

# Instruction Manual



## WFM 300A Component/Composite Waveform Monitor (SN B020000 and Up)

**070-7636-04**

### **Warning**

The 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. Refer to all safety summaries prior to performing service.



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# General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use this product only as specified.

*Only qualified personnel should perform service procedures.*

## To Avoid Fire or Personal Injury

**Use Proper Power Cord.** Use only the power cord specified for this product and certified for the country of use.

**Connect and Disconnect Properly.** Do not connect or disconnect probes or test leads while they are connected to a voltage source.

**Ground the Product.** This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded.

**Observe All Terminal Ratings.** To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

Connect the ground lead of the probe to earth ground only.

Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.

**Do Not Operate Without Covers.** Do not operate this product with covers or panels removed.

**Use Proper Fuse.** Use only the fuse type and rating specified for this product.

**Avoid Exposed Circuitry.** Do not touch exposed connections and components when power is present.

**Wear Eye Protection.** Wear eye protection if exposure to high-intensity rays or laser radiation exists.

**Do Not Operate With Suspected Failures.** If you suspect there is damage to this product, have it inspected by qualified service personnel.

**Do Not Operate in Wet/Damp Conditions.**

**Do Not Operate in an Explosive Atmosphere.**

**Keep Product Surfaces Clean and Dry.**

**Provide Proper Ventilation.** Refer to the manual's installation instructions for details on installing the product so it has proper ventilation.

**Symbols and Terms**

**Terms in this Manual.** These terms may appear in this manual:



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

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**CAUTION.** *Caution statements identify conditions or practices that could result in damage to this product or other property.*

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**Terms on the Product.** These terms may appear on the product:

DANGER indicates an injury hazard immediately accessible as you read the marking.

WARNING indicates an injury hazard not immediately accessible as you read the marking.

CAUTION indicates a hazard to property including the product.

**Symbols on the Product.** The following symbols may appear on the product:





# PART I

# OPERATOR'S INFORMATION

## SECTION 1

## INTRODUCTION AND SPECIFICATIONS

The WFM 300A Component/Composite Waveform Monitor (see Frontispiece) is designed to monitor three-wire component, as well as composite, television signals in a television control facility. This instrument can be rackmounted or placed in a cabinet for portability.

### FEATURES

#### Component Display Modes

In Component operating mode, an innovative Lightning display is available, providing amplitude and timing information for all three channels simultaneously, allowing the operator to set up equipment accurately and efficiently.

The traditional Parade display of three signals provides side-by-side comparison of all signals. In addition, any combination of the three signals can be overlaid for accurate comparisons. Both vertical and horizontal magnification can be applied to allow detailed inspection of the signal being observed.

A Vector display of the color difference signals provides the traditional color bar vector display. The Bowtie display uses the special Bowtie timing test signal generated by the TEKTRONIX TSG-300 Component Television Test Signal Generator to check the processing of the component video signal.

An internal calibration square wave is available when the WAVEFORM/PARADE/CAL button is pressed in for about one second. This signal is useful for quickly checking the calibration of the instrument.

#### Horizontal

The WFM 300A offers a choice of three basic sweep rates: 1 LINE, 2 LINE, or 2 FLD (2 Field). The MAG (Magnification) button can be used with any of the sweep rates to extend the range of choices.

#### Line Selection

Push buttons allow easy selection of a line and field. The selection is displayed as a readout on the crt where it is clearly visible.

## **ACCESSORIES**

### **Standard Accessories**

Standard accessories included with the instrument:

Instruction Manual – 070-7636- XX

Power Cable – 16I-0216-00

Fuse (spare) – 159-0021-00

Scale Illumination Bulbs (spare) – 150-0168-00  
or ANSI #73 (QTY 3)

### **Optional Accessories**

Optional accessories that are available:

Cabinets:

Plain — 1700F00

Portable — 1700F02

Side-by-Side Rack Adapter — 1700F05

Blank Half-Rack-Width Panel — 1700F06

Viewing Hood — 016-0475-00

Front Panel Cover — 200-1566-00

Extender Board (two needed for extending the  
Control board) — 670-7981-00

A full list of standard and optional accessories, including the part numbers, is provided at the end of the Replaceable Mechanical Parts List in Section 10.

