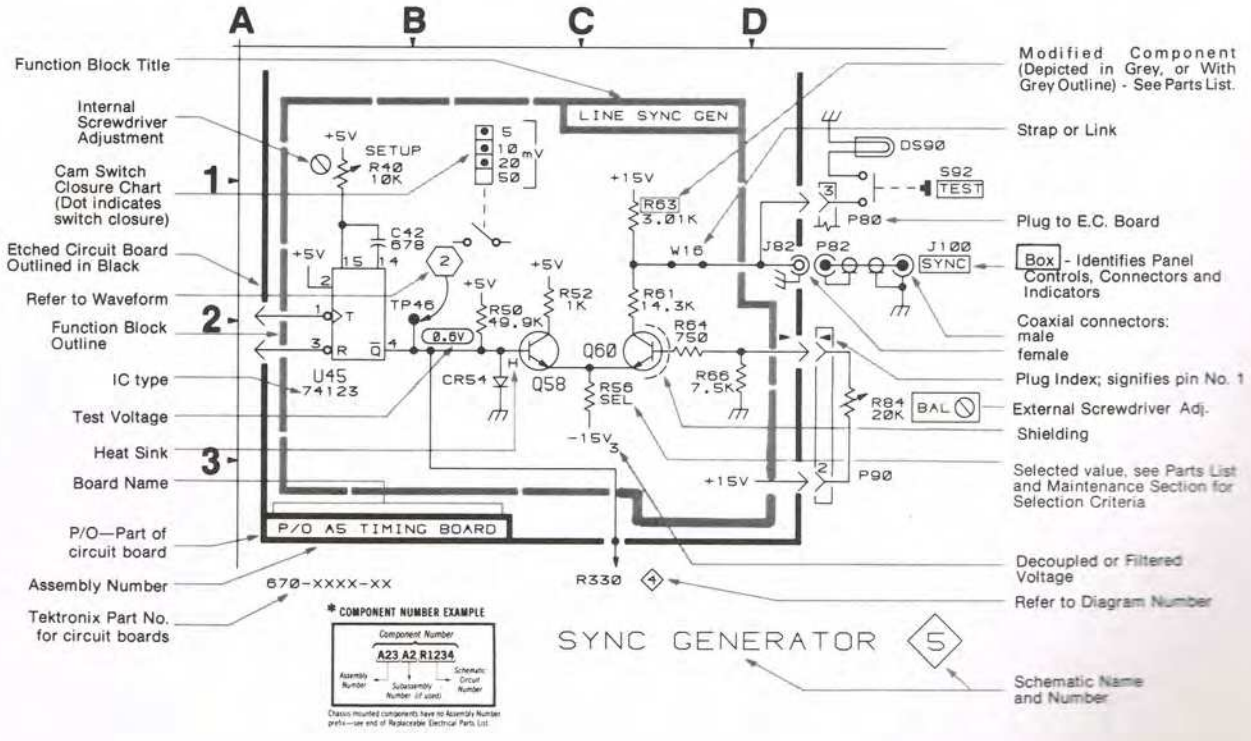
Capacitors = Values one or greater are in picofarads (pF). Values less than one are in microfarads (μF).
Resistors = Ohms (Ω).

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

Assembly Numbers and Grid Coordinates

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

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



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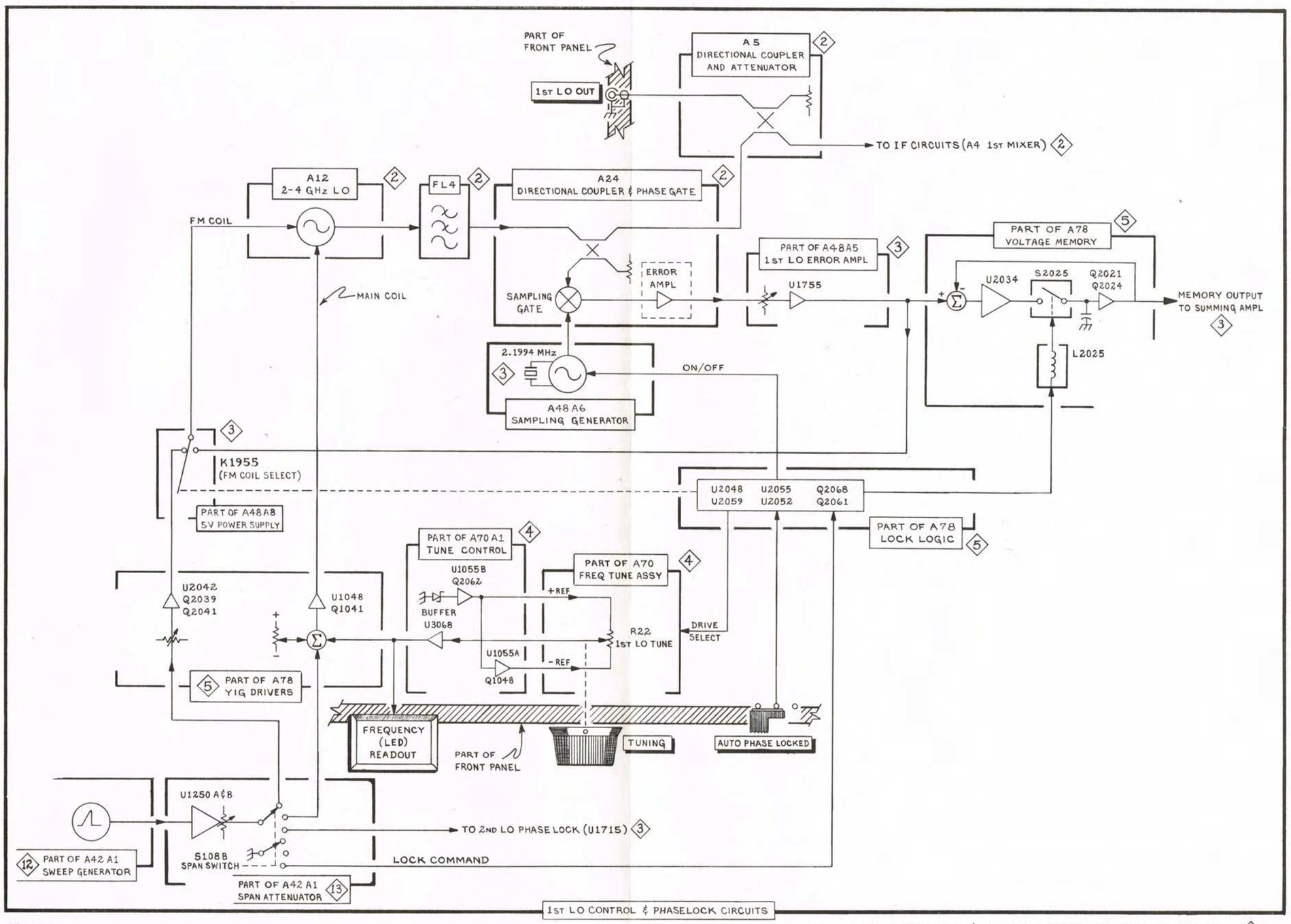


7L14

@3434-73

1ST LO CONTROL & PHASELOCK BLOCK DIAGRAM 1

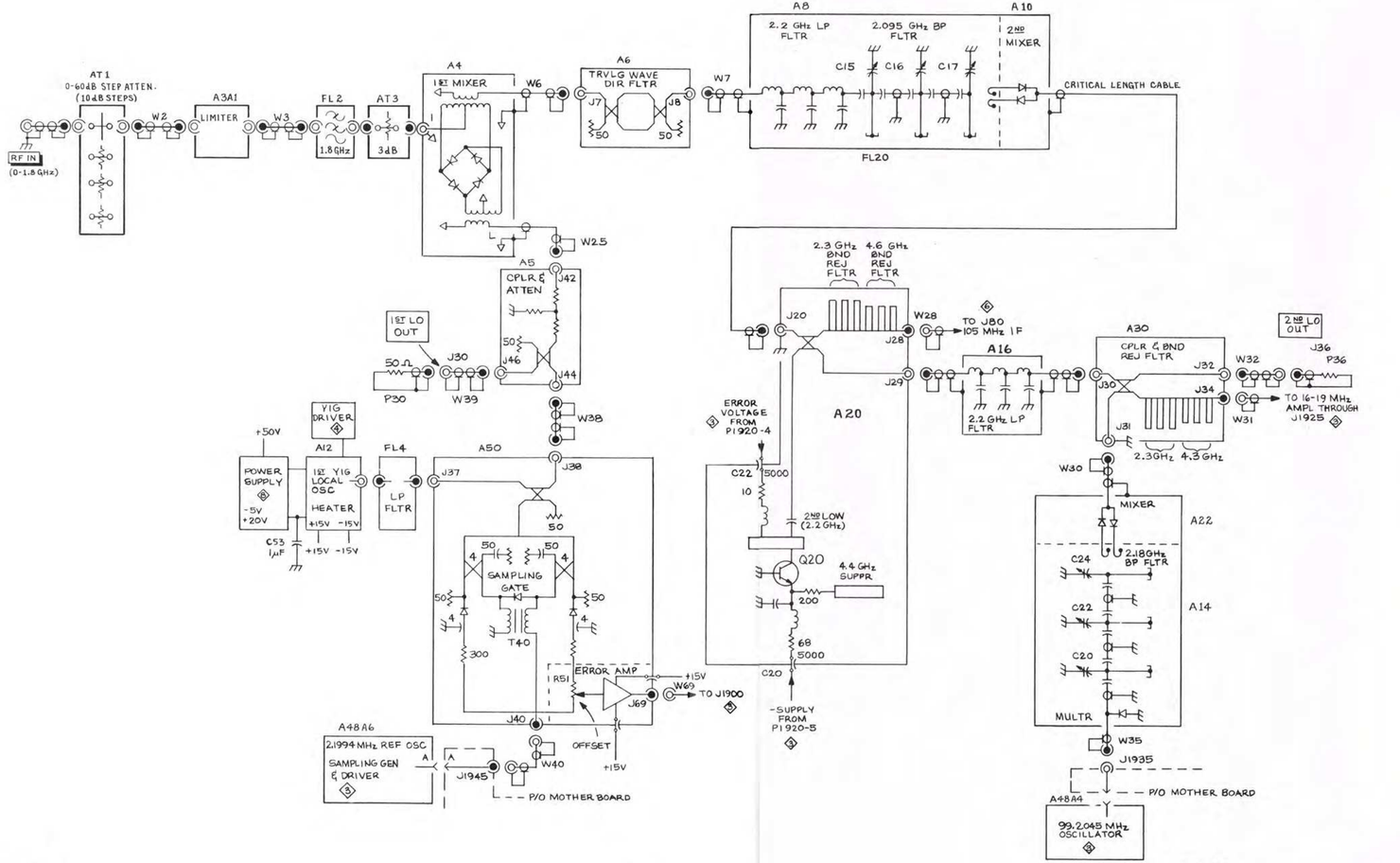
Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE

Component Number: A23 A2 R1234

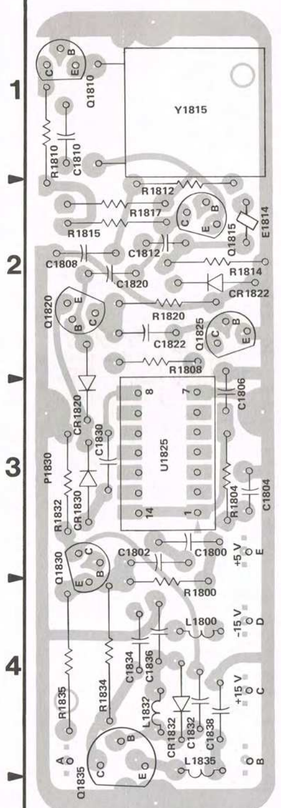
- A23 — Assembly Number
- A2 — Subassembly Number (if used)
- R1234 — Schematic Circuit Number

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

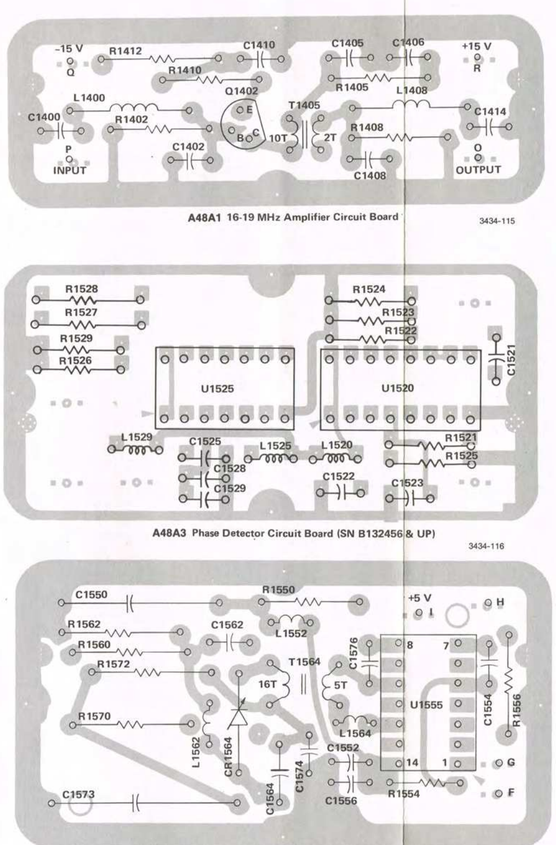


RF SECTION
(MICROWAVE ASSEMBLIES) 2

@ 3434-52



A48A6 Sampling Generator and Driver Circuit Board



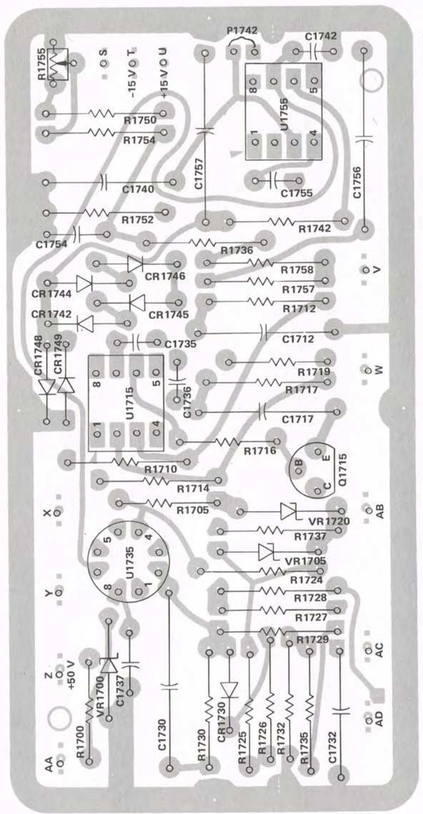
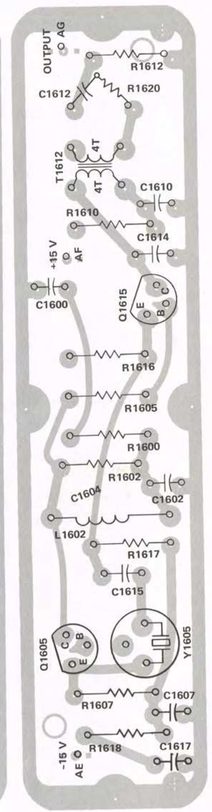
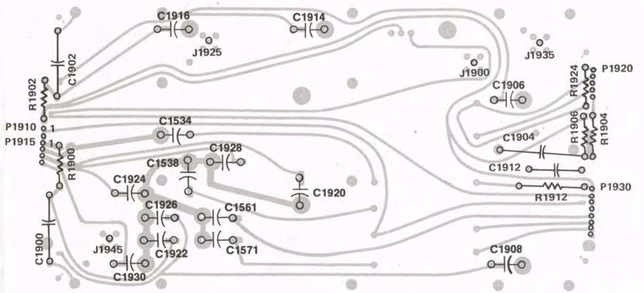


Figure 7-3 A48A5 Summing Ampl & 2nd LO Error Ampl



A48A4 99.2045 MHz Oscillator Circuit Board



PHASE LOCK DIAGRAM ◇3

ASSEMBLY A48A1

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1400	C1	B1	C1410	D1	C1	Q1402	D1	C1	R1410	D1	C1
C1402	C1	C1	C1414	D1	D1				R1412	D1	C1
C1405	D1	D1				R1402	D1	C1			
C1406	D1	D1	L1400	C1	C1	R1405	D1	D1	T1405	D1	D1
C1408	D1	D1	L1408	D1	D1	R1408	D1	D1			

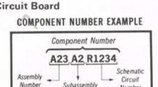
ASSEMBLY A48A2

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1550	C2	C4	C1573	C3	C5	L1564	D3	D4	R1572	D3	C4
C1552	D2	D5	C1574	D3	D4						
C1554	D2	D4	C1576	D3	D4	R1550	C2	C4	T1564	D3	C4
C1556	D2	D5				R1554	D2	D5			
C1561	C3	I2	CR1564	D3	C4	R1556	E2	E4	U1555	D2	D4
C1562	C3	C4				R1560	C2	C4			
C1564	D3	C5	L1552	C2	C4	R1562	C3	C4			
C1571	C3	I2	L1562	D2	C4	R1570	C3	C4			

ASSEMBLY A48A3

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1521	E1	D3	L1520	E2	D3	R1523	E1	D2	R1529	F2	B2
C1522	E2	D3	L1525	F1	C3	R1524	F1	D2			
C1523	E1	D3	L1529	F2	C3	R1525	E2	D3	U1520	E1	D3
C1525	F1	C3				R1526	F1	B3	U1525	F1	C3
C1528	F2	C3	R1521	E1	D3	R1527	F1	B2			
C1529	F2	C3	R1522	E1	D2	R1528	F1	B2			

COMPONENT NUMBER EXAMPLE



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

Static Sensitive Devices
See Maintenance Section

PHASE LOCK DIAGRAM (3) cont'd.

ASSEMBLY A48A4

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1600	B5	G2
C1602	A6	H3
C1604	A5	G3
C1607	A6	H4
C1610	B5	H2
C1612	B5	G1
C1614	B6	H2
C1615	B6	H4
C1617	A6	H5
L1602	A6	G3
Q1605	A6	G4
Q1615	B6	H2
R1600	A5	G3
R1602	A6	G3
R1605	B6	G3
R1607	A6	G4
R1610	B5	G2
R1616	B6	G2
R1617	B6	H3
R1618	A6	H4
R1619	B6	H1
R1620	B5	G1
T1612	B6	G2
Y1605	B6	H4

ASSEMBLY A48A5

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1712	A4	F2
C1717	B4	F3
C1730	B2	F4
C1732	A2	F4
C1735	B3	F2
C1735	B4	F2
C1736	B4	F3
C1737	B3	E4
C1740	A3	E2
C1742	B3	F1
C1754	A3	E2
C1755	B3	F2
C1756	B4	G1
C1757	B3	F1
CR1730	B2	F4
CR1742	B3	E2
CR1744	B3	E2
CR1745	B3	F2
CR1746	B3	F2
CR1748	B3	E3
CR1749	B3	E3
P1742	B3	F1
Q1715	B4	F3
R1700	A4	E4
R1705	A5	F3
R1710	A4	E3
R1712	A4	F2
R1714	A4	F3
R1716	B4	F3
R1717	B5	F3
R1719	C4	F3
R1724	B2	F4
R1725	B2	F4
R1726	B2	F4
R1727	A2	F4
R1728	A2	F4
R1729	B2	F4
R1730	B2	F4
R1732	A2	F4
R1735	A2	F4
R1737	B2	F3
R1742	B3	F2
R1750	A3	E1
R1752	B3	E2
R1754	A3	E1
R1755	A3	E1
R1756	A3	F2
R1757	B4	F2
R1758	B4	F2
U1715	B4	E3
U1735	B2	E4
U1755	B3	F1
VR1700	A4	E4
VR1705	A5	F4
VR1720	A2	F3

ASSEMBLY A48A6

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1800	C5	A3
C1802	C6	A3
C1804	C5	B3
C1806	C6	B3
C1808	C5	A2
C1810	D6	A1
C1812	D6	A2
C1820	D6	A2
C1822	E6	A2
C1830	E6	A3
C1832	E6	A4
C1834	F6	A4
C1836	F6	A4
C1838	F6	A4
CR1820	D5	A3
CR1822	E6	A2
CR1830	E6	A3
CR1832	F6	A4
E1814	D6	B2
L1800	C5	A4
L1832	F6	A4
L1832	F6	A4
L1835	F6	A4
P1830	F5	A3
Q1810	D6	A1
Q1815	D6	A2
Q1820	D6	A2
Q1825	E6	B2
Q1830	E6	A3
Q1835	F6	A4
R1800	C5	A4
R1804	C5	B3
R1808	D5	A2
R1810	D6	A1
R1812	D6	A2
R1814	D6	A2
R1815	D5	A2
R1817	D6	A2
R1820	D6	A2
R1832	E6	A3
R1834	F6	A4
R1835	F6	A4
U1825	E6	A3
Y1815	D6	A1

ASSEMBLY A48A7

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1900	A6	H2
C1902	A6	H1
C1904	D5	K1
C1906	A5	K1
C1908	A6	K2
C1912	C4	K1
C1914	C2	J1
C1916	C1	I1
C1920	C2	J1
C1922	C5	I2
C1924	C5	I2
C1926	C5	I2
C1928	F2	I1
C1930	F6	I2
J1900	A3	K1
J1925	C1	I1
J1935	B6	K1
J1945	F6	I2
R1900	A6	H1
R1902	A6	H1
R1904	D5	K1
R1906	D5	K1
R1912	C4	K1
R1924	C4	K1

ASSEMBLY A48A8

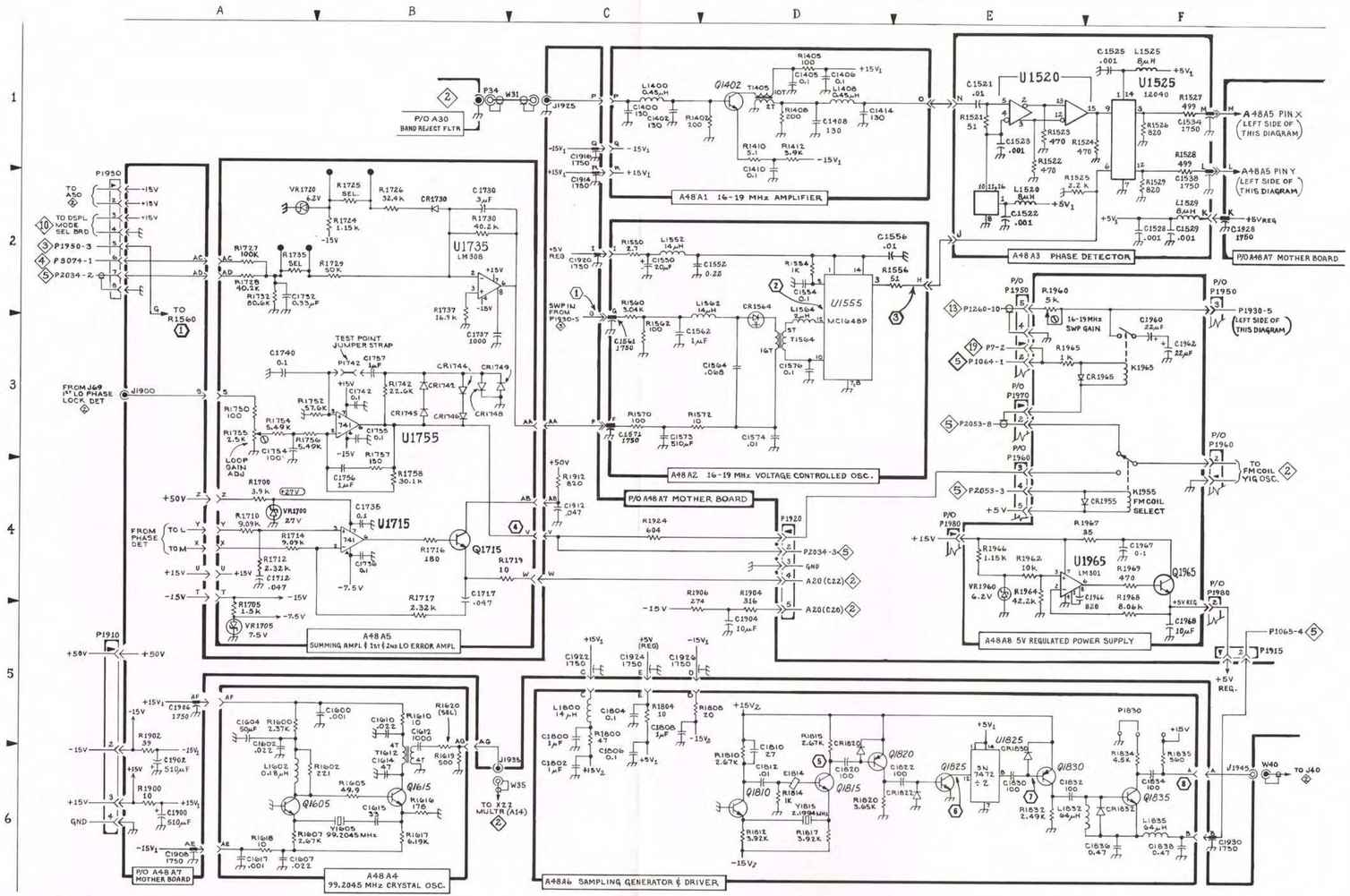
CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1960	F3	K1
C1962	F3	K1
C1966	F4	J1
C1967	F4	I1
C1968	F5	J1
CR1955	F4	J2
CR1965	E3	J2
K1955	F4	J2
K1965	F3	K1
Q1965	F4	I1
R1960	E2	J1
R1962	E4	I1
R1964	E4	I1
R1965	E3	J2
R1966	E4	I1
R1967	F4	J2
R1968	F4	I1
U1965	E4	J1
VR1960	E4	I2

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE

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

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



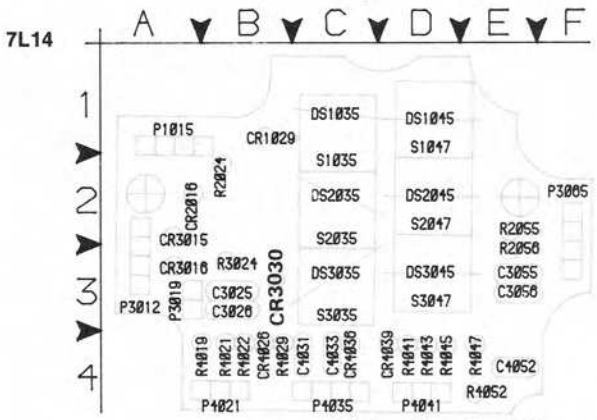


Figure 7-1 FRONT PANEL A1

3434-128

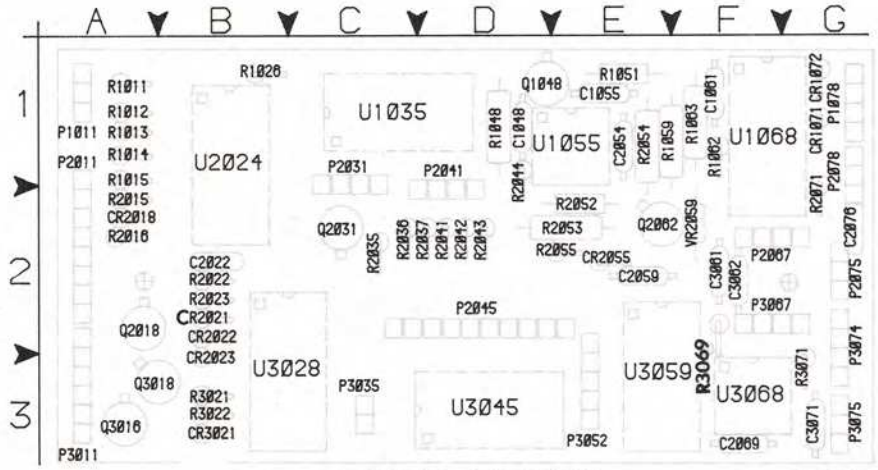
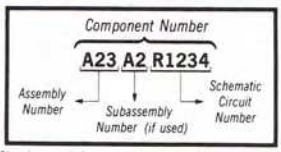


Figure 7-4 TUNE CONTROL **A70**

3434-129

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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

@

FRONT PANEL AND TUNE CONTROL DIAGRAM 4

ASSEMBLY A1

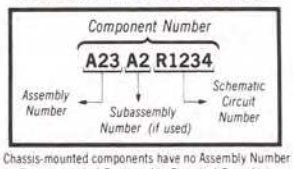
CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C3025	A4	B3	CR3016	A2	A3	DS3045	A2	D3	R4043	A2	D4
C3026	A3	B3	CR3030	A3	B3				R4045	A4	D4
C3055	A3	E3	CR4026	A3	B4	R2024	A4	B2	R4047	A2	E4
C3056	A4	E3	CR4036	A3	C4	R2055	A4	E2	R4052	A2	E4
C4031	A3	C4	CR4039	A2	D4	R2056	A3	E3			
C4033	A2	C4				R3024	A3	B3	S1035	A4	C2
C4052	A2	E4	DS1035	A4	C1	R4019	A4	B4	S1047	A4	D1
			DS1045	A4	D1	R4021	B3	B4	S2035	A3	C2
CR1029	A4	B1	DS2035	A3	C2	R4022	A2	B4	S2047	A3	D2
CR2016	A4	A2	DS2045	A3	D2	R4029	A3	B4	S3035	A2	C3
CR3015	A3	A2	DS3035	A2	C3	R4041	A3	D4	S3047	A2	D3

ASSEMBLY A72A1

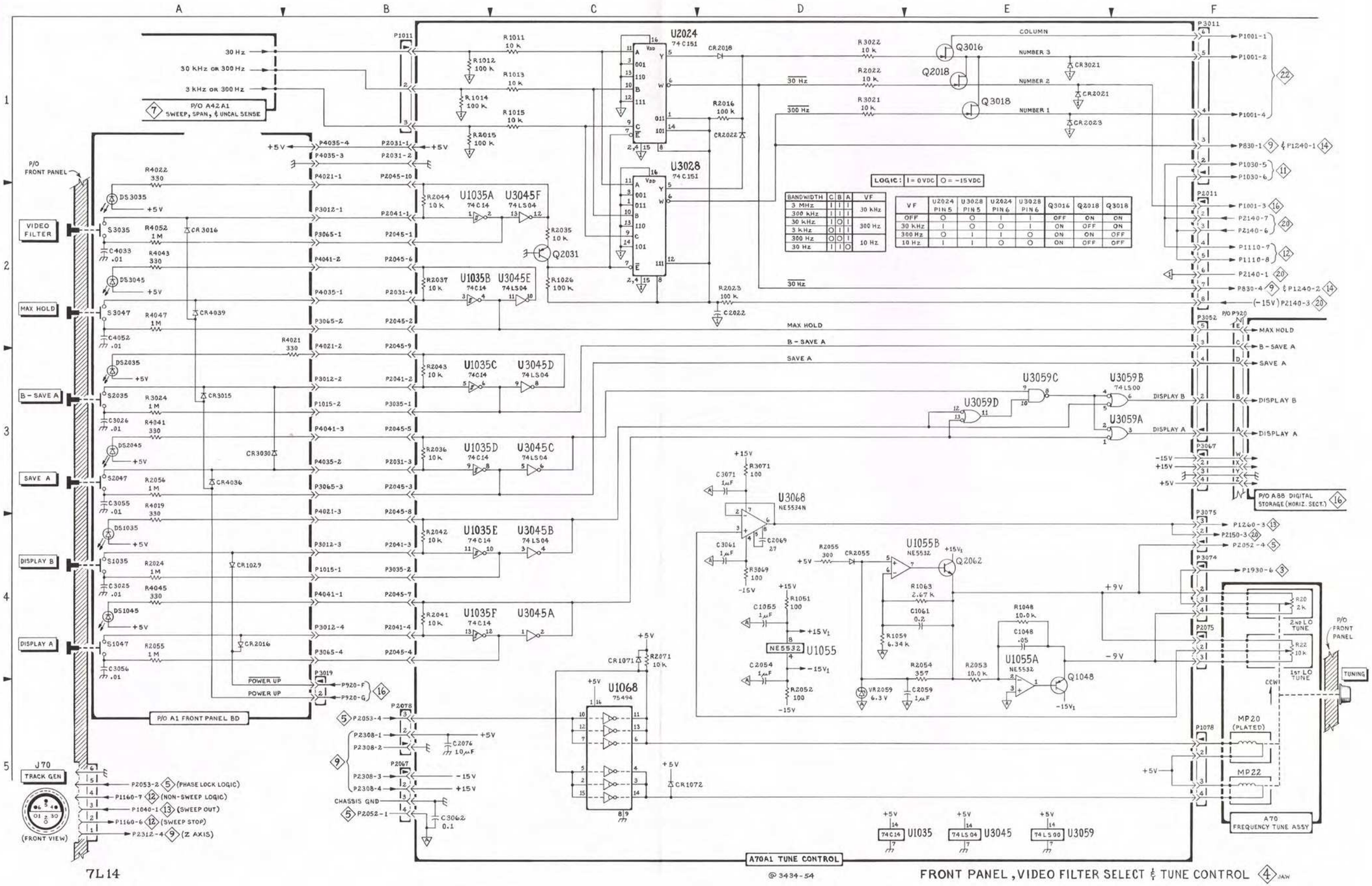
CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1048	E4	D1	Q2018	E1	A2	R2036	B3	C2	U1035	E5	C1
C1055	D4	E1	Q2031	C2	C2	R2037	B2	D2	U1055A	E5	E1
C1061	E4	F1	Q2062	E4	E2	R2041	B4	D2	U1055B	D4	E1
C2022	C2	B2	Q3016	E1	A3	R2042	B4	D2	U1055	D4	E1
C2054	D4	E1	Q3018	E1	A3	R2043	B3	D2	U1068	C5	F1
C2059	E5	E2				R2044	B2	D1	U2024	C1	B1
C2069	D4	F3	R1011	C1	A1	R2052	D5	E2	U3028	C2	B3
C2076	B5	G2	R1012	B1	A1	R2053	E4	E2	U3045A	C4	D3
C3061	D4	F2	R1013	C1	A1	R2054	E4	E1	U3045B	C4	D3
C3062	B5	F2	R1014	B1	A1	R2055	D4	E2	U3045C	C3	D3
C3071	D3	G3	R1015	C1	A1	R2071	C4	G2	U3045D	C3	D3
			R1026	C2	B1	R3021	D1	B3	U3045E	C2	D3
CR1071	C4	G1	R1048	E4	D1	R3022	D1	B3	U3045F	C2	D3
CR1072	C5	G1	R1051	D4	E1	R3069	D4	F3	U3045	E5	D3
CR2018	D1	A2	R1059	D4	E1	R3071	D3	G3	U3059A	F3	E3
CR2021	E1	B2	R1062	C5	F1				U3059B	F3	E3
CR2022	D1	B2	R1063	E4	F1	U1035A	B2	C1	U3059C	E3	E3
CR2023	E1	B3	R2015	B1	A2	U1035B	B2	C1	U3059D	E3	E3
CR2055	D4	E2	R2016	D1	A2	U1035C	B3	C1	U3059	E5	E3
CR3021	E1	B3	R2022	D1	B2	U1035D	B3	C1	U3068	D4	F3
			R2023	D2	B2	U1035E	B4	C1			
Q1048	E5	D1	R2035	C2	C2	U1035F	B4	C1	VR2059	D5	F2

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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


30 Hz
30 kHz OR 300 Hz
3 kHz OR 300 Hz
7 P/O A42 A1 SWEEP, SPAN, & UNCAL SENSE
P/O FRONT PANEL
VIDEO FILTER
MAX HOLD
B - SAVE A
SAVE A
DISPLAY B
DISPLAY A
S3035
S3047
S2035
S2047
S1035
S1047
DS3035
DS3045
DS2035
DS2045
DS1035
DS1045
R4022 330
R4052 1M
R4043 330
R4047 1M
R4021 330
R3024 1M
R4041 330
R2056 1M
R4019 330
R2024 1M
R4045 330
R2055 1M
C4033 .01
C4052 .01
C3026 .01
C3055 .01
C3025 .01
C3056 .01
CR3016
CR4039
CR3015
CR4036
CR1029
CR2016
CR3030
+5V
P4035-4
P4035-3
P4021-1
P3012-1
P3065-1
P4041-2
P4035-1
P3065-2
P4021-2
P3012-2
P1015-2
P4041-3
P4035-2
P3065-3
P4021-3
P3012-3
P1015-1
P4041-1
P3012-4
P3065-4
P2031-1
P2031-2
P2045-10
P2041-1
P2045-1
P2045-6
P2031-4
P2045-2
P2045-9
P2041-2
P3035-1
P2045-5
P2031-3
P2045-3
P2045-8
P2041-3
P3035-2
P2045-7
P2041-4
P2045-4
P3019
POWER UP
P920-F
P920-G
P/O A1 FRONT PANEL BD
P1011
R1011 10 k
R1012 100 k
R1013 10 k
R1014 100 k
R1015 10 k
R2015 100 k
R2044 10 k
R2037 10 k
R2043 10 k
R2036 10 k
R2042 10 k
R2041 10 k
U1035A 74C14
U1035B 74C14
U1035C 74C14
U1035D 74C14
U1035E 74C14
U1035F 74C14
U3045F 74LS04
U3045E 74LS04
U3045D 74LS04
U3045C 74LS04
U3045B 74LS04
U3045A 74LS04
R2035 10 k
R1026 100 k
Q2031
U2024 74C151
U3028 74C151
CR2018
CR2022
R2016 100 k
R2023 100 k
C2022
R3022 10 k
R2022 10 k
R3021 10 k
Q3016
Q2018
Q3018
CR3021
CR2021
CR2023
COLUMN
NUMBER 3
NUMBER 2
NUMBER 1
LOGIC: 1 = 0 VDC 0 = -15 VDC
BANDWIDTH C B A VF
3 MHz 1 1 1 30 kHz
300 kHz 1 1 1
30 kHz 1 0 1 300 Hz
3 kHz 0 1 1
300 Hz 0 0 1 10 Hz
30 Hz 1 1 0
VF U2024 PIN 5 U3028 PIN 5 U2024 PIN 6 U3028 PIN 6 Q3016 Q2018 Q3018
OFF 0 0 1 1 OFF ON ON
30 kHz 1 0 0 1 ON OFF ON
300 Hz 0 1 1 0 ON ON OFF
10 Hz 1 1 0 0 ON OFF OFF
P3011
P1001-1
P1001-2
P1001-4
P830-1 9 & P1240-1 14
P1030-5
P1030-6 11
P2011
P1001-3 16
PZ140-7
PZ140-6 20
P1110-7
P1110-8 12
PZ140-1 20
P830-4 9 & P1240-2 14
(-15V) PZ140-3 20
P3052
P/O P920
MAX HOLD
B - SAVE A
SAVE A
U3059C
U3059D
U3059B 74LS00
U3059A
DISPLAY B
DISPLAY A
P3067
-15V
+15V
+5V
P/O A88 DIGITAL STORAGE (HORIZ. SECT.) 16
P3075
P1260-3 13
P2150-3 20
P2052-4 5
P3074
P1930-6 3
P2075
2ND LO TUNE
1ST LO TUNE
P/O FRONT PANEL
TUNING
CCW
R20 2k
R22 10k
P1078
MP20 (PLATED)
MP22
A70 FREQUENCY TUNE ASSY
U3068 NE5534N
C3071 1 µF
C3061 1 µF
C2069 27
R3071 100
R3069 100
U1055B NE5532
U1055 NE5532
U1055A NE5532
Q2062
Q1048
R2055 300
CR2055
R1063 2.67 k
R1059 6.34 k
C1061 0.2
R1048 10.0 k
C1048 .05
R1051 100
R2052 100
C2054 1 µF
C1055 1 µF
R2054 357
R2053 10.0 k
VR2059 6.3 V
C2059 1 µF
+15 V1
-15 V1
+9 V
-9 V
U1068 75494
CR1071
R2071 10 k
CR1072
P2078
P2308-1
P2308-2
P2308-3
P2308-4
P2067
C2076 10 µF
C3062 0.1
CHASSIS GND
P2053-4 5
P2052-1 5
J70
TRACK GEN
(FRONT VIEW)
P2053-2 5 (PHASE LOCK LOGIC)
P1160-7 12 (NON-SWEEP LOGIC)
P1040-1 13 (SWEEP OUT)
P1160-6 12 (SWEEP STOP)
P2312-4 9 (Z AXIS)
U1035 74C14
U3045 74LS04
U3059 74LS00
A70A1 TUNE CONTROL
@ 3434-54
7L14
FRONT PANEL, VIDEO FILTER SELECT & TUNE CONTROL 4 JAW

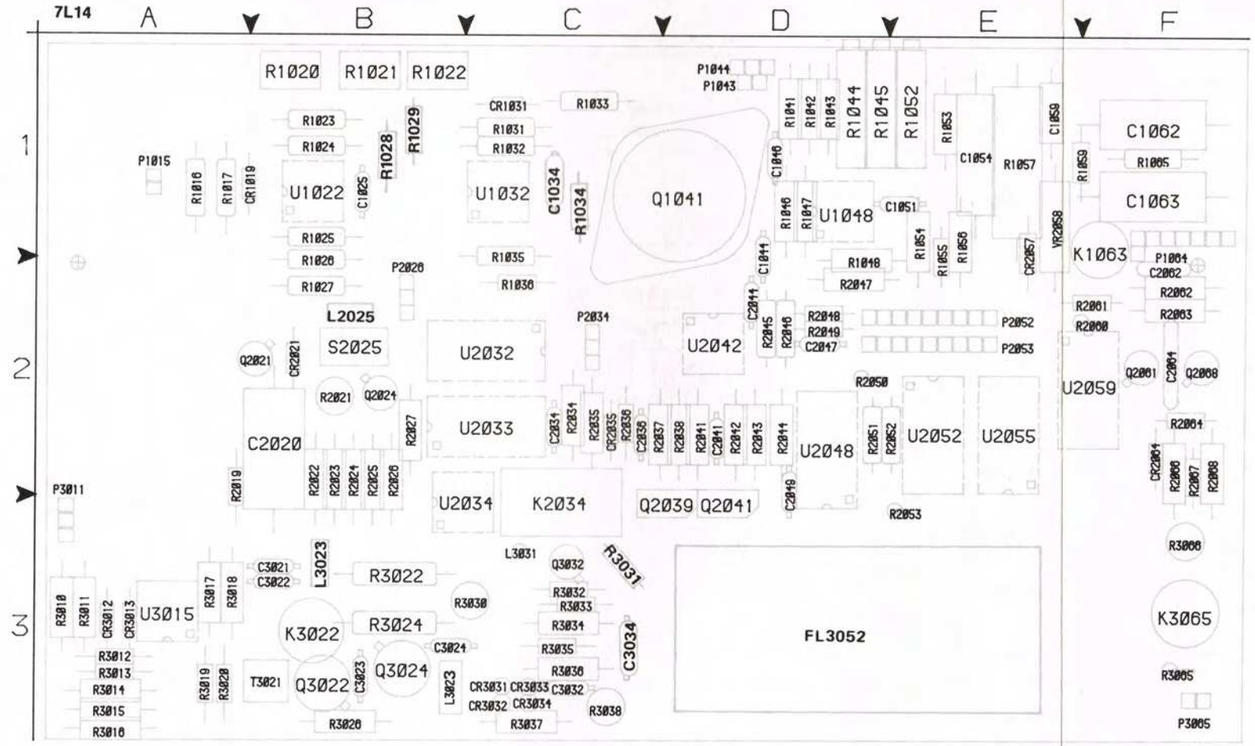
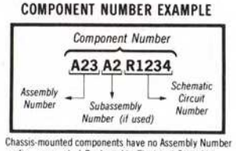


Figure 7-5 YIG DRIVER

A78

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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

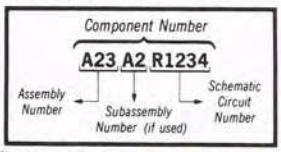
YIG DRIVER, VOLTAGE MEMORY DIAGRAM 5

ASSEMBLY A78

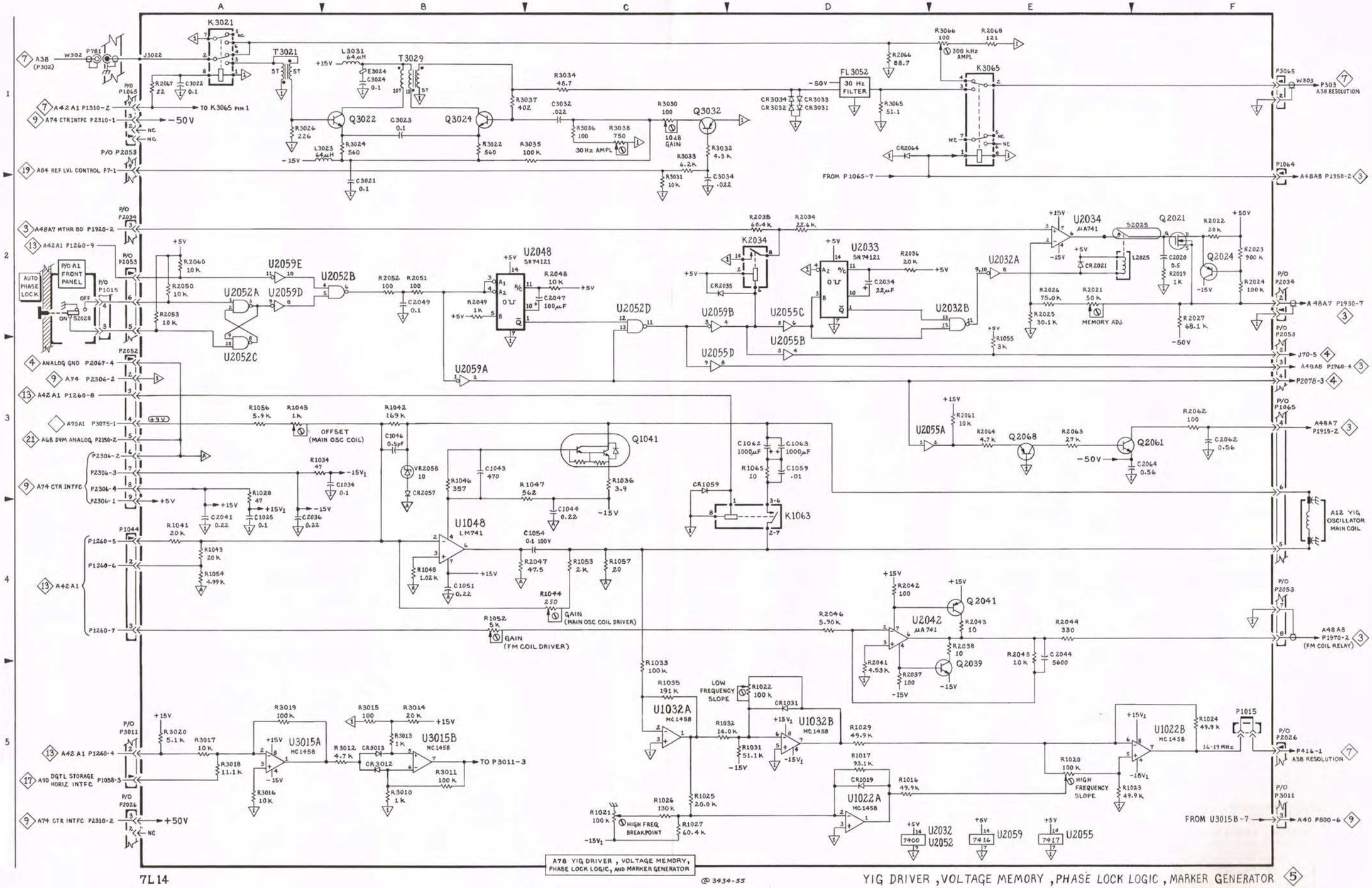
CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1025	A4	B1
C1034	B3	C1
C1044	C4	D1
C1046	B3	D1
C1051	B4	E1
C1054	C4	E1
C1059	D3	E1
C1062	D3	F1
C1063	D3	F1
C2020	F2	B2
C2034	D2	C2
C2036	A4	C2
C2041	A4	D2
C2044	E4	D2
C2047	C2	D2
C2049	B2	D2
C2062	F3	F2
C2064	F3	F2
C3021	B2	B3
C3022	A1	B3
C3023	B1	B3
C3024	B1	B3
C3032	C1	C3
C3034	C2	C3
CR1019	D5	A1
CR1031	D5	C1
CR1059	C3	F1
CR2021	E2	B2
CR2035	C2	C2
CR2057	B3	E1
CR2064	D1	F2
CR3012	B5	A3
CR3013	B5	A3
CR3031	D1	C3
CR3032	D1	C3
CR3033	D1	C3
CR3034	D1	C3
FL3052	D1	D3
K1063	D4	F1
K2034	D2	C3
K3021	A1	B3
K3065	E1	F3
L2025	E2	B2
L3023	B1	B3
L3031	B1	C3
P1015	F5	A1
Q1041	C3	D1
Q2021	F2	B2
Q2024	F2	B2
Q2039	E5	D3
Q2041	E4	D3
Q2061	E3	F2
Q2068	E3	F2
Q3022	B1	B3
Q3024	B1	B3
Q3032	C1	C3
Q3024	B1	B3
R1016	D5	A1
R1017	D5	A1
R1020	E5	B1
R1021	C5	B1
R1022	D5	B1
R1023	E5	B1
R1024	F5	B1
R1025	C5	B1
R1026	C5	B1
R1027	C5	B2
R1028	A3	B1
R1029	D5	B1
R1031	D5	C1
R1032	C5	C1
R1033	C5	C1
R1034	A3	C1
R1035	C5	C1
R1036	C3	C2
R1041	A4	D1
R1042	B3	D1
R1043	A4	D1
R1044	C4	D1
R1045	A3	D1
R1046	B3	D1
R1047	B3	D1
R1048	B4	D1
R1052	B4	E1
R1053	C4	E1
R1054	A4	E1
R1055	E3	E1
R1056	A3	E1
R1057	C4	E1
R1065	D3	F1
R2019	F2	A2
R2021	E2	B2
R2022	F2	B2
R2023	F2	B2
R2024	F2	B2
R2025	E2	B2
R2026	E2	B2
R2027	F2	B2
R2034	D2	C2
R2035	D2	C2
R2036	D2	C2
R2037	D5	D2
R2038	E4	D2
R2041	D5	D2
R2042	D4	D2
R2043	E4	D2
R2044	E4	D2
R2045	E4	D2
R2046	D4	D2
R2047	B4	D2
R2048	C2	D2
R2049	B2	D2
R2050	A2	D2
R2051	B2	D2
R2052	B2	E2
R2053	A2	E3
R2060	A2	F2
R2061	E3	F2
R2062	F3	F2
R2063	E3	F2
R2064	E3	F2
R2066	D1	F2
R2067	A1	F2
R2068	E1	F2
R3010	B5	A3
R3011	B5	A3
R3012	B5	A3
R3013	B5	A3
R3014	B5	A3
R3015	B5	A3
R3016	A5	A3
R3017	A5	A3
R3018	A5	A3
R3019	A5	A3
R3020	A5	A3
R3022	B1	B3
R3024	B1	B3
R3026	A1	B3
R3030	C1	C3
R3031	C2	C3
R3032	C1	C3
R3033	C1	C3
R3034	C1	C3
R3035	C1	C3
R3036	C1	C3
R3037	B1	C3
R3038	C1	C3
R3065	D1	F3
R3066	E1	F3
S2025	F2	B2
T3021	A1	B3
T3029	B1	B3
U1022A	D5	B1
U1022B	F5	B1
U1032A	C5	C1
U1032B	D5	C1
U1048	B4	D1
U2032A	E2	C2
U2032B	E2	C2
U2032	D5	C2
U2033	D2	C2
U2034	E2	C3
U2042	D4	D2
U2048	B2	D2
U2052A	A2	E2
U2052B	B2	E2
U2052C	A3	E2
U2052D	C2	E2
U2052	D5	E2
U2055A	D3	E2
U2055B	D3	E2
U2055C	D2	E2
U2055D	C3	E2
U2055	E5	E2
U2059A	B3	F2
U2059B	C2	F2
U2059D	A2	F2
U2059E	A2	F2
U2059	E5	F2
U3015A	A5	A3
U3015B	B5	A3
VR2058	B3	E1

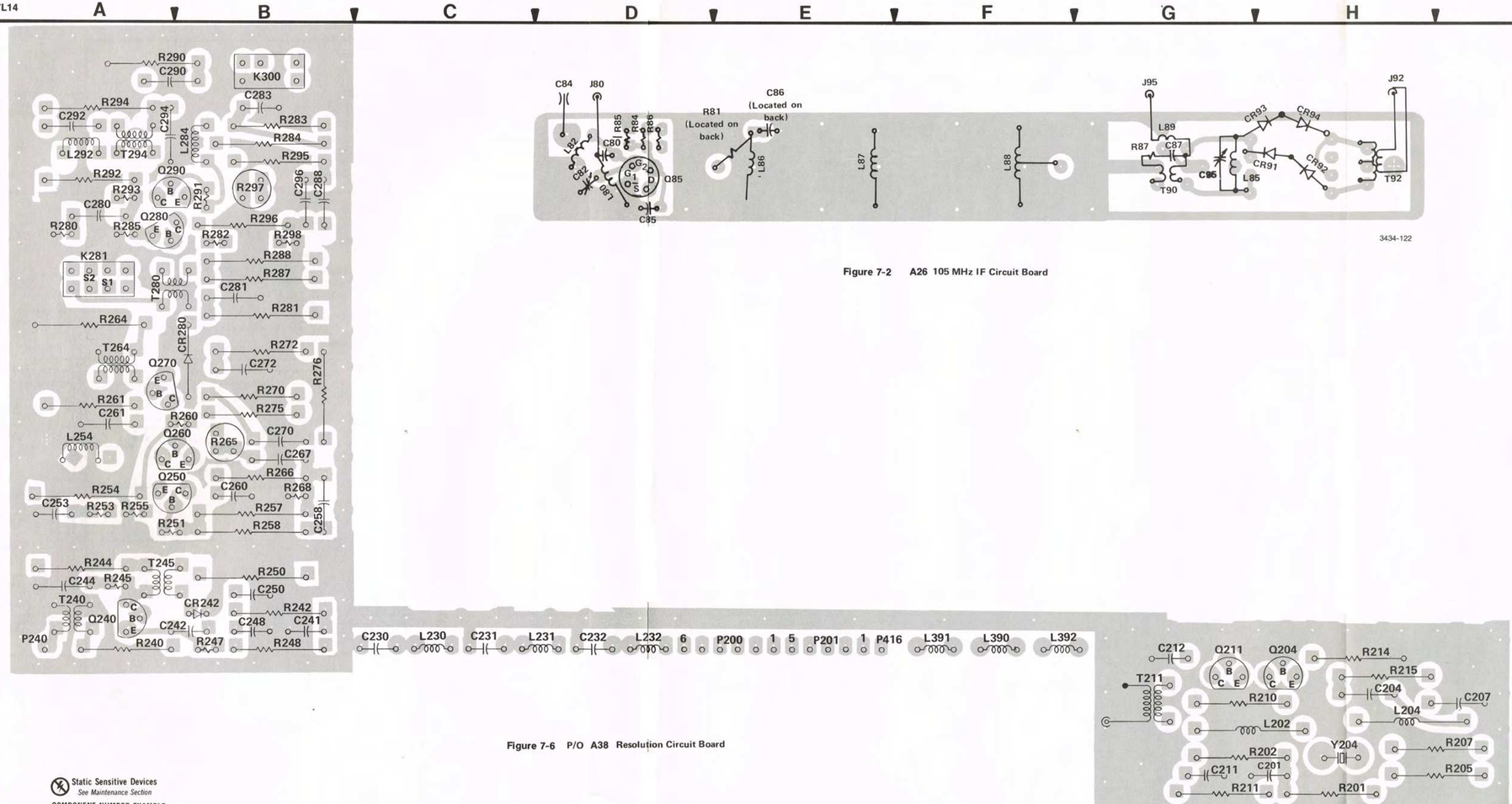
Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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


A
B
C
D
E
F
1
2
3
4
5
K3021
T3021
L3031 6.4 µH
T3029
Q3022
Q3024
Q3032
FL3052 30 Hz FILTER
K3065
300 kHz AMPL
30 Hz AMPL
1048 GAIN
A38 (P302)
W302
P781
J3022
A42 A1 P1510-2
A74 CTRINTFC P2310-1
-50 V
TO K3065 PIN 1
A84 REF LVL CONTROL P7-1
FROM P1065-7
P3065
W303
P303
A38 RESOLUTION
P1064
A48A8 P1950-2
A48A7 MTHR BD P1920-2
A42A1 P1260-9
AUTO PHASE LOCK
P/O A1 FRONT PANEL
S2028
ANALOG GND P2067-4
A74 P2306-2
A42 A1 P1260-8
A70A1 P3075-1
A68 DVM ANALOG P2150-2
A74 CTR INTFC P2310-2
A42 A1 P1260-4
A90 DGTL STORAGE HORIZ INTFC P1058-3
A42 A1
OFFSET (MAIN OSC COIL)
GAIN (MAIN OSC COIL DRIVER)
GAIN (FM COIL DRIVER)
U2059E
U2052A
U2059D
U2052B
U2052C
U2048 SN74121
U2052D
U2059A
U2059B
U2055C
U2055D
K2034
U2033 SN74121
U2034 µA741
U2032A
U2032B
S2025
Q2021
Q2024
CR2021
L2025
MEMORY ADJ.
A48A7 P1930-7
J70-5
A48A8 P1960-4
P2078-3
U2055A
Q2068
Q2061
A48A7 P1915-2
A12 YIG OSCILLATOR MAIN COIL
Q1041
U1048 LM741
K1063
CR1059
U2042 µA741
Q2041
Q2039
(FM COIL RELAY)
LOW FREQUENCY SLOPE
U1032A MC1458
U1032B MC1458
U3015A MC1458
U3015B MC1458
U1022A MC1458
U1022B MC1458
HIGH FREQUENCY SLOPE
HIGH FREQ BREAKPOINT
16-19 MHz
P1015
P416-1
A38 RESOLUTION
FROM U3015B-7
A40 P800-6
U2032 7400
U2052
U2059 7416
U2055 7417
A78 YIG DRIVER, VOLTAGE MEMORY, PHASE LOCK LOGIC, AND MARKER GENERATOR
7L14
5434-55
YIG DRIVER, VOLTAGE MEMORY, PHASE LOCK LOGIC, MARKER GENERATOR



3434-122

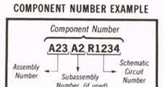
Figure 7-2 A26 105 MHz IF Circuit Board

Figure 7-6 P/O A38 Resolution Circuit Board

3434-123

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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

105 MHz, 3RD MIXER AND PRERESOLUTION AMP DIAGRAM 6

ASSEMBLY A26

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C80	A2	D1
C82	A3	D1
C84	A1	D1
C85	A2	D2
C86	B2	E1
C87	C2	G1
C95	C3	G1
CR91	B3	H1
CR92	B3	H1
CR93	B4	H1
CR94	B4	H1
L80	A2	D1
L82	A3	D1
L85	B3	G1
L86	B2	E1
L87	B2	E1
L88	B2	F1
L89	C2	G1
Q85	A2	D1
R81	B2	D1
R84	A1	D1
R85	A2	D1
R86	B1	D1
R87	C2	G1
T90	B2	G1
T92	B3	H1

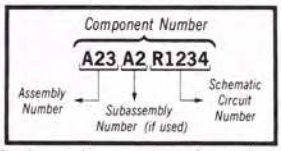
ASSEMBLY A38

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C201	A4	H5
C204	A4	H4
C207	A5	I4
C211	A3	G5
C212	A4	G4
C230	D4	C4
C231	D4	C4
C232	D5	D4
C241	C3	B4
C242	D3	B4
C244	D2	A4
C248	D3	B4
C250	D2	B4
C253	D1	A3
C258	D2	B3
C260	E2	B3
C261	E1	A3
C267	E5	B3
C270	C5	B3
C272	C5	B2
C280	E1	A2
C281	E3	B2
C283	E2	B1
C288	F3	B2
C290	F2	A1
C292	F1	A1
C294	F2	A1
C296	F3	B2
C390	D4	G3
C391	D4	G3
C392	D5	G4
CR242	C3	B4
CR280	E4	B2
K281	E1	A2
K281	F1	A2
K281	F4	A2
K300	F1	B1
L202	A4	G4
L204	A4	H4
L230	D4	C4
L231	D4	D4
L232	D5	D4
L254	D1	A3
L284	E2	B1
L292	F1	A1
L390	D4	F4
L391	D4	F4
L392	D5	F4
Q204	A4	H4
Q211	A3	G4
Q211	A4	G4
Q240	D2	A4
Q250	D2	A3
Q260	E2	B3
Q270	C5	A3
Q280	E2	A2
Q290	F2	A1
R201	A3	H5
R202	A4	G5
R205	A4	I5
R207	A5	I5
R210	A4	G4
R211	A3	G5
R214	A5	H4
R215	A5	H4
R240	D2	A4
R241	C2	A4
R242	D3	B4
R244	D1	A4
R245	D2	A4
R247	D3	B4
R248	D3	B4
R250	D2	B4
R251	D2	A3
R253	D1	A3
R254	D1	A3
R255	D2	A3
R257	D2	B3
R258	D2	B3
R260	E2	B3
R261	E1	A3
R264	E1	A2
R265	D5	B3
R266	E2	B3
R267	D5	B3
R268	E5	B3
R270	C5	B3
R272	C5	B2
R275	D5	B3
R276	D3	B3
R280	E1	A2
R281	E3	B2
R282	E2	B2
R283	F2	B1
R284	F2	B1
R285	F2	A2
R287	E3	B2
R288	E3	B2
R290	F2	A1
R291	F2	B1
R292	F1	A1
R293	F1	A1
R294	F1	A1
R295	F2	B1
R296	F3	B2
R297	F3	B1
R298	F3	B2
T211	A3	G4
T240	C2	A4
T245	D2	A4
T264	E1	A2
T280	E2	A2
T294	F2	A1
Y204	A4	H5

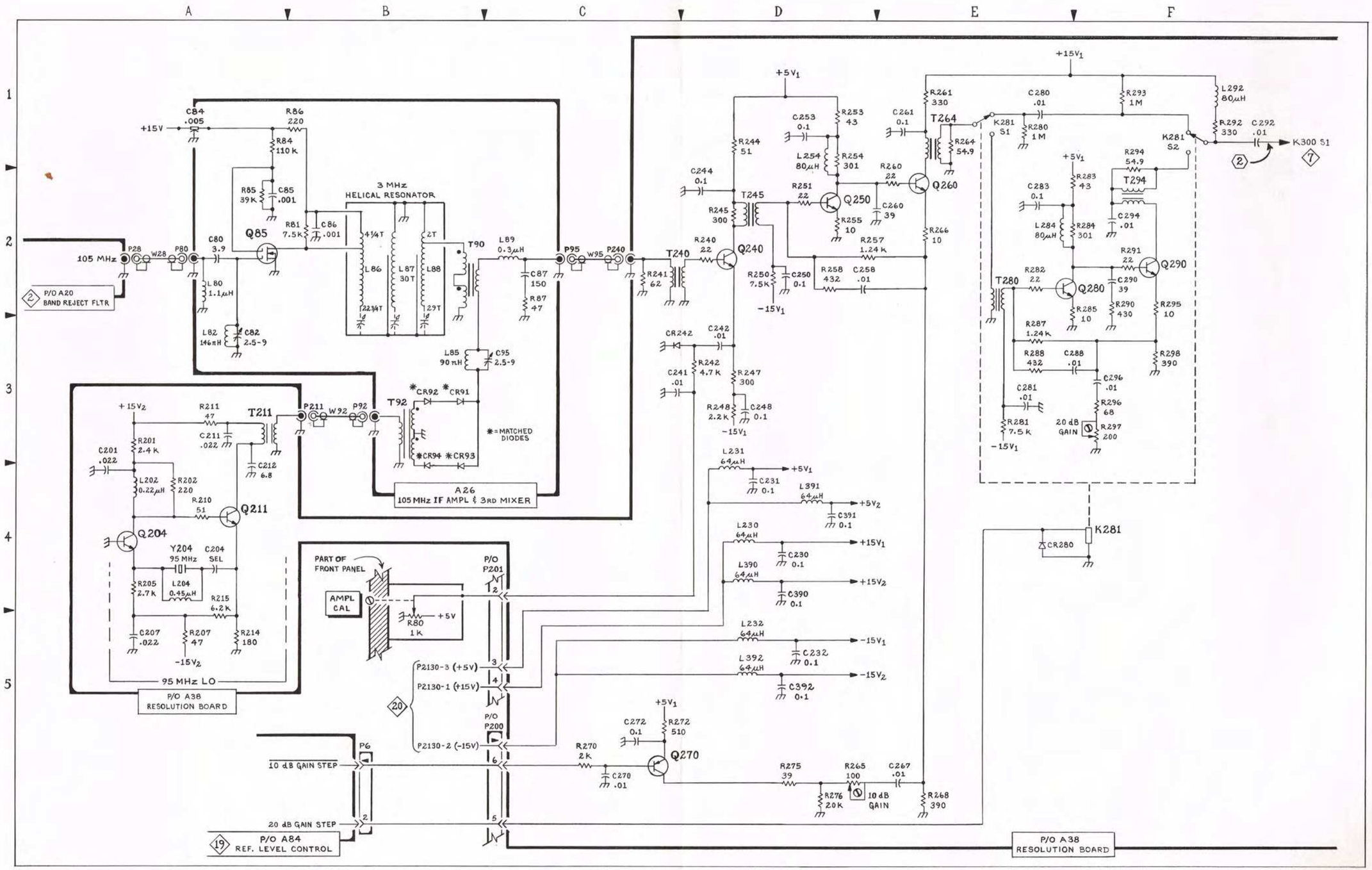
Partial A38 also shown on diagram 7.

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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



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105 MHz IF AMPLIFIER, 3RD MIXER, & PRE-RESOLUTION AMPLIFIER 6 JAW

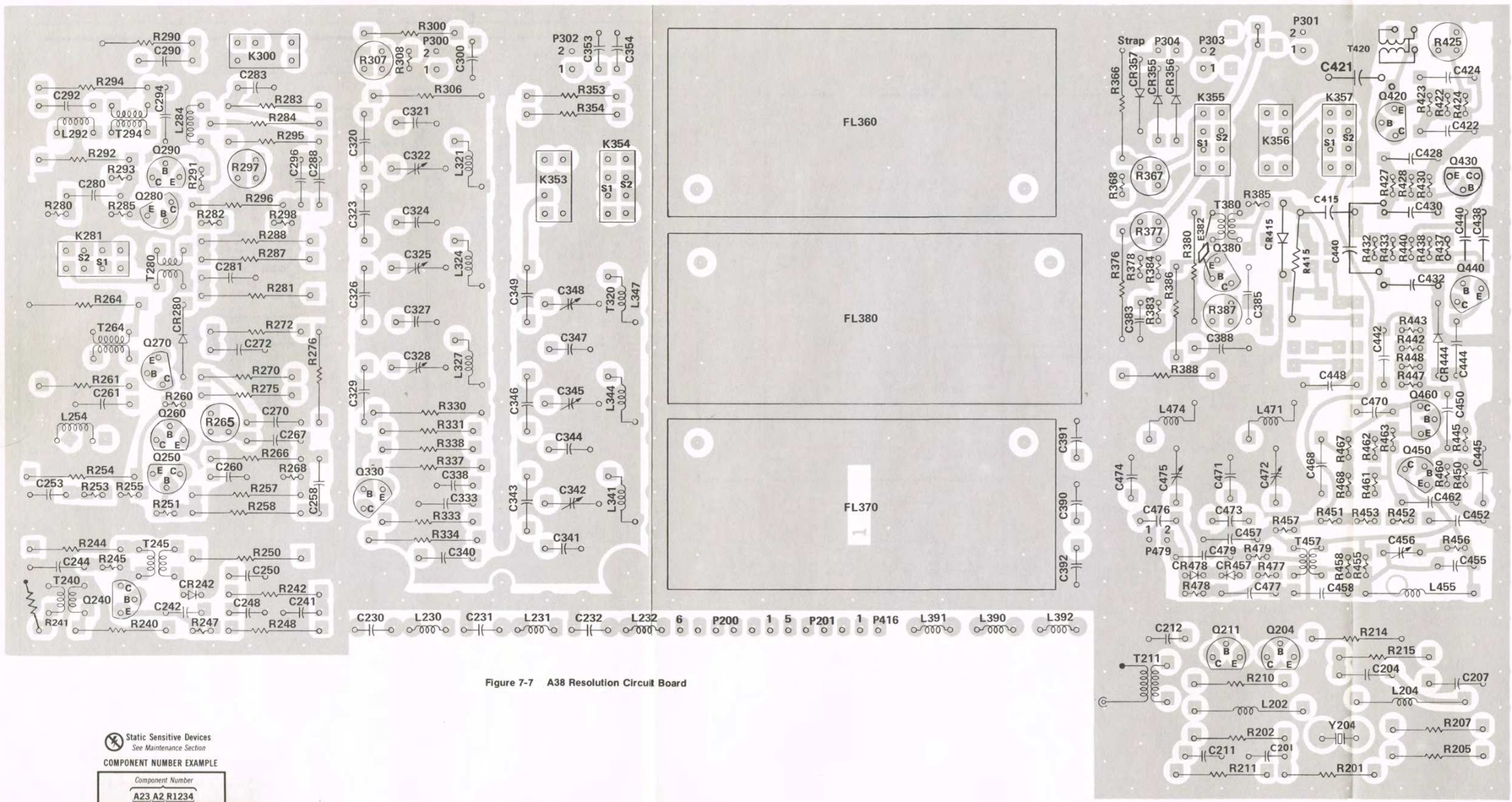
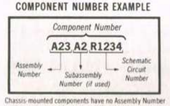


Figure 7-7 A38 Resolution Circuit Board

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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

3434-113

RESOLUTION DIAGRAM 7

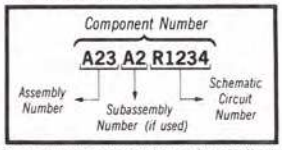
ASSEMBLY A38

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C300	A2	C1	CR355	D3	G1	R377	D1	G2
C320	A2	C1	CR356	D3	G1	R378	D2	G2
C321	A2	C1	CR415	E1	H2	R380	C2	G2
C322	A2	C1	CR444	E2	I2	R383	C2	G2
C323	A2	C2	CR457	F2	G4	R384	C2	G2
C324	A2	C2	CR478	F3	G4	R385	D2	H2
C325	A2	C2				R386	C2	G2
C326	A2	C2	E382	C2	G2	R387	C2	G2
C327	B2	C2				R388	C2	G3
C328	B2	C3	FL360	C1	E1	R415	E1	H2
C329	B2	C3	FL370	C1	E3	R422	D1	I1
C333	B1	C3	FL380	C2	E2	R423	D1	H1
C338	B2	C3				R424	E2	I1
C340	B1	C4	K300	A2	B1	R425	E2	I1
C344	B1	D3	K353	C2	D2	R427	D2	H2
C345	B1	D3	K354	C3	D2	R428	D3	H2
C353	C2	D1	K355	D3	G1	R430	E2	H2
C354	C3	D1	K356	D3	H1	R432	D1	H2
C383	C2	G2	K357	D3	H1	R433	E1	H2
C385	C2	G2				R437	E2	I2
C388	C2	G2	L321	A2	C1	R438	E2	H2
C415	E1	H2	L324	A2	C2	R440	E2	H2
C421	D2	H1	L327	B2	C3	R442	E2	H2
C422	D1	I1	L455	E2	H4	R443	E2	H2
C424	D2	I1	L471	E4	H3	R445	F2	I3
C428	D3	H1	L474	F4	G3	R447	E2	H3
C430	E2	H2				R448	E2	H3
C432	E1	H2	Q330	B2	C3	R450	E2	I3
C438	E2	I2	Q380	C2	G2	R451	F2	H3
C440	E2	H2	Q420	D2	H1	R452	F2	H3
C442	E2	H3	Q430	E2	I2	R453	E2	H3
C444	E2	I2	Q440	E2	I2	R455	F2	H4
C445	F2	I3	Q450	E2	H3	R456	F2	I4
C448	E2	H3	Q460	E3	H3	R457	F2	H4
C450	E2	I3				R458	E2	H4
C452	F2	I3	R300	A2	C1	R460	E3	I3
C455	E2	I4	R306	A2	C1	R461	E3	H3
C456	F2	H4	R307	A2	C1	R462	E3	H3
C457	F2	G4	R308	A2	C1	R463	E3	H3
C458	F2	H4	R330	B2	C3	R467	E3	H3
C462	E3	I3	R331	B2	C3	R468	E3	H3
C468	E4	H3	R333	B1	C3	R477	E3	H4
C470	E3	H3	R334	B1	C4	R478	F3	G4
C471	E4	G3	R337	B2	C3	R479	F3	H4
C472	F4	H3	R338	B2	C3			
C473	F3	G3	R353	C2	D1	T320	B1	D2
C474	F4	G3	R354	B3	D1	T380	C2	G2
C475	F4	G3	R366	C1	G1	T420	D2	H1
C476	F3	G3	R367	C1	G2	T457	F2	H4
C477	F3	G4	R368	C1	G2			
C479	F3	G4	R376	C1	G2			

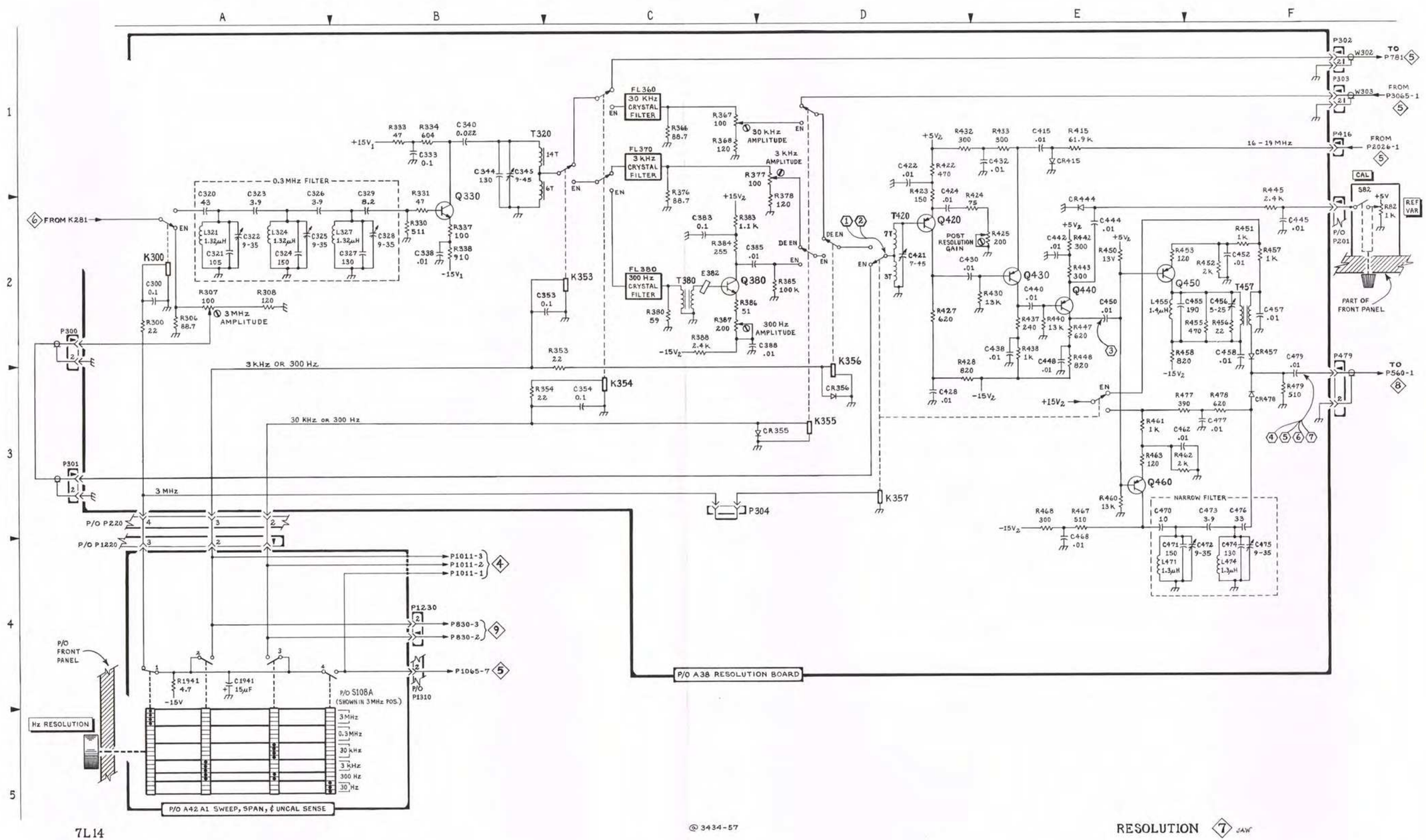
Partial A38 also shown on diagram 6.

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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



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RESOLUTION 7 JAW

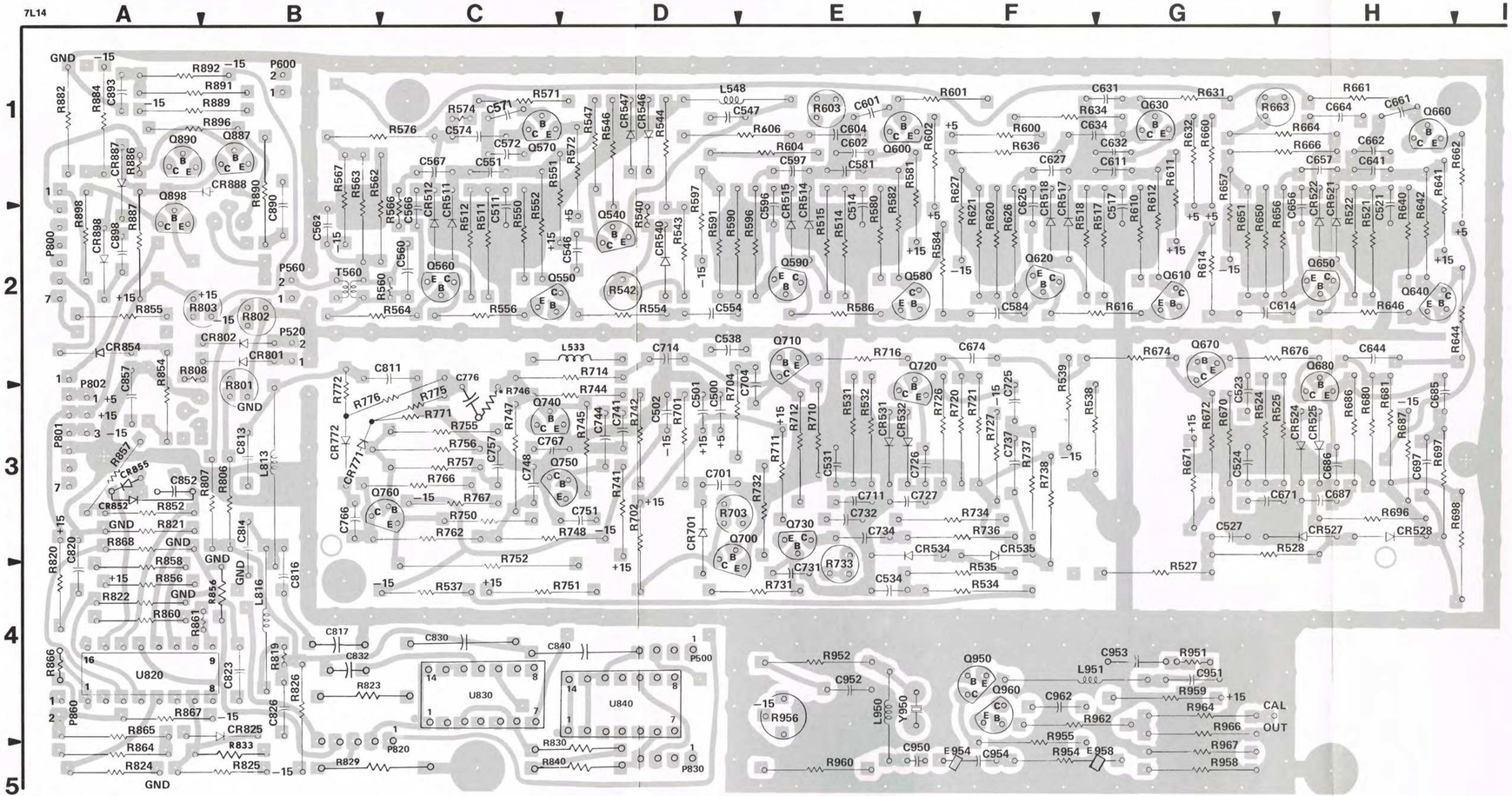


Figure 7-8 A40 Function IF Circuit Board

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.

FUNCTION IF DIAGRAM 8

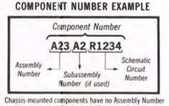
ASSEMBLY A40

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C500	A2	D3	C950	B2	E5	R524	E3	G3	R670	D5	G3
C501	A2	D3	C951	B1	G4	R525	E3	H3	R671	D4	G3
C502	A2	D3	C952	B2	E4	R527	E3	G4	R672	D4	G3
C511	B3	C2	C953	B1	G4	R528	E4	G4	R674	D5	G2
C514	B3	E1	C954	B2	F5	R531	F3	E3	R676	D5	G2
C517	C3	G1	C962	C2	F4	R532	F3	E3	R680	D5	H3
C521	D3	H1				R534	F3	F4	R681	D6	H3
C523	D3	G3	CR511	B3	C2	R535	F4	F4	R686	D6	H3
C524	D3	G3	CR512	B3	C2	R537	E2	C4	R687	D6	H3
C527	E4	G3	CR514	B3	E2	R538	F2	F3	R696	E6	H3
C531	E3	E3	CR515	B3	E2	R539	F3	F3	R697	E6	H3
C534	F4	E4	CR517	C3	F2	R540	A4	D2	R698	E6	I3
C538	F2	D2	CR518	C3	F2	R542	A4	D2	R701	E3	D3
C546	A4	D2	CR521	D3	H2	R543	A5	D2	R702	E4	D3
C547	A5	D1	CR522	D3	H2	R544	A5	D1	R703	E4	D3
C551	A4	C1	CR524	D3	H3	R546	A5	D1	R704	E4	D3
C554	B5	D2	CR525	E3	H3	R547	A4	D1	R710	E5	E3
C560	A6	C2	CR527	E4	H3	R550	A5	C2	R711	E4	E3
C562	A6	B2	CR528	E4	H3	R551	A4	D1	R712	E4	E3
C566	B6	C2	CR531	E3	E3	R552	A4	C2	R714	F4	D2
C567	B6	C1	CR532	F3	E3	R554	B5	D2	R716	E5	E2
C571	B5	C1	CR534	F4	E4	R556	A5	C2	R720	E5	F3
C572	B5	C1	CR535	F4	F4	R560	A6	C2	R721	E6	F3
C574	B5	C1	CR540	A4	D1	R562	A6	C2	R726	E6	F3
C581	B4	E1	CR546	A5	D1	R563	A6	B1	R727	E6	F3
C584	C5	F2	CR547	A5	D1	R564	A6	C2	R731	F5	E4
C596	B6	E1	CR701	E3	D3	R566	A6	C2	R732	F5	E3
C597	B6	E1	CR771	G5	B3	R567	B6	B1	R733	F6	E4
C601	C5	E1	CR772	G5	B3	R571	B5	C1	R734	F6	F3
C602	B5	E1	CR801	G2	B2	R572	B5	D1	R736	F6	F3
C604	B5	E1	CR802	G2	B2	R574	B6	C1	R737	F6	F3
C611	C4	G1				R576	B6	B1	R738	F6	F3
C614	C5	G2	E954	B2	F5	R580	B5	E2	R741	F4	D3
C626	C6	F1	E958	B2	F5	R581	B4	E1	R742	F4	D3
C627	C6	F1				R582	B4	E2	R744	F4	D3
C631	C5	G1	L533	E2	D2	R584	B5	F2	R745	F4	D3
C632	C5	G1	L548	A5	D1	R586	B5	E2	R746	F5	C3
C634	C5	F1	L813	G5	B3	R590	B5	D2	R747	F5	C3
C641	D4	H1	L816	G5	B4	R591	B6	D2	R748	F6	C3
C644	D5	H2	L950	B2	E4	R596	B6	E2	R750	G4	C3
C656	D6	H1	L951	B1	F4	R597	B6	D2	R751	G4	C4
C657	D6	H1				R600	B3	F1	R752	G4	C4
C661	D5	H1	Q540	A4	D2	R601	C5	F1	R755	G4	C3
C662	D5	H1	Q550	A5	C2	R602	C5	F1	R756	G5	C3
C664	D5	H1	Q560	A6	C2	R603	C6	E1	R757	G4	C3
C671	D4	G3	Q570	B5	C1	R604	C6	E1	R762	G6	C3
C674	E5	F2	Q580	B5	E2	R606	C6	E1	R766	G6	C3
C685	D6	H3	Q590	B6	E2	R610	C5	G2	R767	G6	C3
C686	D6	H3	Q600	C5	E1	R611	C4	G1	R771	F6	C3
C687	E6	H3	Q610	C5	G2	R612	C4	G2	R772	G5	B3
C697	E6	H3	Q620	C6	F2	R614	C5	G2	R775	F5	C3
C701	E4	D3	Q630	C5	G1	R616	C5	F2	R776	F5	C3
C704	E4	E3	Q640	D5	H2	R620	C5	F2	R801	G2	B3
C711	E4	E3	Q650	D6	H2	R621	C6	F2	R802	G2	B2
C714	F4	D2	Q660	D5	H1	R626	C6	F2	R803	G3	B2
C725	E6	F3	Q670	D5	G2	R627	C6	F2	R806	G2	B3
C726	E6	F3	Q680	D6	H3	R631	C5	G1	R807	G2	B3
C727	E6	E3	Q700	E4	D4	R632	C5	G1	R808	G3	A2
C731	F5	E4	Q710	E5	E2	R634	C6	F1	R819	G5	B4
C732	F5	E3	Q720	E6	E3	R636	C6	F1	R951	B1	G4
C734	F5	E3	Q730	F5	E3	R640	D5	H2	R952	B2	E4
C737	F6	F3	Q740	F4	C3	R641	D4	H1	R954	B2	F5
C741	F4	D3	Q750	G4	C3	R642	D4	H2	R955	B2	F4
C744	F4	D3	Q760	G4	C3	R644	D5	I2	R956	A2	E4
C748	F6	C3	Q950	B2	F4	R646	D5	H2	R958	B2	G5
C751	G4	D3	Q960	B2	F4	R650	C5	G2	R959	B1	G4
C757	G5	C3				R651	C6	G2	R960	B2	E5
C766	G5	B3	R511	B3	C2	R656	D6	H2	R962	C2	F4
C767	G6	C3	R512	B3	C2	R657	D6	G2	R964	C2	G4
C776	F5	C3	R514	B3	E2	R660	C3	G1	R966	C2	G4
C811	G5	C2	R515	B3	E2	R661	D5	H1	R967	C2	G5
C813	G5	B3	R517	C3	G2	R662	D5	I1			
C814	G5	B3	R518	C3	F2	R663	D6	G1	T560	A6	B2
C816	G5	B4	R521	D3	H2	R664	D6	H1			
C817	G5	B4	R522	D3	H2	R666	D6	H1	Y950	B2	E4

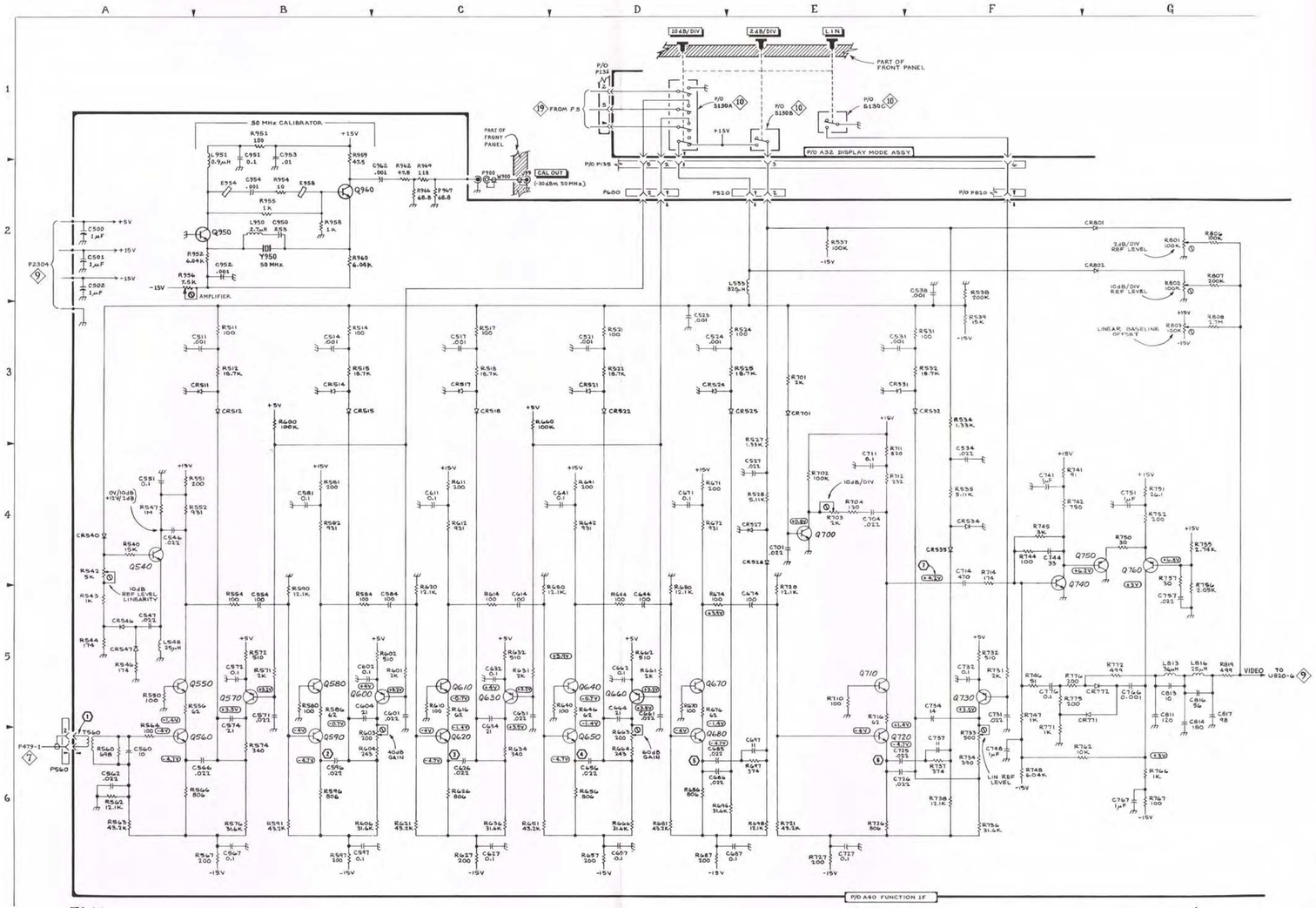
Partial A40 also shown on diagram 9.

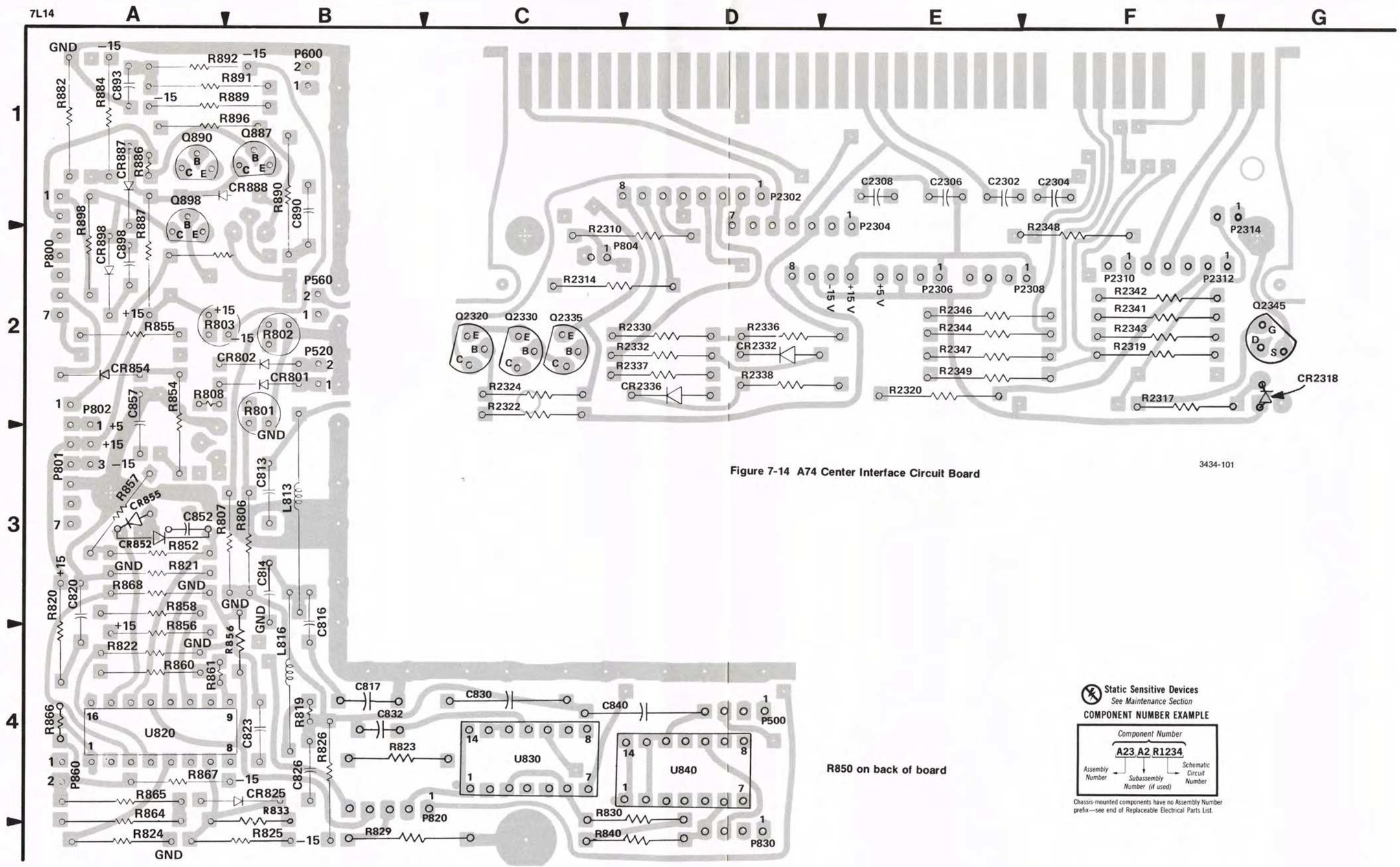
Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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





3434-101

Figure 7-14 A74 Center Interface Circuit Board

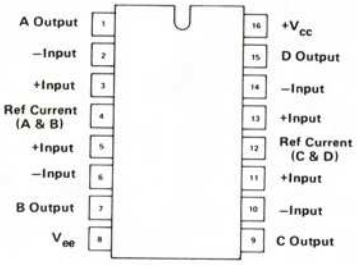
3434-126

Figure 7-9 P/O A40 Function IF Circuit 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.