## **SPECIFICATIONS**

The Performance Requirements listed in the Electrical Characteristics apply over an ambient temperature range of 0°C to +50°C. The rated accuracies are valid when the instrument is calibrated at an ambient temperature range of +20°C to +30°C, after a warm-up time of 20 minutes.

Test equipment used to verify Performance Requirements must be calibrated and working within the limits specified in the Recommended Equipment List located in Checks and Adjustments, Section 5.

# ELECTRICAL SPECIFICATIONS

Table 1-1  
Vertical Deflection System

Characteristics	Performance Requirements	Supplemental Information	Perf. Ck. Step No.
Frequency Response 1 V Full Scale	50 kHz to 6.0 MHz within 2% of response at 50 kHz.		9
X5 Gain	50 kHz to 5.0 MHz within 2% of response at 50 kHz.	0.2 V input signal applied to instrument.	9
Dif'd Step		$\geq -20$ dB at 14 kHz and 2.0 MHz.	
Luminance	-25 dB at 3.58 MHz and 4.43 MHz. < 1% change between Flat and Lum at 15 kHz.	$20 \text{ Log}_{10} = 39 \text{ mV} \div 700 \text{ mV}$ .	
Transient Response 1 V Full Scale	Specifications apply for full screen height video input signal, with V GAIN control in detent.		
Pulse-to-Bar	0.99:1.00 to 1.01:1.00.	2T pulse X5 gain; 1T pulse X1 gain.	7
Ringing and Overshoot		2% or less. 2T pulse X5 gain. 1T pulse X1 gain.	
Tilt		1% of 100% video.	
Variable Gain Range 1 V Full Scale	A 1 V input signal can be adjusted to 250 mV display.  A 666 mV signal can be adjusted to 1 V display.		5
Deflection Accuracy	1 V within 2% with 1 V input.	1 V is full scale.	2
With X5 Gain	1 V within 3% with 0.2 V input.		4
Vertical Position Range		A 1 V signal can be positioned such that sync is on the 0.7 line or 100% white is at the -0.3 V line.	

Table 1-2  
DC Restoration

Characteristics	Performance Requirements	Supplemental Information	Perf. Ck. Step No.
Clamp Reference		Clamps during back porch of sync reference.	
Attenuation of 50 Hz on Input Signal		≤ 20% for Component operation. ≤ 20% for Composite operation.	
Blanking Level Shift with 10% to 90% APL Change		≤ 1% at 100% (1 V).	

Table 1-3  
Inputs

Characteristics	Performance Requirements	Supplemental Information	Perf. Ck. Step No.
CH 1, CH 2, CH 3, COMPOSITE, and EXTERNAL REFERENCE Return Loss (75Ω)		At least 40 dB from 50 kHz to 6 MHz. Loop-through terminated in 75Ω, input in use or not, instrument power on or off.	23
Cross Talk Between Channels		> 46 dB isolation between channels, measured at 3 MHz. CH1, CH2, CH3.	
Loop-Through Isolation		> 60 dB isolation between channels, measured at 3 MHz. CH1, CH2, CH3.	
Maximum Input Level for Normal Operation CH 1, CH 2, CH 3, Composite		+ 1.5 V, - 1 V (dc + peak ac).	
EXTERNAL REFERENCE		+ 2 V to -4 V peak ac (compatible with comp sync).	