MO 53A 155-0035-00
Quad Op Amp

1673-108

VIDEO FILTER, PULSE STRETCHER, BASELINE CLIP DIAGRAM 9

ASSEMBLY A40

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C820	D4	A3
C823	C4	B4
C826	B1	B4
C830	B1	C4
C832	B2	B4
C840	B2	D4
C852	B4	A3
C857	B4	A2
C890	C3	B1
C893	D3	A1
C898	D2	A2
CR825	B1	B4
CR852	A3	A3
CR854	B3	A2
CR855	B4	A3
CR887	C2	A1
CR888	C3	B1
CR898	D2	A2
Q887	C3	B1
Q890	C3	A1
Q898	C2	A1
R820	D4	A4
R821	D4	A3
R822	D4	A4
R823	C4	B4
R824	B1	A5
R825	B1	B5
R826	B1	B4
R829	A3	B5
R830	A2	D4
R833	B1	B4
R840	A2	D4
R852	B4	A3
R854	B4	A2
R855	B4	A2
R856	A3	B4
R856	C3	A4
R857	B4	A3
R858	B3	A3
R860	C3	A4
R861	C4	A4
R864	C4	A4
R865	D4	A4
R866	D4	A4
R867	D4	A4
R868	D4	A3
R882	B3	A1
R884	B3	A1
R886	B3	A1
R887	C2	A2
R889	C3	A1
R890	C3	B1
R891	D3	A1
R892	D3	A1
R896	C3	A1
R898	C2	A2
U820A	D4	A4
U820B	B1	A4
U820C	B4	A4
U820D	A3	A4
U830	A2	C4
U840	A2	D4

Partial A40 also shown on diagram 8.

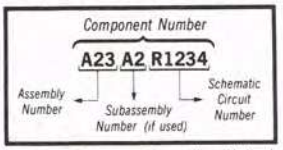
ASSEMBLY A74

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C2302	E4	E1
C2304	E4	F1
C2306	F5	E1
C2308	F5	E1
CR2318	E4	G2
CR2332	F3	D2
CR2336	F3	D2
Q2320	E3	C2
Q2330	F3	C2
Q2335	F3	C2
Q2345	F4	G2
R2310	E3	D2
R2314	E4	C2
R2317	E4	F2
R2319	F4	F2
R2320	F2	E2
R2322	E2	C2
R2324	E3	C2
R2330	F3	D2
R2332	F3	D2
R2336	F2	D2
R2337	F3	D2
R2338	F3	D2

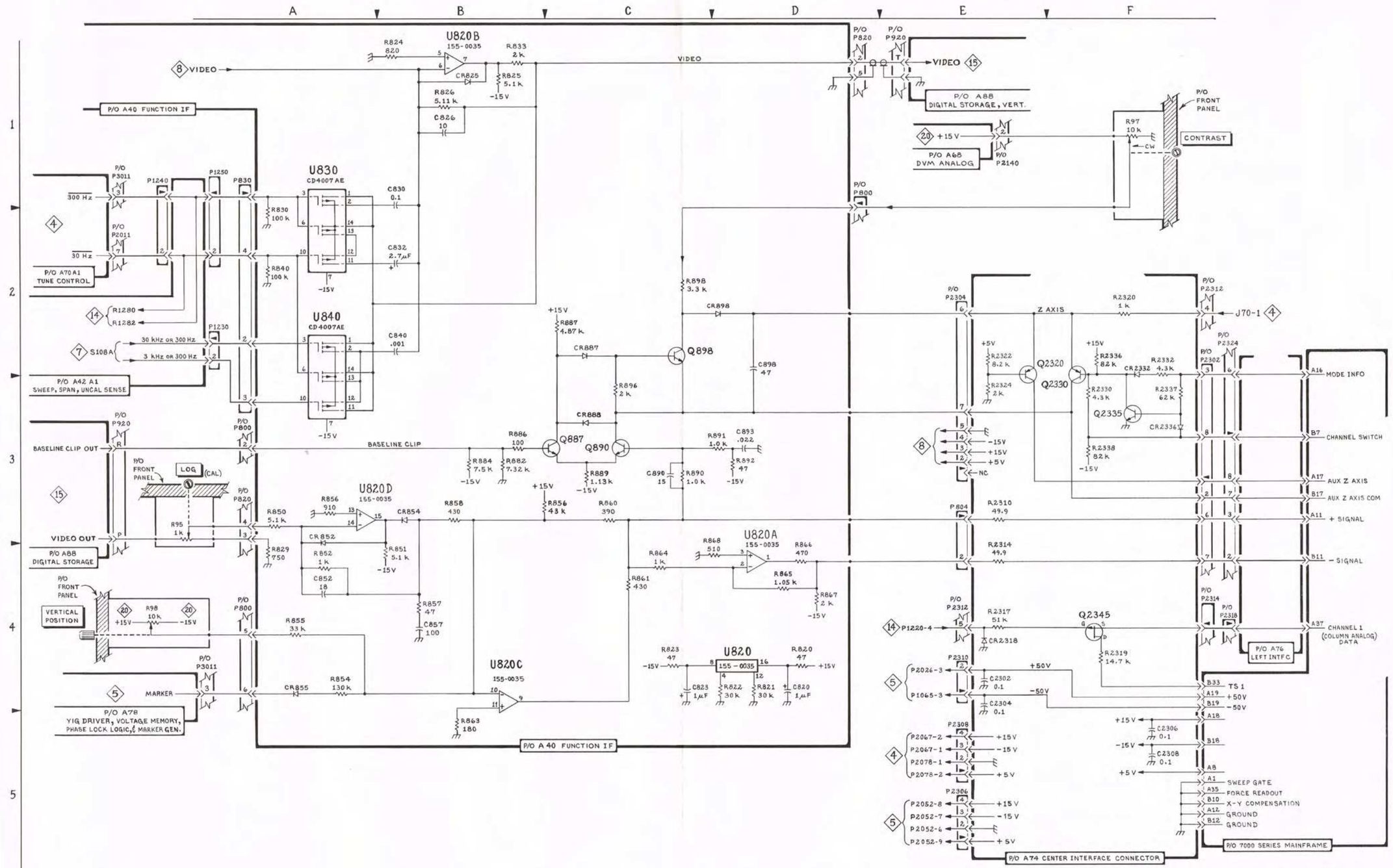
Partial A74 also shown on diagram 22.

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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



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VIDEO FILTER, VIDEO AMPLIFIER, PULSE STRETCHER, BASELINE CLIPPER, & Z AXIS SWITCHING 9 JAW

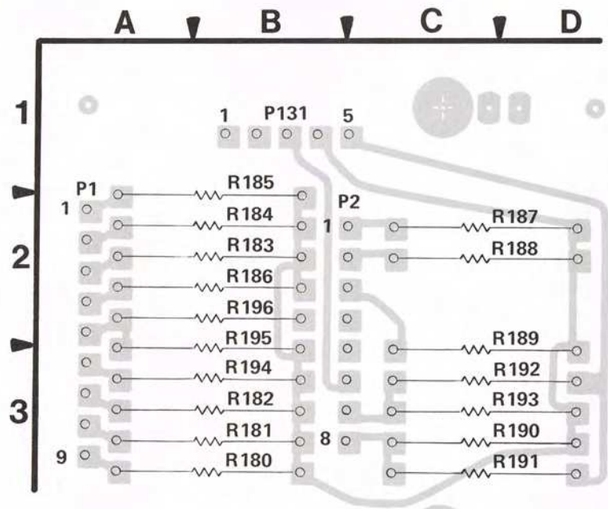
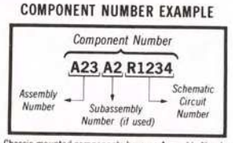


Figure 7-13 A1A1 Reference Level Readout Circuit Board

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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

@

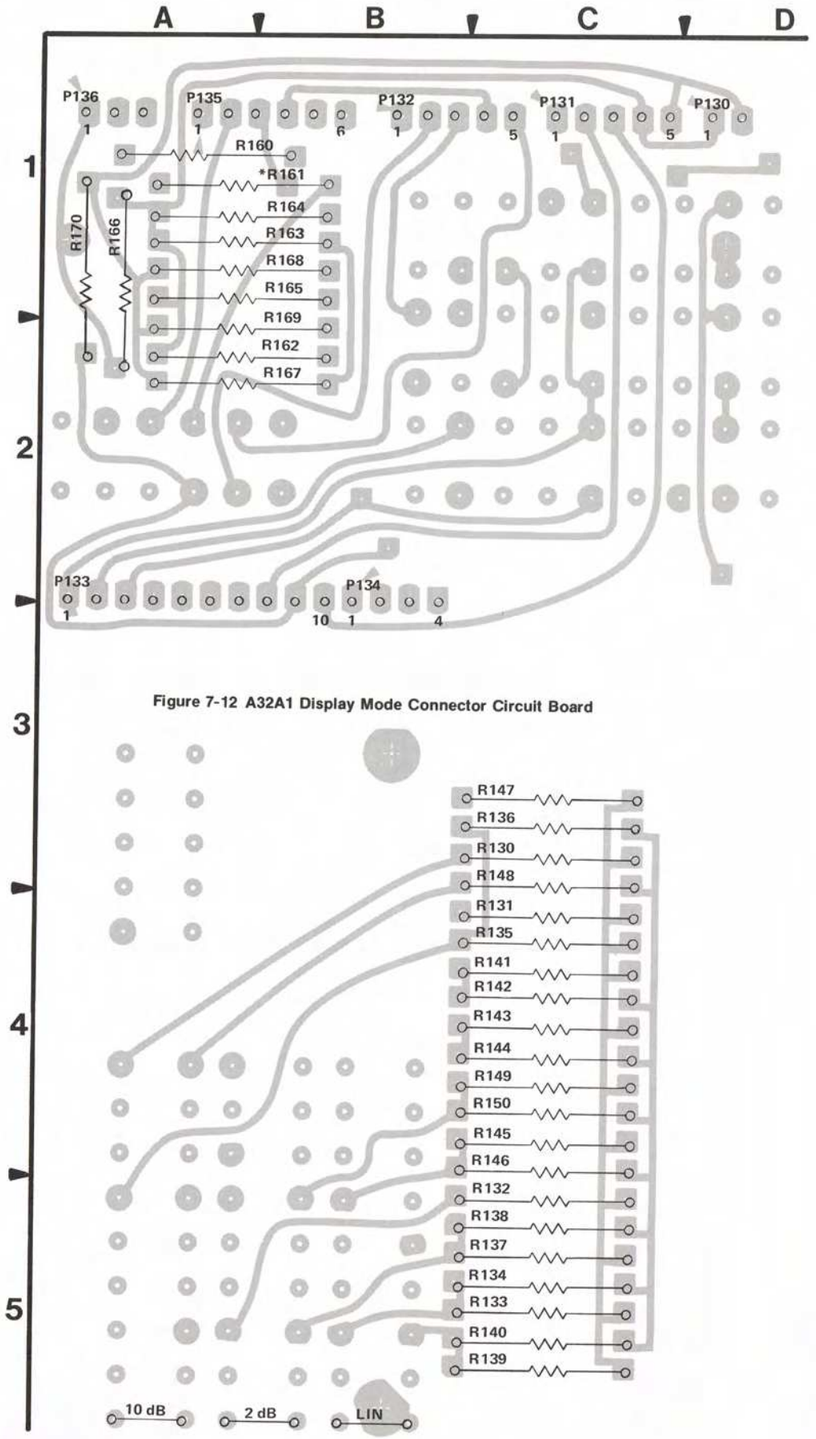


Figure 7-12 A32A1 Display Mode Connector Circuit Board

Figure 7-10 A32 Display Mode Resistor Circuit Board

3434-111

DISPLAY MODE AND IF SELECTORS DIAGRAM

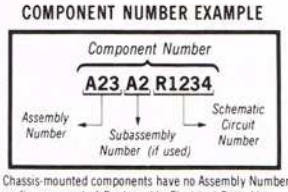
10

ASSEMBLY A32

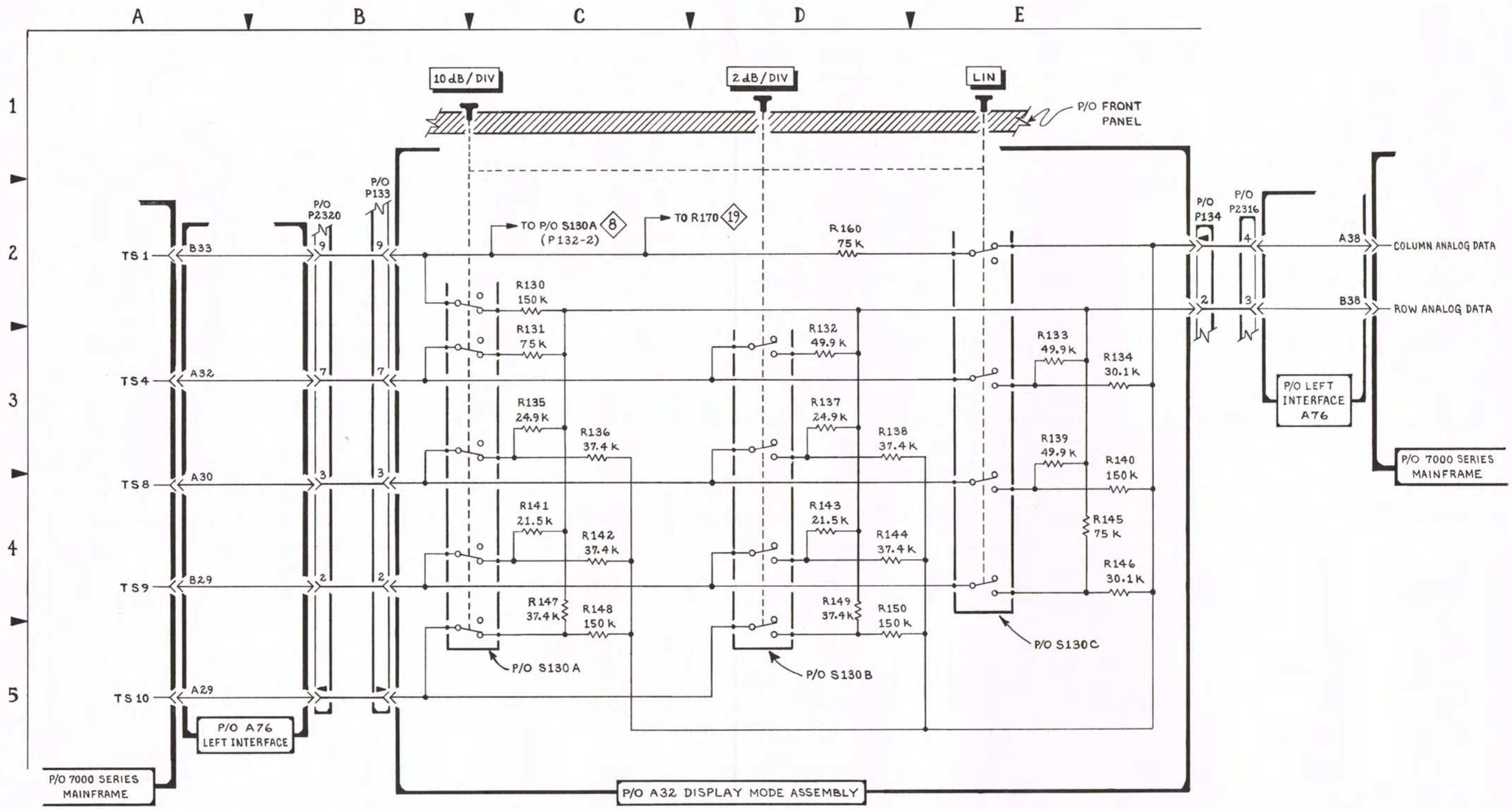
CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
R130	C2	C3	R141	C4	C4
R131	C3	C4	R142	C4	C4
R132	D3	C5	R143	D4	C4
R133	E3	C5	R144	D4	C4
R134	E3	C5	R145	E4	C4
R135	C3	C4	R146	E4	C4
R136	C3	C3	R147	C4	C3
R137	D3	C5	R148	C5	C3
R138	D3	C5	R149	D4	C4
R139	E3	C5	R150	D5	C4
R140	E4	C5			

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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



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DISPLAY MODE & IF SELECTORS 10

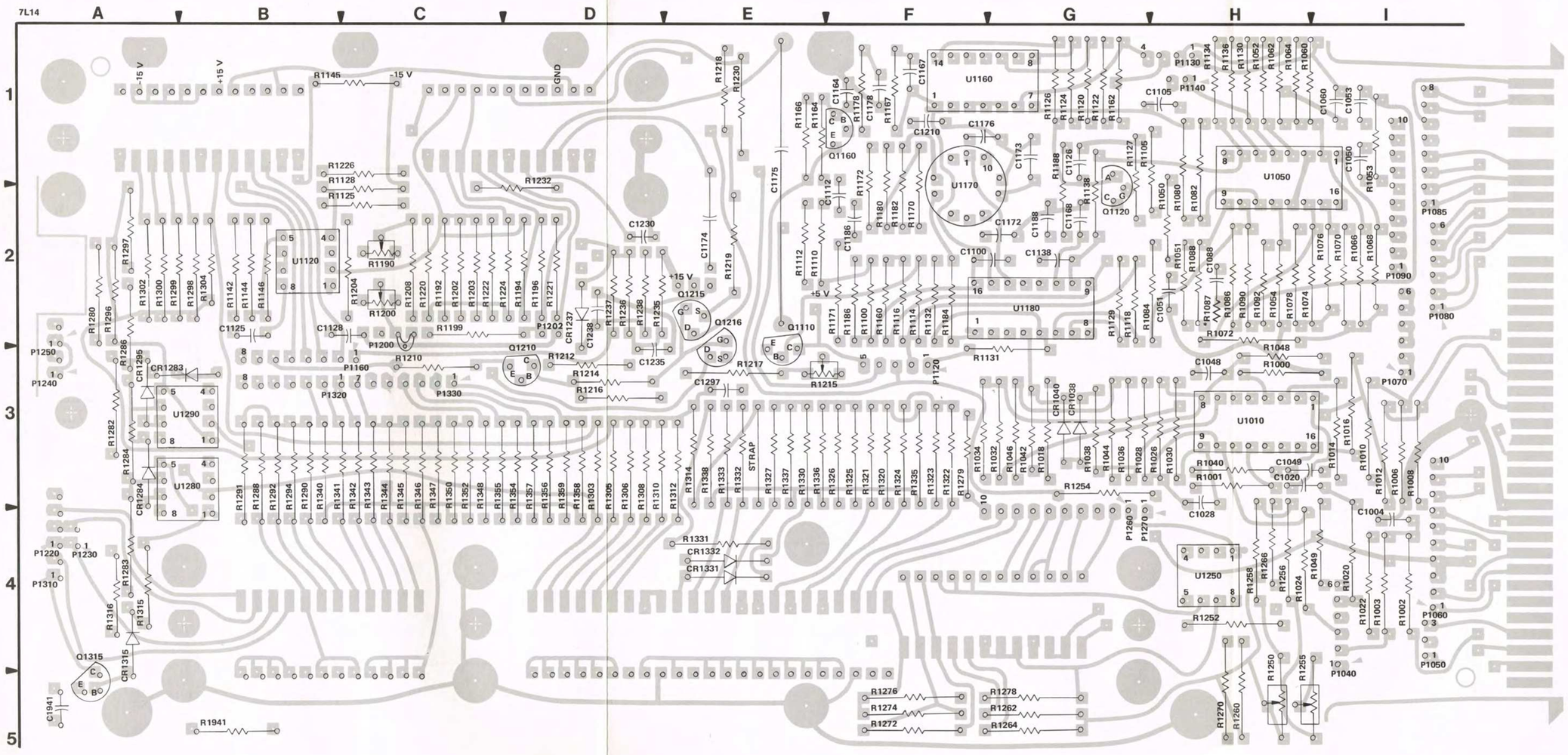


Figure 7-11 A42A1 Sweep Circuit Board

SWEEP TRIGGERING DIAGRAM 11

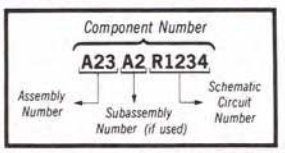
ASSEMBLY A42A1

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1004	A1	I4	R1022	B3	I4
C1020	A3	H3	R1024	D3	H4
C1028	D3	H4	R1026	D3	H3
C1048	A4	H3	R1028	D3	G3
C1049	A3	H3	R1030	D3	H3
			R1032	E3	G3
CR1038	E3	G3	R1034	E3	F3
CR1040	E3	G3	R1036	E2	G3
			R1038	E3	G3
R1000	E4	H3	R1040	E2	H3
R1001	E4	H3	R1042	E3	G3
R1002	A1	I4	R1044	D2	G3
R1003	A1	I4	R1046	D3	G3
R1006	A2	I3	R1048	A4	H3
R1008	A3	I3	R1049	A3	I4
R1010	A3	I3			
R1012	A3	I3	U1010A	A3	H3
R1014	A2	I3	U1010B	D3	H3
R1016	A3	I3	U1010C	E3	H3
R1018	A3	G3	U1010	E4	H3
R1020	B3	I4			

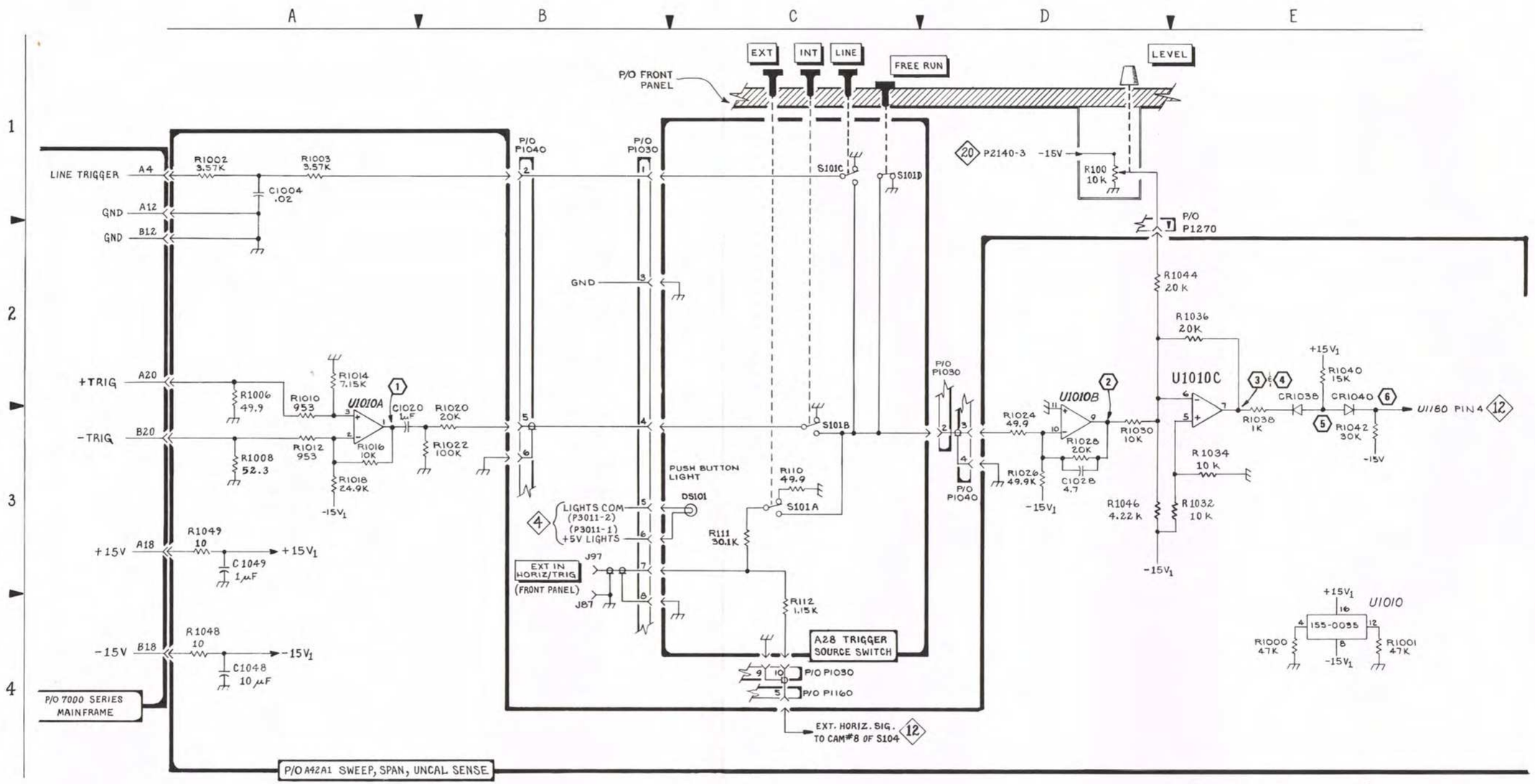
Partial A42A1 also shown on diagrams 12, 13, 14 and 18.

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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



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SWEEP TRIGGERING 11

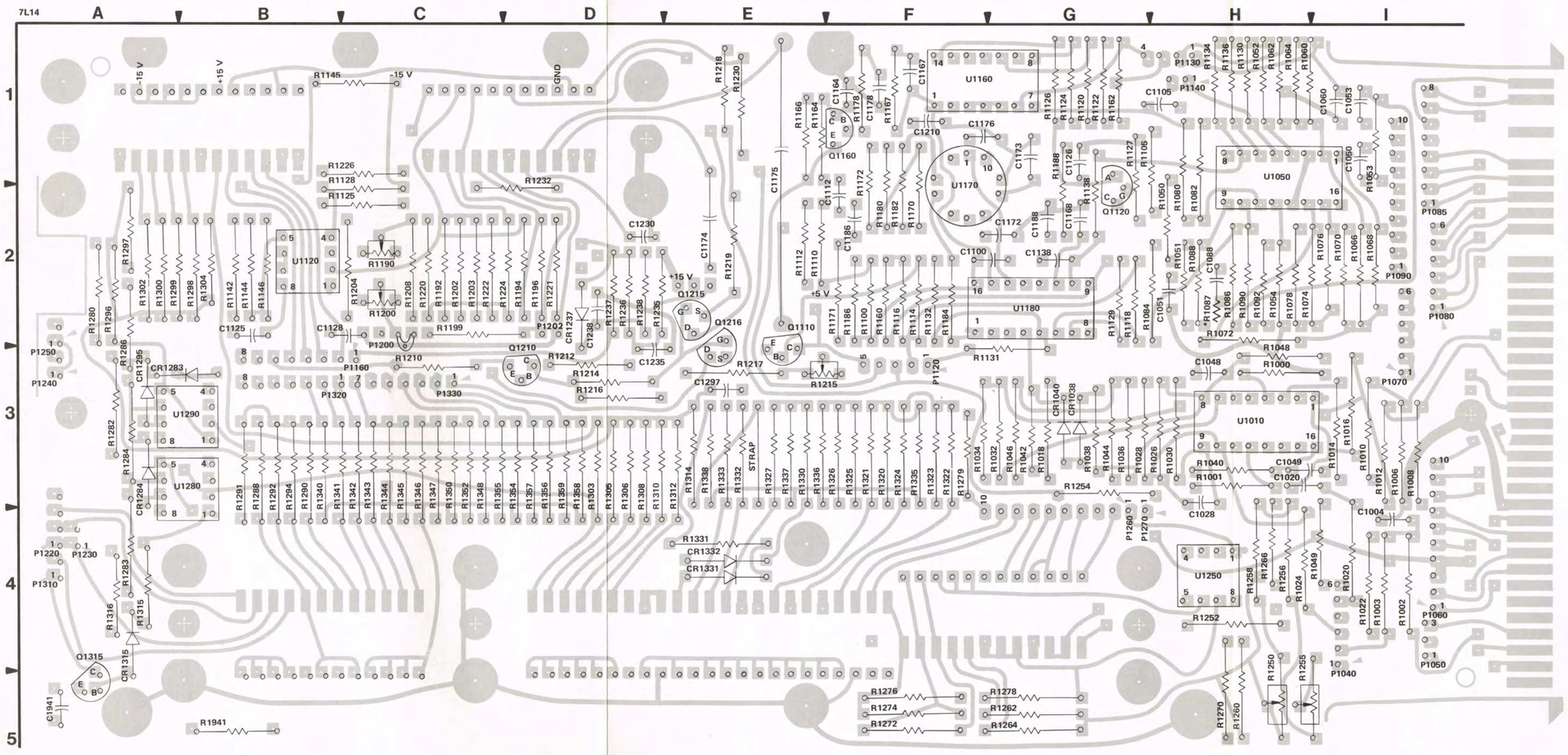


Figure 7-11 A42A1 Sweep Circuit Board

SWEEP SELECTOR AND GENERATOR DIAGRAM 12

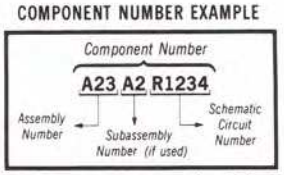
ASSEMBLY A42A1

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1100	A7	G2	Q1210	D4	D3	R1146	B7	B2	R1215	E5	E3
C1105	A7	H1	Q1215	D4	E2	R1160	B2	F2	R1216	D5	D3
C1112	A3	F2	Q1216	D5	E2	R1162	C2	G1	R1217	E5	E3
C1125	B7	B2				R1164	D2	E1	R1218	C4	E1
C1126	A3	G1	R1100	A7	F2	R1166	D3	E1	R1219	E4	E2
C1128	B8	C2	R1105	A7	H1	R1167	B3	F1	R1220	E5	C2
C1138	B5	G2	R1110	A2	E2	R1170	C4	F1	R1221	E4	D2
C1164	D2	F1	R1112	A3	E2	R1171	C3	F2	R1222	E5	C2
C1167	C3	F1	R1114	A3	F2	R1172	C3	F1	R1224	E5	D2
C1168	B3	G2	R1116	A3	F2	R1178	C4	F1	R1226	F6	C1
C1172	C4	G2	R1118	B3	G2	R1180	B3	F1	R1230	D3	E1
C1173	C4	G1	R1120	A3	G1	R1182	B3	F1	R1232	E3	D2
C1174	E4	E2	R1122	A4	G1	R1184	B5	F2	R1235	E2	D2
C1175	E4	E1	R1124	A4	G1	R1186	A5	F2	R1236	E3	D2
C1176	C4	F1	R1125	B7	C2	R1188	C5	G1	R1237	F3	D2
C1178	C5	F1	R1126	A3	G1	R1190	D6	C2	R1238	E2	D2
C1186	B5	F2	R1127	A4	G1	R1192	D6	C2			
C1188	C5	G2	R1128	B8	C2	R1194	D6	D2	U1050B	A5	H1
C1210	D4	F1	R1129	A4	G2	R1196	D6	D2	U1120A	D5	B2
C1230	E3	D2	R1130	A5	H1	R1199	B5	C2	U1120B	B7	B2
C1235	E3	D3	R1131	A4	G3	R1200	C5	C2	U1120	B8	B2
C1238	E3	D2	R1132	A4	F2	R1202	D5	C2	U1160A	C3	F1
			R1134	A5	H1	R1203	D5	C2	U1160B	C3	F1
CR1237	E3	D2	R1136	A5	H1	R1204	D5	C2	U1160C	A4	F1
			R1138	A5	G2	R1208	D5	C2	U1160	B8	F1
Q1110	A3	E3	R1142	B6	B2	R1210	D4	C3	U1180	B3	G2
Q1120	A4	G1	R1144	B7	B2	R1212	D5	D3			
Q1160	D3	F1	R1145	B7	C1	R1214	D4	D3			

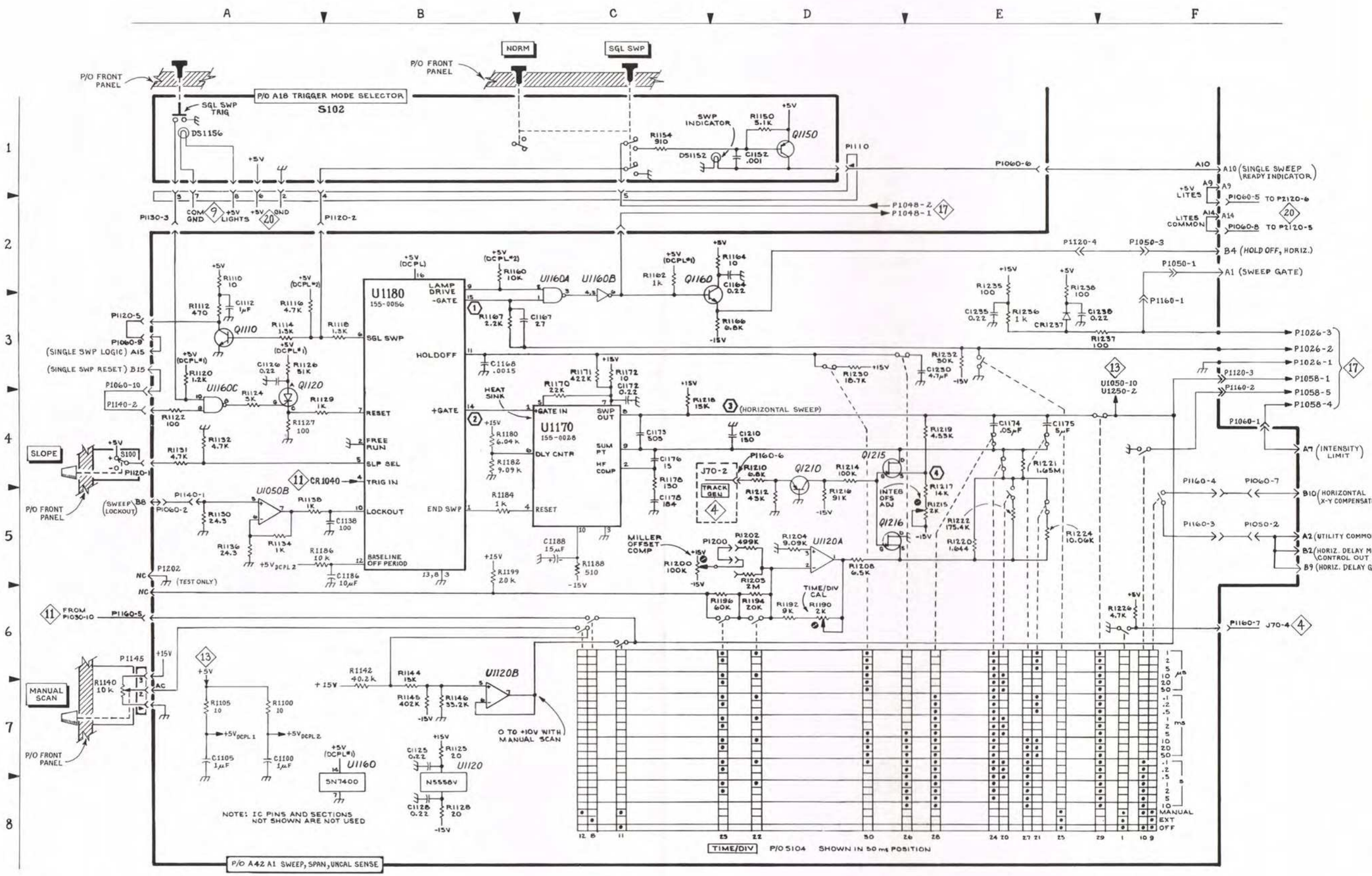
Partial A42A1 also shown on diagrams 11, 13, 14 and 18.

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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



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SWEEP SELECTOR & GENERATOR 12

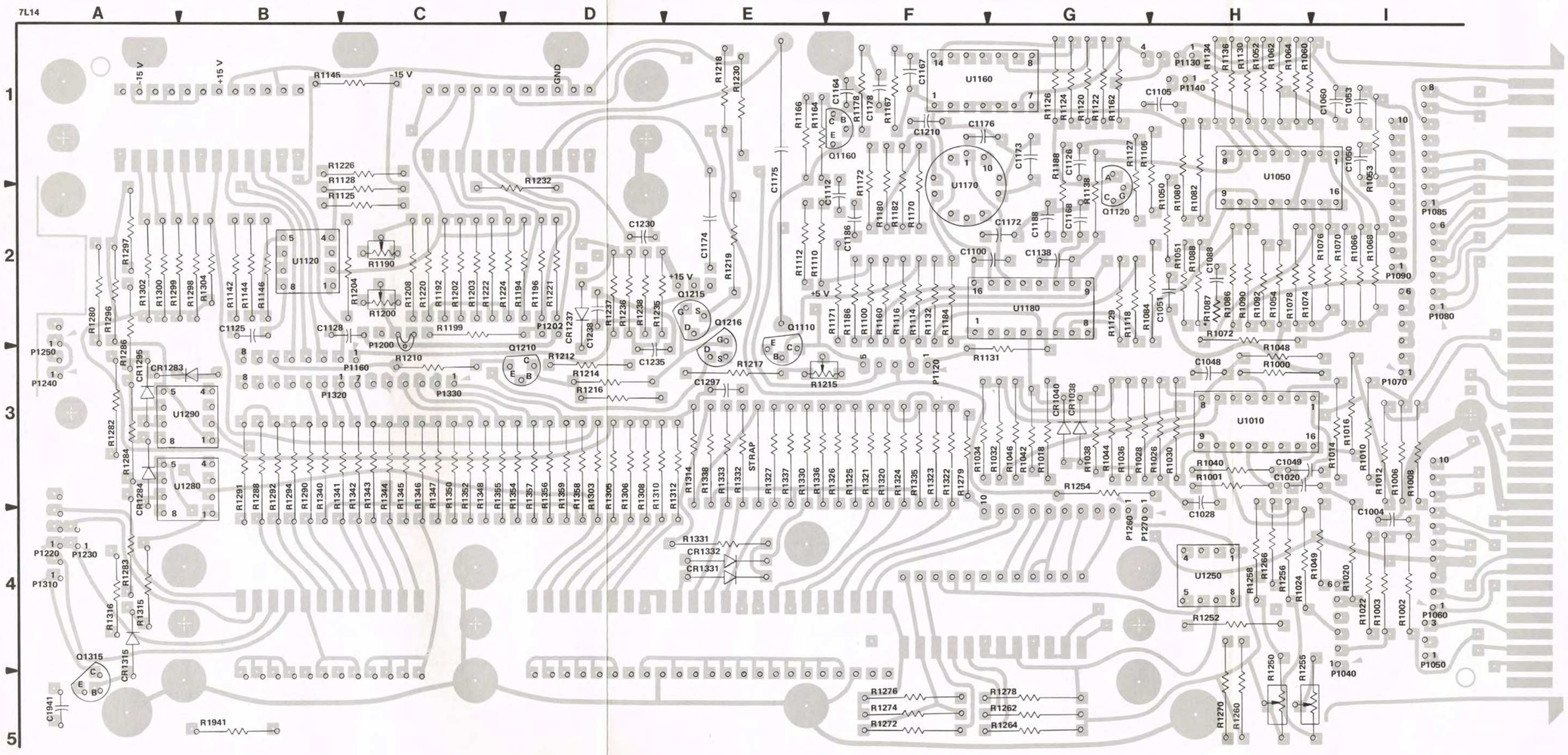


Figure 7-11 A42A1 Sweep Circuit Board

HORIZONTAL AMPLIFIER AND FREQUENCY SPAN SELECTOR DIAGRAM

13

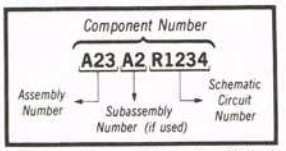
ASSEMBLY A42A1

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1050	C2	I1	R1074	C1	H2	R1262	C3	G5
C1051	B2	H2	R1076	D1	I2	R1264	C3	G5
C1053	B2	I1	R1078	D1	H2	R1266	E2	H4
C1060	B1	I1	R1080	D1	H1	R1270	C3	H5
C1088	E1	H2	R1082	D1	H1	R1272	C3	F5
			R1084	D2	H2	R1274	C3	F5
R1050	D2	H2	R1086	D2	H2	R1276	D3	F5
R1051	B2	H2	R1087	E1	H2	R1278	D3	G5
R1052	C2	H1	R1088	E1	H2	R1279	D3	F3
R1053	B2	I1	R1090	E2	H2			
R1054	C2	H2	R1092	E2	H2	U1050A	B1	H1
R1060	B1	H1	R1250	B3	H5	U1050C	D1	H1
R1062	B1	H1	R1252	B2	H4	U1050D	D1	H1
R1064	B1	H1	R1254	B2	G3	U1050	C2	H1
R1066	C1	I2	R1255	B3	H5	U1250A	B2	H4
R1068	C1	I2	R1256	B3	H4	U1250B	C3	H4
R1070	C1	I2	R1258	B3	H4			
R1072	C1	H2	R1260	B2	H5			

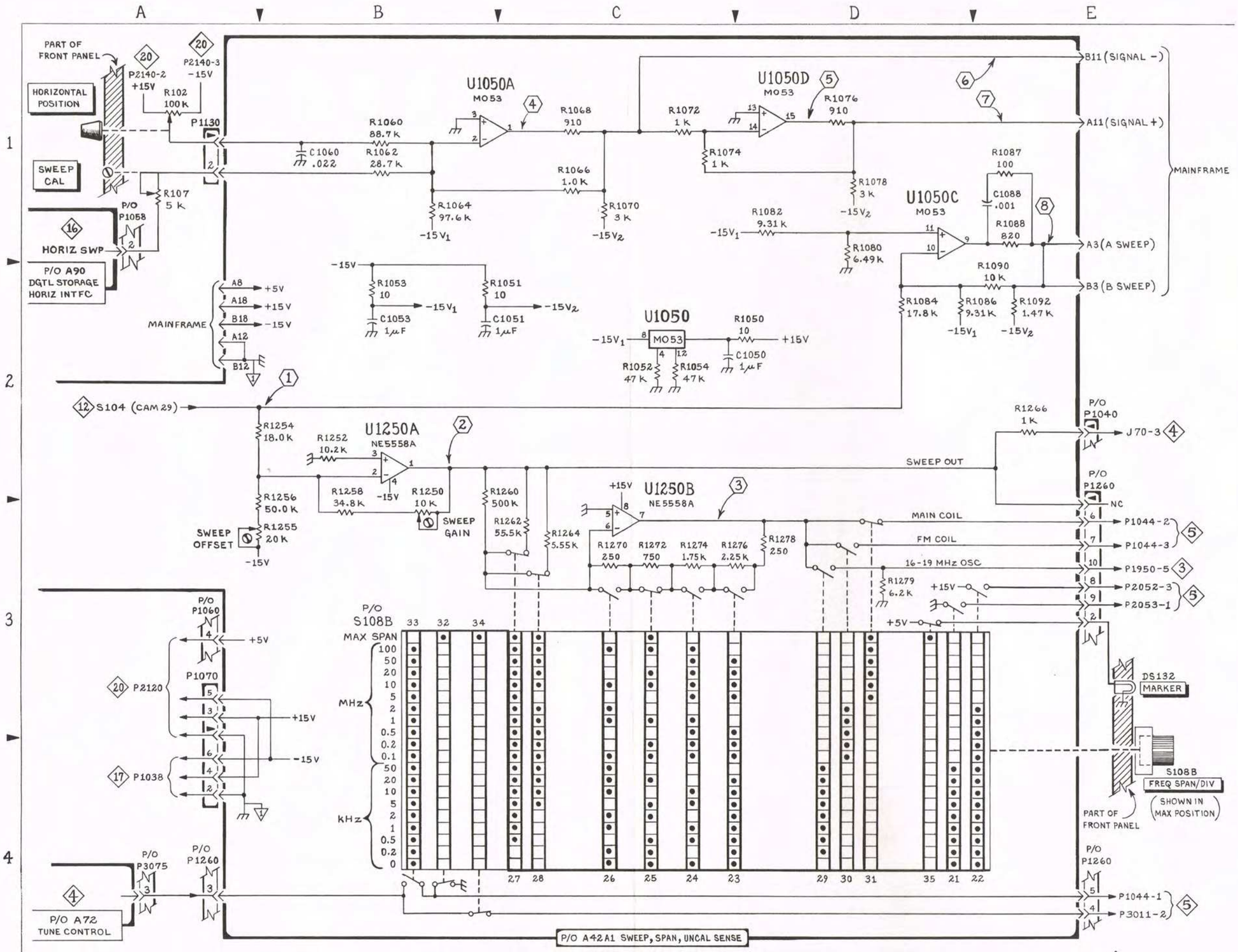
Partial A42A1 also shown on diagrams 11, 12, 14 and 18.