**Table 1-4**  
**Horizontal Deflection System (Waveform & Parade Mode)**

Characteristics	Performance Requirements	Supplemental Information	Perf. Ck. Step No.
Sweep	Sweep will occur in all sweep rate settings with or without a reference signal.		13
Synchronization	Sweep will synchronize to sync amplitude of 0.3 V p-p $\pm$ 6 dB.		13
2 FLD Sweep Repetition Rate	Equal to frame rate of selected reference.		13
2 FLD MAG (Magnification)		Approximately X20.	
2 FLD MAG Registration		Some portion of vertical blanking interval is visible when unmagnified 2 FLD sweep is centered.	
1 LINE Sweep Repetition Rate		Equal to line rate of selected reference.	
2 LINE Sweep Repetition Rate		Equal to half line rate of selected reference.	
Sweep Length	Unmagnified sweeps shall be the same length within 1/2 major division.	2 LINE and 2 FLD sweep lengths are nominally 12.5 divisions.	13
Timing Accuracies 1 $\mu$ s/Div. & 0.2 $\mu$ s/Div.  Linearity 1 $\mu$ s/Div. & 0.2 $\mu$ s/Div.  Differential Linearity 1 $\mu$ s/Div. & 0.2 $\mu$ s/Div.	Within 2%.  Within 2%.  Within 2%.	All timing and linearity specifications exclude the first and last major divisions of the unmagnified display, and apply to the central ten divisions of the graticule.	12
2 LINE MAG Registration	Some portion of horizontal blanking interval is visible when unmagnified 2 LINE is centered.		14
LINE SELECT		Displays the selected line in 1 LINE. Displays the selected line first in 2 LINE. In 15-Line, displays overlaid lines in 1 LINE or 2 LINE.	
Horizontal Position		Any portion of a synchronized video sweep can be positioned to the center of the screen in all sweep modes.	

Table 1-5  
Calibration

Characteristics	Performance Requirements	Supplemental Information	Perf. Ck. Step No.
Calibrator		An internally generated square wave.	
Amplitude	0.7 V $\pm$ 1%.		3

Table 1-6  
Composite

Characteristics	Performance Requirements	Supplemental Information	Perf. Ck. Step No.
OUTPUT Frequency Response	50 kHz to 6 MHz, within 5% of response at 50 kHz.	Terminated in 75 $\Omega$ .	11
Differential Gain (50% APL)	Less than 1% with a 1.0 V display.	At 4.43 MHz.	22
Dc Level on Output	$\pm$ 0.1 V or less into 75 $\Omega$ load.	No input signal.	11
Intensification (Brightup)		During line select only. Active video of selected lines has a dc offset of approximately 140 mV.	
Output Return Loss (75 $\Omega$ )	At least 30 dB, 50 kHz to 6 MHz.	With instrument turned on. $20 \text{ Log}_{10} = 9.4 \text{ mV} \div 300 \text{ mV}$ .	24
Input to Output Gain Ratio	1:1 $\pm$ 5% at 15 kHz.		

Table 1-7  
Parade Mode

Characteristics	Performance Requirements	Supplemental Information	Perf. Ck. Step No.
Sweep Repetition Rate	Field or line rate of selected reference.		13
Magnifier		Functions in normal manner during Parade mode.	
Order of Display		CH 1, CH 2, CH 3.	

Table 1-8  
Vector Mode (Component Only)

Characteristics	Performance Requirements	Supplemental Information	Perf. Ck. Step No.
Vertical Bandwidth	1 MHz $\pm$ 100 kHz.		16
Horizontal to Vertical Bandwidth Matching	No eye opening at 500 kHz or 2 MHz.	Apply sine wave to CH 2 and CH 3 simultaneously.	16
Vertical Gain Accuracy	$\pm$ 1%.	700 mV signal causes beam to deflect from -0.3 to 0.7 on internal graticule.	18
Horizontal Gain Accuracy	$\pm$ 1%.	700 mV signal causes beam to deflect 9 div. on internal graticule.	18
Electronic Graticule Accuracy	$\pm$ 1%.	Vertical: Using GBR Format 100% graticule, position top of green box to -0.3 on internal graticule; top of red box should match 0.7 on internal graticule.  <i>NOTE: Use minimum scale intensity possible with best focus. 1% is about a trace width.</i>  Horizontal: Using GBR Format 100% graticule, right side of green box to right side of cyan box should be 9 div. on internal graticule.	18
Display to Graticule Registration	$\pm$ 1/4 box.	Color bar 'black' display dot is centered in target.	18
Electronic Graticule Shape		Use Vector GBR Format 100% graticule. 'X5' should be enabled for better resolution. No visible gaps or tails at corners of target boxes.	18
Vector Display		CH 2 is displayed on Horizontal axis. CH 3 is displayed on Vertical axis.	