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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


A
B
C
D
E
1
2
3
4
PART OF FRONT PANEL
HORIZONTAL POSITION
SWEEP CAL
P2140-2 +15V
P2140-3 -15V
R102 100K
P1130
R107 5K
P/O P1058
HORIZ SWP
P/O A90 DGTL STORAGE HORIZ INTFC
MAINFRAME
A8 +5V
A18 +15V
B18 -15V
A12
B12
U1050A MO53
R1060 88.7K
R1062 28.7K
C1060 .022
R1064 97.6K
R1066 1.0K
R1068 910
R1070 3K
U1050D MO53
R1072 1K
R1074 1K
R1076 910
R1078 3K
U1050C MO53
R1082 9.31K
R1080 6.49K
R1087 100
C1088 .001
R1088 820
R1090 10K
R1084 17.8K
R1086 9.31K
R1092 1.47K
B11 (SIGNAL -)
A11 (SIGNAL +)
A3 (A SWEEP)
B3 (B SWEEP)
MAINFRAME
-15V
R1053 10
C1053 1μF
R1051 10
C1051 1μF
U1050 MO53
R1050 10
C1050 1μF
R1052 47K
R1054 47K
S104 (CAM 29)
R1254 18.0K
R1252 10.2K
U1250A NE5558A
R1256 50.0K
R1255 20K
SWEEP OFFSET
R1258 34.8K
R1250 10K
SWEEP GAIN
R1260 500K
R1262 55.5K
R1264 5.55K
U1250B NE5558A
R1270 250
R1272 750
R1274 1.75K
R1276 2.25K
R1278 250
SWEEP OUT
R1266 1K
P/O P1040
J70-3
P/O P1260
NC
MAIN COIL
FM COIL
16-19 MHz OSC
R1279 6.2K
P1044-2
P1044-3
P1950-5
P2052-3
P2053-1
P/O P1060
P1070
P2120
P1038
P/O S108B MAX SPAN
MHz
kHz
DS132 MARKER
S108B FREQ SPAN/DIV
SHOWN IN MAX POSITION
PART OF FRONT PANEL
P/O P3075
P/O A72 TUNE CONTROL
P1044-1
P3011-2
P/O A42A1 SWEEP, SPAN, UNCAL SENSE
7L14
@3434-63
HORIZONTAL AMPLIFIER & FREQUENCY SPAN SELECTOR
JAW

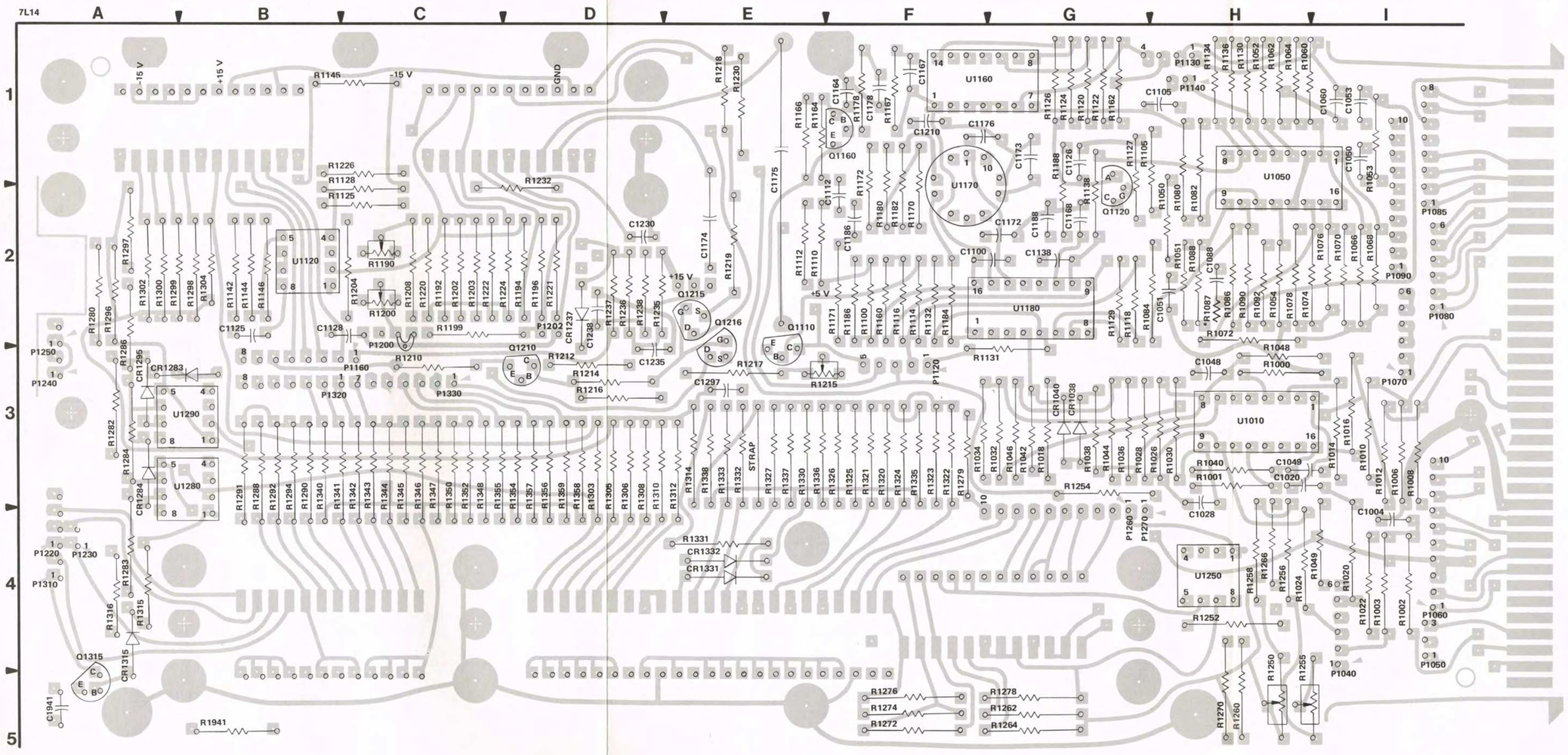


Figure 7-11 A42A1 Sweep Circuit Board

UNCAL DIAGRAM 14

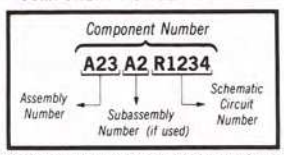
ASSEMBLY A42A1

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1297	C2	E3	R1298	C2	B2
			R1299	C3	A2
CR1283	A1	B3	R1300	C3	A2
CR1284	B1	A3	R1302	C3	A2
CR1295	B2	A3	R1303	C2	D3
CR1315	E1	A4	R1304	C2	B2
			R1305	D2	D3
Q1315	E1	A5	R1306	D3	D3
			R1308	D3	D3
R1280	A1	A2	R1310	D3	D3
R1282	A1	A3	R1312	D3	E3
R1283	A1	A4	R1314	D3	E3
R1284	A1	A3	R1315	E1	A4
R1286	B1	A2			
R1288	A2	B3	U1280A	C1	B3
R1290	A2	B3	U1280B	A1	B3
R1291	B2	B3	U1280	E4	B3
R1292	A2	B3	U1290A	B2	B3
R1294	A2	B3	U1290B	B2	B3
R1296	B2	A2	U1290	E4	B3
R1297	B2	A2			

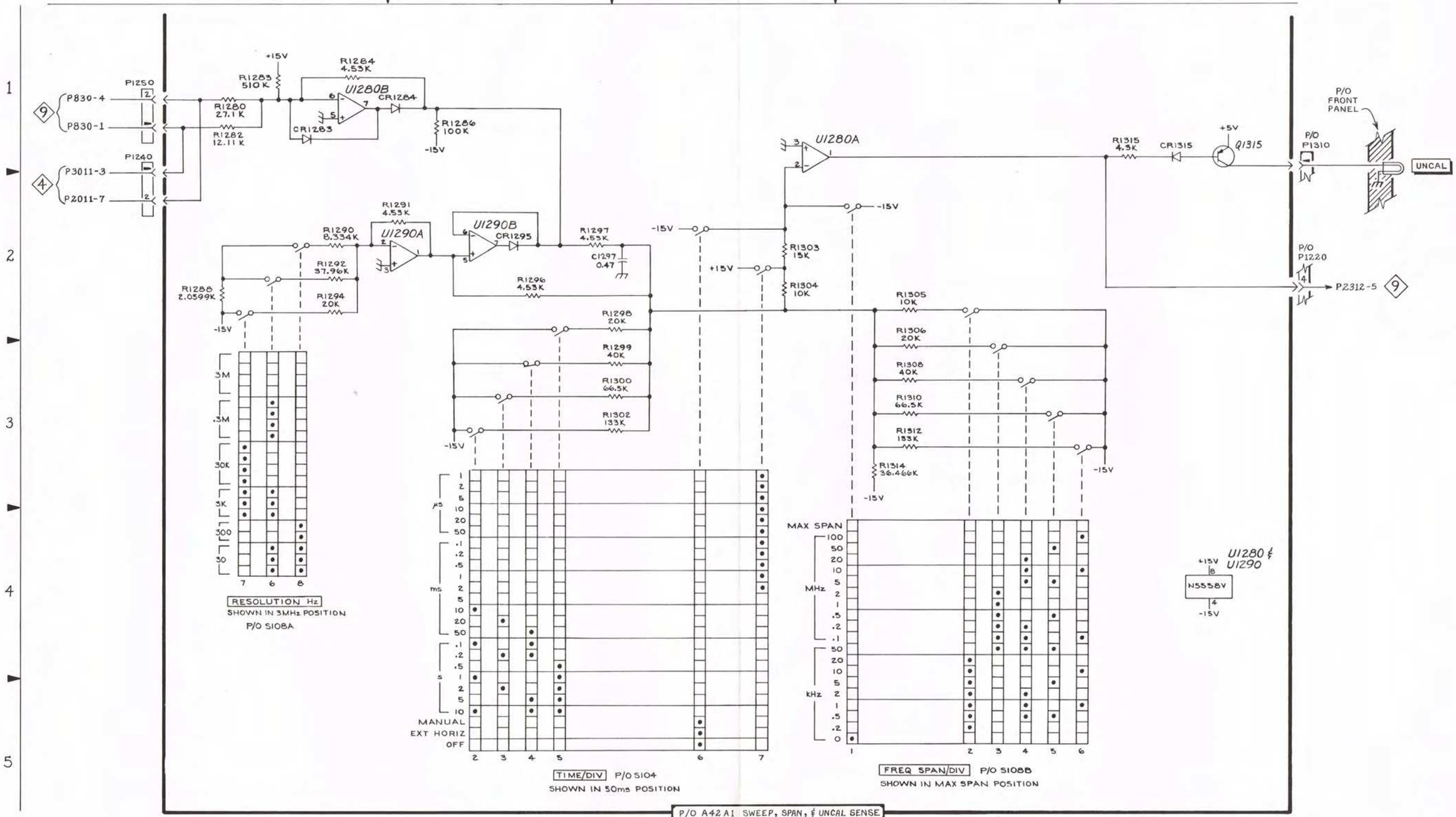
Partial A42A1 also shown on diagrams 11, 12, 13 and 18.

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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



P/O A42A1 SWEEP, SPAN, & UNCAL SENSE

@3434-64

UNCAL & FREQUENCY SPAN 14

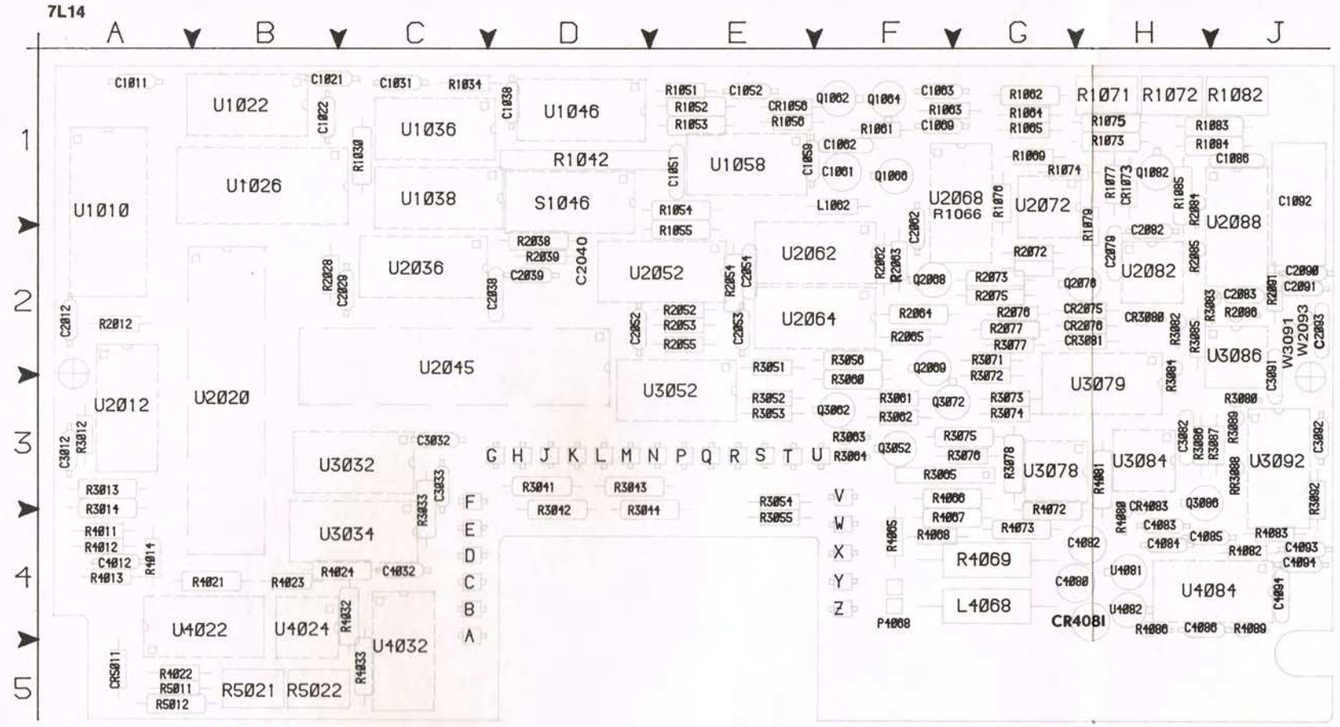


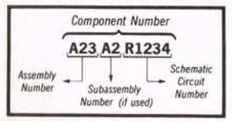
Figure 7-18 DIGITAL STORAGE A88

3434-125A

Assembly A88

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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

DIGITAL STORAGE VERTICAL DIAGRAM 15

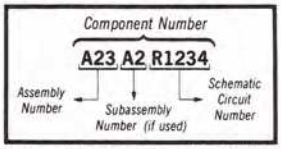
ASSEMBLY A88

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1059	M5	E1	R1082	F2	J1	R3086	E5	H3
C1086	G3	J1	R1083	F2	J1	R3087	E5	J3
C1092	G3	J1	R1084	G2	J1	R3088	B4	J3
C2029	D2	C2	R1085	F4	H1	R3089	B4	J3
C2038	E1	D2	R2028	D2	B2	R3091	D1	J2
C2039	D2	D2	R2038	E1	D2	R3092	C5	J3
C2040	D1	D2	R2039	E2	D2	R4066	D5	G4
C2052	F3	D2	R2052	F3	E2	R4067	B1	G4
C2053	F3	E2	R2053	F3	E2	R4072	B1	G4
C2054	F3	E2	R2054	F3	E2	R4073	A1	G4
C2062	N5	F1	R2062	G1	F2	R4080	B1	H4
C2079	G3	H2	R2063	P5	F2	R4081	B1	H3
C2083	B3	J2	R2064	G1	F2	R4082	D5	J4
C2090	B5	J2	R2065	G1	F2	R4083	C5	J4
C2091	B5	J2	R2072	E1	G2	R4086	D5	H4
C3032	B5	C3	R2073	E1	G2	R4089	C1	J4
C3082	B1	H3	R2074	E1	G2	U1058A	D1	E1
C3092	C5	J3	R2075	E1	G2	U1058	M5	E1
C4085	D5	J4	R2076	G3	G2	U2036	E1	C2
C4086	C5	J4	R2077	F4	G2	U2045	E1	C2
C4093	C5	J4	R2085	C5	H2	U2052	F3	E2
C4094	C1	J4	R2086	B3	J2	U2062D	F4	E2
			R2091	C5	J2	U2064A	E4	E2
			R2093	H2	J2	U2064D	E4	E2
CR1073	F4	H1	R3052	G3	E3	U2064	N5	E2
CR2075	G4	H2	R3053	G4	E3	U2068A	E1	G1
CR2076	G4	H2	R3054	A5	E3	U2068	P5	G1
CR3080	B3	H2	R3055	A5	E3	U2072	G2	G1
CR3081	G4	H2	R3064	D5	F3	U2088	H2	J1
CR4083	B1	H3	R3065A	G5	F3	U3032A	F2	C3
			R3065B	F5	F3	U3032B	D3	C3
Q1082	F4	H1	R3065C	G5	F3	U3032	E5	C3
Q2068	G1	F2	R3065E	F5	F3	U3052A	G4	E3
Q2069	G4	F2	R3065G	F5	F3	U3052B	F4	E3
Q2076	G4	H2	R3065	D5	F3	U3052C	G3	E3
Q3064	D5	F3	R3071	G4	G2	U3078A	F5	G4
Q3072	G3	G4	R3072	G4	G2	U3078B	E5	G4
Q3086	A1	J3	R3073	B4	G4	U3079A	C4	H2
R1055	E2	E1	R3074	C4	G4	U3079B	B1	H2
R1066	E1	F2	R3075	C4	G4	U3084	B1	H3
R1071	F2	H1	R3076	C1	G4	U3084	F5	H3
R1072	B1	H1	R3077	B4	G2	U3086A	B3	J2
R1073	G2	H1	R3078	F5	G4	U3086B	C4	J2
R1074	G3	G1	R3080	B4	J3	U3092	D1	J3
R1075	F2	H1	R3082	C4	H2	U4032A	C1	C5
R1076	P5	G1	R3083	C4	J2	U4084	C1	J4
R1077	F4	H1	R3084	A3	H2	W2093	H2	J2
R1079	G2	H1	R3085	B1	H2	W3091	D1	J2

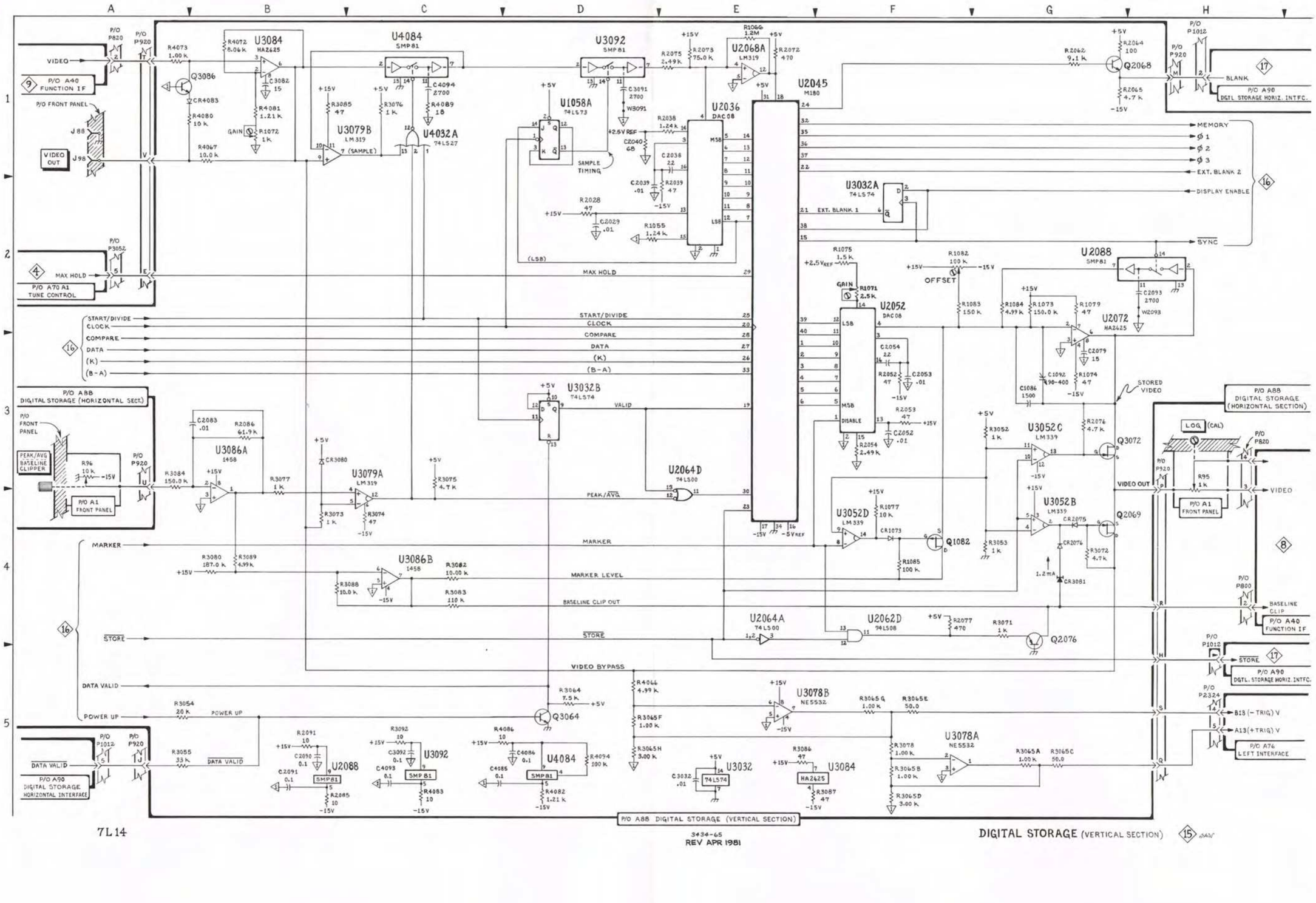
Partial A88 also shown on diagram 16.

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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


VIDEO
P/O A40 FUNCTION IF
P/O FRONT PANEL
J88
VIDEO OUT
J98
R4073 1.00 K
Q3086
CR4083
R4080 10 K
R4067 10.0 K
U3084 HA2625
R4072 6.04 K
C3082 15
R4081 1.21 K
GAIN
R1072 1K
U4084 SMP81
R3085 47
R3076 1 K
C4094 2700
R4089 18
U3079B LM319
(SAMPLE)
U4032A 74LS27
U3092 SMP81
C3091 2700
W3091
+2.5V REF
C2040 68
U1058A 74LS73
SAMPLE TIMING
R2038 1.24 K
C2038 22
C2039 .01
R2039 47
R2028 47
C2029 .01
R1055 1.24 K
(LSB)
U2036 DAC08
MSB
LSB
R2075 2.49 K
R2073 75.0 K
R1066 1.2M
U2068A LM319
R2072 470
U2045 M180
R2062 9.1 K
Q2068
R2064 100
R2065 4.7 K
P/O P1012
P/O P920
BLANK
P/O A90 DGTL STORAGE HORIZ. INTFC.
MEMORY
ϕ 1
ϕ 2
ϕ 3
EXT. BLANK 2
DISPLAY ENABLE
SYNC
U3032A 74LS74
EXT. BLANK 1
MAX HOLD
P/O A70 A1 TUNE CONTROL
START/DIVIDE
CLOCK
COMPARE
DATA
(K)
(B-A)
U3032B 74LS74
VALID
U2064D 74LS00
PEAK/AVG.
MARKER
MARKER LEVEL
BASELINE CLIP OUT
STORE
VIDEO BYPASS
DATA VALID
POWER UP
R3054 20 K
R3055 33 K
R3064 7.5 K
Q3064
R1075 1.5 K
+2.5V REF
GAIN
R1071 2.5 K
U2052 DAC08
R1082 100 K
OFFSET
R1083 150 K
U2088 SMP81
R1084 4.99 K
R1073 150.0 K
R1079 47
C2093 2700
W2093
U2072 HA2625
C2079 15
C2054 22
R2052 47
C2053 .01
R2053 47
C2052 .01
R2054 2.49 K
DISABLE
C1092 90-400
C1086 1500
R1074 47
STORED VIDEO
P/O A88 DIGITAL STORAGE (HORIZONTAL SECT.)
P/O FRONT PANEL
PEAK/AVG BASELINE CLIPPER
R96 10 K
P/O A1 FRONT PANEL
P/O P920
C2083 .01
R2086 61.9 K
U3086A 1458
R3084 150.0 K
R3077 1 K
U3079A LM319
CR3080
R3073 1 K
R3074 47
R3075 4.7 K
U3086B 1458
R3080 187.0 K
R3089 4.99 K
R3082 10.00 K
R3088 10.0 K
R3083 110 K
U2064A 74LS00
U2062D 74LS08
R2077 470
R3071 1 K
Q2076
U3052C LM339
U3052D LM339
U3052B LM339
R3052 1 K
R3053 1 K
R2076 4.7 K
Q3072
Q2069
Q1082
R1077 10 K
CR1073
R1085 100 K
CR2075
CR2076
R3072 4.7 K
1.2mA
CR3081
LOG (CAL)
R95 1 K
VIDEO OUT
VIDEO
P/O A1 FRONT PANEL
P/O A88 DIGITAL STORAGE (HORIZONTAL SECTION)
P/O P800
BASELINE CLIP
P/O A40 FUNCTION IF
STORE
P/O A90 DGTL. STORAGE HORIZ. INTFC.
P/O P2324
B13 (– TRIG) V
A13 (+ TRIG) V
P/O A76 LEFT INTERFACE
R4044 4.99 K
R3065F 1.00 K
R3065H 3.00 K
U3078B NE5532
R3065G 1.00 K
R3065E 50.0
R3078 1.00 K
R3065B 1.00 K
R3065D 3.00 K
U3078A NE5532
R3065A 1.00 K
R3065C 50.0
U3032 74LS74
C3032 .01
U3084 HA2625
R3086 47
R3087 47
R2091 10
C2090 0.1
C2091 0.1
R2085 10
U2088 SMP81
R3092 10
C3092 0.1
C4093 0.1
R4083 10
U3092 SMP81
R4086 10
C4086 0.1
C4085 0.1
R4082 1.21 K
R4094 100 K
U4084 SMP81
DATA VALID
POWER UP
P/O A90 DIGITAL STORAGE HORIZONTAL INTERFACE
P/O A88 DIGITAL STORAGE (VERTICAL SECTION)
7L14
3434-65
REV APR 1981
DIGITAL STORAGE (VERTICAL SECTION)

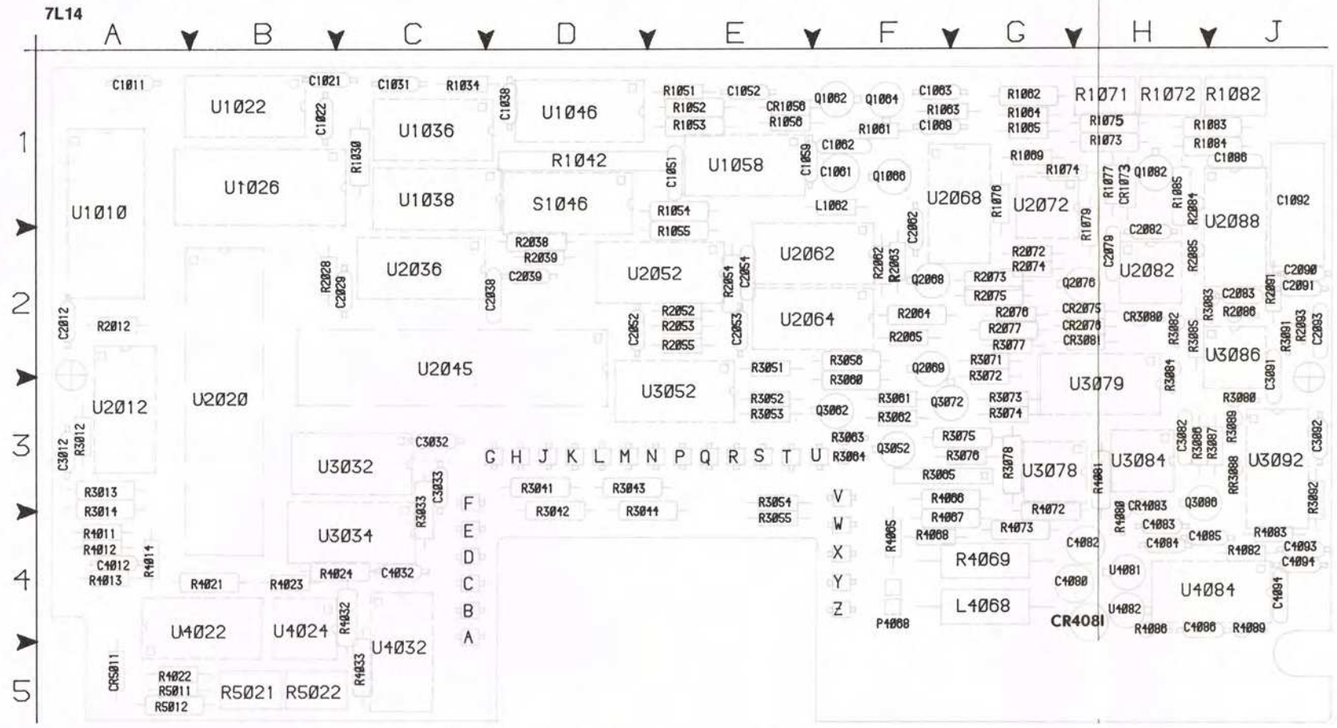


Figure 7-15 DIGITAL STORAGE A88

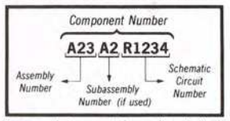
3434-125

Assembly A88

@

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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

DIGITAL STORAGE HORIZONTAL DIAGRAM 16

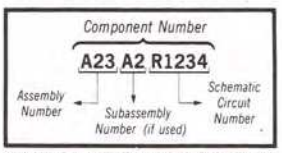
ASSEMBLY A88

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1011	J5	A1	R1053	Q4	E1	R5011	L2	A5
C1021	K5	B1	R1054	M3	E1	R5012	K2	A5
C1022	K5	B1	R1056	K1	E1	R5021	K2	B5
C1031	L5	C1	R1061	K1	F1	R5022	K2	B5
C1038	R4	D1	R1062	K1	G1			
C1051	M3	E1	R1063	K1	F1	U1010	J5	A1
C1052	Q4	E1	R1064	J1	G1	U1010	P2	A1
C1061	K1	F1	R1065	J1	G1	U1022	K5	B1
C1062	K1	F1	R1069	M1	G1	U1022	P4	B1
C1063	K1	F1	R2012	L3	A2	U1026	K5	B1
C1069	M1	F1	R2055	K3	E2	U1026	P3	B1
C2012	L3	A2	R2084	Q5	H1	U1036	L5	C1
C2082	Q5	H1	R3012	L3	A3	U1036	P4	C1
C3012	L3	A3	R3013	L3	A3	U1038	L5	C1
C3033	L3	C3	R3014	L3	A3	U1038	R2	C1
C4012	L2	A4	R3033	L3	C3	U1046	Q4	D1
C4032	N3	C4	R3041	K3	D3	U1058B	L1	E1
C4080	K5	H4	R3042	K3	D3	U2012	L3	A3
C4081	L5	H4	R3043	K3	D3	U2020	M1	B3
C4082	L4	H4	R3044	J4	D3	U2062A	N4	E2
C4083	L5	H4	R3051	Q2	E2	U2062B	M2	E2
C4084	L5	J4	R3056	K3	F2	U2062C	M3	E2
			R3060	K4	F2	U2064C	Q2	E2
CR1056	K1	E1	R3061	N1	F3	U2068B	M1	G1
CR5011	L2	A5	R3062	Q1	F3	U2082	M5	H2
			R3063	N1	F3	U2082	Q5	H2
L1062	K1	F1	R4011	L2	A4	U3034A	L4	C4
L4068	L5	G4	R4012	L2	A4	U3034B	N3	C4
			R4013	L2	A4	U3052A	K3	E3
Q1062	K1	F1	R4014	K2	A4	U4022A	L2	B4
Q1064	K1	F1	R4021	L2	B4	U4022B	L2	B4
Q1066	J1	F1	R4022	L2	A5	U4024A	K2	B4
Q3062	N1	F3	R4023	J2	B4	U4024B	J2	B4
			R4024	N3	C4	U4032B	J3	C5
R1030	M4	C1	R4032	K2	C4	U4032C	M2	C5
R1034	R4	C1	R4033	J2	C5	U4081	L5	H4
R1042	Q3	D1	R4065	L4	F4	U4082	K5	H4
R1051	Q4	E1	R4068	K5	F4			
R1052	Q5	E1	R4069	L5	G4			

Partial A88 also shown on diagram 15.

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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

J K L M N P Q R

1 2 3 4 5

P/O A88 DIGITAL STORAGE (VERTICAL SECTION)

P/O A90 DIGITAL STORAGE HORIZONTAL INTFC.

P/O A88 DIGITAL STORAGE (VERTICAL SECTION)

P/O A70 A1 TUNE CONTROL

P/O A88 DIGITAL STORAGE (HORIZONTAL SECTION)

P/O A1 FRONT PANEL

P/O A90 DIGITAL STORAGE HORIZ. INTFC.

SYNC

DATA VALID

HORIZ SWP

STORE

POWER UP

START/DIVIDE

DISPLAY ENABLE

COMPARE

B-A

CLOCK

MARKER

EXT. BLANK Z

MEMORY

DISPLAY A

DISPLAY B

B-SAVE A

SAVE A

INTENSITY

DATA VALID

STORE HORIZ.

DATA

Φ3

Φ2

Φ1

(K)

U1058B 74LS73

U2020 M181

U2062B 74LS08

U4032C 74LS27

U2062C 74LS08

U2062A 74LS08

U4024B 1458

U4024A 1458

U4022B LM319

U4022A LM319

U2012 MC3410

U3034B MC14528

U3034A MC14528

U3052A LM339

U4032B 74LS27

U4082

U4081

U2068B LM319

U2068 LM319

U1010 9140

U1026 9140

U1036 74LS174

U1022 74LS174

U1046 3410

U1038 74LS151

U2082 1458

U2064 74LS00

U1058 74LS73

Q1066

Q1064

Q1062

Q3062

S1046

TP1049

7L14

© 3434-66

DIGITAL STORAGE (HORIZONTAL SECTION) 16

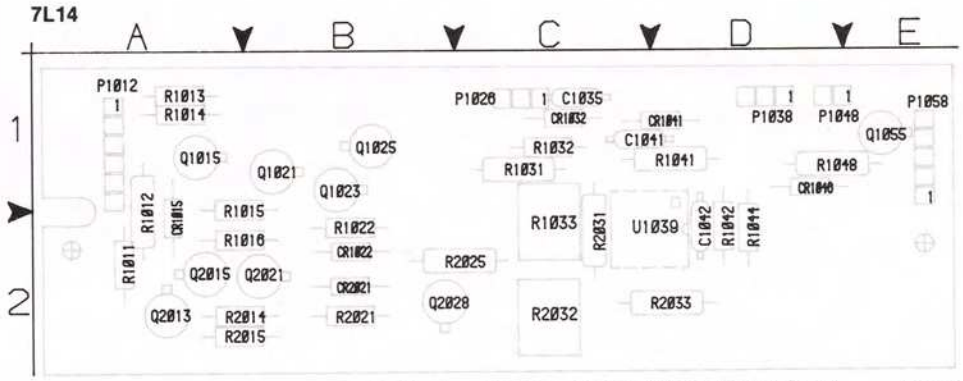
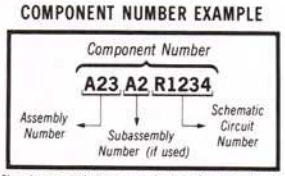


Figure 7-17 DIGITAL STORAGE HORIZONTAL A9Ø

3434-124

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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

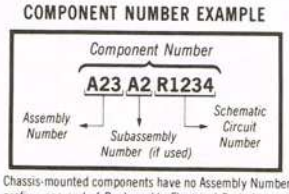
DIGITAL STORAGE HORIZONTAL INTERFACE DIAGRAM 17

ASSEMBLY A90

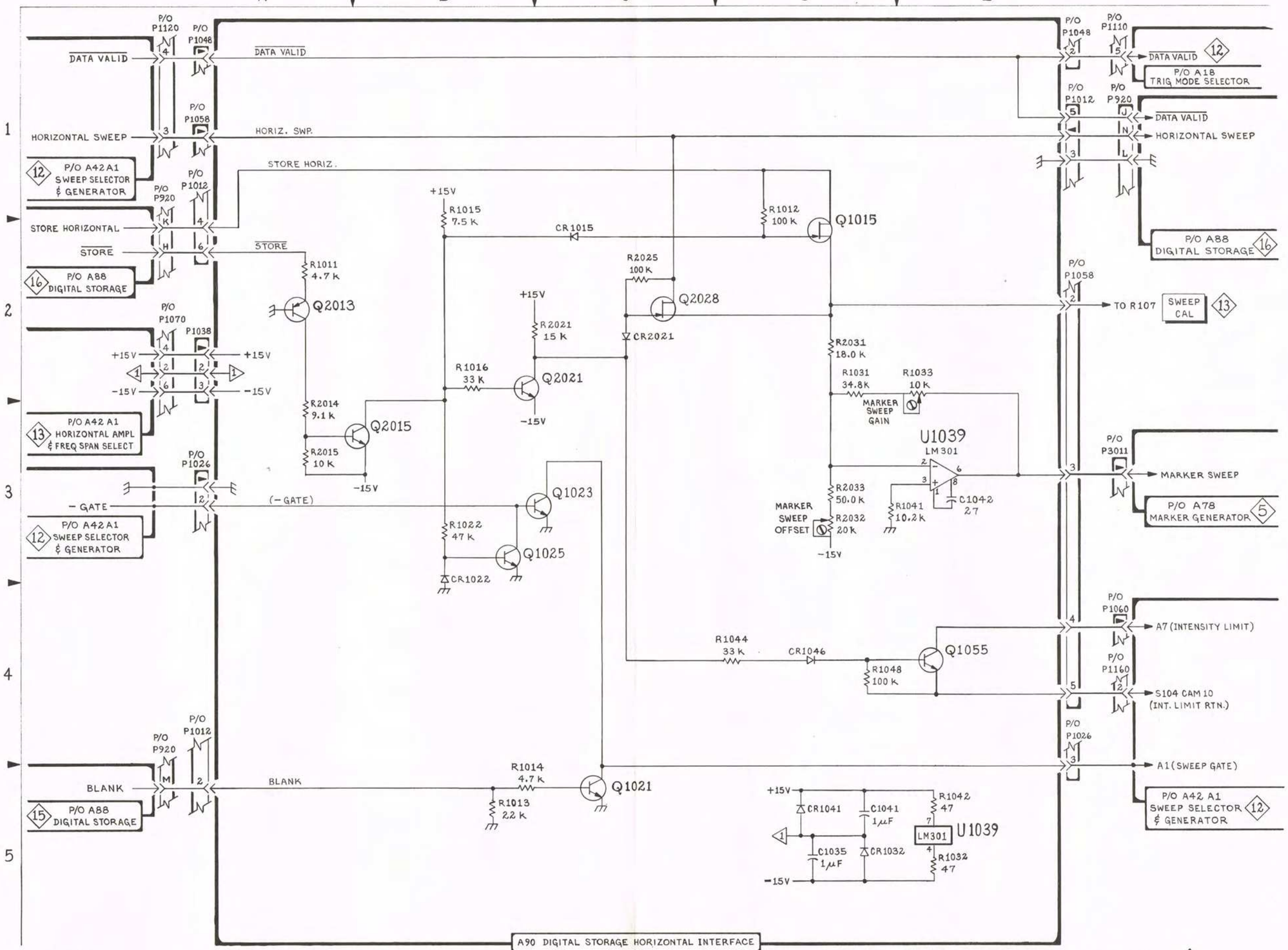
CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C1035	D5	C1	R1013	B5	A1
C1041	D5	C1	R1014	B5	A1
C1042	E3	D2	R1015	B2	B1
			R1016	B2	B2
CR1015	C2	A2	R1022	B3	B2
CR1022	B3	B2	R1031	D2	C1
CR1032	D5	C1	R1032	E5	C1
CR1041	D5	D1	R1033	E2	C2
CR1046	D4	D1	R1041	D3	D1
CR2021	C2	B2	R1042	E5	D2
			R1044	D4	D2
Q1015	D2	A1	R1048	D4	D1
Q1021	C5	B1	R2014	A3	B2
Q1023	C3	B1	R2015	A3	B2
Q1025	B3	B1	R2021	C2	B2
Q1055	E4	E1	R2025	C2	C2
Q2013	A2	A2	R2031	D2	C2
Q2015	B3	A2	R2032	D3	C2
Q2021	B2	B2	R2033	D3	D2
Q2028	C2	B2			
			U1039	E3	D2
R1011	A2	A2	U1039	E5	D2
R1012	D1	A2			

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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



7L14

@ 3434-67

DIGITAL STORAGE HORIZONTAL INTERFACE 17

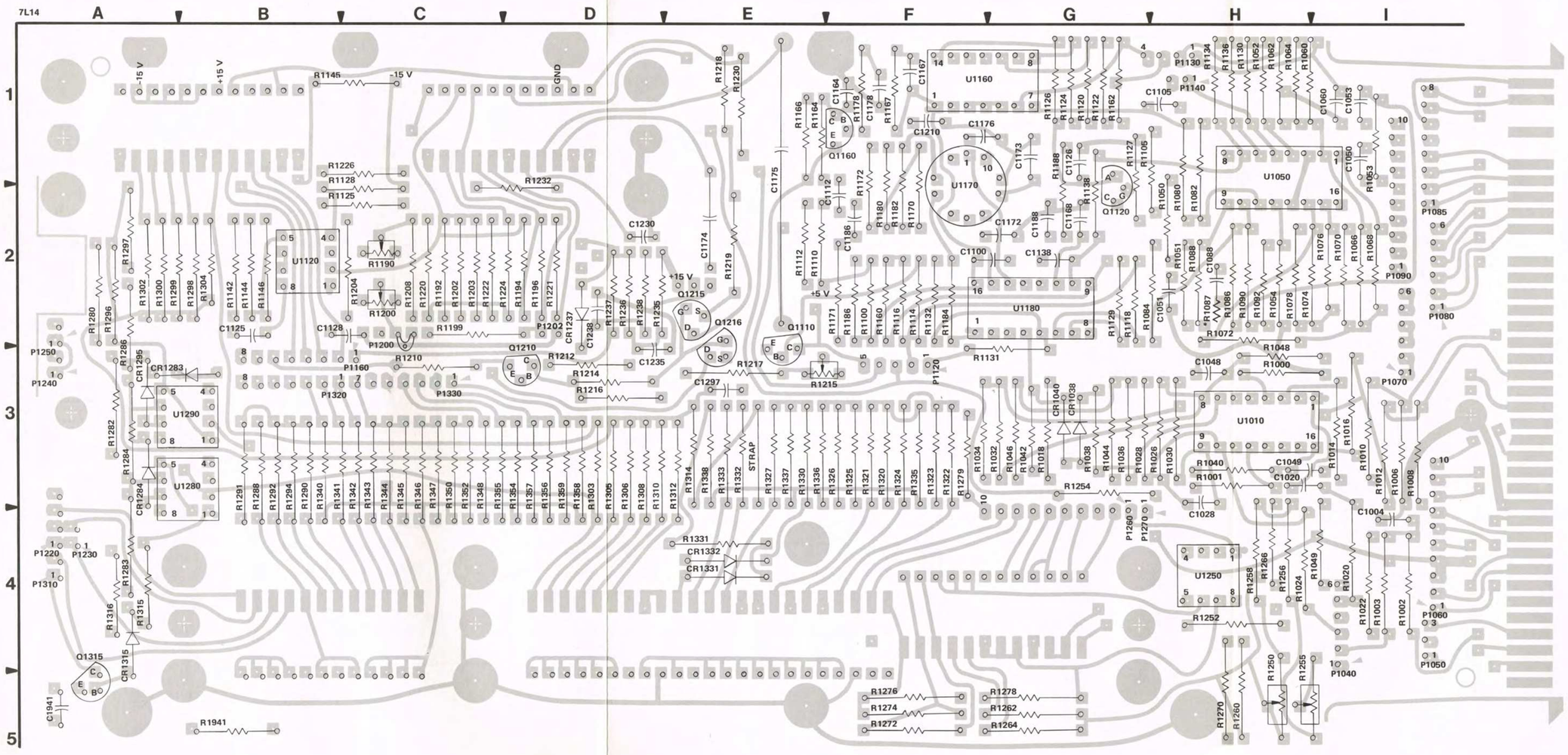


Figure 7-11 A42A1 Sweep Circuit Board

FREQUENCY SPAN AND RESOLUTION READOUT DIAGRAM

18

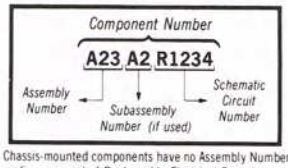
ASSEMBLY A42A1

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
CR01331	B2	E4	R1338	C2	E3
CR1332	B2	E4	R1340	D2	B3
			R1341	D3	B3
R1320	A2	F3	R1342	D2	C3
R1321	A2	F3	R1343	D3	C3
R1322	A2	F3	R1344	D2	C3
R1323	B2	F3	R1345	D3	C3
R1324	B2	F3	R1346	D2	C3
R1325	B2	F3	R1347	D3	C3
R1326	B2	F3	R1348	E3	C3
R1327	B2	E3	R1350	E2	C3
R1330	B2	E3	R1352	E3	C3
R1331	B2	E4	R1354	E2	D3
R1332	B2	E3	R1355	E3	C3
R1333	C2	E3	R1356	E2	D3
R1335	C2	F3	R1357	E3	D3
R1336	C2	E3	R1358	F2	D3
R1337	C2	E3	R1359	F3	D3

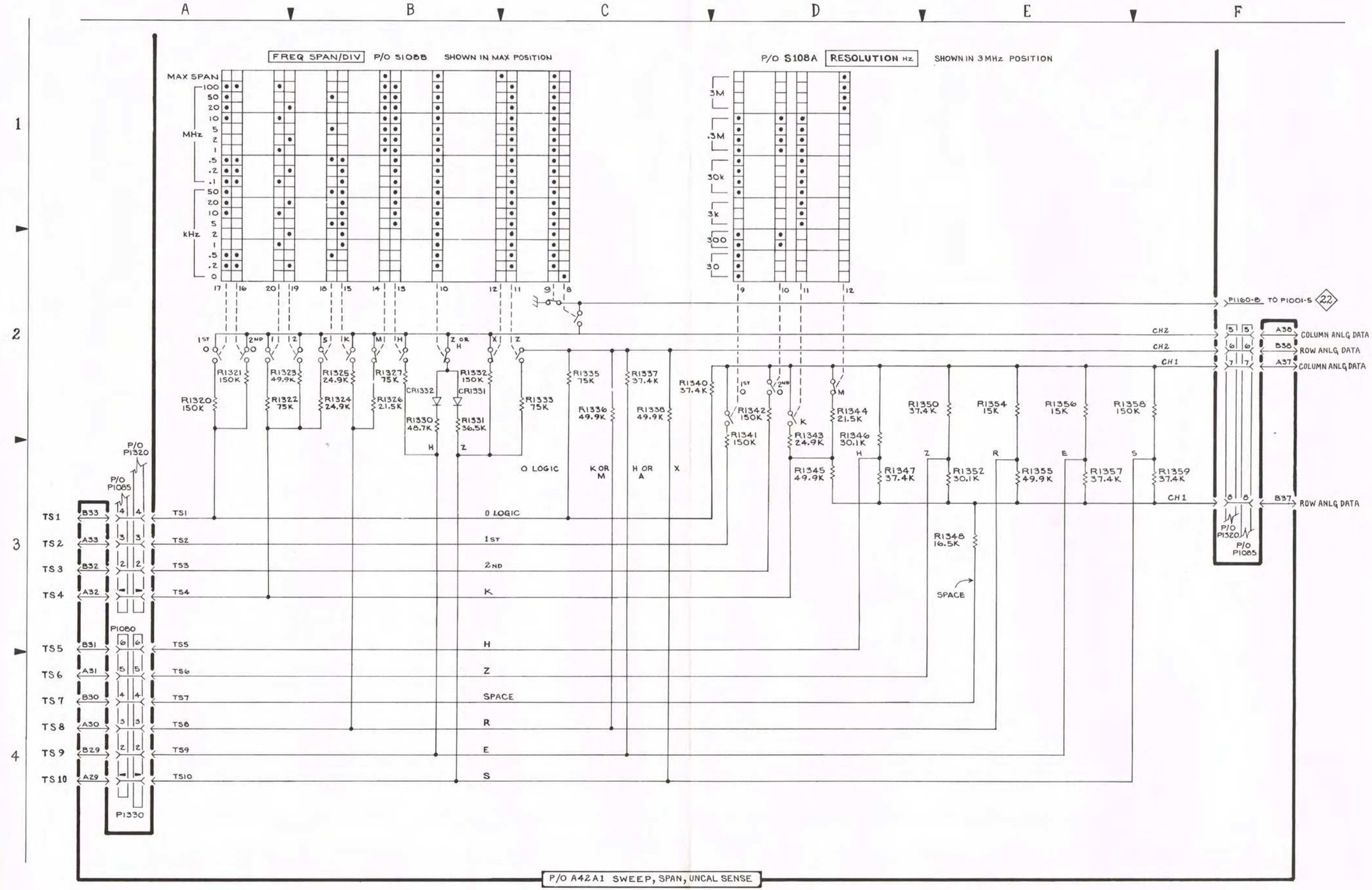
Partial A42A1 also shown on diagrams 11, 12, 13 and 14.

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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



7L14

@3434-68

FREQUENCY SPAN & RESOLUTION READOUT 18

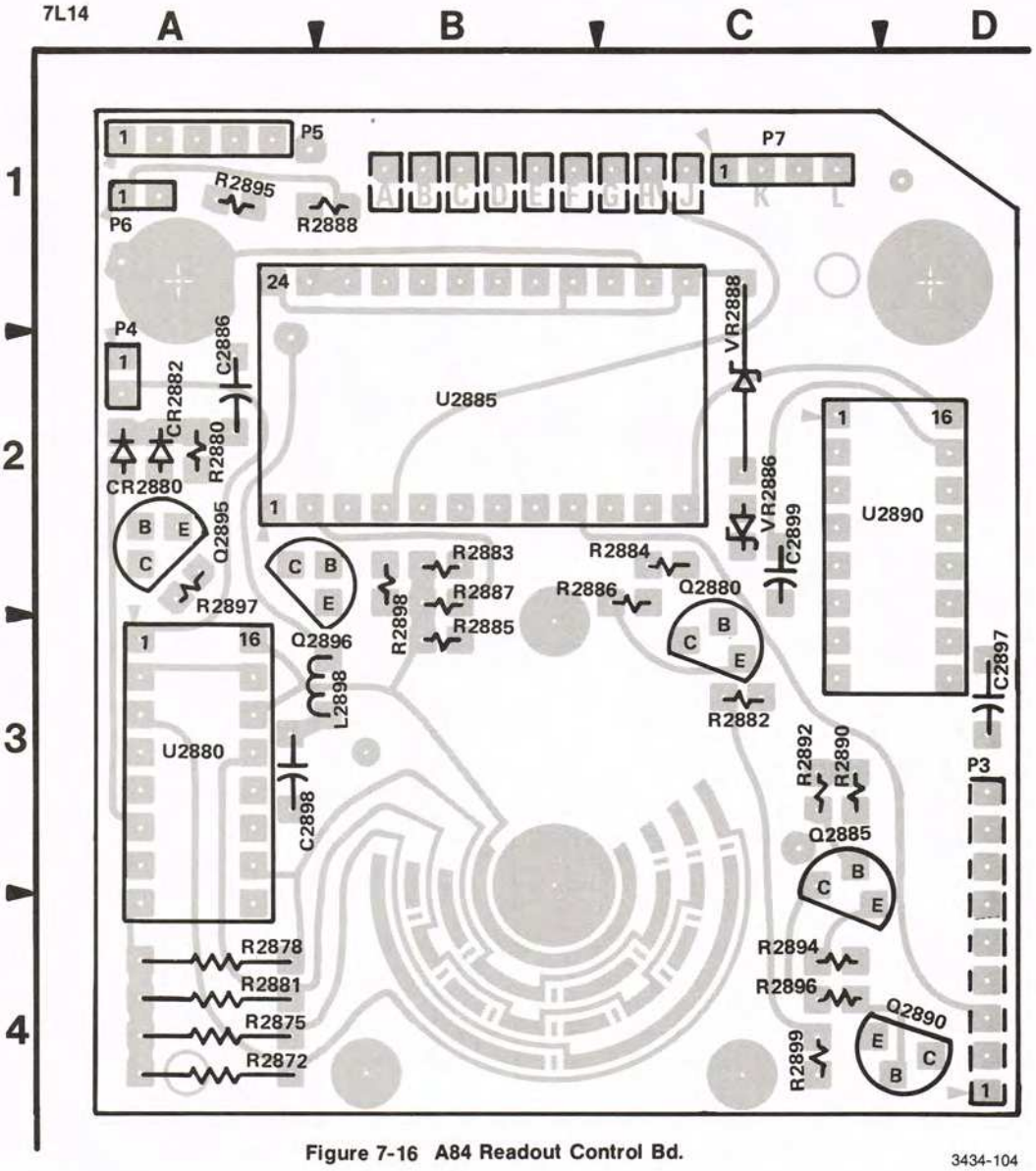
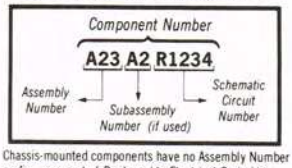


Figure 7-16 A84 Readout Control Bd.