Table 1-9  
Lightning Mode (Component Only)

Characteristics	Performance Requirements	Supplemental Information	Perf. Ck. Step No.
Vertical Balance Range	+ 1.5 and -0.5 divisions vertically.	Turn V BAL control fully clockwise. Position display vertically to place lower color bar 'black' display dot on the 0.350 V dashed line of the internal graticule; the upper color bar 'black' dot should be above 0.5 V.  Turn V BAL control fully counter-clockwise. Position upper color bar 'black' dot to 0.350 V; lower color bar 'black' dot should be below 0.3 V.	19
Vertical Gain Accuracy	± 2%.	0.700 V signal should deflect 0.5 V on internal graticule.	19
Electronic Graticule Display		CH 1 is displayed on the Vertical axis. CH 2 is displayed on the top half of the Horizontal axis. CH3 is displayed on the bottom half of the Horizontal axis.	

Table 1-10  
Bowtie Mode (Component Only)

Characteristics	Performance Requirements	Supplemental Information	Perf. Ck. Step No.
Common Mode Rejection Ratio	> 34 dB at 3 MHz.	Apply 400 mV sine wave to CH 1 and CH 2 simultaneously. CH 3 should be terminated with no signal. Right side display should be 400 mV. Left side display should be less than 8 mV.  <i>NOTE: Timing error contributed by WFM 300A at specification limit will be less than 0.6 ns.</i>	17
Electronic Graticule Display		CH 1 minus CH 2 is displayed on the left half of the Vertical axis. CH 1 minus CH 3 is displayed on the right half of the Vertical axis.	



**Table 1-11  
Transcoder**

Characteristics	Performance Requirements	Supplemental Information	Perf. Ck. Step No.
Input Format		Standard: SMPTE Format. Option 10: BetaCam® Format. Option 14: MII Format.	
Accuracy	Designed for better than 1%; checked to 3% to catch obvious errors.	Use Lightning Mode of another WFM 300A to check GBR outputs. Color bar dots should be inside targets.  Alternate Method: Measure GBR output amplitudes with a waveform monitor.  Component generator must have an accuracy of 1% or better.	21
GBR Outputs Impedance		75Ω nominal. Back porch clamped to 0 V.	
Gamut Limit	Factory preset threshold settings are nominally +745 mV and -45 mV within ±5 mV.	Blinking bright-up display on picture monitor. The gamut strobe can be turned ON and OFF via Menu selection.	20

**Table 1-12  
CRT Display**

Characteristics	Performance Requirements	Supplemental Information	Perf. Ck. Step No.
CRT Viewing Area		80 X 100 mm. Horizontal = 12.5 div.	
Accelerating Potential		Nominally 13.75 kV.	
Trace Rotation Range	> ± 1° from horizontal.	Total adjustment range is typically 8°.	1

**Table 1-13  
Power Source**

Characteristics	Performance Requirements	Supplemental Information	Perf. Ck. Step No.
Mains Voltage Range	90 – 250 V.	Continuous range from 90 to 250 Vac	1
Mains Frequency Range		48 Hz to 66 Hz.	
Power Consumption		35 Watts maximum.	

**Table 1-14  
Environmental Characteristics**

Characteristics	Supplemental Information
Temperature Non-Operating	-55°C to +75°C.
Operating	0°C to +50°C.
Altitude Non-Operating	To 50,000 feet.
Operating	To 15,000 feet.
Vibration — Operating	15 minutes each axis at 0.015 inch, frequency varied from 10-55-10 Hz in 1-minute cycles with instrument secured to vibration platform. Ten minutes each axis at any resonant point or at 55 Hz if no resonant point is found.
Shock — Non-Operating	30 g's, 1/2 sine, 11 ms duration, 3 shocks per surface (18 total).
Transportation	Qualified under NTSC Test Procedure 1A, Category II (24-inch drop).
Humidity	Will operate at 95% relative humidity for up to five days. Meets the five-day cycling humidity test as called out in Tektronix standard 062-2847-00.  Do not operate instrument with visible moisture on the circuit boards.