3434-104

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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

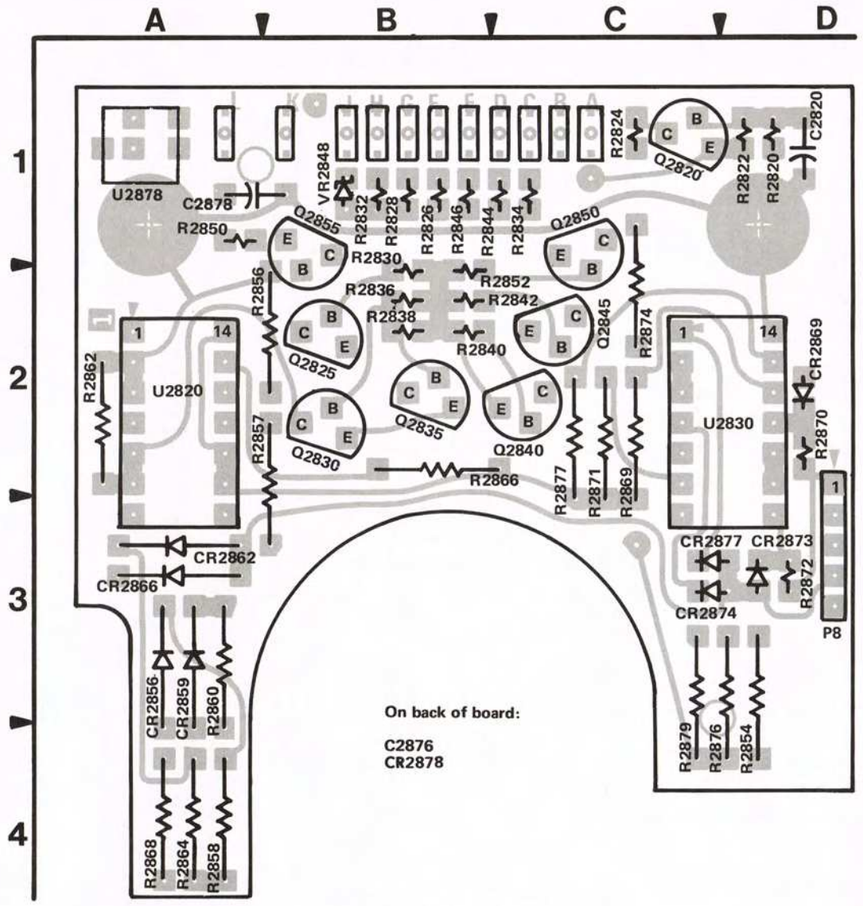


Figure 7-18 A82 CRT Readout Bd.

3434-105

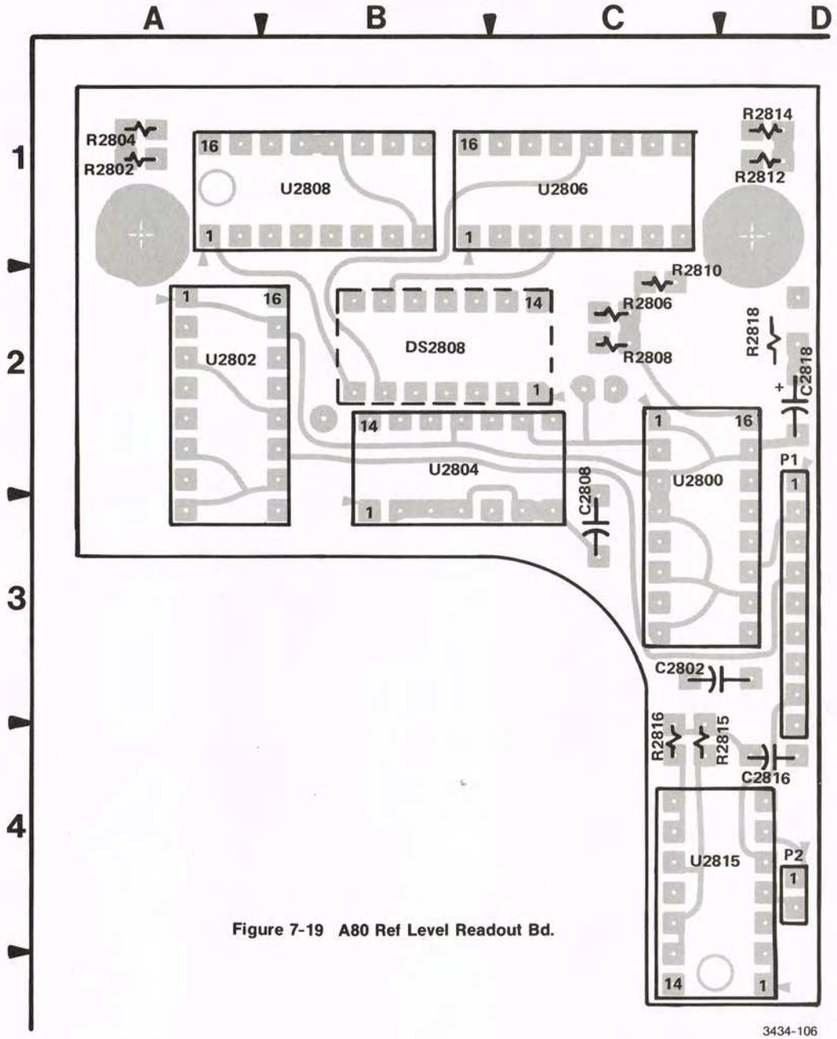


Figure 7-19 A80 Ref Level Readout Bd.

3434-106

REFERENCE LEVEL READOUT DIAGRAM 19

ASSEMBLY A32A1

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
R162	A5	A2	R165	A4	A1	R168	A4	A1
R163	A4	A1	R166	A4	A1	R169	A4	A2
R164	A4	A1	R167	A4	A2	R170	A4	A1

ASSEMBLY A80

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C2802	E2	C3	R2808	F1	C2	U2802	E2	A2
C2808	F1	C3	R2810	F1	C2	U2804	F3	B2
C2816	E3	D4	R2812	F1	D1	U2806	F2	C1
C2818	E1	D2	R2814	F1	D1	U2808	F2	B1
			R2815	E3	C4	U2815A	E3	C4
DS2808	F2	B2	R2816	E3	C4	U2815C	E3	C4
			R2817	E1	D2	U2815D	E3	C4
R2802	F1	A1	R2818	E1	D2	U2815	E3	C4
R2804	F1	A1						
R2806	F1	C2	U2800	E1	C3			

ASSEMBLY A82

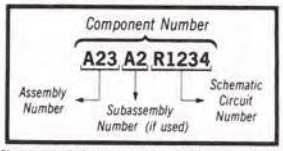
CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C2820	B4	D1	Q2855	D4	B1	R2858	B5	A4
C2876	D4	B4				R2860	B5	A3
C2878	D4	A1	R2820	B4	D1	R2862	C4	A2
			R2822	B4	D1	R2864	B5	A4
CR2856	B5	A3	R2824	B3	C1	R2866	C4	B2
CR2859	B5	A3	R2826	B3	B1	R2868	C5	A4
CR2862	B5	A3	R2828	B3	B1	R2869	E4	C2
CR2866	C5	A3	R2830	B5	B2	R2870	D5	D2
CR2869	D5	D2	R2832	C3	B1	R2871	E4	C2
CR2873	D5	D3	R2834	D3	C1	R2872	D5	D3
CR2874	D5	C3	R2836	B4	B2	R2874	E5	C2
CR2877	D5	C3	R2838	B4	B2	R2876	D5	D3
CR2878	C4	B4	R2840	D4	B2	R2877	E3	C2
			R2842	D4	B2	R2879	D5	C3
Q2820	B4	C1	R2844	D3	C1			
Q2825	C5	B2	R2846	D3	B1	U2820	C5	A2
Q2830	C4	B2	R2850	D4	A1	U2830	D5	D2
Q2835	C4	B2	R2852	D5	B2	U2878	C4	A1
Q2840	D4	C2	R2854	B5	D3			
Q2845	D4	C2	R2856	C4	B2	VR2848	D3	B1
Q2850	D5	C1	R2857	B5	B2			

ASSEMBLY A84

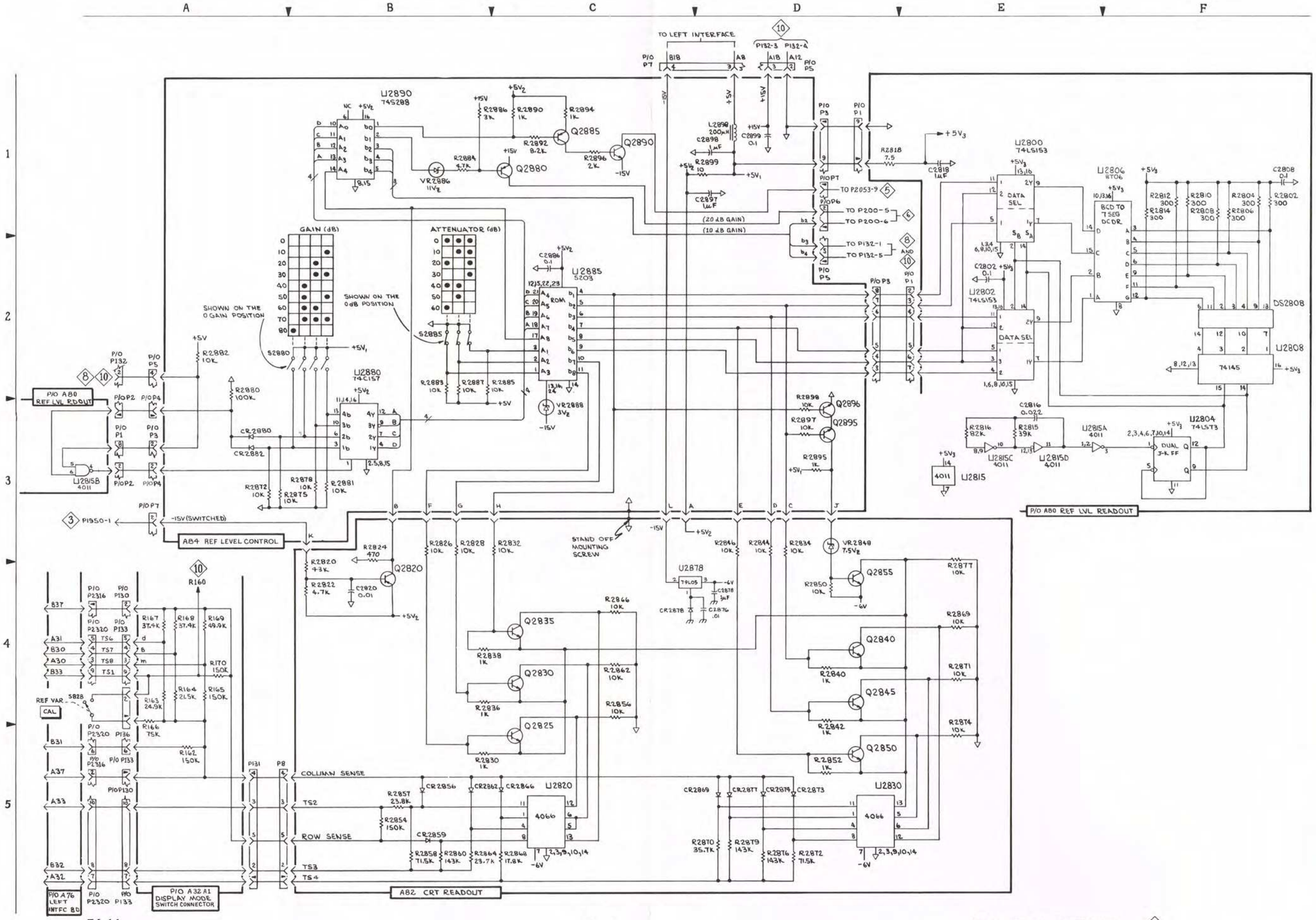
CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C2886	C2	A2	Q2896	D3	A2	R2892	C1	C3
C2897	D1	D3				R2894	C1	C4
C2898	D1	A3	R2872	A3	A4	R2895	D3	A1
C2899	D1	C2	R2875	A3	A4	R2896	C1	C4
			R2878	B3	A4	R2897	D3	A2
CR2880	A3	A2	R2880	A2	A2	R2898	D3	B2
CR2882	A3	A2	R2881	B3	A4	R2899	D1	C4
			R2882	A2	C3			
L2898	D1	A3	R2883	B2	B2	U2880	B2	A3
			R2884	B1	C2	U2885	C2	B2
Q2880	C1	C3	R2885	B2	B3	U2890	B1	D2
Q2885	C1	C3	R2886	B1	C2			
Q2890	C1	D4	R2887	B2	B2	VR2886	B1	C2
Q2895	D3	A2	R2890	C1	C3	VR2888	C3	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.



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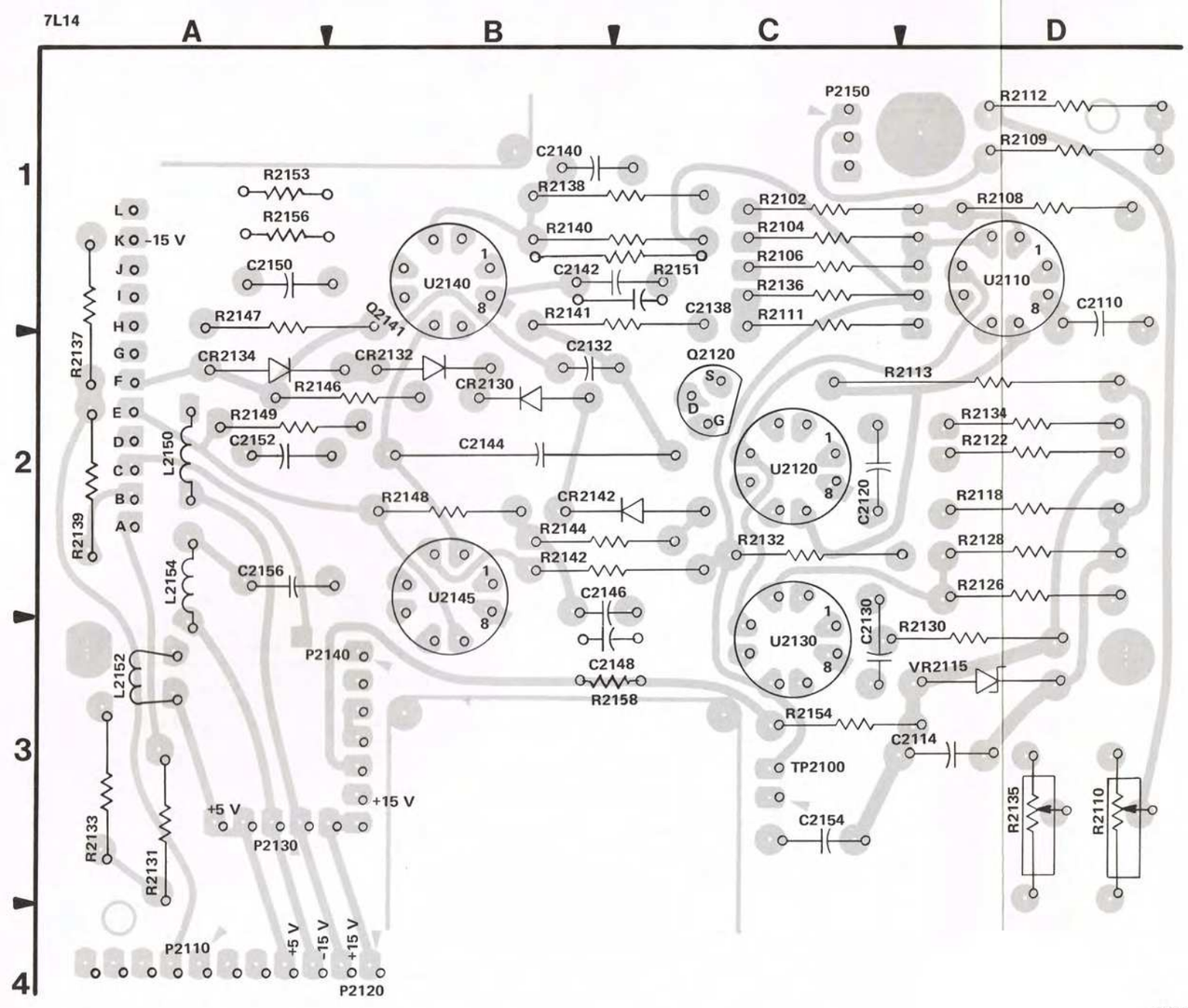
REFERENCE LEVEL READOUT 19



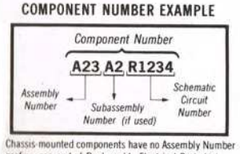
3434-103

Figure 7-20 A68 DVM Analog Circuit Board

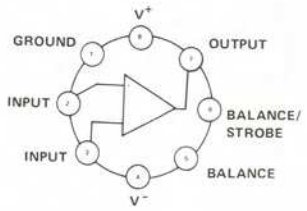
Assembly A68 @

Static Sensitive Devices
See Maintenance Section

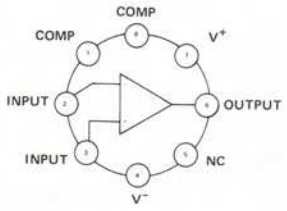
COMPONENT NUMBER EXAMPLE



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



LM311 156-0096-00
Voltage Comparator



LM308 156-0223-00
Op Amp

1673-111

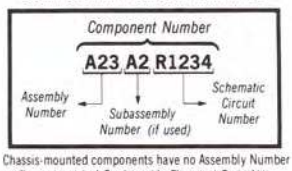
FREQUENCY READOUT ANALOG DIAGRAM 20

ASSEMBLY A68

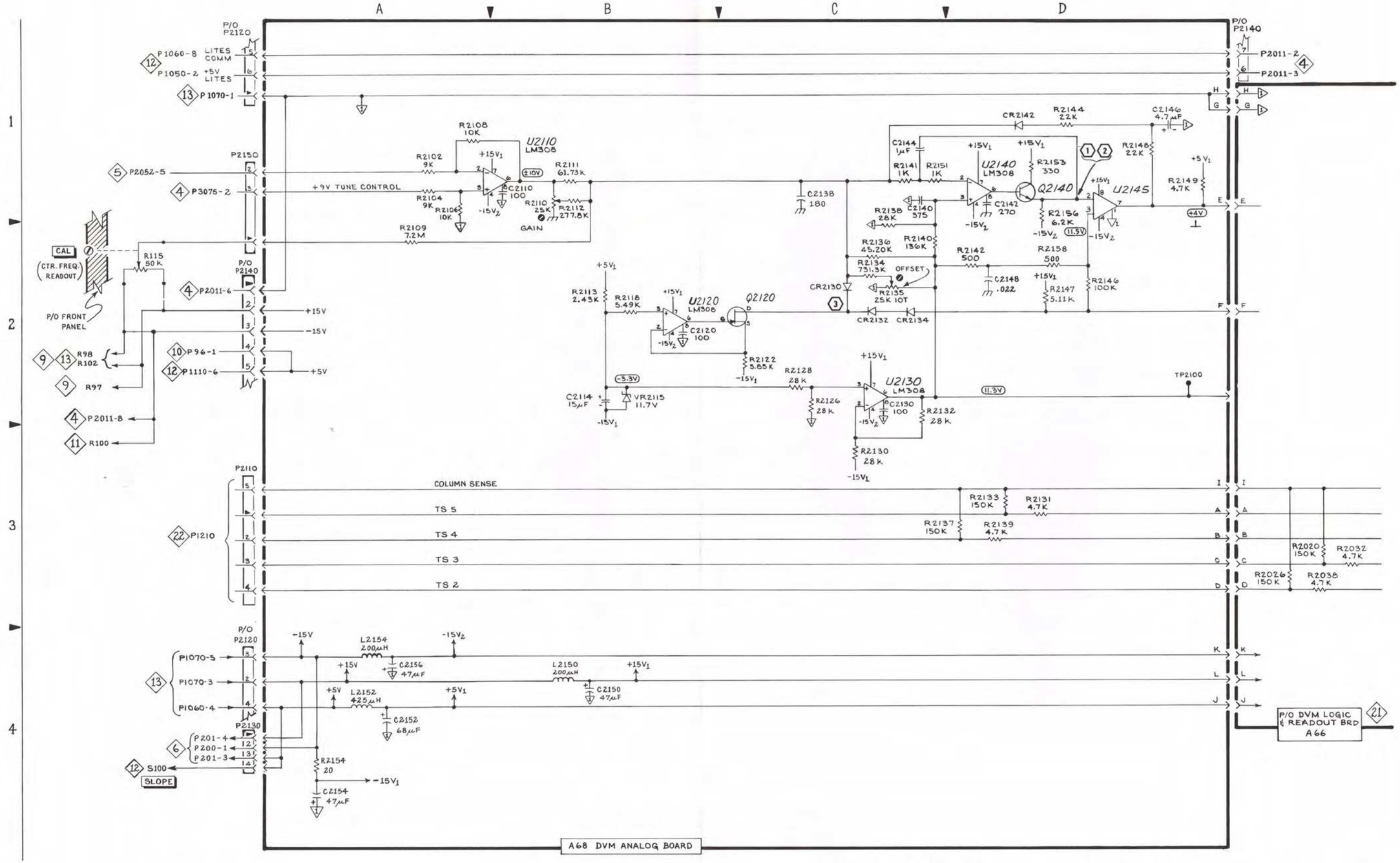
CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C2110	B1	D1
C2114	B2	D3
C2120	B2	C2
C2130	C2	C3
C2138	C1	C1
C2140	C1	B1
C2142	D1	C1
C2144	C1	B2
C2146	D1	B2
C2148	D2	B3
C2150	B4	A1
C2152	A4	A2
C2154	A4	C3
C2156	A4	A2
CR2130	C2	B2
CR2132	C2	B2
CR2134	C2	A2
CR2142	D1	C2
L2150	B4	A2
L2152	A4	A3
L2154	A4	A2
Q2120	C2	C2
Q2140	B1	D1
Q2141	D1	B1
R2102	A1	C1
R2104	A1	C1
R2106	A1	C1
R2108	A1	D1
R2109	A2	D1
R2110	B1	D3
R2111	B1	C1
R2112	B1	D1
R2113	B2	D2
R2118	B2	D2
R2122	C2	D2
R2126	C2	D2
R2128	C2	D2
R2130	C3	D3
R2131	D3	A3
R2132	C2	C2
R2133	D3	A3
R2134	C2	D2
R2135	C2	D3
R2136	C2	C1
R2137	D3	A1
R2138	C2	C1
R2139	D3	A2
R2140	C2	C1
R2141	C1	B1
R2142	D2	B2
R2144	D1	B2
R2146	D2	B2
R2147	D2	A1
R2148	D1	B3
R2149	D1	A2
R2151	C1	C1
R2153	D1	A1
R2154	A4	C3
R2156	D1	A1
R2158	D2	B3
TP2100	D2	C3
U2110	B1	D1
U2120	B2	C2
U2130	C2	C3
U2140	D1	B1
U2145	D1	B2
VR2115	B2	D3

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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



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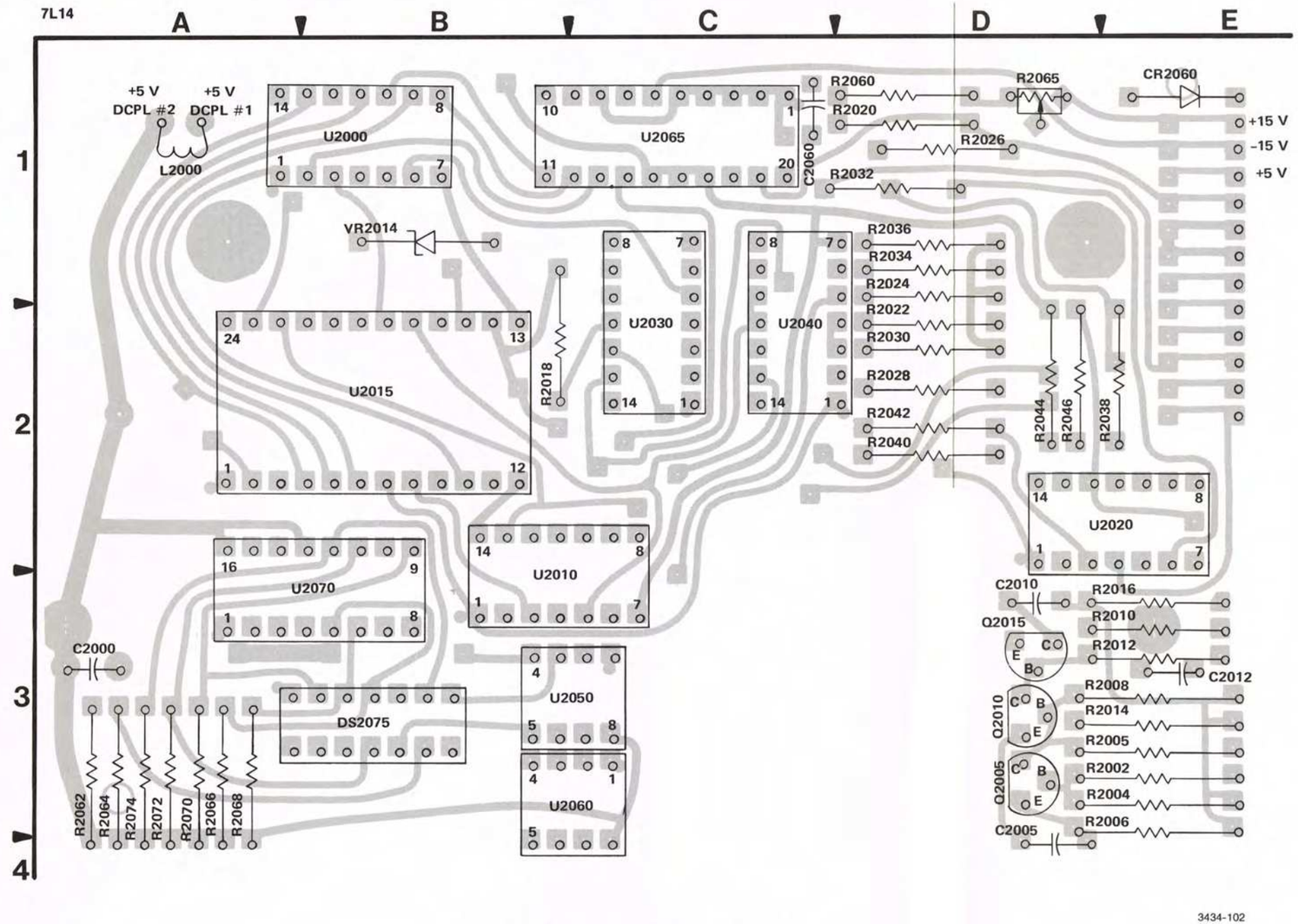
FREQUENCY READOUT-ANALOG SECTION 20

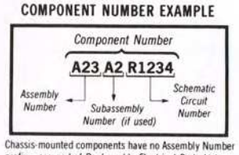


3434-102

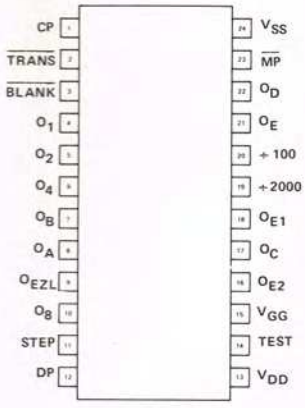
Figure 7-21 A60 DVM Readout Circuit Board

Static Sensitive Devices
See Maintenance Section

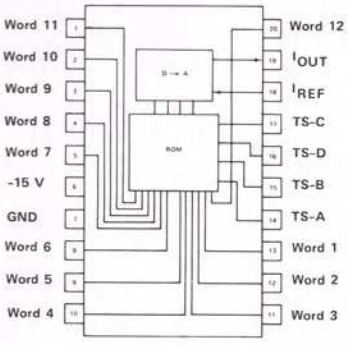
COMPONENT NUMBER EXAMPLE



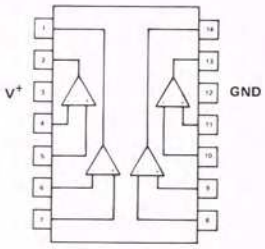
@ Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.



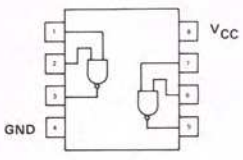
3814 156-0306-00
4.5 Decade Counter



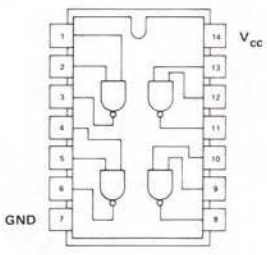
M92 155-0088-00
ML, Legend Generator



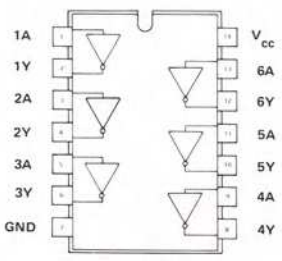
LM339 156-0411-00
Quad Comp, Single Supply



75451 156-0094-00
Dual Peripheral Driver



SN 7400 156-0030-00
Four Input NAND Gate



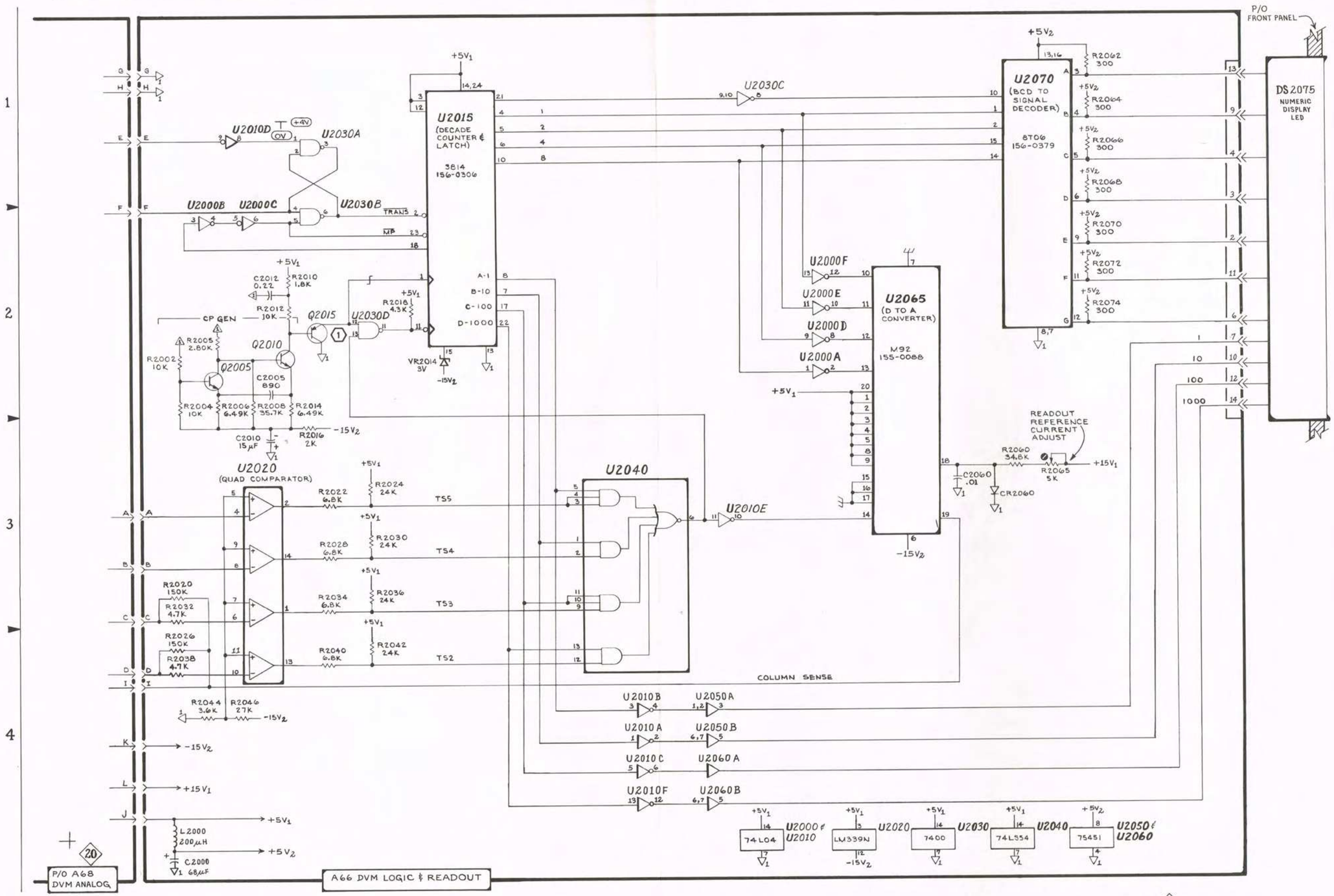
SN74L04 156-0292-00
Hex Inverter

1673-113

DVM LOGIC DIAGRAM 21

ASSEMBLY A66

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
C2000	A4	A3	R2022	B3	D2	U2000	D4	B1
C2005	B2	D4	R2024	B3	D1	U2008B	A2	B1
C2010	A3	D3	R2026	A4	D1	U2010A	C4	B3
C2012	A2	E3	R2028	B3	D2	U2010B	C4	B3
C2015	B2	D3	R2030	B3	D2	U2010C	C4	B3
C2060	E3	C1	R2032	A3	D1	U2010D	A1	B3
			R2034	B3	D1	U2010E	D3	B3
CR2014	B2	B1	R2036	B3	D1	U2010F	C4	B3
CR2060	E3	E1	R2038	A4	E2	U2010	D4	B3
			R2040	B4	D2	U2015	B2	B2
DS2075	F1	B3	R2042	B4	D2	U2020	A3	E2
			R2044	A4	D2	U2020	D4	E2
L2000	A4	A1	R2046	A4	D2	U2030A	B1	C2
			R2060	E3	D1	U2030B	B2	C2
Q2005	A2	D3	R2062	E1	A3	U2030C	D1	C2
Q2010	B2	D3	R2064	E1	A3	U2030D	B2	C2
Q2015	D3	B2	R2065	E3	D1	U2030	E4	C2
			R2066	E1	A3	U2040	C3	C2
R2002	A2	E3	R2068	E1	A3	U2040	E4	C2
R2004	A2	E3	R2070	E2	A3	U2050A	D4	B3
R2005	A2	E3	R2072	E2	A3	U2050B	D4	B3
R2006	A2	E3	R2074	E2	A3	U2050	E4	B3
R2008	A2	E3				U2060A	D4	B3
R2010	B2	E3	U2000A	D2	B1	U2060B	D4	B3
R2012	B2	E3	U2000B	A2	B1	U2060	E4	B3
R2014	B2	E3	U2000C	A2	B1	U2065	E2	C1
R2016	B3	E3	U2000D	D2	B1	U2070	E1	B3
R2018	B2	B2	U2000E	D2	B1			
R2020	A3	D1	U2000F	D2	B1	VR2014	B1	B2



7L14

@ 3434-71

DVM LOGIC & READOUT 21

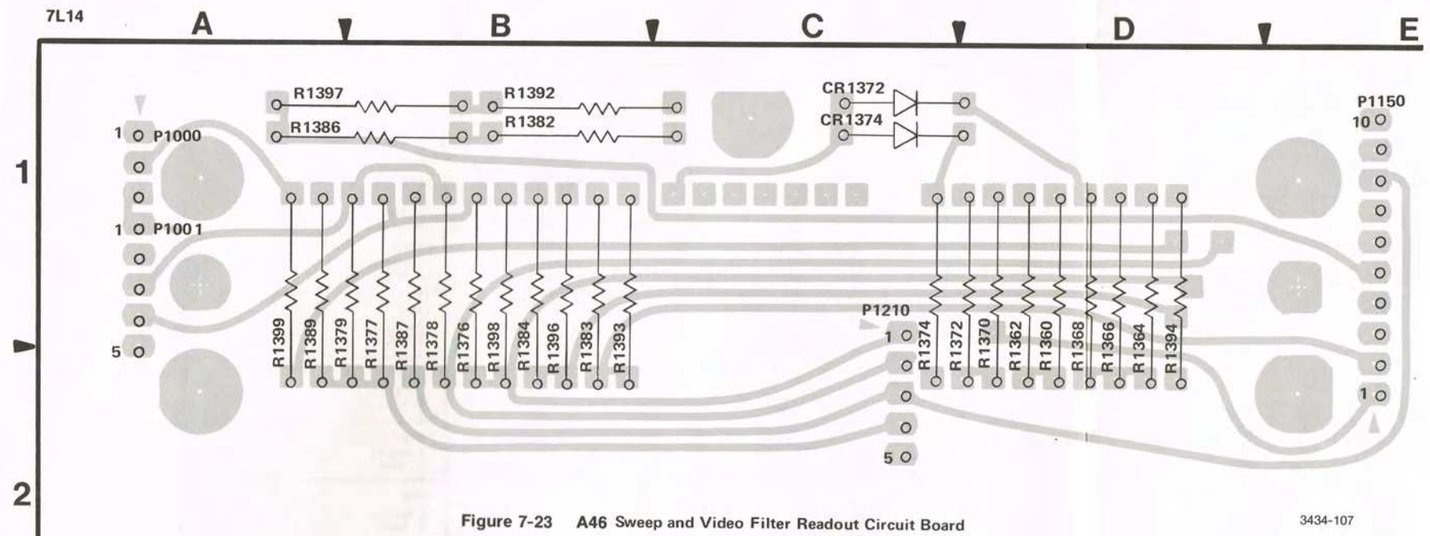


Figure 7-23 **A46** Sweep and Video Filter Readout Circuit Board

3434-107

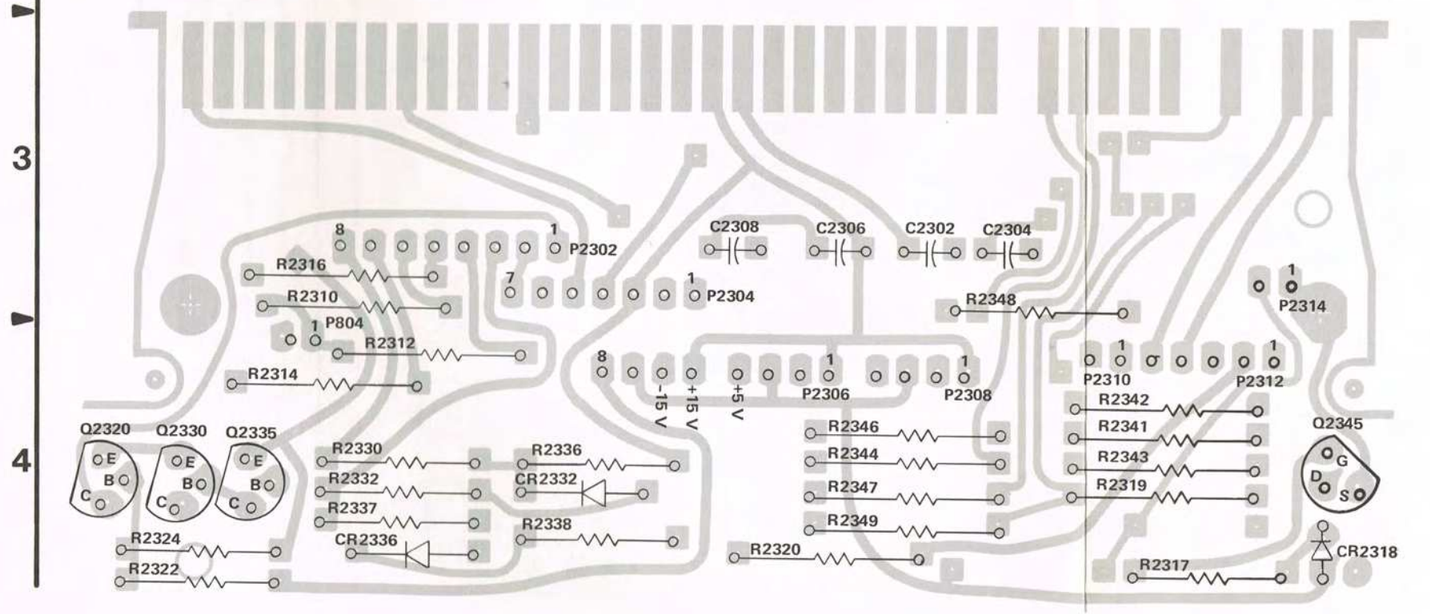
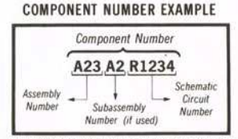


Figure 7-22 **A74** Center Interface Circuit Board

3434-108

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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

SWEEP AND VIDEO FILTER READOUT DIAGRAM

22

ASSEMBLY A42A2

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
CR01372	A3	C1	R1379	B2	B1
CR1374	B3	C1	R1382	C2	B1
			R1383	C2	B1
R1360	A3	D1	R1384	C2	B1
R1362	A3	D1	R1386	C2	B1
R1364	A3	D1	R1387	C2	B1
R1366	A3	D1	R1389	C2	A1
R1368	A3	D1	R1392	C2	B1
R1370	A3	D1	R1393	D2	B1
R1372	A3	D1	R1394	D2	D1
R1374	B3	C1	R1396	D2	B1
R1376	B3	B1	R1397	D2	B1
R1377	B3	B1	R1398	D2	B1
R1378	B2	B1	R1399	D2	A1

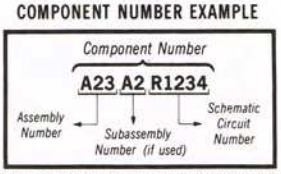
ASSEMBLY A74

CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION	CIRCUIT NUMBER	SCHEM LOCATION	BOARD LOCATION
R2341	E1	F2	R2346	E1	E2
R2342	E1	F2	R2347	E1	E2
R2343	E1	F2	R2348	E1	F2
R2344	E1	E2	R2349	E1	E2

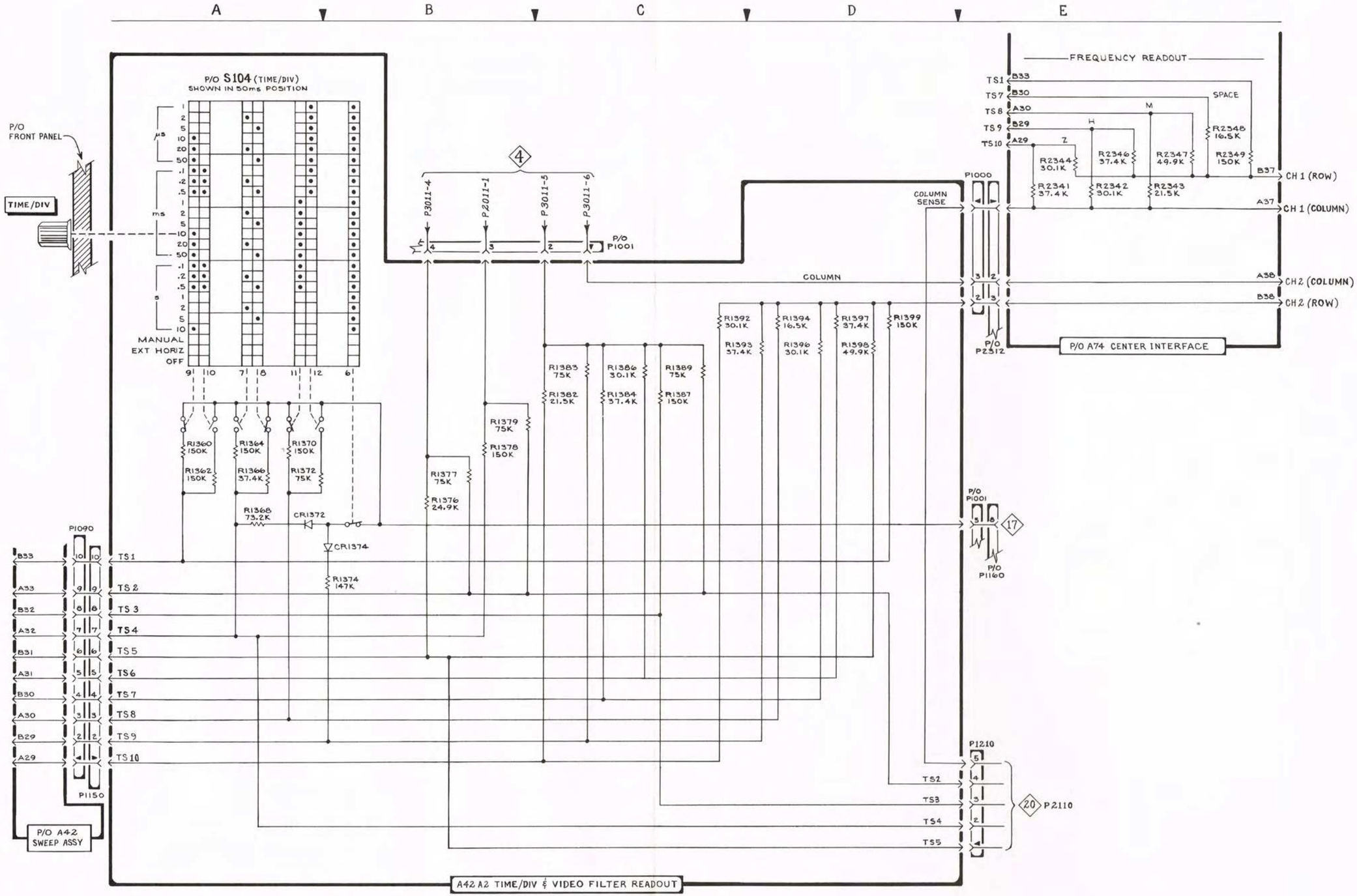
Partial A74 also shown on diagram 9.

Static Sensitive Devices
See Maintenance Section

COMPONENT NUMBER EXAMPLE



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



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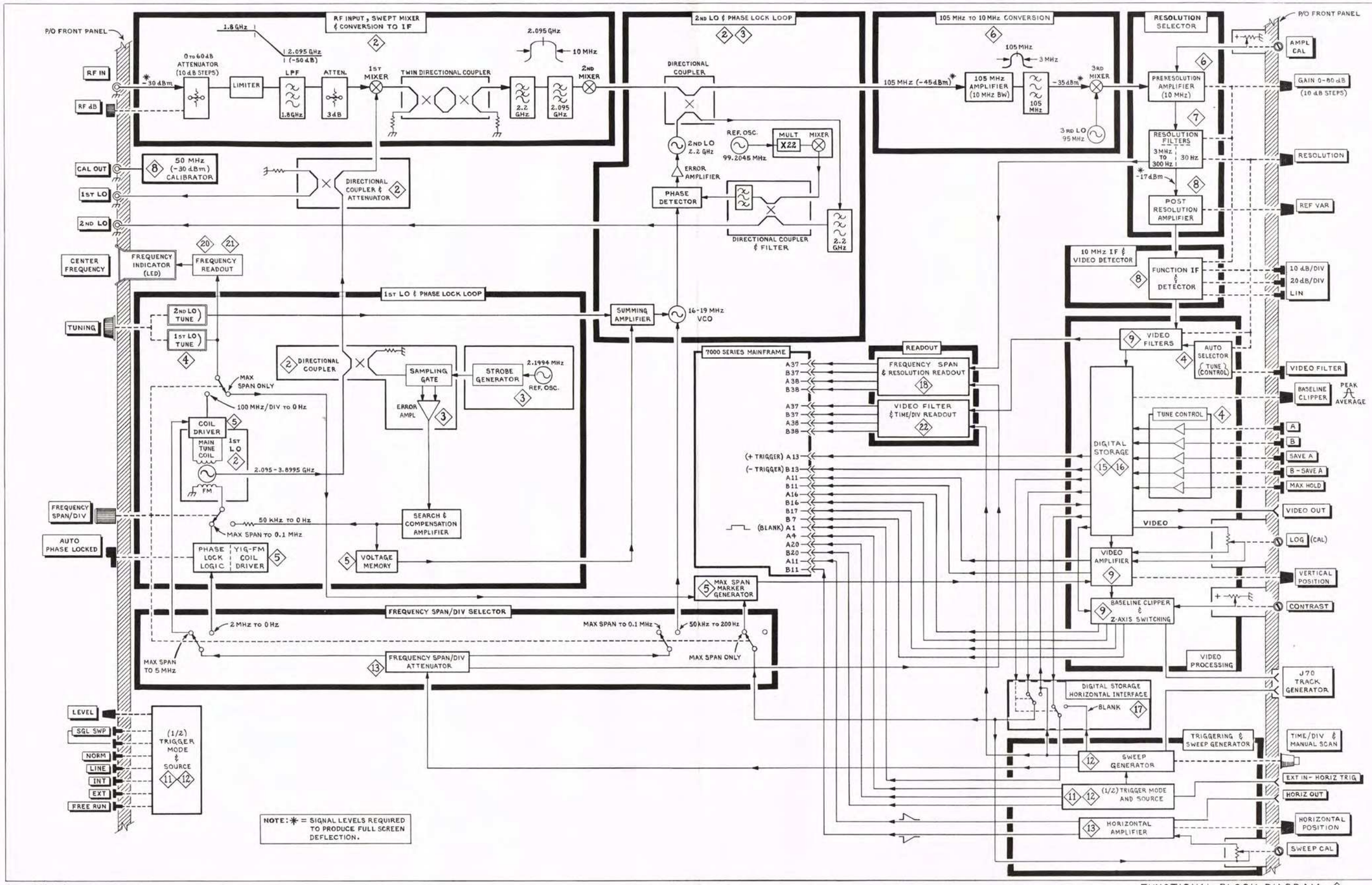
@ 3434-72

TIME/DIV & VIDEO FILTER READOUT 22



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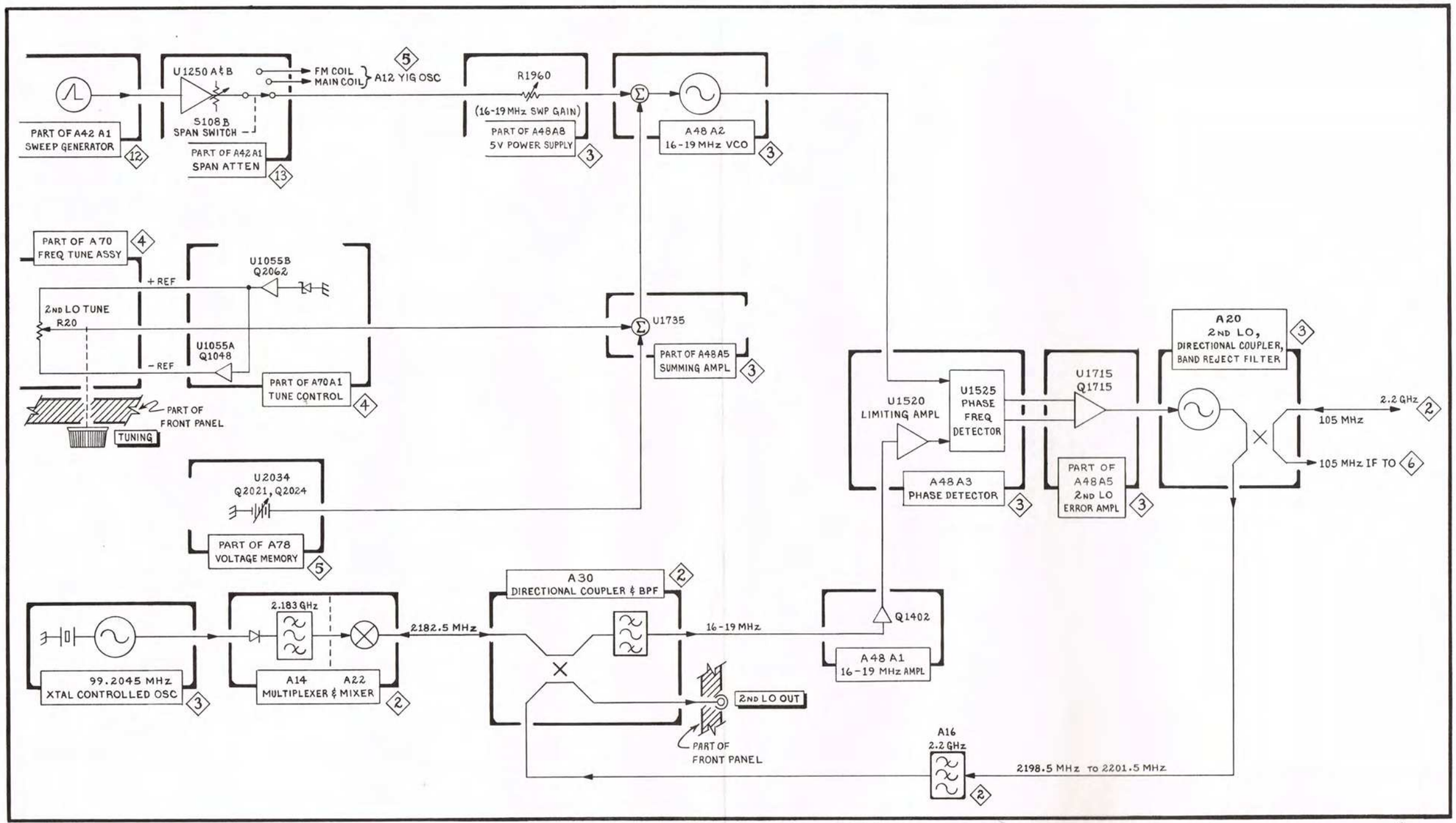
FUNCTIONAL BLOCK DIAGRAM 1 JAW



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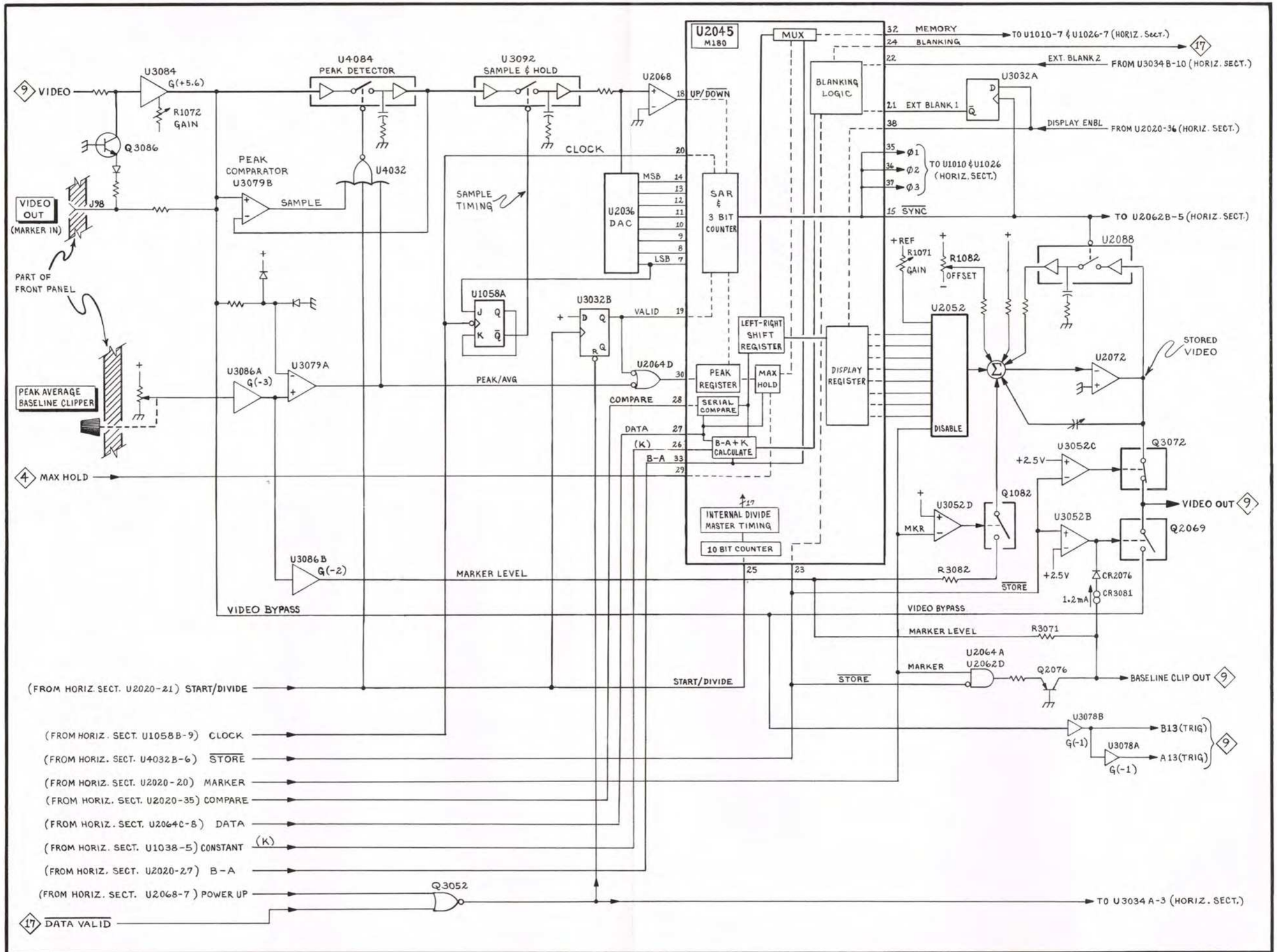
@ 3434-74

2ND LO CONTROL & PHASE LOCK BLOCK DIAGRAM 2



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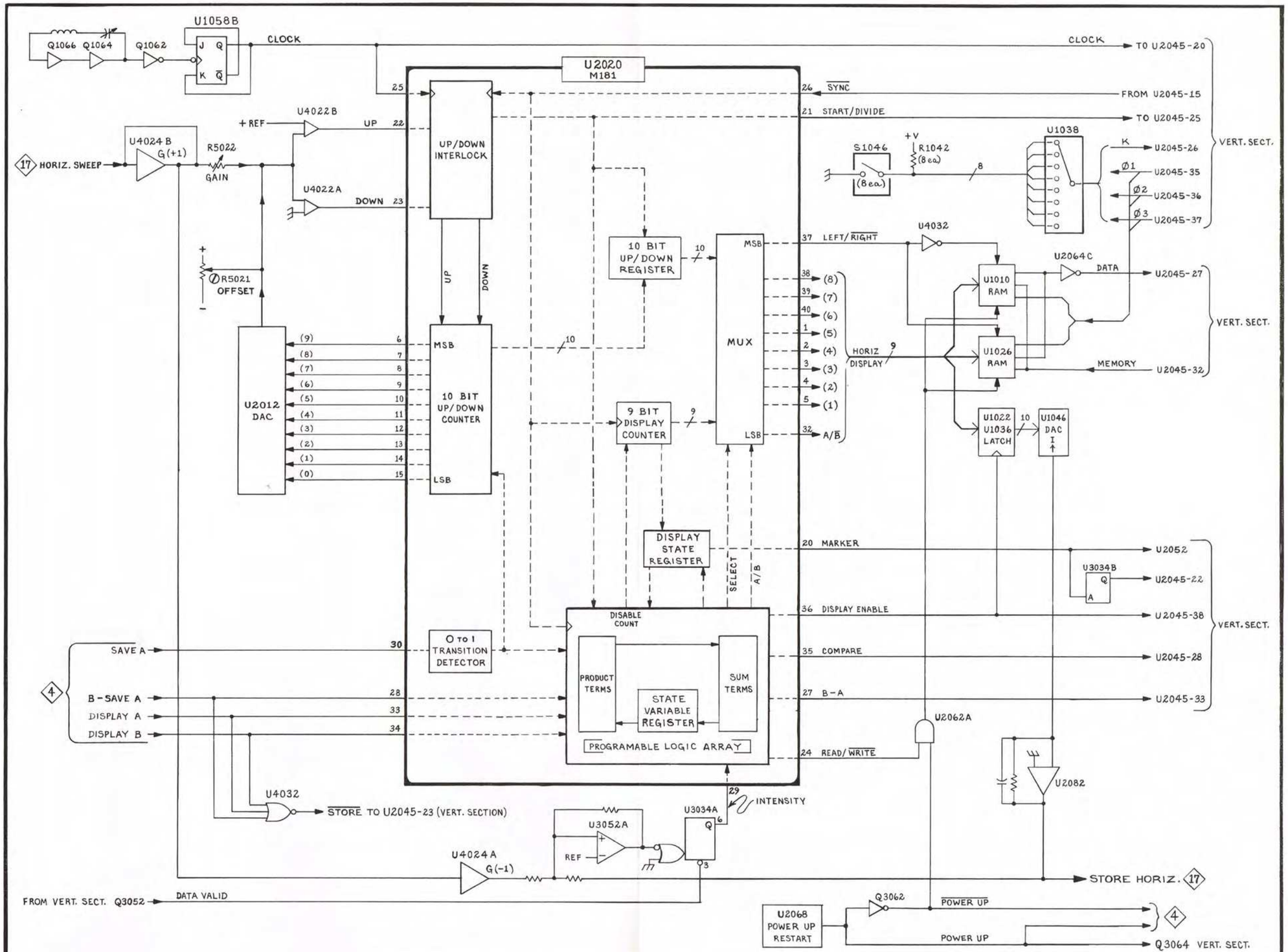
@3434-75

DIGITAL STORAGE (VERTICAL SECTION) BLOCK DIAGRAM 3



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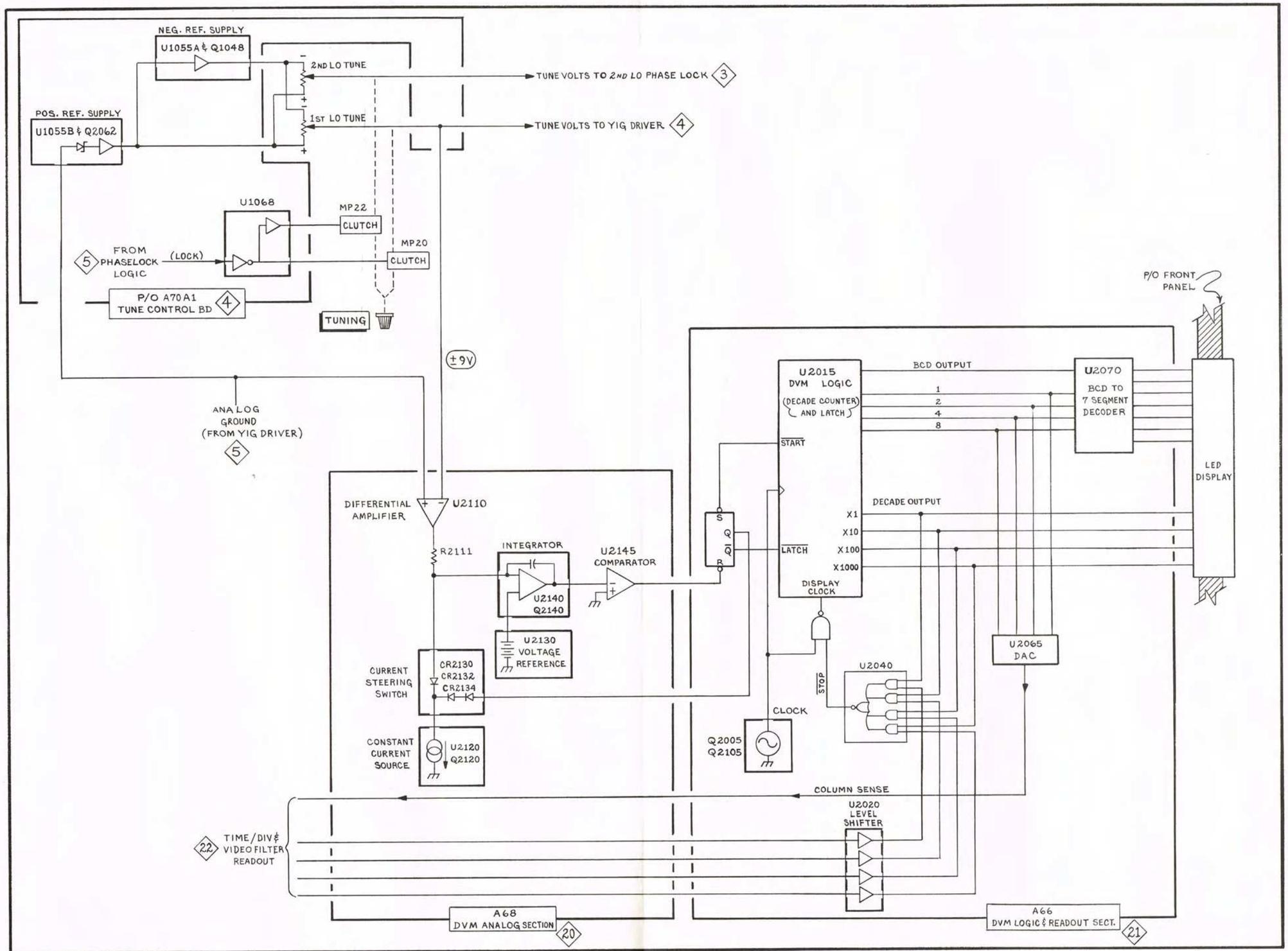
@3434-76

DIGITAL STORAGE (HORIZONTAL SECTION) BLOCK DIAGRAM 4



7L14

©3434-77

CENTER FREQUENCY CONTROL AND READOUT 5

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
#	NUMBER SIZE
ACTR	ACTUATOR
ADPTR	ADAPTER
ALIGN	ALIGNMENT
AL	ALUMINUM
ASSEM	ASSEMBLED
ASSY	ASSEMBLY
ATTEN	ATTENUATOR
AWG	AMERICAN WIRE GAGE
BD	BOARD
BRKT	BRACKET
BRS	BRASS
BRZ	BRONZE
BSHG	BUSHING
CAB	CABINET
CAP	CAPACITOR
CER	CERAMIC
CHAS	CHASSIS
CKT	CIRCUIT
COMP	COMPOSITION
CONN	CONNECTOR
COV	COVER
CPLG	COUPLING
CRT	CATHODE RAY TUBE
DEG	DEGREE
DWR	DRAWER
ELCTRN	ELECTRON
ELEC	ELECTRICAL
ELCTLT	ELECTROLYTIC
ELEM	ELEMENT
EPL	ELECTRICAL PARTS LIST
EQPT	EQUIPMENT
EXT	EXTERNAL
FIL	FILLISTER HEAD
FLEX	FLEXIBLE
FLH	FLAT HEAD
FLTR	FILTER
FR	FRAME or FRONT
FSTNR	FASTENER
FT	FOOT
FXD	FIXED
GSKT	GASKET
HDL	HANDLE
HEX	HEXAGON
HEX HD	HEXAGONAL HEAD
HEX SOC	HEXAGONAL SOCKET
HLCPS	HELICAL COMPRESSION
HLEXT	HELICAL EXTENSION
HV	HIGH VOLTAGE
IC	INTEGRATED CIRCUIT
ID	INSIDE DIAMETER
IDENT	IDENTIFICATION
IMPLR	IMPELLER
IN	INCH
INCAND	INCANDESCENT
INSUL	INSULATOR
INTL	INTERNAL
LPHLDR	LAMPHOLDER
MACH	MACHINE
MECH	MECHANICAL
MTG	MOUNTING
NIP	NIPPLE
NON WIRE	NOT WIRE WOUND
OBD	ORDER BY DESCRIPTION
OD	OUTSIDE DIAMETER
OVH	OVAL HEAD
PH BRZ	PHOSPHOR BRONZE
PL	PLAIN or PLATE
PLSTC	PLASTIC
PN	PART NUMBER
PNH	PAN HEAD
PWR	POWER
RCPT	RECEPTACLE
RES	RESISTOR
RGD	RIGID
RLF	RELIEF
RTNR	RETAINER
SCH	SOCKET HEAD
SCOPE	OSCILLOSCOPE
SCR	SCREW
SE	SINGLE END
SECT	SECTION
SEMICOND	SEMICONDUCTOR
SHLD	SHIELD
SHLDR	SHOULDERED
SKT	SOCKET
SL	SLIDE
SLFLKG	SELF-LOCKING
SLVG	SLEEVING
SPR	SPRING
SQ	SQUARE
SST	STAINLESS STEEL
STL	STEEL
SW	SWITCH
T	TUBE
TERM	TERMINAL
THD	THREAD
THK	THICK
TNSN	TENSION
TPG	TAPPING
TRH	TRUSS HEAD
V	VOLTAGE
VAR	VARIABLE
W/	WITH
WSHR	WASHER
XFMR	TRANSFORMER
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
000AU	HM GEROME	PO BOX 1089	UNIONTOWN, PA 15401
000CY	NORTHWEST FASTENER SALES, INC.	7923 SW CIRRUS DRIVE	BEAVERTON, OR 97005
000EX	O'HARA METAL PRODUCT COMPANY	542 BRANNAN STREET	SAN FRANCISCO, CA 94107
000FW	WESTERN SINTERING CO INC.	2620 STEVENS DRIVE	RICHLAND, WA 99352
000GL	LEMO USA INC.	335 TESCONI CIRLE	SANTA ROSA, CA 95401
00328	STERLING INSTRUMENT DIV. OF DESIGNATRONICS INC.	55 S DENTON AVE.	NEW HYDE PART, NY 11040
00779	AMP, INC.	P O BOX 3608	HARRISBURG, PA 17105
06090	RAYCHEM CORPORATION	300 CONSTITUTION DRIVE	MENLO PARK, CA 94025
06383	PANDUIT CORPORATION	17301 RIDGELAND	TINLEY PARK, IL 60477
07111	PNEUMO DYNAMICS CORPORATION	4800 PRUDENTIAL TOWER	BOSTON, MA 02199
08261	SPECTRA-STRIP CORP.	7100 LAMPSON AVE.	GARDEN GROVE, CA 92642
12327	FREEWAY CORPORATION	9301 ALLEN DRIVE	CLEVELAND, OH 44125
12360	ALBANY PRODUCTS CO., DIV. OF PNEUMO DYNAMICS CORPORATION	145 WOODWARD AVENUE	SOUTH NORWALK, CT 06586
13257	AMERACE, LTD.	10 ESNA PARK DRIVE	MARKHAM, ONTARIO, CANADA
18203	ENGELMANN MICROWAVE CO.	SKYLINE DR.	MONTVILLE, NJ 07045
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
22599	ESNA, DIV. OF AMERACE CORPORATION	16150 STAGG STREET	VAN NUYS, CA 91409
26805	OMNI SPECTRA INC., MICROWAVE CONNECTOR DIV.	140 FOURTH AVE	WALTHAM, MA 02154
55210	GETTIG ENG. AND MFG. COMPANY	PO BOX 85, OFF ROUTE 45	SPRING MILLS, PA 16875
70318	ALLMETAL SCREW PRODUCTS CO., INC.	821 STEWART AVE.	GARDEN CITY, NY 11530
70485	ATLANTIC INDIA RUBBER WORKS, INC.	571 W. POLK ST.	CHICAGO, IL 60607
71159	BRISTOL SOCKET SCREW, DIV. OF AMERICAN CHAIN AND CABLE CO., INC.	P O BOX 2244, 40 BRISTOL ST.	WATERBURY, CT 06720
71279	CAMBRIDGE THERMIONIC CORP.	445 CONCORD AVE.	CAMBRIDGE, MA 02138
71468	ITT CANNON ELECTRIC	666 E. DYER RD.	SANTA ANA, CA 92702
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
74445	HOLO-KROME CO.	31 BROOK ST. WEST	HARTFORD, CT 06110
77250	PHEOLL MANUFACTURING CO., DIVISION OF ALLIED PRODUCTS CORP.	5700 W. ROOSEVELT RD.	CHICAGO, IL 60650
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120
79136	WALDES, KOHINOOR, INC.	47-16 AUSTEL PLACE	LONG ISLAND CITY, NY 11101
79807	WROUGHT WASHER MFG. CO.	2100 S. O BAY ST.	MILWAUKEE, WI 53207
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153
86928	SEASTROM MFG. COMPANY, INC.	701 SONORA AVENUE	GLENDALE, CA 91201
87308	N. L. INDUSTRIES, INC., SOUTHERN SCREW DIV.	P. O. BOX 1360	STATESVILLE, NC 28677
91836	KINGS ELECTRONICS CO., INC.	40 MARBLEDALE ROAD	TUCKAHOE, NY 10707
93907	TEXTRON INC. CAMCAR DIV	600 18TH AVE	ROCKFORD, IL 61101
95987	WECKESSER CO., INC.	4444 WEST IRVING PARK RD.	CHICAGO, IL 60641
98159	RUBBER TECK, INC.	19115 HAMILTON AVE., P O BOX 389	GARDENA, CA 90247
98291	SEALECTRO CORP.	225 HOYT	MAMARONECK, NY 10544
98335	WEATHERFORD ENGINEERING AND MFG. COMPANY		WEATHERFORD, TX 76086
98978	INTERNATIONAL ELECTRONIC RESEARCH CORP.	135 W. MAGNOLIA BLVD.	BURBANK, CA 91502

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	337-1064-04			1		SHIELD,ELEC:SIDE PLUG-IN UNITS	80009	337-1064-00
-2	366-0494-00			1		KNOB:GRAY WITH SETSCREW	80009	366-0494-00
	213-0153-00			1		. SETSCREW:5-40 X 0.125,STL BK OXD,HEX SKT	000CY	OBD
-3	366-1601-00			1		KNOB:GY,0.126 ID X1.396 OD X 0.7H	80009	366-1601-00
	213-0153-00			2		. SETSCREW:5-40 X 0.125,STL BK OXD,HEX SKT	000CY	OBD
-4	366-1058-81			1		KNOB:GRAY	80009	366-1058-81
						(ATTACHING PARTS)		
-5	214-1095-00			1		PIN,SPG,SPLIT:0.094 OD X 0.187 INCH LONG	22599	52-022-094-0187
						- - - * - - -		
-6	105-0076-00			1		REL BAR,LATCH:PLUG-IN UNIT	80009	105-0076-00
-7	366-1391-02			1		KNOB:GY,0.081 ID,0.28 OD,0.32 L	80009	366-1391-02
	213-0239-00			1		. SETSCREW:3-48 X 0.062 INCH,HEX SOC STL	71159	OBD
-8	366-1077-00			1		KNOB:GRAY	80009	366-1077-00
	213-0246-00			1		. SETSCREW:5-40 X 0.093 ITL BK OXD,HEX SKT	71159	OBD
-9	366-1083-00			1		SHELL,KNOB:GRAY,0.392 OD	80009	366-1083-00
	213-0725-00			1		. SETSCREW:3-48 X 0.095 INCH,HEX SOC STL	74445	OBD
-10	366-1057-00			1		KNOB:GRAY	80009	366-1057-00
	213-0153-00			2		. SETSCREW:5-40 X 0.125,STL BK OXD,HEX SKT	000CY	OBD
-11	358-0301-00			5		BUSHING,SLEEVE:FOR 0.185 DIA HOLE,GRAY	80009	358-0301-00
-12	366-1389-00			3		KNOB:GRAY	80009	366-1389-00
	213-0306-00			1		. SETSCREW:2-56 X 0.062 INCH,OX STL	74445	OBD
-13	366-1795-00			1		KNOB ASSEMBLY:BLK,GY,PULL TO UNLOCK	80009	366-1795-00
	213-0153-00			1		. SETSCREW:5-40 X 0.125,STL BK OXD,HEX SKT	000CY	OBD
-14	354-0472-02			1		RING,KNOB SKIRT:CLEAR	80009	354-0472-02
						(ATTACHING PARTS)		
-15	211-0186-00			2		SCREW,MACHINE:0-80 X 0.125,FILH,SST,SLOT	12360	00A008AHBUU01
						- - - * - - -		
-16	366-1796-00			1		KNOB:GY,0.438 OD,0.906 OD X 0.7 H	80009	366-1796-00
	213-0153-00			2		. SETSCREW:5-40 X 0.125,STL BK OXD,HEX SKT	000CY	OBD
-17	354-0412-01			1		RING,KNOB SKIRT:DULL BLACK,1.453 OD	80009	354-0412-01
-18	401-0137-00	B010100	B010100X	1		BUSHING,PLASTIC:NYLON,0.255 ID X 0.088 L	80009	401-0137-00
-19	333-2640-00			1		PANEL,FRONT:	80009	333-2640-00
-20	378-0815-02			1		FILTER,LIGHT:RED,0.398 W X0.868 L	80009	378-0815-02
-21	426-1096-01			1		FRAME READOUT:FREQ TUNING	80009	426-1096-01
-22	131-0818-00			1		. CONNECTOR,RCPT,:BNC,FEMALE	91836	KC19-153BNC
-23	131-1471-00			1		CONN,RCPT,ELEC:RA,3 EA MALE & FEMALE CONT	000GL	RA 1.306 NYLON
-24	358-0653-00			1		BUSHING,GND:0.252 ID X 0.406 OD X 0.25 L	80009	358-0653-00
-25	136-0387-00			5		JACK,TIP:GRAY	71279	450-4352-01-0318
-26	348-0235-00			2		SHLD GSKT,ELEC:4.734 INCH LONG	80009	348-0235-00
-27	214-3156-00			1		SPRING,GROUND:STAINLESS STEEL	80009	214-3156-00
-28	----- -----			1		CABLE ASSY,RF:(SEE W900 EPL)		
-29	----- -----			1		CKT BOARD ASSY:FRONT PANEL(SEE A1 REPL)		
						(ATTACHING PARTS)		
-30	211-0116-00			3		SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
						- - - * - - -		
	----- -----			-		. CKT BOARD ASSY INCLUDES:		
-31	131-0608-00			21		. TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-32	----- -----			2		RESISTOR,VAR:(SEE R80,R95 REPL)		
-33	----- -----			2		RESISTOR,VAR:(SEE R96,R98 REPL)		
-34	----- -----			1		RESISTOR,VAR:(SEE R102 REPL)		
-35	----- -----			1		RESISTOR,VAR:(SEE R97 REPL)		
-36	----- -----			1		RESISTOR,VAR:(SEE R107 REPL)		
-37	214-1280-00			1		SPRING,HLCPS:0.14 OD X 1.126"L,0.16"DIA W	80009	214-1280-00
-38	200-1691-00			5		COVER,XSTR:TO-5 PLASTIC	80009	200-1691-00
-39	----- -----			1		CKT BOARD ASSY:DVM ANALOG(SEE A68 REPL)		
						(ATTACHING PARTS)		
-40	211-0116-00			1		SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
						- - - * - - -		
	----- -----			-		. CKT BOARD ASSY INCLUDES:		
-41	131-0589-00			30		. TERM,PIN:0.46 L X 0.025 SQ.PH BRZ GL	22526	47350
-42	136-0252-04			46		. SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
-43	131-0608-00			9		. TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
	105-0404-03			1		SPRITE,CATCH:W/SPRING & HARDWARE	80009	105-0404-03
						(ATTACHING PARTS)		
-44	211-0097-00			1		SCREW,MACHINE:4-40 X 0.312 INCH,PNH STL	83385	OBD
-45	210-0586-00			1		NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	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-	----- -----			-		. LATCH ASSY INCLUDES:		
-46	105-0404-02			1		. SPRIKE,CATCH:	80009	105-0404-02
						(ATTACHING PARTS)		
-47	211-0005-00			1		. SCREW,MACHINE:4-40 X 0.125 INCH,PNH STL	83385	OBD
-48	211-0008-00			1		. SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
-49	214-2634-00			1		. SPRING,LATCH:STAINLESS STEEL	80009	214-2634-00
-50	----- -----			1		CKT BOARD ASSY:TRIG MODE SEL(SEE A18 REPL)		
						(ATTACHING PARTS)		
-51	211-0156-00			2		SCREW,MACHINE:1-72 X 0.25",82 DEG,FLH STL	93907	OBD
						- - - * - - -		
	----- -----			-		. CKT BOARD ASSY INCLUDES:		
-52	136-0252-04			3		. SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
-53	131-0608-00			8		. TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-54	214-1054-00			1		SPRING,FLAT:0.825 X 0.322,SST	80009	214-1054-00
-55	105-0075-00			1		BOLT,LATCH:7A & 7B SER PL-IN	80009	105-0075-00
-56	386-2777-00			2		PLATE,RETAINING:PLUG-IN	80009	386-2777-00
						(ATTACHING PARTS)		
-57	211-0105-00			4		SCREW,MACHINE:4-40 X 0.188,100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-58	----- -----			1		CKT BOARD ASSY:TRIGGER SOURCE SW(SEE A28 REPL)		
						(ATTACHING PARTS)		
-59	211-0156-00			2		SCREW,MACHINE:1-72 X 0.25",82 DEG,FLH STL	93907	OBD
						- - - * - - -		
	----- -----			-		. CKT BOARD ASSY INCLUDES:		
-60	131-0608-00			10		. TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-61	----- -----			1		RESISTOR,VAR:(SEE R100,S100 REPL)		
						(ATTACHING PARTS)		
-62	210-0583-00			1		NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20317-402
						- - - * - - -		
-63	----- -----			1		RESISTOR,VAR:(SEE R82,S82 REPL)		
						(ATTACHING PARTS)		
-64	210-0583-00			2		NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20317-402
						- - - * - - -		
-65	----- -----			1		RESISTOR,VAR:(SEE R115 REPL)		
-66	210-0223-00			4		TERMINAL,LUG:0.25 INCH DIA,SE	86928	A313-136
-67	200-0935-00			1		BASE,LAMPHOLDER:0.29 OD X 0.19 CASE	80009	200-0935-00
-68	352-0157-00			1		LAMPHOLDER:WHITE PLASTIC	80009	352-0157-00
-69	378-0602-01			1		LENS,LIGHT:AMBER	80009	378-0602-01
-70	----- -----			1		CKT BOARD ASSY:TUNE CONTROL(SEE A72 REPL)		
						(ATTACHING PARTS)		
-71	211-0507-00			2		SCREW,MACHINE:6-32 X 0.312 INCH,PNH STL	83385	OBD
						- - - * - - -		
	----- -----			-		. CKT BOARD ASSY INCLUDES:		
-72	131-0608-00			67		. TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
	----- -----			1		FREQ TUN ASSY:(SEE A70 REPL)		
						(ATTACHING PARTS)		
-73	212-0040-00			2		SCREW,MACHINE:8-32 X 0.375 100 DEG,FLH STL	83385	OBD
						- - - * - - -		
	----- -----			-		. FREQ TUNE ASSY INCLUDES:		
-74	385-0127-00			2		. SPACER,POST:0.281 L W/6-32 THD THRU,AL	80009	385-0127-00
						(ATTACHING PARTS)		
-75	211-0504-00			2		. SCREW,MACHINE:6-32 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
-76	----- -----			1		. RESISTOR,VAR:(SEE R22 REPL)		
						(ATTACHING PARTS)		
-77	220-0495-00			1		. NUT,PLAIN,HEX.:0.375-32 X 0.438 INCH BRS	73743	OBD
-78	210-0012-00			1		. WASHER,LOCK:INTL,0.375 ID X 0.50" OD STL	78189	1220-02-00-0541C
						- - - * - - -		
-79	----- -----			1		. RESISTOR,VAR:(SEE R20 REPL)		
						(ATTACHING PARTS)		
-80	220-0495-00			1		. NUT,PLAIN,HEX.:0.375-32 X 0.438 INCH BRS	73743	OBD
-81	210-0012-00			1		. WASHER,LOCK:INTL,0.375 ID X 0.50" OD STL	78189	1220-02-00-0541C
						- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-82	386-3038-00			2		. SUPPORT,SHAFT:	80009	386-3038-00
-83	354-0184-00			1		. RING,RETAINING:FOR 0.250 INCH DIA SHAFT	79136	5555-25
-84	210-0992-00			1		. WASHER,NONMETAL:0.265 INCH IDX 0.437" OD	80009	210-0992-00
-85	401-0074-00			1		. BEARING,SLEEVE:NYLON,0.25 IDX 0.316 OD	80009	401-0074-00
-86	175-5139-00			1		. CA ASSY,SP,ASSY:6.0 INCH LONG RIBBON	80009	175-5139-00
	352-0161-01			1		. . CONN BODY,PL,EL:3 WIRE BROWN	80009	352-0161-01
-87	175-5140-00			1		. CA ASSY,SP,ASSY:6.0 INCH LONG RIBBON	80009	175-5140-00
	352-0162-01			1		. . CONN BODY,PL,EL:4 WIRE BROWN	80009	352-0162-01
-88	348-0003-00			1		. GROMMET,RUBBER:0.312 INCH DIAMETER	70485	1411B6040
-89	----- -----			1		. CLUTCH,MAGNETIC:(SEE MP22 REPL)		
						(ATTACHING PARTS)		
-90	214-0484-00			1		. SCREW,DRIVE:#2 X 0.312,RHSTEEL	80009	214-0484-00
						- - - * - - -		
-91	----- -----			1		. CLUTCH,MAGNETIC:(SEE MP20 REPL)		
						(ATTACHING PARTS)		
-92	214-0484-00			1		. SCREW,DRIVE:#2 X 0.312,RHSTEEL	80009	214-0484-00
						- - - * - - -		
-93	352-0162-01			1		. CONN BODY,PL,EL:4 WIRE BROWN	80009	352-0162-01
-94	131-0707-00			4		. CONNECTOR,TERM.:22-26 AWG,BRS& CU BE GOLD	22526	47439
-95	343-0713-00			1		. COLLAR,SHAFT:0.125 ID X 0.23 H,AL	80009	343-0713-00
-96	213-0246-00			1		. SETSCREW:5-40 X 0.093 ITL BK OXD,HEX SKT	71159	OBD
-97	210-0991-00			1		. WASHER,SPR TNSN:0.128 ID X 0.24 OD	78189	3502-05-016
-98	401-0328-00			1		. GEAR,SPUR:20 T,.125 SHAFT	00328	BP16-20P1
-99	384-1320-00			1		. SHAFT,GEAR:0.1247 OD X 2.0 L,SST	00328	G2-16
-100	210-1240-00			2		. WASHER,FLAT:0.125 ID X 0.016 THK,BRS	80009	210-1240-00
-101	384-1321-00			2		. SHAFT,GEAR:0.2497 OD X 1.125 L,SST	00328	G4-9
-102	401-0327-00			2		. GEAR,SPUR:130 T,1.3542 PD AL;.25 SFT	00328	H24A-130-P1
-103	386-2844-01			1		. SUPPORT,DR SFT:	80009	386-2844-01
						(ATTACHING PARTS)		
-104	211-0021-00			2		. SCREW,MACHINE:4-40 X 1.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
-105	214-2035-00			1		. BELT,FLAT:8.5 X 0.17,TEFLON IMPRG	80009	214-2035-00
						(ATTACHING PARTS)		
-106	213-0109-00			1		. SCREW,DRIVE:SPIRAL OD X 0.125 INCH LONG	77250	OBD
						- - - * - - -		
-107	384-0931-00			1		. SFT,RETURN SPR:	80009	384-0931-00
						(ATTACHING PARTS)		
-108	354-0219-00			1		. RING,RETAINING:FOR 0.25 INCH SHAFT	79136	5103-25-MD-R
-109	210-0940-00			1		. WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
-110	210-0839-00			1		. WSHR,SPR TNSN:0.25 ID X 0.438 OD	78189	3539-14-01-0541C
						- - - * - - -		
-111	380-0378-00			1		. HOUSING,RTN SPR:DELRIN	80009	380-0378-00
						(ATTACHING PARTS)		
-112	213-0181-00			1		. SCR,TPG,THD FOR:2-32 X 0.375 INCH,PNH STL	83385	OBD
-113	213-0113-00			1		. SCR,TPG,THD FOR:2-32 X 0.312 INCH,PNH STL	93907	OBD
						- - - * - - -		
-114	214-2034-00			1		. SPRING,FLAT:46.0 X 0.125,PH BRZ	80009	214-2034-00
-115	426-1103-02			1		. FR,VAR RES DRV:	80009	426-1103-02
-116	386-4402-00			1		SUBPANEL,FRONT:RIGHT	80009	386-4402-00
						(ATTACHING PARTS)		
-117	213-0192-00			8		SCR,TPG,THD FOR:6-32 X 0.50 INCH,PNH STL	87308	OBD
						- - - * - - -		
-118	----- -----			1		CKT BOARD ASSY:DVM LOGIC & RDOUT(SEE A66 REPL)		
						(ATTACHING PARTS)		
-119	211-0008-00			2		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-120	129-0353-01			2		SPACER,POST:0.385 INCH LONG,HEX	80009	129-0353-01
-121	211-0116-00			2		SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
						- - - * - - -		
	----- -----			-		. CKT BOARD ASSY INCLUDES:		
-122	136-0583-01			1		. SKT,PL-IN ELEK:LED READOUT,14 DIP	80009	136-0583-01
-123	136-0328-03			12		. SOCKET,PIN TERM:HORIZ,SQ PIN RCPT	22526	47710
-124	136-0252-04			135		. SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
-125	----- -----			1		CKT BD ASSY:DGTL STOR VERT INTFC(SEE A88 REPL)		
						(ATTACHING PARTS)		
-126	211-0116-00			4		SCR,ASSEM WSHR:4-40 X 0.312 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
1-	----- -----			-		. CKT BOARD ASSY INCLUDES:		
-127	131-0993-00			1		. BUS,CONDUCTOR:2 WIRE BLACK	00779	530153-2
-128	131-0608-00			2		. TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-129	136-0263-04			24		. SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-130	214-0519-00			1		. WASHER,FLAT:0.5 ID X 0.9 OD	80009	214-0519-00
-131	200-1691-00			2		. COVER,XSTR:TO-5,PLASTIC	80009	200-1691-00
-132	136-0621-00			2		. SOCKET,PLUG-IN:22 CONTACT	73803	CS9002-22
-133	----- -----			1		CKT BOARD ASSY:DIG STOR MONITOR(SEE A92 REPL)		
						(ATTACHING PARTS)		
-134	211-0069-00			1		SCREW,MACHINE:2-56 X 0.125 INCH,PNH STL	77250	OBD
-135	211-0087-01			2		SCREW,MACHINE:2-56 X 0.188,82 DEG,FLH STL	83385	OBD
						- - - * - - -		
	----- -----			-		. CKT BOARD ASSY INCLUDES:		
-136	179-2762-00			1		. WIRING HARNESS:DIGITAL STORAGE	80009	179-2762-00
-137	352-0169-03			2		. . CONN BODY,PL,EL:2 WIRE ORANGE	80009	352-0169-03
-138	352-0162-03			1		. . CONN BODY,PL,EL:4 WIRE ORANGE	80009	352-0162-03
-139	352-0163-03			1		. . CONN BODY,PL,EL:5 WIRE ORANGE	80009	352-0163-03
-140	352-0164-03			1		. . CONN BODY,PL,EL:6 WIRE ORANGE	80009	352-0164-03
-141	131-0707-00			20		. . CONNECTOR,TERM.:22-26 AWG,BRS& CU BE GOLD	22526	47439
-142	131-2428-00			2		. . CONN PLUG,ELEC:18-20 AWG,BRS& CU BE GOLD	22526	47441
-143	346-0032-00			2		. . STRAP,RETAINING:0.075 DIA X 4.0 L,MLD RBR	98159	2859-75-4
-144	131-0787-00			24		. . CONTACT,ELEC:0.64 INCH LONG	22526	47359
-145	342-0505-00			1		INSULATOR PLATE:POLYESTER	80009	342-0505-00
-146	441-1527-00			1		CHASSIS,PL-IN:	80009	441-1527-00
						(ATTACHING PARTS)		
-147	211-0200-00			1		SCREW,CAP:4-40 X 0.250,SCH,SST	80009	211-0200-00
-148	211-0008-00			1		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
	----- -----			-		. PLUG-IN CHASSIS ASSY INCLUDES:		
-149	426-1720-00			1		. FRAME SECT,CAB:UPPER LEFT	80009	426-1720-00
						(ATTACHING PARTS)		
-150	211-0105-00			3		. SCREW,MACHINE:4-40 X 0.188,100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-151	346-0032-00			1		STRAP,RETAINING:0.075 DIA X 4.0 L,MLD RBR	98159	2859-75-4
-152	351-0339-00			2		SLIDE,GUIDE:INTERMEDIATE,AL,3.5 L	80009	351-0339-00
-153	351-0340-00			2		SLIDE,GUIDE:SST,3.54 L	80009	351-0340-00
						(ATTACHING PARTS)		
-154	210-0586-00			2		NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	83385	OBD
						- - - * - - -		
-155	337-2741-00			1		SHIELD,ELEC:CAL COVER,TOP	80009	337-2741-00
						(ATTACHING PARTS)		
-156	211-0005-00			2		SCREW,MACHINE:4-40 X 0.125 INCH,PNH STL	83385	OBD
						- - - * - - -		
-157	337-1564-00			1		SHIELD,ELEC:FUNCT IF TOP	80009	337-1564-00
						(ATTACHING PARTS)		
-158	211-0005-00			4		SCREW,MACHINE:4-40 X 0.125 INCH,PNH STL	83385	OBD
						- - - * - - -		
-159	342-0511-00			1		INSULATOR,PLATE:CIRCUIT BOARD,POLYESTER	80009	342-0511-00
-160	----- -----			1		CKT BOARD ASSY:LEFT INTFC(SEE A76 REPL)		
-161	131-1425-00			2		. CONTACT SET,ELE:R ANGLE,0.150" L,STR OF 36	22526	65521-136
-162	131-1426-00			1		. CONTACT SET,ELE:R ANGLE,0.250L,STRIP OF 36	22526	65524-136
-163	131-0608-00			12		. TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
	131-0827-00			6		. CONTACT,ELEC:0.55 INCH LONG	22526	47349
-164	342-0236-00			1		INSULATOR,PLATE:CIRCUIT BOARD,MYLAR	80009	342-0236-00
-165	----- -----			1		CKT BOARD ASSY:CENTER INTFC(SEE A74 REPL)		
-166	131-0608-00			19		. TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-167	131-1425-00			1		. CONTACT SET,ELE:R ANGLE,0.150" L,STR OF 36	22526	65521-136
-168	343-0013-00			1		CLAMP,LOOP:0.375 INCH DIA	95987	3-8-6B
						(ATTACHING PARTS)		
-169	210-0586-00			1		NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	83385	OBD
-170	210-0863-00			1		WSHR,LOOP CLAMP:FOR 0.50" WIDE CLAMP,STL	95987	C191
-171	211-0014-00			1		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
1-172	343-0004-00			1		CLAMP,LOOP:0.312 INCH DIAMETER,PLSTC	95987	5-16-6B
						(ATTACHING PARTS)		
-173	210-0586-00			1		NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	83385	OBD
-174	210-0863-00			1		WSHR,LOOP CLAMP:FOR 0.50" WIDE CLAMP,STL	95987	C191
-175	211-0014-00			1		SCREW,MACHINE:4-40 X 0.50 INCH,PNH STL	83385	OBD
						- - - * - - -		
-176	386-4374-00			1		PLATE,DRAWER:	80009	386-4374-00
						(ATTACHING PARTS)		
-177	211-0105-00			1		SCREW,MACHINE:4-40 X 0.188,100 DEG,FLH STL	83385	OBD
-178	211-0007-00			1		SCREW,MACHINE:4-40 X 0.188 INCH,PNH STL	83385	OBD
						- - - * - - -		
-179	426-1730-00			1		FR SECT,PLUG-IN:UPPER LEFT	80009	426-1730-00
						(ATTACHING PARTS)		
-180	211-0008-00			1		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-181	213-0192-00			1		. SCR,TPG,THD FOR:6-32 X 0.50 INCH,PNH STL	87308	OBD
						- - - * - - -		
-182	407-2619-00			2		BRACKET,SUPPORT:CIRCUIT BOARD	80009	407-2619-00
-183	343-0004-00			1		CLAMP,LOOP:0.312 INCH DIAMETER,PLSTC	95987	5-16-6B
						(ATTACHING PARTS)		
-184	210-0586-00			1		NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	83385	OBD
-185	211-0101-00			1		SCREW,MACHINE:4-40 X 0.25,100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-186	426-1728-00			1		FR SECT,PLUG-IN:LOWER LEFT	80009	426-1728-00
						(ATTACHING PARTS)		
-187	213-0192-00			2		SCR,TPG,THD FOR:6-32 X 0.50 INCH,PNH STL	87308	OBD
						- - - * - - -		
-188	214-1061-00			1		SPRING,GROUND:FLAT	80009	214-1061-00
-189	220-0547-01			2		NUT,BLOCK:0.38 X 0.26 X0.282 (2)4-40 THD	000FW	OBD
						(ATTACHING PARTS)		
-190	211-0101-00			2		SCREW,MACHINE:4-40 X 0.25,100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-191	426-0779-00			1		FR SECT,PLUG-IN:UPPER RIGHT	80009	426-0779-00
						(ATTACHING PARTS)		
-192	211-0008-00			1		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-193	213-0192-00			2		SCR,TPG,THD FOR:6-32 X 0.50 INCH,PNH STL	87308	OBD
						- - - * - - -		
-194	343-0013-00			1		CLAMP,LOOP:0.375 INCH DIA	95987	3-8-6B
						(ATTACHING PARTS)		
-195	210-0586-00			1		NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	83385	OBD
-196	210-0863-00			1		WSHR,LOOP CLAMP:FOR 0.50" WIDE CLAMP,STL	95987	C191
-197	210-0201-00			1		TERMINAL,LUG:SE #4	86928	A373-157-2
						- - - * - - -		
-198	220-0706-00			1		NUT,SLEEVE:4-40 X 0.188 HEX,BRS,CU-SN	80009	220-0706-00
						(ATTACHING PARTS)		
-199	210-0586-00			1		NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	83385	OBD
						- - - * - - -		
-200	386-4406-00			1		SPRT,OSCILLATOR:	80009	386-4406-00
-201	200-1359-00			1		COVER,CKT BOARD:	80009	200-1359-00
-202	337-1948-00			1		SHIELD,ELEC:30HZ FILTER DRIVER	80009	337-1948-00
						(ATTACHING PARTS)		
-203	211-0007-00			2		SCREW,MACHINE:4-40 X 0.188 INCH,PNH STL	83385	OBD
						- - - * - - -		
-204	129-0338-00			2		POST,ELEC-MECH:HEX.,0.188 X 0.64 INCH LONG	80009	129-0338-00
-205	386-2225-00			3		SUPPORT,CKT BD:ALUMINUM	80009	386-2225-00
						(ATTACHING PARTS)		
-206	211-0008-00			3		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		
-207	426-0776-00			1		FR SECT,PLUG-IN:LOWER RIGHT	80009	426-0776-00
						(ATTACHING PARTS)		
-208	213-0192-00			2		SCR,TPG,THD FOR:6-32 X 0.50 INCH,PNH STL	87308	OBD
-209	361-0326-00			1		SPACER,SLEEVE:0.18 ID X 0.25 OD X 0.10"L	80009	361-0326-00
						- - - * - - -		
-210	-----	-----		1		CABLE ASSY,RF:(SEE W28 REPL)		
-211	343-0004-00			1		CLAMP,LOOP:0.312 INCH DIAMETER,PLSTC	95987	5-16-6B
						(ATTACHING PARTS)		
-212	211-0007-00			1		SCREW,MACHINE:4-40 X 0.188 INCH,PNH STL	83385	OBD
-213	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
1-214	337-1579-00			1		SHEILD,ELEC:LEFT RESOLUTION	80009	337-1579-00
						(ATTACHING PARTS)		
-215	211-0005-00			4		SCREW,MACHINE:4-40 X 0.125 INCH,PNH STL	83385	OBD
						- - - * - - -		
-216	129-0338-00			4		POST,ELEC-MECH:HEX.,0.188 X 0.64 INCH LONG	80009	129-0338-00
-217	343-0001-00			1		CLAMP,LOOP:0.15 INCH DIA,PLASTIC	95987	1-8-6B
						(ATTACHING PARTS)		
-218	211-0007-00			1		SCREW,MACHINE:4-40 X 0.188 INCH,PNH STL	83385	OBD
-219	210-0863-00			1		WSHR,LOOP CLAMP:FOR 0.50" WIDE CLAMP,STL	95987	C191
						- - - * - - -		
-220	337-1578-00			1		SHIELD,ELEC:RIGHT RESOLUTION	80009	337-1578-00
						(ATTACHING PARTS)		
-221	211-0007-00			3		SCREW,MACHINE:4-40 X 0.188 INCH,PNH STL	83385	OBD
						- - - * - - -		
-222	129-0339-00			3		POST,ELEC-MECH:0.27 LONG X 0.25 HEX BRS	80009	129-0339-00
-223	386-2893-00			1		SUPPORT,DRAWER:	80009	386-2893-00
						(ATTACHING PARTS)		
-224	213-0192-00			2		SCR,TPG,THD FOR:6-32 X 0.50 INCH,PNH STL	87308	OBD
						- - - * - - -		
-225	351-0284-00			1		SLIDE,GUIDE:	80009	351-0284-00
						(ATTACHING PARTS)		
-226	213-0192-00			2		SCR,TPG,THD FOR:6-32 X 0.50 INCH,PNH STL	87308	OBD
						- - - * - - -		
-227	351-0217-02			3		GUIDE,CKT BD:GRAY DELRIN,4.7 INCH LONG	80009	351-0217-02
						(ATTACHING PARTS)		
-228	220-0556-00			4		NUT,SLEEVE:6-32 X 0.252 OD X 0.015"L BRS	80009	220-0556-00
-229	220-0557-00			8		NUT,SLEEVE:6-32 X 0.204 OD X 0.118 L BRS	80009	220-0557-00
-230	211-0559-00			12		SCREW,MACHINE:6-32 X 0.375"100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-231	386-2782-02			1		SPRT,REAR PANEL:	80009	386-2782-02
-232	386-2781-02			1		SPRT,REAR PANEL:	80009	386-2781-02
-233	386-4403-00			1		PANEL,REAR:	80009	386-4403-00
						(ATTACHING PARTS)		
-234	211-0008-00			1		SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
						- - - * - - -		

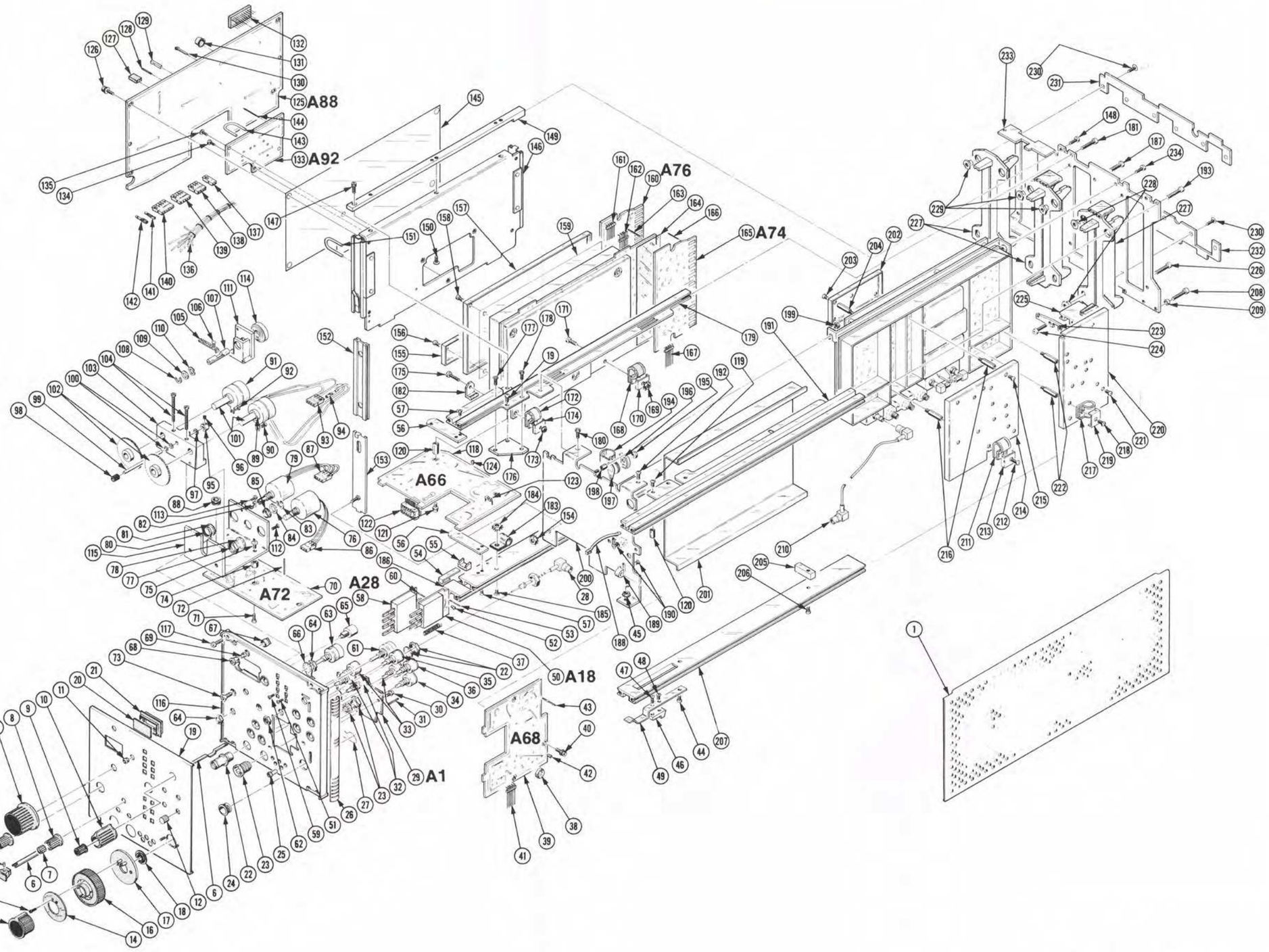

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FIG. 2 CKT BOARDS
& ASSEMBLIES

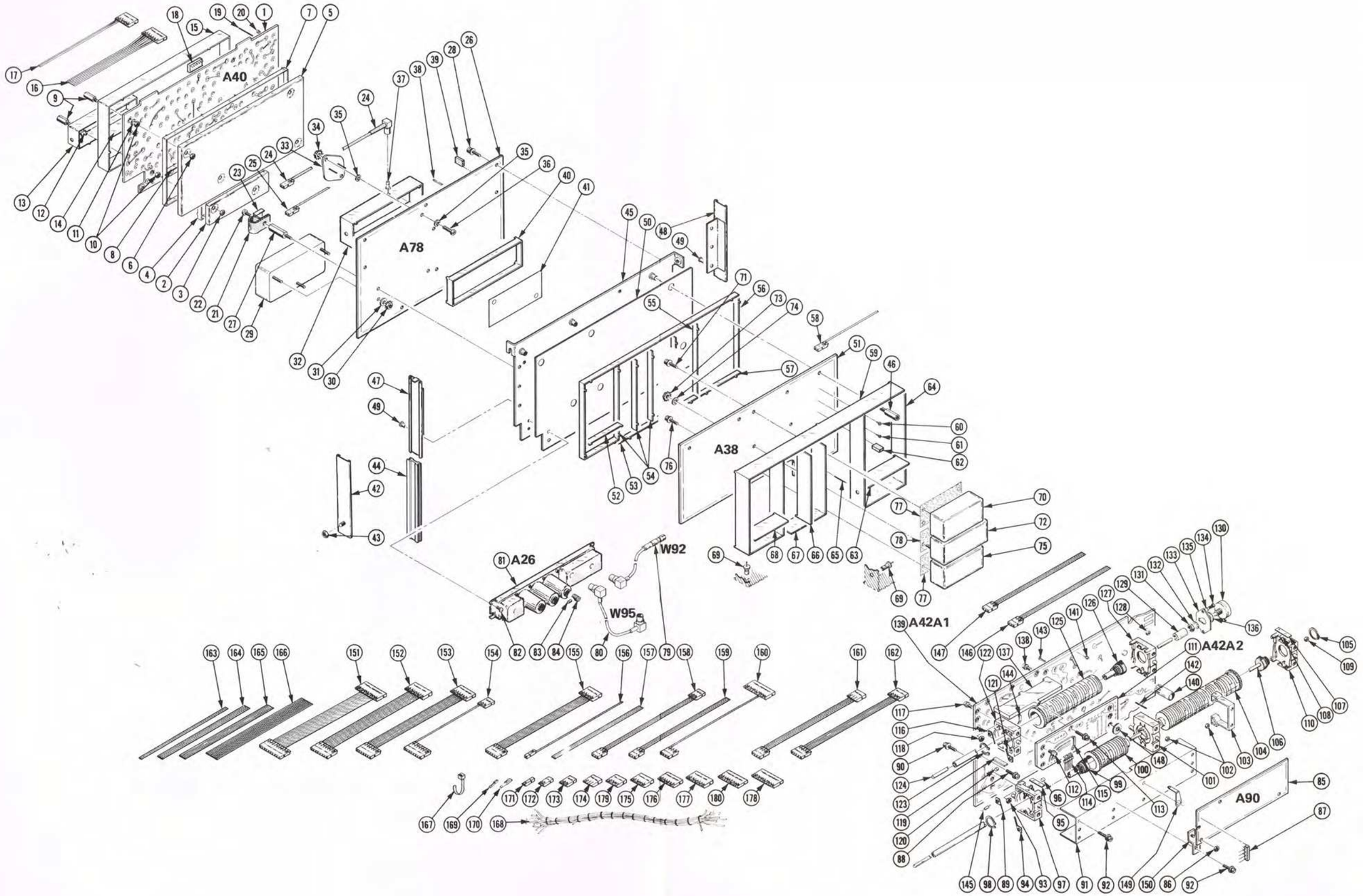


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
2-1	----- -----			1		CKT BOARD ASSY:FUNTION IF(SEE A40 REPL)		
-2	337-1563-00			1		. SHIELD,ELEC:CAL COVER,BOTTOM	80009	337-1563-00
						(ATTACHING PARTS)		
-3	210-0406-00			2		. NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
						- - - * - - -		
-4	337-1556-00			1		. SHIELD,ELEC:CALIBRATION BOTTOM	80009	337-1556-00
-5	337-1568-00			1		. SHEILD,ELEC:FUNCT IF BOTTOM	80009	337-1568-00
						(ATTACHING PARTS)		
-6	210-0406-00			4		. NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
						- - - * - - -		
-7	337-1570-00			1		. SHEILD,ELEC:P/O FUNCT IF BOTTOM	80009	337-1570-00
-8	337-1569-00			1		. SHEILD,ELEC:P/O FUNCT IF BOTTOM	80009	337-1569-00
-9	129-0299-00			6		. POST,ELEC-MECH:HEX,0.333 INCH LONG	80009	129-0299-00
						(ATTACHING PARTS)		
-10	210-0406-00			6		. NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-11	210-1002-00			6		. WASHER,FLAT:0.125 ID X 0.25 INCH OD,BRS	12327	OBD
						- - - * - - -		
-12	131-0391-01			1		. CONNECTOR,RCPT,:50 OHM,COAX,SNAP-ON MALE	98291	51-051-0119
-13	337-2742-00			1		. SHIELD,ELEC:CALIBRATION,TOP	80009	337-2742-00
-14	337-2740-00			1		. SHIELD,ELEC:P/O FUNCTION IF,TOP	80009	337-2740-00
-15	337-2739-00			1		. SHIELD,ELEC:P/O FUNCTION IF,TOP	80009	337-2739-00
-16	175-3689-00			1		. CA ASSY,SP,ELEC:3.0 INCH LONG RIBBON	80009	175-3689-00
	352-0165-01			1		. . CONN BODY,PL,EL:7 WIRE BROWN	80009	352-0165-01
-17	198-2776-00			1		. WIRE SET,ELEC:	80009	198-2776-00
	352-0169-01			1		. . HLDR TERM CONN:2 WIRE,BROWN	80009	352-0169-01
-18	136-0269-02			2		. SKT,PL-IN ELEK:MICROCIRCUIT,14 DIP,LOW CLE	73803	CS9002-14
-19	136-0589-00			21		. SOCKET,PLUG-IN:CRT	80009	136-0589-00
-20	136-0252-07			97		. SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
	175-5138-00	XB010129		1		. CA ASSY,SP,ELEC:3,26 AWG,5.0 L,RIBBON	80009	175-5138-00
-21	343-0013-00			1		CLAMP,LOOP:0.375 INCH DIA	95987	3-8-6B
						(ATTACHING PARTS)		
-22	211-0097-00			1		SCREW,MACHINE:4-40 X 0.312 INCH,PNH STL	83385	OBD
-23	210-0863-00			1		WSHR,LOOP CLAMP:FOR 0.50" WIDE CLAMP,STL	95987	C191
						- - - * - - -		
-24	----- -----			1		CABLE ASSY,RF:(SEE W302 REPL)		
-25	----- -----			1		CABLE ASSY,RF:(SEE W303 REPL)		
-26	----- -----			1		CKT BOARD ASSY:YIG DRIVER(SEE A78 REPL)		
						(ATTACHING PARTS)		
-27	129-0354-00			1		SPACER,POST:0.54 L,W/4-40THD ONE END	80009	129-0354-00
-28	211-0116-00			3		SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
						- - - * - - -		
	----- -----			-		. CKT BOARD ASSY INCLUDES:		
-29	----- -----			1		. FILTER,BANDPASS:(SEE FL3052 REPL)		
						(ATTACHING PARTS)		
-30	210-0586-00			2		. NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	83385	OBD
-31	210-0994-00			2		. WASHER,FLAT:0.125 ID X 0.25" OD,STL	86928	5702-201-20
						- - - * - - -		
-32	337-1874-00			2		. SHIELD,ELEC:OSC SWEEP CONTACT	80009	337-1874-00
-33	----- -----			1		. TRANSISTOR:(SEE Q1041 REPL)		
						(ATTACHING PARTS)		
-34	210-0457-00			2		. NUT,PL,ASSEM WA:6-32 X 0.312 INCH,STL	83385	OBD
-35	210-1092-00			4		. WASHER,FLAT:0.147 ID X 0.312" OD,BRS	12327	OBD
-36	211-0510-00			2		. SCREW,MACHINE:6-32 X 0.375,PNH,STL,CD PL	83385	OBD
						- - - * - - -		
-37	131-0391-00			1		. CONNECTOR,RCPT,:50 OHM,COAX,SNAP-ON MALE	98291	51-051-0049
-38	131-0608-00			45		. TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-39	131-0993-00			1		. BUS,CONDUCTOR:2 WIRE BLACK	00779	530153-2
-40	337-1949-00			1		. SHIELD,ELEC:30HZ FILTER DRIVER	80009	337-1949-00
-41	337-2069-00			-		SHLD GSKT,ELEK:YIG DRIVER	80009	337-2069-00
-42	351-0340-00			2		SLIDE,GUIDE:SST,3.54 L	80009	351-0340-00
						(ATTACHING PARTS)		
-43	210-0586-00			2		NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	83385	OBD
						- - - * - - -		
-44	351-0339-00			2		SLIDE,GUIDE:INTERMEDIATE,AL,3.5 L	80009	351-0339-00
-45	441-1198-01			1		CHAS,PL-IN UNIT:MAIN	80009	441-1198-01
						(ATTACHING PARTS)		
-46	129-0338-00			8		POST,ELEC-MECH:HEX.,0.188 X 0.64 INCH LONG	80009	129-0338-00
						- - - * - - -		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
2-	----- -----			-		. MAIN CHASSIS PL-IN UNIT INCLUDES:		
-47	351-0338-01			1		. SLIDE,GUIDE:CHASSIS END,SST,3.52 L	80009	351-0338-01
-48	351-0345-01			1		. SLIDE,GUIDE:CHASSIS END,SST,3.52 L	80009	351-0345-01
-49	210-0659-01			4		. EYELET,METALLIC:0.121 OD X 0.156 INCH LONG	80009	210-0659-01
-50	348-0293-00			1		SHLD GSKT,ELEK:CKT BOARD,8.4X 4.45	80009	348-0293-00
-51	----- -----			1		CKT BOARD ASSY:RESOLUTION(SEE A38 REPL)		
-52	337-1590-00			1		. SHIELD,ELEC:PHASE LOCK BOT,LEFT	80009	337-1590-00
-53	337-1581-00			1		. SHIELD,ELEC:RESOLUTION BOTTOM 2	80009	337-1581-00
-54	337-1582-00			3		. SHIELD,ELEC:RESOLUTION BOTTOM 3	80009	337-1582-00
-55	337-1583-00			1		. SHIELD,ELEC:RESOLUTION BOTTOM 4	80009	337-1583-00
-56	337-1580-00			1		. SHIELD,ELEC:RESOLUTION BOTTOM 1	80009	337-1580-00
-57	337-1584-00			1		. SHIELD,ELEC:RESOLUTION BOTTOM 5	80009	337-1584-00
-58	198-2960-00			1		. WIRE SET,ELEC:	80009	198-2960-00
	352-0169-00			1		. . HLDR,TERM CONN:2 WIRE BLACK	80009	352-0169-00
-59	337-1572-00			1		. SHIELD,ELEC:RESOLUTION TOP1	80009	337-1572-00
-60	136-0252-07			42		. SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-61	136-0252-01			47		. CONTACT,ELEC:0.178 INCH LONG	00779	1-332095-2
-62	131-0993-00			1		. BUS,CONDUCTOR:2 WIRE BLACK	00779	530153-2
-63	337-1576-00			1		. SHIELD,ELEC:RESOLUTION TOP 5	80009	337-1576-00
-64	337-1575-00			1		. SHIELD,ELEC:RESOLUTION TOP 4	80009	337-1575-00
-65	131-0608-00			24		. TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-66	337-1573-00			1		. SHIELD,ELEC:RESOLUTION TOP 2	80009	337-1573-00
-67	337-1574-00			1		. SHIELD,ELEC:RESOLUTION TOP 3	80009	337-1574-00
-68	337-1588-00			1		. SHIELD,ELEC:RESOLUTION TOP 6	80009	337-1588-00
-69	131-0391-00			2		. CONNECTOR,RCPT,:50 OHM,COAX,SNAP-ON MALE	98291	51-051-0049
-70	----- -----			1		. FILTER,BANDPASS:(SEE FL360 REPL)		
						(ATTACHING PARTS)		
-71	211-0116-00			2		. SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
						- - - * - - -		
-72	----- -----			1		. FILTER,BANDPASS:(SEE FL380 REPL)		
						(ATTACHING PARTS)		
-73	210-0586-00			2		. NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	83385	OBD
-74	210-1092-00			2		. WASHER,FLAT:0.147 ID X 0.312" OD,BRS	12327	OBD
						- - - * - - -		
-75	----- -----			1		. FILTER BANDPASS:(SEE FL370 REPL)		
						(ATTACHING PARTS)		
-76	211-0116-00			2		. SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
						- - - * - - -		
-77	131-2524-00			2		. CONTACT,ELEC:GROUNDING	80009	131-2524-00
-78	131-2523-00			1		. CONTACT,ELEC:GROUNDING	80009	131-2523-00
-79	----- -----			1		CABLE ASSY,RF:(SEE W92 REPL)		
-80	----- -----			1		CABLE ASSY,RF:(SEE W95 REPL)		
-81	----- -----			1		IF MODULE:(SEE A26 REPL)		
						(ATTACHING PARTS)		
-82	211-0069-00			4		SCREW,MACHINE:2-56 X 0.125 INCH,PNH STL	77250	OBD
						- - - * - - -		
	----- -----			-		. IF MODULE INCLUDES:		
-83	377-0376-00			3		. INSR,ANTIROTATI:ADJ SCREW	80009	377-0376-00
-84	213-0269-00			3		. SCREW,TUNING:0.25-40 X 0.312 BRS SIL PL	80009	213-0269-00
-85	----- -----			1		CKT BD ASSY:DGTL STOR HORIZ INTFC(SEE A90 REPL)		
						(ATTACHING PARTS)		
-86	210-0405-00			3		NUT,PLAIN,HEX.:2-56 X 0.188 INCH,BRS	73743	2X12157-402
						- - - * - - -		
	----- -----			-		. CKT BOARD ASSY INCLUDES:		
-87	131-1425-00			1		. CONTACT SET,ELE:R ANGLE,0.150" L,STR OF 36	22526	65521-136
	----- -----			1		CKT BOARD ASSY:SWEEP(SEE A42 REPL)		
						(ATTACHING PARTS)		
-88	211-0116-00			3		SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
						- - - * - - -		
	----- -----			-		. CKT BOARD ASSY INCLUDES:		
-89	131-0963-00			2		. CONTACT,ELEC:GROUNDING	000EX	OBD
	----- -----			1		. SW CAM ACTR AS:(SEE S108 REPL)		
						(ATTACHING PARTS)		
-90	211-0116-00			8		. SCR,ASSEM WSHR:4-40 X 0.312 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-	----- -----			-		. . CAM SWITCH ASSY INCLUDES:		
-91	200-1633-00			1		. . COVER,CAM SW:12 & 35 ELEMENTS	80009	200-1633-00
						(ATTACHING PARTS)		
-92	211-0678-00			8		. . SCR,ASSEM WSHR:4-40 X 0.281 L,PNH STEEL	78189	OBD
						- - - * - - -		
-93	210-0406-00			2		. . NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-94	131-0963-00			1		. . CONTACT,ELEC:GROUNDING	000EX	OBD
-95	214-1139-00			1		. . SPRING,FLAT:0.885 X 0.156CU BE GLD CLR	80009	214-1139-00
	214-1139-02			1		. . SPRING,FLAT:GREEN COLORED	80009	214-1139-02
-96	214-1752-00			2		. . ROLLER,DETENT:	80009	214-1752-00
-97	401-0180-00			1		. . BEARING,CAM SW:FRONT & REAR	80009	401-0180-00
						(ATTACHING PARTS)		
-98	354-0390-00			1		. . RING,RETAINING:0.338 ID X 0.025" THK,STL	79136	5100-37MD
						- - - * - - -		
-99	384-0878-25			1		. . SHAFT,CAM SW:5.574 L X 0.248 OD	80009	384-0878-25
-100	105-0820-00			1		. . ACTUATOR,CAM SW:RESOLUTION	80009	105-0820-00
-101	401-0178-03			1		. . BEARING,CAM SW:CENTER/REAR	80009	401-0178-03
-102	210-0406-00			6		. . NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-103	407-1199-00			1		. . BRACKET,COVER:ABS	80009	407-1199-00
-104	105-0819-00			1		. . ACTUATOR,CAM SW:FREQ SPAN	80009	105-0819-00
						(ATTACHING PARTS)		
-105	354-0390-00			1		. . RING,RETAINING:0.338 ID X 0.025" THK,STL	79136	5100-37MD
						- - - * - - -		
-106	384-1476-01			1		. . SHAFT,CAM SW:0.125 OD X 11.653 L	80009	384-1476-01
-107	214-1139-02			1		. . SPRING,FLAT:GREEN COLORED	80009	214-1139-02
	214-1139-03			1		. . SPRING,FLAT:RED COLORED	80009	214-1139-03
-108	214-1152-00			2		. . HEAT SINK,ELEC:2 BTN,0.4 SPACE PB SW	80009	214-1152-00
-109	210-0406-00			4		. . NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
110	401-0180-00			1		. . BEARING,CAM SW:FRONT & REAR	80009	401-0180-00
-111	----- -----			1		. . CKT BOARD ASSY:SWP & VID FLTR RDOUT(SEE		
	----- -----			-		. . A42A2 REPL)		
						(ATTACHING PARTS)		
-112	211-0678-00			4		. . SCR,ASSEM WSHR:4-40 X 0.281 L,PNH STEEL	78189	OBD
-113	211-0116-00			4		. . SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
						- - - * - - -		
	----- -----			-		. . CKT BOARD ASSY INCLUDES:		
-114	131-1425-00			1		. . CONTACT SET,ELE:R ANGLE,0.150" L,STR OF 36	22526	65521-136
-115	131-0604-00			7		. . CONTACT,ELEC:CKT BD SW,SPR,CU BE	80009	131-0604-00
-116	131-0963-00			1		. CONTACT,ELEC:GROUNDING	000EX	OBD
	----- -----			1		. SW CAM ACTR AS:(SEE S104 REPL)		
						(ATTACHING PARTS)		
-117	211-0116-00			4		. SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
						- - - * - - -		
	----- -----			-		. . CAM SWITCH ASSY INCLUDES:		
-118	210-0406-00			2		. . NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-119	214-1139-02			1		. . SPRING,FLAT:GREEN COLORED	80009	214-1139-02
	214-1139-03			1		. . SPRING,FLAT:RED COLORED	80009	214-1139-03
-120	214-1752-00			2		. . ROLLER,DETENT:	80009	214-1752-00
-121	131-0963-00			1		. . CONTACT,ELEC:GROUNDING	000EX	OBD
-122	401-0180-00			1		. . BEARING,CAM SW:FRONT & REAR	80009	401-0180-00
						(ATTACHING PARTS)		
-123	354-0390-00			1		. . RING,RETAINING:0.338 ID X 0.025" THK,STL	79136	5100-37MD
						- - - * - - -		
-124	384-1230-00			1		. . SHAFT,CAM SW:0.125 OD X 8.043 LONG	80009	384-1230-00
-125	105-0818-00			1		. . ACTUATOR,CAM SW:SWEEP	80009	105-0818-00
-126	384-0878-26			-		. . SHAFT,CAM SW:0.248 OD X 4.804 LONG	80009	384-0878-26
-127	401-0178-06			-		. . BEARING,CAM SW:0.428 ID,PLASTIC,W/INSERTS	80009	401-0178-06
-128	210-0406-00			4		. . NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
-129	376-0141-00			1		. . CPLG,SHAFT,RDG:FOR 0.08 TO 0.125"DIA SHAFT	80009	376-0141-00
-130	----- -----			1		. . RESISTOR,VAR:(SEE R1140 REPL)		
						(ATTACHING PARTS)		
-131	210-0583-00			1		. . NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS	73743	2X20317-402
-132	210-0046-00			1		. . WASHER,LOCK:0.261 ID,INTL,0.018 THK,BRS	78189	1214-05-00-0541C
						- - - * - - -		
-133	386-1792-00			1		. . PL,VAR RES MTG:STEEL CD PL	80009	386-1792-00
						(ATTACHING PARTS)		
-134	211-0022-00			2		. . SCREW,MACHINE:2-56 X 0.188 INCH,PNH STL	83385	OBD
-135	210-0001-00			2		. . 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
2-136	210-1091-00			1		. . WASHER,FLAT:0.266 ID X 0.437 INCH OD,STL	12327	OBD
-137	386-2878-00			1		. STIF,CIRCUIT BD:READOUT SWEEP	80009	386-2878-00
						(ATTACHING PARTS)		
-138	211-0116-00			3		. SCR,ASSEM WSHR:4-40 X 0.312 INCH,PNH BRS	83385	OBD
						- - - * - - -		
-139	----- -----			1		. CKT BOARD ASSY:SWP,SPAN,**UNCAL SENSE**(SEE		
	----- -----			-		. A42A1 REPL)		
-140	214-0269-00			1		. . HEAT SINK,XSTR:0.312 DIA X 0.75 L	98978	TXD-032-75
-141	136-0252-07			128		. . SOCKET,PIN CONN:W/O DIMPLE	22526	75060-012
-142	131-0608-00			107		. . TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-143	131-1493-00			1		. . CONTACT,ELEC:TEST POINT STRAP	80009	131-1493-00
-144	131-0604-00			70		. . CONTACT,ELEC:CKT BD SW,SPR,CU BE	80009	131-0604-00
-145	131-0566-00			1		. . BUS CONDUCTOR:DUMMY RES,2.375,22 AWG	55210	L-2007-1
146	175-2632-00			1		. . CA ASSY,SP,ELEC:3,22 AWG,3.0 L	80009	175-2632-00
	352-0161-00			1		. . . HLDR,TERM CONN:3 WIRE BLACK	80009	352-0161-00
	175-5141-00			1		. . CA ASSY,SP,ELEC:4.0 INCH LONG,RIBBON	80009	175-5141-00
	352-0161-01			1		. . . CONN BODY,PL,EL:3 WIRE BROWN	80009	352-0161-01
-147	198-3054-00			1		. WIRE SET,ELEC:	80009	198-3054-00
	352-0161-01			1		. . CONN BODY,PL,EL:3 WIRE BROWN	80009	352-0161-01
-148	342-0224-00			1		INSULATOR,PLATE:TRANSISTOR	80009	342-0224-00
-149	210-0228-00			1		TERMINAL,LUG:0.176 ID X 0.312"OD,SE	78189	2103-08-00-2520N
-150	386-4376-00			3		SUPPORT,CKT BD:	80009	386-4376-00
-151	175-5148-00			1		CA ASSY,SP,ELEC:5.5 INCH LONG,RIBBON	80009	175-5148-00
	352-0168-01			2		. CONN BODY,PL,EL:10 WIRE BROWN	80009	352-0168-01
-152	175-5146-00			1		CA ASSY,SP,ELEC:8.0 INCH LONG,RIBBON	80009	175-5146-00
	352-0166-01			2		. CONN BODY,PL,EL:8 WIRE BROWN	80009	352-0166-01
	175-5147-00			1		CA ASSY,SP,ELEC:10.0 INCH LONG,RIBBON	80009	175-5147-00
	352-0166-01			2		. CONN BODY,PL,EL:8 WIRE BROWN	80009	352-0166-01
-153	175-5145-00			2		CA ASSY,SP,ELEC:3.0 INCH LONG,RIBBON	80009	175-5145-00
	352-0165-01			2		. CONN BODY,PL,EL:7 WIRE BROWN	80009	352-0165-01
-154	175-5155-00			1		CA ASSY,SP,ELEC:5.5 INCH LONG,RIBBON	80009	175-5155-00
	352-0161-01			2		. CONN BODY,PL,EL:3 WIRE BROWN	80009	352-0161-01
	352-0166-01			1		. CONN BODY,PL,EL:8 WIRE BROWN	80009	352-0166-01
-155	175-5144-00			1		CA ASSY,SP,ELEC:10.0 INCH LONG,RIBBON	80009	175-5144-00
	352-0164-01			2		. CONN BODY,PL,EL:6 WIRE BROWN	80009	352-0164-01
-156	195-0995-00			1		LEAD,ELECTRICAL:12.0 INCH LONG	80009	195-0995-00
	352-0171-01			2		. CONN BODY,PL,EL:1 WIRE BROWN	80009	352-0171-01
-157	175-5138-00			1		CA ASSY,SP,ELEC:5.0 INCH LONG,RIBBON	80009	175-5138-00
-158	175-5142-00			1		CA ASSY,SP,ELEC:5.5 INCH LONG,RIBBON	80009	175-5142-00
	352-0161-01			2		. CONN BODY,PL,EL:3 WIRE BROWN	80009	352-0161-01
-159	175-5149-00			1		CA ASSY,SP,ELEC:3.0 INCH LONG,RIBBON	80009	175-5149-00
	352-0161-01			1		. CONN BODY,PL,EL:3 WIRE BROWN	80009	352-0161-01
	175-5150-00			1		CA ASSY,SP,ELEC:4.5 INCH LONG,RIBBON	80009	175-5150-00
	352-0161-00			1		. HLDR,TERM CONN:3 WIRE BLACK	80009	352-0161-00
-160	175-5151-00			1		CA ASSY,SP,ELEC:3.0 INCH LONG,RIBBON	80009	175-5151-00
	352-0162-02			1		. CONN BODY,PL,EL:4 WIRE RED	80009	352-0162-02
	352-0168-00			1		. CONN BODY,PL,EL:10 WIRE BLACK	80009	352-0168-00
-161	175-5152-00			1		CA ASSY,SP,ELEC:3.0 INCH LONG,RIBBON	80009	175-5152-00
	352-0162-01			2		. CONN BODY,PL,EL:4 WIRE BROWN	80009	352-0162-01
-162	175-5143-00			1		CA ASSY,SP,ELEC:5.5 INCH LONG,RIBBON	80009	175-5143-00
	352-0163-01			2		. CONN BODY,PL,EL:5 WIRE BROWN	80009	352-0163-01
	198-3502-00			1		WIRE SET,ELEC:	80009	198-3502-00
	131-0707-00			80		. CONNECTOR,TERM.:22-26 AWG,BRS& CU BE GOLD	22526	47439
-163	175-0825-00			FT		. WIRE,ELECTRICAL:2 WIRE RIBBON	80009	175-0825-00
-164	175-0827-00			FT		. CABLE,SP,ELEC:4,26 AWG,STRD,PVC JKT,RBN	08261	SS04267(1061)0C
-165	175-0828-00			FT		. WIRE,ELECTRICAL:5 WIRE RIBBON	08261	SS-0526-710610C
-166	175-0833-00			FT		. WIRE,ELECTRICAL:10 WIRE RIBBON	08261	SS-1026-7
	352-0169-00			2		. HLDR,TERM CONN:2 WIRE BLACK	80009	352-0169-00
	352-0162-01			2		. CONN BODY,PL,EL:4 WIRE BROWN	80009	352-0162-01
	352-0163-00			4		. CONN BODY,PL,EL:5 WIRE BLACK	80009	352-0163-00
	352-0163-01			2		. CONN BODY,PL,EL:5 WIRE BROWN	80009	352-0163-01
	352-0167-00			2		. HLDR,TERM CONN:9 WIRE BLACK	80009	352-0167-00
	352-0168-01			2		. CONN BODY,PL,EL:10 WIRE BROWN	80009	352-0168-01
-167	346-0120-00			4		STRAP,TIEDOWN:5.5 L MIN,PLASTIC	06383	SST 1.5M
-168	179-2759-00			1		WIRING HARNESS:SWEEP	80009	179-2759-00
-169	131-0707-00			89		. CONNECTOR,TERM.:22-26 AWG,BRS& CU BE GOLD	22526	47439

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
2-170	131-0708-00			7		. CONTACT,ELEC:0.48"L,28-32 AWG WIRE	22526	47437
	131-2428-00			3		. CONN PLUG,ELEC:18-20 AWG,BRS& CU BE GOLD	22526	47441
-171	352-0171-00			1		. HLDR,TERM CONN:1 WIRE BLACK	80009	352-0171-00
-172	352-0169-00			4		. HLDR,TERM CONN:2 WIRE BLACK	80009	352-0169-00
-173	352-0161-00			2		. HLDR,TERM CONN:3 WIRE BLACK	80009	352-0161-00
-174	352-0162-00			1		. HLDR,TERM CONN:4 WIRE BLACK	80009	352-0162-00
-175	352-0164-00			4		. CONN BODY,PL,EL:6 WIRE BLACK	80009	352-0164-00
-176	352-0165-00			1		. CONN BODY,PL,EL:7 WIRE BLACK	80009	352-0165-00
-177	352-0166-00			3		. CONN BODY,PL,EL:8 WIRE BLACK	80009	352-0166-00
-178	352-0168-00			10		. CONN BODY,PL,EL:10 WIRE BLACK	80009	352-0168-00
	179-2760-00			-		WIRING HARNESS:RESOLUTION/FUNCTION/IF	80009	179-2760-00
	131-0708-00			2		. CONTACT,ELEC:0.48"L,28-32 AWG WIRE	22526	47437
	131-2428-00			2		. CONN PLUG,ELEC:18-20 AWG,BRS& CU BE GOLD	22526	47441
	131-0707-00			64		. CONNECTOR,TERM.:22-26 AWG,BRS& CU BE GOLD	22526	47439
	352-0171-06			1		. CONN BODY,PL,EL:1 WIRE BLUE	80009	352-0171-06
	352-0169-06			7		. CONN BODY,PL,EL:2 WIRE BLUE	80009	352-0169-06
	352-0161-06			3		. CONN BODY,PL,EL:3 WIRE BLUE	80009	352-0161-06
	352-0162-06			5		. HLDR,TERM CONN:4 WIRE,BLUE	80009	352-0162-06
-179	352-0163-06			4		. CONN BODY,PL,EL:5 WIRE BLUE	80009	352-0163-06
	352-0164-06			2		. CONN BODY,PL,EL:6 WIRE BLUE	80009	352-0164-06
	179-2761-00			1		WIRING HARNESS:YIG DRIVER	80009	179-2761-00
	131-0707-00			63		. CONNECTOR,TERM.:22-26 AWG,BRS& CU BE GOLD	22526	47439
	131-0708-00			12		. CONTACT,ELEC:0.48"L,28-32 AWG WIRE	22526	47437
	131-2428-00			7		. CONN PLUG,ELEC:18-20 AWG,BRS& CU BE GOLD	22526	47441
	352-0171-05			2		. CONN BODY,PL,EL:1 WIRE GREEN	80009	352-0171-05
	352-0169-05			6		. CONN BODY,PL,EL:2 WIRE GREEN	80009	352-0169-05
	352-0161-05			6		. CONN BODY,PL,EL:3 WIRE GREEN	80009	352-0161-05
	352-0162-05			2		. CONN BODY,PL,EL:4 WIRE GREEN	80009	352-0162-05
	352-0165-05			1		. CONN BODY,PL,EL:7 WIRE GREEN	80009	352-0165-05
	352-0166-05			2		. CONN BODY,PL,EL:8 WIRE GREEN	80009	352-0166-05
-180	352-0167-05			1		. CONN BODY,PL,EL:9 WIRE GREEN	80009	352-0167-05
	352-0168-05			1		. CONN BODY,PL,EL:10 WIRE GREEN	80009	352-0168-05

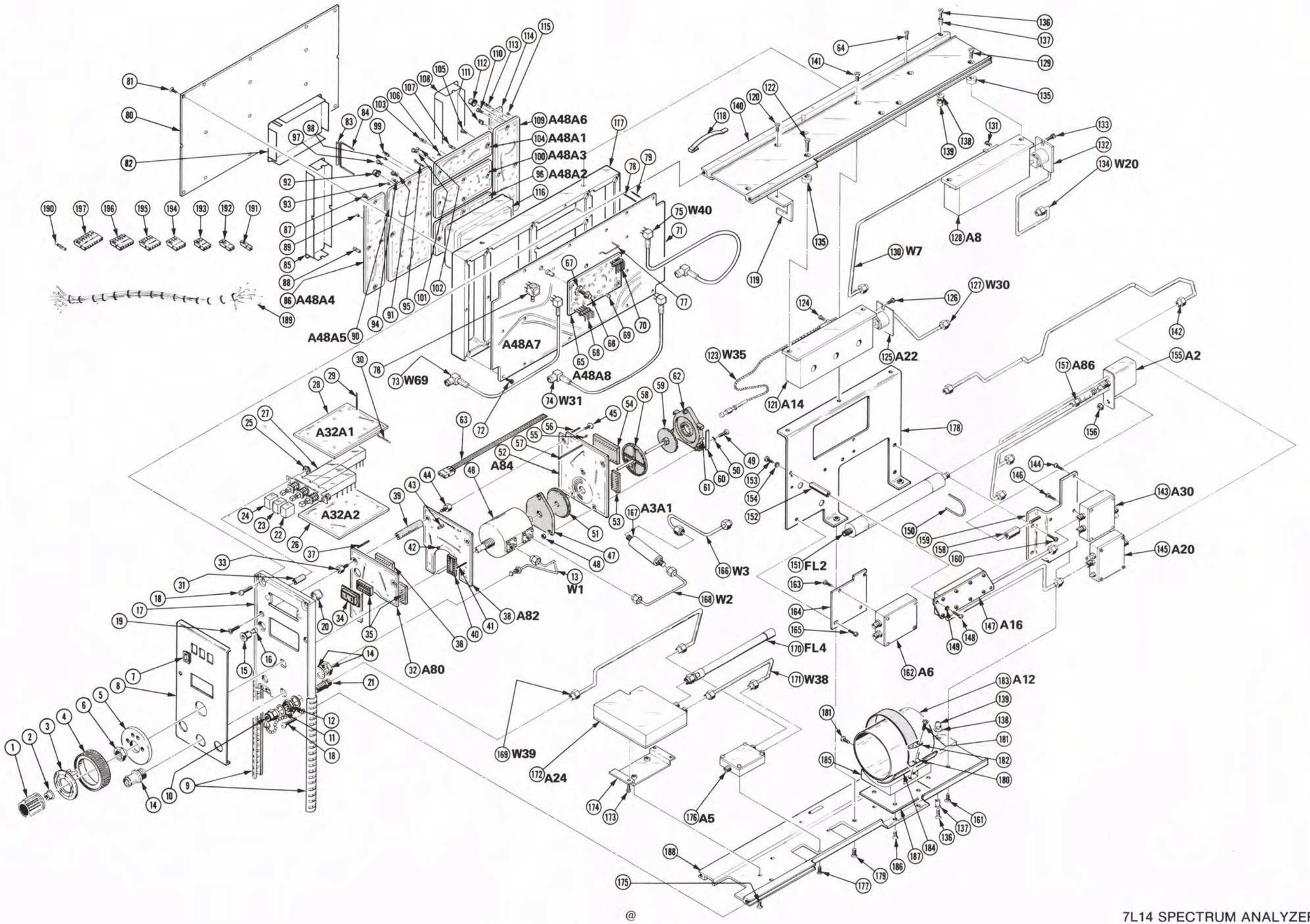
Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
3-	614-0593-00			1		SUBPANEL ASSY:LEFT SIDE	80009	614-0593-00
-1	366-1028-00			1		. KNOB:GRAY	80009	366-1028-00
	213-0153-00			2		. . SETSCREW:5-40 X 0.125,STL BK OXD,HEX SKT	000CY	OBD
-2	358-0414-00			1		. BUSHING,SLEEVE:0.25 OD X 0.21 INCH LONG	80009	358-0414-00
-3	354-0418-09			1		. RING,KNOB SKIRT:CLEAR VERT DISPLAY	80009	354-0418-09
-4	366-1796-00			1		. KNOB:GY,0.25 ID X 1.452 OD X 0.38 H	80009	366-1796-00
-5	354-0412-02			1		. RING,KNOB SKIRT:1.453 W/MARK,BLACK	80009	354-0412-02
						(ATTACHING PARTS)		
-6	220-0589-00			1		. NUT,SLEEVE:0.375-32 X 0.50 INCH,HEX,BRS	80009	220-0589-00
						- - - * - - -		
-7	426-0681-00			3		. FR,PUSH BUTTON:GRAY PLASTIC	80009	426-0681-00
-8	333-1813-02			1		. PANEL,FRONT:	80009	333-1813-02
-9	348-0235-00			2		. SHLD GSKT,ELEC:4.734 INCH LONG	80009	348-0235-00
-10	015-1025-01			2		. TERM.,COAX:3MM MALE,50 OHM,W/CH	18203	T186C5
						(ATTACHING PARTS)		
-11	210-0940-00			1		. WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD
-12	220-0531-02			2		. NUT,PLAIN,HEX.:0.25-36 X 0.312 INCH,STL	80009	220-0531-02
						- - - * - - -		
-13	----- -----			1		. CA ASSY,SP,ELEC:(SEE W1 REPL)		
-14	131-1124-00			1		. . CONN,RCPT,ELEC:BNC,FEMALE	80009	131-1124-00
-15	378-0602-01			1		. LENS,LIGHT:AMBER	80009	378-0602-01
-16	352-0157-00			2		. LAMPHOLDER:WHITE PLASTIC	80009	352-0157-00
-17	386-1447-86			1		. SUBPANEL,FRONT:LEFT	80009	386-1447-86
						(ATTACHING PARTS)		
-18	213-0192-00			4		. SCR,TPG,THD FOR:6-32 X 0.50 INCH,PNH STL	87308	OBD
-19	211-0538-00			2		. SCREW,MACHINE:6-32 X 0.312"100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-20	200-0935-00			1		. BASE,LAMPHOLDER:0.29 OD X 0.19 CASE	80009	200-0935-00
-21	131-1470-00			2		. CONNECTOR,RCPT,:DOUBLE MALE FEED THROUGH	26805	2084-0000-00
-22	366-1257-89			1		. PUSH BUTTON:SIL GY,LIN	80009	366-1257-89
-23	366-1257-61			1		. PUSH BUTTON:SIL GY,2 DB/DIV	80009	366-1257-61
-24	366-1257-62			1		. PUSH BUTTON:SIL GY,10 DB/DIV	80009	366-1257-62
	----- -----			1		. CKT BOARD ASSY:DISPLAY MODE(SEE A32 REPL)		
						(ATTACHING PARTS)		
-25	210-0586-00			2		. NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	83385	OBD
						- - - * - - -		
	----- -----			-		. . CKT BOARD ASSY INCLUDES:		
-26	----- -----			1		. . CKT BOARD ASSY:DISPLAY MODE(SEE A32A2 REPL)		
-27	----- -----			1		. . SWITCH,PUSH:(SEE S130 REPL)		
-28	----- -----			1		. . CKT BOARD ASSY:DSPL MODE SW(SEE A32A1 REPL)		
-29	131-0608-00			14		. . . TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-30	131-1425-00			1		. . . CONTACT SET,ELE:R ANGLE,0.150" L,STR OF 3	622526	65521-136
-31	361-0939-00			2		. SPACER,SLEEVE:0.5 L X 0.113ID,PLASTIC	80009	361-0939-00
-32	----- -----			1		. CKT BOARD ASSY:REF LEVEL RDOUT(SEE A80 REPL)		
						(ATTACHING PARTS)		
-33	129-0208-00			2		. SPACER,POST:0.312" LONG,6-32 ONE END	80009	129-0208-00
						- - - * - - -		
	----- -----			-		. . CKT BOARD ASSY INCLUDES:		
-34	----- -----			1		. . LAMP,LED:(SEE DS2808 REPL)		
-35	136-0269-02			3		. . SKT,PL-IN ELEK:MICROCIRCUIT,14 DIP,LOW CLE	73803	CS9002-14
-36	136-0260-02			4		. . SKT,PL-IN ELEK:MICROCIRCUIT,16 DIP,LOW CLE	71785	133-51-92-008
-37	131-0608-00			11		. . TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-38	----- -----			1		. CKT BOARD ASSY:CRT READOUT(SEE A82 REPL)		
						(ATTACHING PARTS)		
-39	385-0017-00			2		. SPACER,POST:1.156 L W/6-32 THD EA END	80009	385-0017-00
						- - - * - - -		
	----- -----			-		. . CKT BOARD ASSY INCLUDES:		
-40	136-0269-02			2		. . SKT,PL-IN ELEK:MICROCIRCUIT,14 DIP,LOW CLE	73803	CS9002-14
-41	131-0608-00			5		. . TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-42	136-0252-04			27		. . SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
-43	136-0263-04			11		. . SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-44	129-0208-00			2		. SPACER,POST:0.312" LONG,6-32 ONE END	80009	129-0208-00
						(ATTACHING PARTS)		
-45	211-0504-00			2		. SCREW,MACHINE:6-32 X 0.25 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
3-46	----- -----			1		. ATTENUATOR,VAR:(SEE AT1 REPL)		
	672-0633-00			1		. CKT BOARD ASSY:REF LEVEL CONTROL,W/ROTARY SW	80009	672-0633-00
-47	401-0341-00			1		. . BEARING,RTRY SW:REAR,0.252 ID	80009	401-0341-00
						(ATTACHING PARTS)		
-48	220-0636-00			3		. . NUT,PLAIN,HEX.:2-56 X 0.188 INCH HEX,BRS	73743	OBD
-49	211-0185-00			3		. . SCREW,MACHINE:2-56 X 0.438",PNH,STL	07111	OBD
-50	210-0053-00			3		. . WASHER,LOCK:INTL,0.092 ID X 0.175"OD,STL	83385	OBD
						- - - * - - -		
-51	352-0423-05			1		. . HOLDER,CONTACT:1 CONTACT	80009	352-0423-05
-52	----- -----			1		. . CKT BOARD ASSY:REF LEVEL CONT(SEE A84 REPL)		
-53	136-0260-02			2		. . . SKT,PL-IN ELEK:MICROCIRCUIT,16 DIP,LOW CLE	71785	133-51-92-008
-54	136-0578-00			1		. . . SKT,PL-IN ELEK:MICROCKT,24 PIN,LOW PROFILE	73803	C S9002-24
-55	136-0252-04			15		. . . SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
-56	131-0608-00			20		. . . TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-57	131-0591-00			9		. . . CONTACT,ELEC:0.835 INCH LONG	22526	47352
-58	352-0457-05			1		. . HOLDER,CONTACT:1 CONTACT	80009	352-0457-05
-59	384-1465-01			1		. . EXTENSION SHAFT:W/DETENT,9 POSITION	80009	384-1465-01
-60	214-1126-00			2		. . SPRING,FLAT:GOLD COLORED	80009	214-1126-00
-61	214-1127-00			2		. . ROLLER,DETENT:0.125 DIA X 0.125 INCH L	80009	214-1127-00
-62	401-0340-01			1		. . BEARING,RTRY SW:FRONT,0.375 DIA	80009	401-0340-01
-63	198-3054-00			1		. . WIRE SET,ELEC:	80009	198-0354-00
	----- -----			1		. AMPL,PHASE LOCK:(SEE A48 REPL)		
						(ATTACHING PARTS)		
-64	211-0087-01			4		. SCREW,MACHINE:2-56 X 0.188,82 DEG,FLH STL	83385	OBD
						- - - * - - -		
	----- -----			-		. . PHASE LOCK ASSY INCLUDES:		
-65	---- -----			1		. . CKT BOARD ASSY:POWER SUPPLY(SEE A48A8 REPL)		
						(ATTACHING PARTS)		
-66	211-0121-00			2		. . SCR,ASSEM WSHR:4-40 X 0.438 INCH,PNH BRS	83385	OBD
-67	210-0921-00			1		. . WASHER,MICA:0.50 X 0.141 XO.005 INCH THK	80009	210-0921-00
						- - - * - - -		
	----- -----			-		. . . CKT BOARD ASSY INCLUDES:		
-68	131-0426-00			1		. . . CONN,PLUG,ELEC:6 CONTACT,MALE	71468	MC11E-10-6PN
-69	136-0252-04			20		. . . SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
-70	131-1425-00			1		. . . CONTACT SET,ELE:R ANGLE,0.150" L,STR OF 36	22526	65521-136
-71	----- -----			1		. . CKT BOARD ASSY:MOTHER(SEE A48A7 REPL)		
						(ATTACHING PARTS)		
-72	211-0162-00			17		. . SCREW,MACHINE:2-56 X 0.188 INCH,SCH,SST	000AH	OBD
						- - - * - - -		
	----- -----			-		. . . CKT BOARD ASSY INCUDES:		
-73	----- -----			1		. . . CABLE ASSY,RF:(SEE W69 REPL)		
-74	----- -----			1		. . . CABLE ASSY,RF:(SE W31 REPL)		
-75	----- -----			1		. . . CABLE ASSY,RF:(SEE W40 REPL)		
-76	131-1841-00			1		. . . CONN,RCPT,ELEC:CKT CARD,R ANGLE SNAP-ON	98291	051-053-0199
-77	131-0595-00			14		. . . CONTACT,ELEC:1.37 INCH LONG	22526	47355
-78	131-0787-00			14		. . . CONTACT,ELEC:0.64 INCH LONG	22526	47359
-79	131-0608-00			19		. . .TERMINAL,PIN:0.365 L X 0.025 PH BRZ GOLD	22526	47357
-80	337-1917-00			1		. . SHIELD,ELEC:HONEYCOMB COVER	80009	337-1917-00
						(ATTACHING PARTS)		
-81	211-0087-00			17		. . SCREW,MACHINE:2-56 X 0.188 INCH,FLH SST	70318	OBD
						- - - * - - -		
-82	337-2587-00			1		. . SHIELD,ELEC:CIRCUIT BOARD	80009	337-2587-00
-83	162-0581-00			FT		. . INS,SLV,ELEC:7 INCH LONG	06090	OBD
-84	195-0157-00			2		. . LEAD,ELECTRICAL:1,20 AWG,0.575 L	80009	195-0157-00
-85	337-2585-00			1		. . SHIELD,ELEC:CIRCUIT BOARD	80009	337-2585-00
-86	----- -----			1		. . CKT BOARD ASSY:99.2045 MHZ OSC		
	----- -----			-		. . (SEE A48A4 REPL)		
						(ATTACHING PARTS)		
-87	211-0162-00			2		. . SCREW,MACHINE:2-56 X 0.188 INCH,SCH,SST	000AH	OBD
						- - - * - - -		
	----- -----			-		. . . CKT BOARD ASSY INCLUDES:		
-88	136-0263-04			3		. . . SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-89	136-0252-04			9		. . . SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
-90	----- -----			1		. . CKT BOARD ASSY:SUM AMPL & 2ND LO ERROR		
	----- -----			-		. . (SEE A48A5 REPL)		
						(ATTACHING PARTS)		
-91	211-0162-00			4		. . SCREW,MACHINE:2-56 X 0.188 INCH,SCH,SST	000AH	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
3-	----- -----			-		. . . CKT BOARD ASSY INCLUDES:		
-92	200-1691-00			2		. . . COVER,XSTR:TO-5,PLASTIC	80009	200-1691-00
-93	136-0252-04			27		. . . SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
-94	136-0263-04			12		. . . SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-95	214-0579-00			4		. . . TERM,TEST POINT:BRS CD PL	80009	214-0579-00
-96	----- -----			1		. . CKT BOARD ASSY:16-19 MHZ REF OSC		
	----- -----			-		. . (SEE A48A2 REPL)		
						(ATTACHING PARTS)		
-97	211-0162-00			4		. . SCREW,MACHINE:2-56 X 0.188 INCH,SCH,SST	000AH	OBD
						- - - * - - -		
	----- -----			-		. . . CKT BOARD ASSY INCLUDES:		
-98	136-0252-04			14		. . . SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
-99	136-0263-04			4		. . . SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-100	----- -----			1		. . CKT BOARD ASSY:PHASE DETECTOR		
	----- -----			-		. . (SEE A48A3 REPL)		
						(ATTACHING PARTS)		
-101	211-0162-00			4		. . SCREW,MACHINE:2-56 X 0.188 INCH,SCH,SST	000AH	OBD
						- - - * - - -		
	----- -----			-		. . . CKT BOARD ASSY INCLUDES:		
-102	136-0252-04			30		. . . SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
-103	136-0263-04			5		. . . SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-104	----- -----			1		. . CKT BOARD ASSY:16-19 MHZ AMPL OSC		
	----- -----			-		. . (SEE A48A1 REPL)		
						(ATTACHING PARTS)		
-105	211-0162-00			4		. . SCREW,MACHINE:2-56 X 0.188 INCH,SCH,SST	000AH	OBD
						- - - * - - -		
	----- -----			-		. . . CKT BOARD ASSY INCLUDES:		
-106	136-0252-04			3		. . . SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
-107	136-0263-04			4		. . . SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-108	337-2586-00			1		. . SHIELD,ELEC:CIRCUIT BOARD	80009	337-2586-00
-109	----- -----			1		. . CKT BOARD ASSY:SMPLG GEN & DRVR		
	----- -----			-		. . (SEE A48A6 REPL)		
						(ATTACHING PARTS)		
-110	211-0162-00			4		. . SCREW,MACHINE:2-56 X 0.188 INCH,SCH,SST	000AH	OBD
						- - - * - - -		
	----- -----			-		. . . CKT BOARD ASSY INCLUDES:		
-111	131-1493-00			1		. . . CONTACT,ELEC:TEST POINT STRAP	80009	131-1493-00
-112	200-1691-00			1		. . . COVER,XSTR:TO-5,PLASTIC	80009	200-1691-00
-113	136-0263-04			5		. . . SOCKET,PIN TERM:FOR 0.025 INCH SQUARE PIN	22526	75377-001
-114	124-0050-00			1		. . . PLASTIC STRIP:0.75W X 9.875" LG,FOAM TAPE	80009	124-0050-00
-115	136-0252-04			35		. . . SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
-116	337-1989-01			1		. . SHIELD,ELEC:REF OSC,BOTTOM	000AU	OBD
-117	337-1912-00			1		. . SHIELD,ELEC:HONEYCOMB	80009	337-1912-00
-118	214-1061-00			1		. SPRING,GROUND:FLAT	80009	214-1061-00
-119	407-1441-00			1		. BRACKET,ELEC SW:	80009	407-1441-00
						(ATTACHING PARTS)		
-120	211-0101-00			1		. SCREW,MACHINE:4-40 X 0.25,100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-121	----- -----			1		. HYB CKT ASSY:(SEE A14 REPL)		
						(ATTACHING PARTS)		
-122	211-0038-00			2		. SCREW,MACHINE:4-40 X 0.312,FLH,100 DEG	83385	OBD
						- - - * - - -		
	----- -----			-		. . HYB CKT ASSY INCLUDES:		
-123	----- -----			1		. . CA ASSY,SP,ELEC:(SEE W35 REPL)		
-124	211-0162-00			1		. . SCREW,MACHINE:2-56 X 0.188 INCH,SCH,SST	000AH	OBD
-125	----- -----			-		. BAL MIXER ASSY:(SEE A22 REPL)		
						(ATTACHING PARTS)		
-126	211-0217-00			2		. SCREW,CAP:1-72 X 0.188 INCH,SCH,SST	70318	OBD
						- - - * - - -		
	----- -----			-		. . MIXER UNIT INCLUDES:		
-127	----- -----			1		. . CABLE ASSY,RF:(SEE W30 REPL)		
-128	----- -----			1		. HYB CKT ASSY:(SEE A8 REPL)		
						(ATTACHING PARTS)		
-129	211-0038-00			2		. SCREW,MACHINE:4-40 X 0.312,FLH,100 DEG	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
3-	----- -----			-		. . HYB CKT ASSY INCLUDES:		
-130	----- -----			1		. . CABLE ASSY,RF:(SEE W7 REPL)		
-131	211-0162-00			1		. . SCREW,MACHINE:2-56 X 0.188 INCH,SCH,SST	000AH	OBD
-132	----- -----			1		. BAL MIXER ASSY:(SEE A10 REPL)		
						(ATTACHING PARTS)		
-133	211-0217-00			2		. SCREW,CAP:1-72 X 0.188 INCH,SCH,SST	70318	OBD
						- - - * - - -		
	----- -----			-		. . MIXER UNIT INCLUDES:		
-134	----- -----			1		. . CABLE ASSY,RF:(SEE W20 REPL)		
-135	361-0601-00			4		. SPACER,SLEEVE:0.125 ID X 0.14 INCH LONG	80009	361-0601-00
-136	211-0102-00			2		. SCREW,MACHINE:4-40 X 0.500",FLH,STL	83385	OBD
-137	401-0237-00			2		. BEARING,SLEEVE:0.125 ID X 0.23 L,SST	80009	401-0237-00
-138	210-1098-00			2		. WASHER,FLAT:0.219 ID X 0.406 OD,NYLON	80009	210-1098-00
-139	210-0589-00			2		. NUT,SELF LKG HE:4-40 X 0.250 INCH	13257	22 NM-40
-140	426-1731-00			1		. FR SECT,PLUG-IN:UPPER	80009	426-1731-00
						(ATTACHING PARTS)		
-141	211-0101-00			3		. SCREW,MACHINE:4-40 X 0.25,100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-142	----- -----			1		. CABLE ASSY,RF:(SEE W32 REPL)		
-143	----- -----			1		. HYB CKT ASSY:(SEE A30 REPL)		
						(ATTACHING PARTS)		
-144	211-0022-00			2		. SCREW,MACHINE:2-56 X 0.188 INCH,PNH STL	83385	OBD
						- - - * - - -		
-145	----- -----			1		. HYB CKT ASSY:(SEE A20 REPL)		
						(ATTACHING PARTS)		
-146	211-0022-00			2		. SCREW,MACHINE:2-56 X 0.188 INCH,PNH STL	83385	OBD
						- - - * - - -		
-147	----- -----			1		. FILTER LOW PASS:(SEE A16 REPL)		
						(ATTACHING PARTS)		
-148	211-0001-00			2		. SCREW,MACHINE:2-56 X 0.25 INCH,PNH STL	87308	OBD
-149	210-0001-00			2		. WASHER,LOCK:INTL,0.092 ID X 0.18"OD,STL	78189	1202-00-00-0541C
						- - - * - - -		
-150	346-0032-00			2		. STRAP,RETAINING:0.075 DIA X 4.0 L,MLD RBR	98159	2859-75-4
-151	----- -----			1		. FILTER LOW PASS:(SEE FL2 REPL)		
-152	129-0328-00			2		. POST,ELEC-MECH:0.812 " LONG X 0.156 HEX BRS	80009	129-0328-00
						(ATTACHING PARTS)		
-153	211-0022-00			2		. SCREW,MACHINE:2-56 X 0.188 INCH,PNH STL	83385	OBD
-154	210-0001-00			2		. WASHER,LOCK:INTL,0.092 ID X 0.18"OD,STL	78189	1202-00-00-0541C
						- - - * - - -		
-155	----- -----			1		. MIXER UNIT,RF:(SEE A2 REPL)		
						(ATTACHING PARTS)		
-156	210-0586-00			1		. NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	83385	OBD
						- - - * - - -		
-157	----- -----			-		. ATTENUATOR FXD:(SEE A86 REPL)		
-158	129-0098-00			1		. POST,ELEC-MECH:0.250 HEX.X0.406 INCH L,BRS	80009	129-0098-00
-159	386-4407-00			1		. SUPPORT,FILTER:	80009	386-4407-00
						(ATTACHING PARTS)		
-160	211-0022-00			2		. SCREW,MACHINE:2-56 X 0.188 INCH,PNH STL	83385	OBD
-161	211-0101-00			3		. SCREW,MACHINE:4-40 X 0.25,100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-162	----- -----			1		. HYB CKT ASSY:(SEE A6 REPL)		
						(ATTACHING PARTS)		
-163	211-0022-00			2		. SCREW,MACHINE:2-56 X 0.188 INCH,PNH STL	83385	OBD
						- - - * - - -		
-164	386-2793-00			1		. PL,MTG,HYB CKT:SINGLE	80009	386-2793-00
						(ATTACHING PARTS)		
-165	211-0022-00			4		. SCREW,MACHINE:2-56 X 0.188 INCH,PNH STL	83385	OBD
						- - - * - - -		
	----- -----			1		. CABLE ASSY,RF:(SEE A3 REPL)		
-166	----- -----			1		. . CABLE ASSY,RF:(SEE W3 REPL)		
-167	----- -----			1		. . LIMITER ASSY:(SEE A3A1 REPL)		
-168	----- -----			1		. . CABLE ASSY,RF:(SEE W2 REPL)		
-169	----- -----			1		. CABLE ASSY,RF:(SEE W39 REPL)		
-170	----- -----			1		. FILTER LOW PASS:(SEE FL4 REPL)		
-171	----- -----			1		. CABLE ASSY,RF:(SEE W38 REPL)		

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
3-172	----- -----			1		. HYB CKT ASSY:(SEE A24 REPL)		
						(ATTACHING PARTS)		
-173	213-0162-00			4		. SCREW,MACHINE:0.25-20 X 0.75" 82 DEG,FLH STL	74445	OBD
						- - - * - - -		
-174	407-1430-00			1		. BRACKET,PH GATE:	80009	407-1430-00
						(ATTACHING PARTS)		
-175	211-0101-00			2		. SCREW,MACHINE:4-40 X 0.25,100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-176	----- -----			12		. HYB CKT ASSY:(SEE A5 REPL)		
						(ATTACHING PARTS)		
-177	211-0030-00			2		. SCREW,MACHINE:2-56 X 0.25"82 DEG,FLH STL	83385	OBD
						- - - * - - -		
-178	386-4377-00			1		. SUPPORT,FR SECT:CENTER	80009	386-4377-00
						(ATTACHING PARTS)		
-179	211-0101-00			2		. SCREW,MACHINE:4-40 X 0.25,100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-180	343-0880-00			1		. CLAMP,YIG:	80009	343-0880-00
						(ATTACHING PARTS)		
-181	211-0008-00			2		. SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-182	210-0227-00			1		. TERMINAL,LUG:0.141 ID,LOCKING,BRZ TINNED	98335	GC7462M
						- - - * - - -		
-183	----- -----			1		. OSC ASSY:(SEE A12 REPL)		
-184	361-0711-00			1		. SPACER,OSC:0.04 X 2.0 X 1.7,AL	80009	361-0711-00
-185	214-3058-00			1		. HEAT SINK,ELEC:OSCILLATOR,BLACK	80009	214-3058-00
						(ATTACHING PARTS)		
-186	211-0101-00			4		. SCREW,MACHINE:4-40 X 0.25,100 DEG,FLH STL	83385	OBD
						- - - * - - -		
-187	361-0768-00			1		. SPACER,PLATE:YIG OSCILLATOR	80009	361-0768-00
-188	426-1732-00			1		. FR SECT,PLUG-IN:LOWER	80009	426-1732-00
-189	179-2764-00			1		. WIRING HARNESS:RF	80009	179-2764-00
-190	131-0707-00			43		. . CONNECTOR,TERM.:22-26 AWG,BRS& CU BE GOLD	22526	47439
-191	352-0171-00			1		. . HLDR,TERM CONN:1 WIRE BLACK	80009	352-0171-00
-192	352-0169-00			3		. . HLDR,TERM CONN:2 WIRE BLACK	80009	352-0169-00
-193	352-0161-00			2		. . HLDR,TERM CONN:3 WIRE BLACK	80009	352-0161-00
-194	352-0162-00			5		. . HLDR,TERM CONN:4 WIRE BLACK	80009	352-0162-00
-195	352-0164-00			1		. . CONN BODY,PL,EL:6 WIRE BLACK	80009	352-0164-00
-196	352-0166-00			2		. . CONN BODY,PL,EL:8 WIRE BLACK	80009	352-0166-00
	179-2098-00			1		. WIRING HARNESS:DISPERSION MODE	80009	179-2098-00
	131-0707-00			16		. . CONNECTOR,TERM.:22-26 AWG,BRS& CU BE GOLD	22526	47439
	352-0171-06			1		. . CONN BODY,PL,EL:1 WIRE BLUE	80009	352-0171-06
	352-0169-06			2		. . CONN BODY,PL,EL:2 WIRE BLUE	80009	352-0169-06
-197	352-0163-06			1		. . CONN BODY,PL,EL:5 WIRE BLUE	80009	352-0163-06
	352-0164-06			1		. . CONN BODY,PL,EL:6 WIRE BLUE	80009	352-0164-06
	179-2115-00			1		. WIRING HARNESS:PHASE LOCK	80009	179-2115-00
	131-0707-00			8		. . CONNECTOR,TERM.:22-26 AWG,BRS& CU BE GOLD	22526	47439
	352-0162-00			1		. . HLDR,TERM CONN:4 WIRE BLACK	80009	352-0162-00
	352-0163-00			1		. . CONN BODY,PL,EL:5 WIRE BLACK	80009	352-0163-00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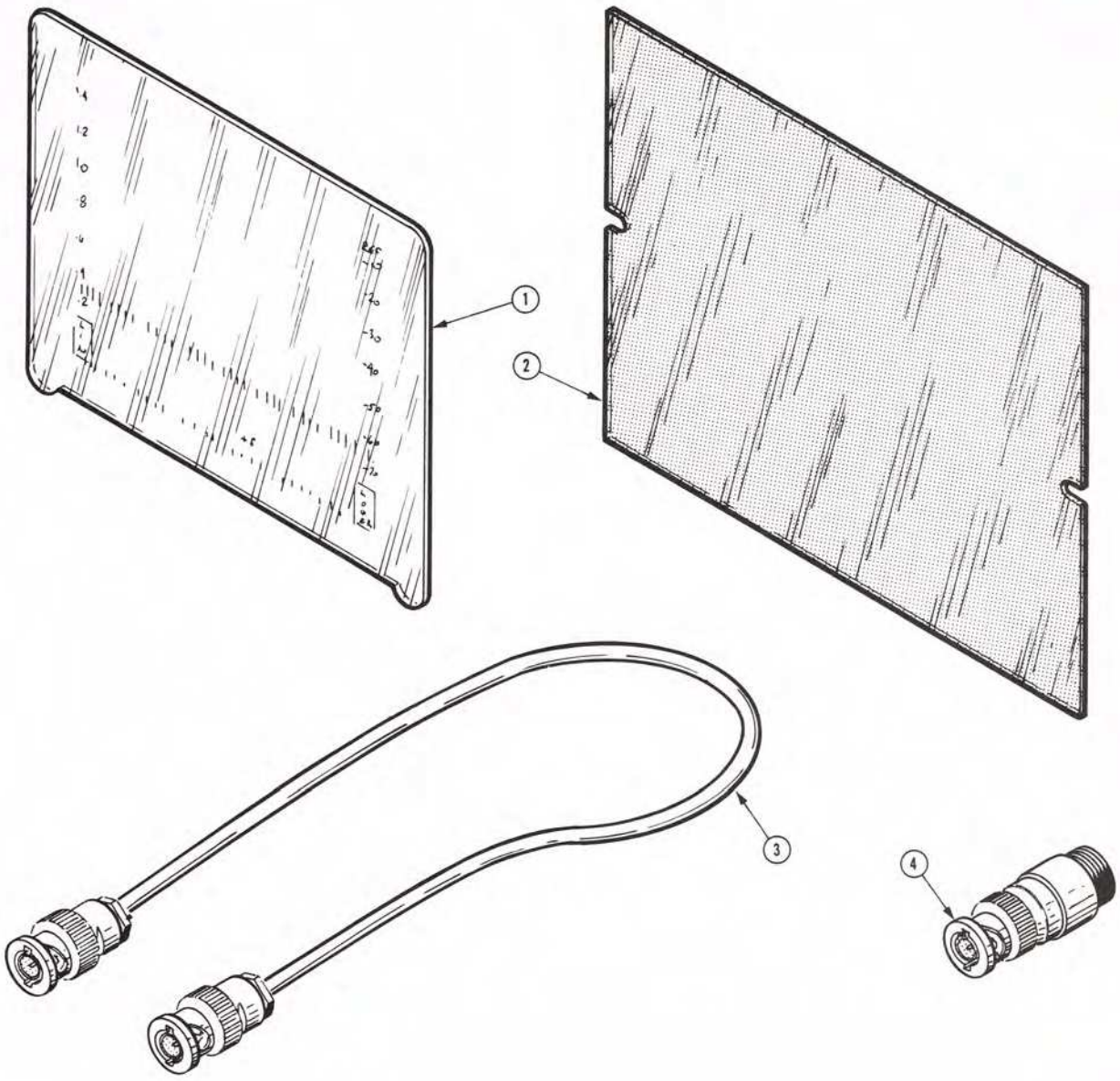


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
-1	337-1159-02			1		SHLD,IMPLOSION:	80009	337-1159-02
-2	378-0684-01			1		FILTER,LT,CRT:AMBER,PLASTIC	80009	378-0684-01
-3	012-0113-00			1		CABLE ASSY,RF:50 OHM COAX,72 INCH LONG	80009	012-0113-00
-4	103-0058-00			1		ADAPTER,CONN:N FEMALE TO BNC MALE	91836	KN99-46TR5
	070-3434-00			1		MANUAL,TECH:INSTRUCTION	80009	070-3434-00

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	Performance of replacement equipment is the same or better than equipment being replaced.	
115		
2101		
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: 4-6-81 Change Reference: C2/481

Product: 7L14 SPECTRUM ANALYZER Manual Part No.: 070-3434-00

DESCRIPTION

TEXT ADDITIONS

SECTION 4
CALIBRATION

p. 4-12 Step 12, part j.

ADD new steps k. and l. as follows:

k. Reduce the FREQ SPAN/DIV to 1 kHz and the RESOLUTION bandwidth to 3 kHz.

l. Check the bandwidth of the response at the -6 dB level.Bandwidth must equal 3 kHz ± 600Hz.

INCREMENT, by two letters, the remaining parts of Step 12.

p. 4-32 following Adjust the Post-Resolution Amplifier Gain

ADD:

Adjust the Display Flatness

a. Set the 7L14 front-panel controls as follows:

FREQ SPAN/DIV	MAX
RESOLUTION	3 MHz
Display Mode	2 dB
REFERENCE LEVEL	+10 dBm
TIME/DIV	10 ms
DISPLAY A and B	off
Baseline Clipper	fully counter-clockwise

b. Connect the Sweep Oscillator to the 7L14 RF INput.

DESCRIPTION

c. Set the Sweep Oscillator as follows:

TRIGGERS	Auto Int.
ALC	INT
CW	on
RF	on
TIME	100 s, VARIABLE fully counter-clockwise

d. Tune the 7L14 CENTER FREQUENCY control counter-clockwise to move the center frequency notch marker off screen to the left of the 0 Hz spur.

e. Remove jumper P1015 (Fig. 4-X).

f. Set the Sweep Oscillator to 50 MHz and adjust the output for six divisions of signal. (The six divisions of signal at 50 MHz is the reference point to which display flatness will be checked.)

g. Set the 7L14 DISPLAY A and B to on.

h. Set the Sweep Oscillator for full sweep.

i. Set the 7L14 MAX HOLD to on. A display of instrument flatness will be on the crt. Check flatness for 1.5 dB with reference to 50 MHz (See Figs. 4-Xa, 4-Xb, and 4-Xc). If flatness does not meet this specification flatness compensation must be adjusted.

j. Reinstall the jumper P1015.

k. Set the 7L14 as follows:

SAVE A	on
MAX HOLD	off
Attenuator	fully clockwise
REFERENCE LEVEL	-80 dBm
VIDEO FILTER	on

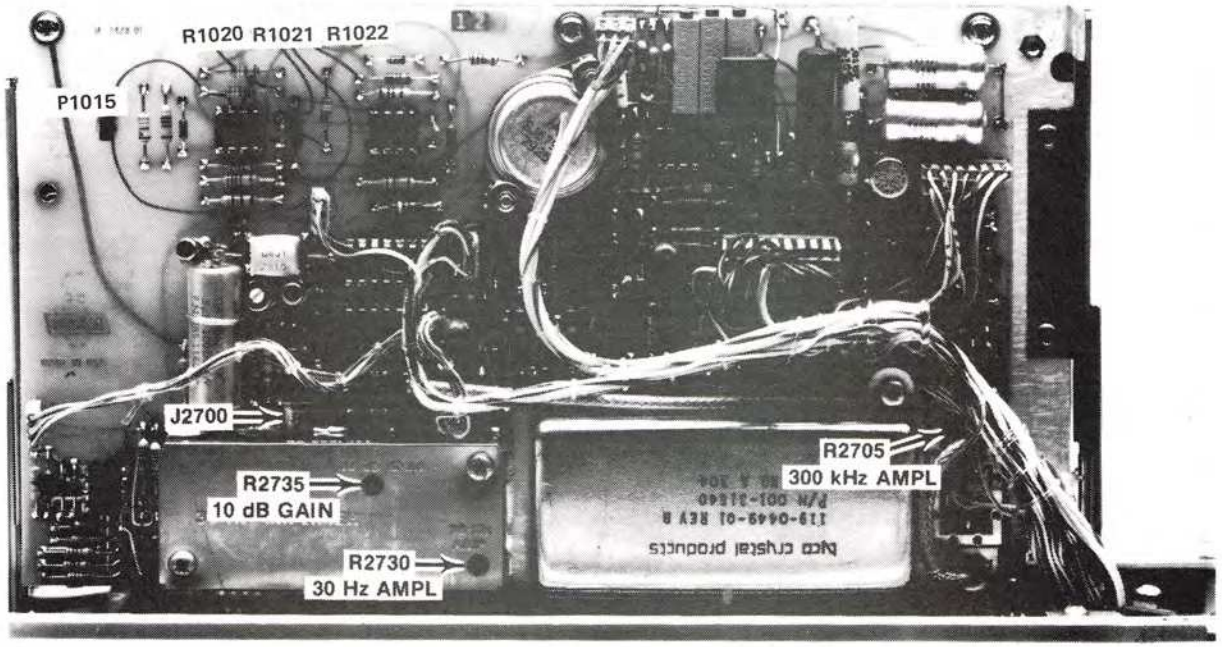
l. Disconnect the Sweep Oscillator. Slope of the displayed baseline can now be adjusted to compensate for low ares in the instrument flatness.

m. Adjust R1020, R1021, and R1022 to compensate for any low areas in the flatness display. Flatness compensation affects very broad areas of the frequency spectrum and will require some experimentation to adjust properly (see Figs. 4-Xa, 4-Xb, and 4-Xc).

n. Repeat parts b. through i. except part e.

o. Check that flatness is within 1.5 dB referenced to 50 MHz.

DESCRIPTION



B. Gain compensation adjustments on the Yig Driver, 30 Hz Filter circuit board.

3434-39

Fig. 4-X

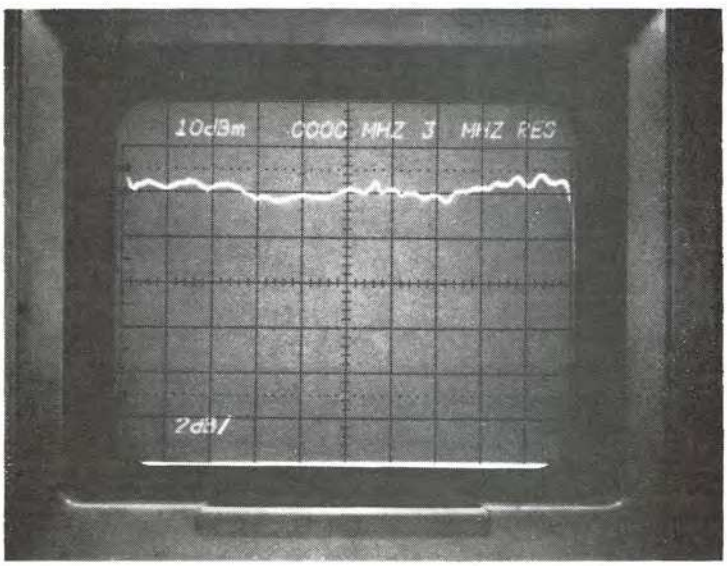


Fig. 4-Xa

DESCRIPTION

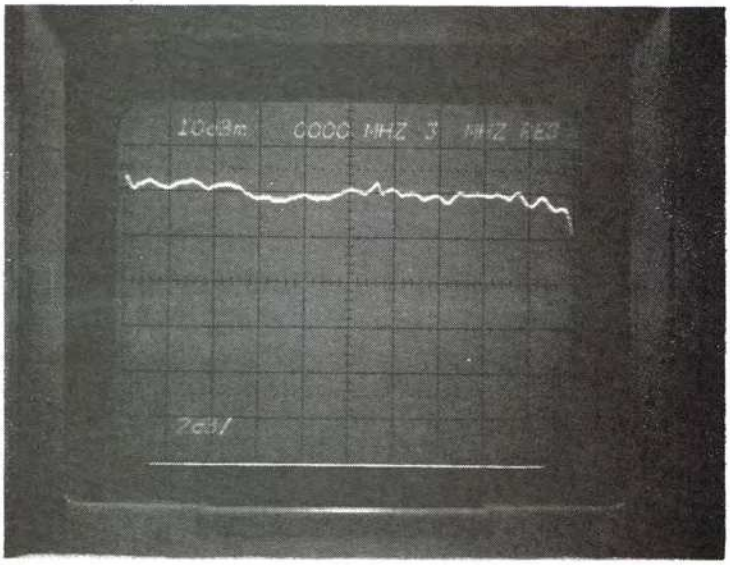


Fig. 4-Xb

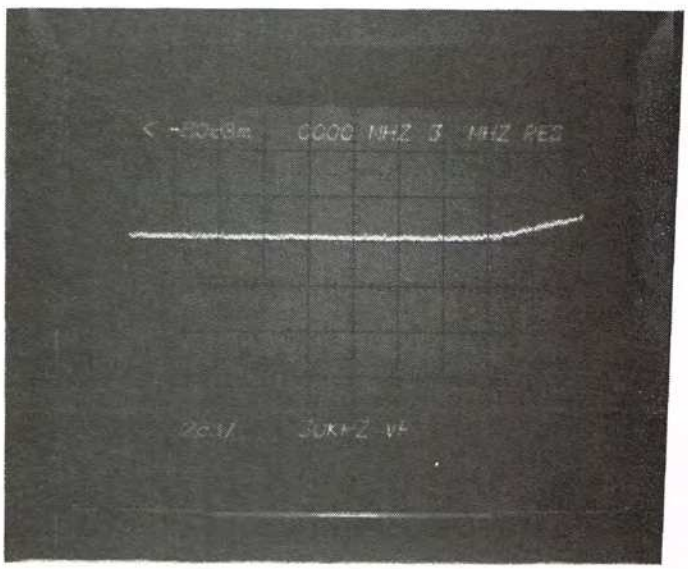


Fig. 4-Xc

Tektronix
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MANUAL CHANGE INFORMATION

Date: 7-6-81 Change Reference: C3/781

Product: 7L14 SPECTRUM ANALYZER Manual Part No.: 070-3434-00

DESCRIPTION

TEXT ADDITIONS

SECTION 4

CALIBRATION

page 4-26, CALIBRATION OF DIGITAL STORAGE

ADD:

NOTE

Perform Function IF alignment before calibrating the Digital Storage circuit.

Part e of CALIBRATION OF DIGITAL STORAGE: ADD to the step:

Adjust LOG CAL for 8 divisions of signal on the spectrum analyzer.

W A R N I N G

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

TEKTRONIX®

This insert is provided as a supplement to the instruction manual furnished with this modified instrument. The information given in this insert supersedes that given in the manual.

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7L14

MOD 139U

MODIFICATION INSERT

Tektronix, Inc ● P. O. Box 500 ● Beaverton, Oregon 97077 Phone 644-0161 ● Cables: Tektronix

060581

061-2536-00

This manual insert describes MOD 139U as it applies to the TEKTRONIX 7L14 Spectrum Analyzer plug-in unit. The input amplitude limiter and 1.8 GHz low-pass filter have been deleted and replaced by a direct connection from the attenuator to the isolating pad and mixer. The center start tuning range and the Max Span mode have been increased to 0 - 2.5 GHz. The Max Span mode has been changed from 180 to 250 MHz/div, with center tuning changed from 900 to 1250 MHz.

CHARACTERISTICS

Spurious Responses. Because of the elimination of the input low-pass 1.8 GHz filter, the following spurious responses will be observed.

1. IF Feedthrough. Untunable baseline lift in response to external 2.095 GHz input will be at least 15 dB below the response to a converted signal. Width of the response range will be determined by the RESOLUTION setting.

2. Images. Image responses <(L.O. harmonics) - (2 to 6 GHz input) ≈2.095 GHz, or (4.095 to 6.795 GHz input) - (L.O.) ≈2.095 GHz)> are at least 10 dB below normal response.

3. Internal Spurious Responses. For input signals 0 to 1.8 GHz, the limit is unchanged (-100 dBm). From 1.8 to 2.5 GHz, no greater than -60 dBm (principally at 2.2 GHz).

Additional Characteristics. Sensitivity, stability, and incidental FM characteristics over the 0 - 2500 MHz range are within standard 7L14 limits for 0 - 1800 MHz. Flatness limits are increased from +1, -2 dB to +1, -3 dB over the 1800 - 2500 MHz range (only) referred to the 50 MHz response. Frequency tuning readout accuracy in the 1800 - 2500 MHz range (only) is within ±(5 MHz + 0.5% of center frequency + 20% of SPAN/DIV setting).

Maximum Safe Input. With the input amplitude limiter removed, maximum safe input is as follows:

RF Atten	Max Input	Voltage*
0 dB	-30 dBm	7 mV
10 dB	-20 dBm	20 mV
20 dB	-10 dBm	70 mV
30 dB	0 dBm	200 mV
40 dB	+10 dBm	700 mV
50 dB	+20 dBm	2 V
60 dB	+30 dBm	7 V

* rms + dc

CALIBRATION

The following special conditions apply while calibrating the 7L14 MOD 139U according to the procedure in the 7L14 Instruction Manual.

1. The Oscillator Assembly, A12, and the Hybrid Circuit Assembly, A24, are selected prior to assembly.

2. The 1st Mixer Unit is selected for a +1 dB, -3 dB flatness, 0 - 2.5 GHz.

3. The CENTER FREQUENCY readout will be 0000 to 2500 MHz instead of 0000 to 1800 MHz.

4. Max Span should be 0 - 2500 MHz instead of 0 - 1800 MHz. Adjust R2815 on the added circuit board for Max Span Calibration.

PARTS LIST

Electrical

Change To:

A2	037-7008-00	MIXER UNIT, DBL, 1ST MIXER
A12*	037-7010-00	OSCILLATOR ASSEMBLY, 2 - 4 GHz
A24*	037-7007-00	HYBRID CIRCUIT ASSEMBLY
FL2	030-0913-02	COAX. ASSEMBLY
FL4	175-1443-00	CABLE, RIGID
A68R2122	321-0281-06	RESISTOR, FXD, FILM, 8.25 kΩ,0.25%,0.125W
A78R1041	321-0304-00	RESISTOR, FXD, FILM, 14.3 kΩ, 1%, 0.125 W
A78R3020	315-0202-00	RESISTOR, FXD, CMPSN, 2 kΩ, 5%, 0.25 W

Delete:

A78R1043	321-0318-06	RESISTOR, FXD, FILM, 20 kΩ, 0.25%,0.125 W
A78R1056	321-0267-00	RESISTOR, FXD, FILM, 5.9 kΩ, 1%, 0.125 W

Mechanical

Add:

131-0787-00	4	TERMINAL, PIN, SQUARE, 0.71 L x 0.025
175-2028-00	1	CABLE ASSEMBLY, RF, 50 Ω, COAXIAL
210-0201-00	1	TERMINAL, LUG, 0.12 ID, LOCKING

Change To:

333-1813-01	1	PANEL, FRONT, LEFT
333-2640-01	1	PANEL, FRONT, RIGHT

Accessories

Add:

061-2536-00	1	INSERT, MANUAL -- 7L14 MOD 139U

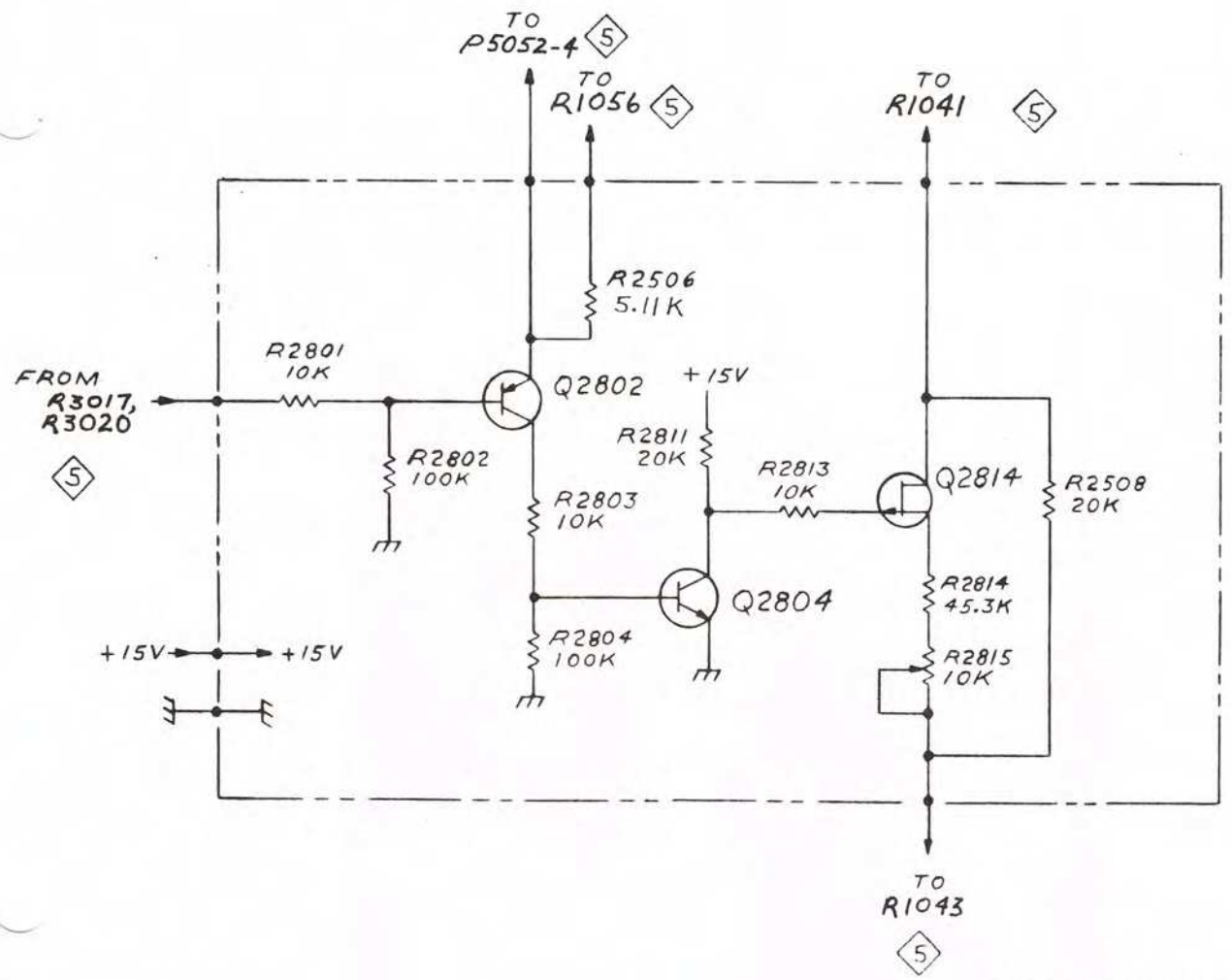
* The Oscillator Assembly (A12) and the Hybrid Circuit Assembly (A24) are selected for this modification. When ordering replacements, order by the Modification part number listed above instead of the Standard part number. Also, be sure that the part number ordered corresponds to the serial number of your instrument.

PARTS LIST (cont)

MAX SPAN EXTENDER Circuit Board Assembly

Q2802	151-0188-00	TRANSISTOR, PNP, SILICON, 2N3906
Q2804	151-0190-0s	TRANSISTOR, NPN, SILICON, 2N3904
Q2814	151-1066-00	TRANSISTOR, FET, SILICON, P1086E
R2506*	321-0261-00	RESISTOR, FXD, FILM, 5.11 kΩ, 1%, 0.125 W
R2508*	321-0318-00	RESISTOR, FXD, FILM, 20 kΩ, 1%, 0.125 W
R2801	315-0103-00	RESISTOR, FXD, CMPSN, 10 kΩ, 5%, 0.25 W
R2802	315-0104-00	RESISTOR, FXD, CMPSN, 100 kΩ, 5%, 0.25 W
R2803	315-0103-00	RESISTOR, FXD, CMPSN, 10 kΩ, 5%, 0.25 W
R2804	315-0104-00	RESISTOR, FXD, CMPSN, 100 kΩ, 5%, 0.25 W
R2811	315-0203-00	RESISTOR, FXD, CMPSN, 20 kΩ, 5%, 0.25
R2813	315-0103-00	RESISTOR, FXD, CMPSN, 10 kΩ, 5%, 0.25 W
R2814	321-0352-00	RESISTOR, FXD, FILM, 45.2 kΩ, 1%, 0.125 W
R2815	311-1319-00	RESISTOR, VAR, NONWW, 10 kΩ, 0.5 W, TRIM.

* Relocated from YIG Driver, Voltage Memory, and 30 Hz Filter board.



MAX SPAN EXTENDER