Table 1–15: Certifications and compliances

Category	Standards or description
EC Declaration of Conformity – EMC <sup>1</sup>	<p>Meets intent of Directive 89/336/EEC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Union:</p> <p>EN 50081-1 Emissions:  EN 55022                      Class B Radiated and Conducted Emissions</p> <p>EN 50082-1 Immunity:  IEC 801-2                      Electrostatic Discharge Immunity  IEC 801-3                      RF Electromagnetic Field Immunity  IEC 801-4                      Electrical Fast Transient/Burst Immunity</p> <p><sup>1</sup> High-quality shielded cables must be used to ensure compliance to the above listed standards.</p>
FCC Compliance	Emissions comply with FCC Code of Federal Regulations 47, Part 15, Subpart B, Class A Limits.
Installation (Overvoltage) Category	<p>Terminals on this product may have different installation (overvoltage) category designations. The installation categories are:</p> <p>CAT III    Distribution-level mains (usually permanently connected). Equipment at this level is typically in a fixed industrial location.</p> <p>CAT II    Local-level mains (wall sockets). Equipment at this level includes appliances, portable tools, and similar products. Equipment is usually cord-connected.</p> <p>CAT I    Secondary (signal level) or battery operated circuits of electronic equipment.</p>
Pollution Degree	<p>A measure of the contaminates that could occur in the environment around and within a product. Typically the internal environment inside a product is considered to be the same as the external. Products should be used only in the environment for which they are rated.</p> <p>Pollution Degree 1                      No pollution or only dry, nonconductive pollution occurs. Products in this category are generally encapsulated, hermetically sealed, or located in clean rooms.</p> <p>Pollution Degree 2                      Normally only dry, nonconductive pollution occurs. Occasionally a temporary conductivity that is caused by condensation must be expected. This location is a typical office/home environment. Temporary condensation occurs only when the product is out of service.</p> <p>Pollution Degree 3                      Conductive pollution, or dry, nonconductive pollution that becomes conductive due to condensation. These are sheltered locations where neither temperature nor humidity is controlled. The area is protected from direct sunshine, rain, or direct wind.</p> <p>Pollution Degree 4                      Pollution that generates persistent conductivity through conductive dust, rain, or snow. Typical outdoor locations.</p>
Safety Standards	
U.S. Nationally Recognized Testing Laboratory Listing	<p>UL1244                      Standard for electrical and electronic measuring and test equipment.</p>
Canadian Certification	CAN/CSA C22.2 No. 231                      CSA safety requirements for electrical and electronic measuring and test equipment.

**Table 1-15: Certifications and compliances (cont.)**

Category	Standards or description
European Union Compliance	Low Voltage Directive 73/23/EEC, amended by 93/69/EEC EN 61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use.
Additional Compliance	IEC61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use.
Safety Certification Compliance	
Temperature, operating	+5 to +40° C
Altitude (maximum operating)	2000 meters
Equipment Type	Test and measuring
Safety Class	Class 1 (as defined in IEC 1010-1, Annex H) – grounded product
Overvoltage Category	Overvoltage Category II (as defined in IEC 1010-1, Annex J)
Pollution Degree	Pollution Degree 2 (as defined in IEC 1010-1). Note: Rated for indoor use only.

**Table 1-16  
Physical Characteristics**

Characteristics	Supplemental Information
Dimensions (Overall) Height Width Length	5 1/4 inches (133.4 mm). 8 1/2 inches (215.9 mm). 18 1/8 inches (460.4 mm).
Weight	Approximately 9 lbs (4 kg).

# SECTION 2

## OPERATING INSTRUCTIONS

### INTRODUCTION

This section of the manual is intended to help you become familiar with the WFM 300A Component/Composite Waveform Monitor. The contents include the following:

A description of the front-panel controls and indicators, rear-panel connectors, and graticules.

An Operator's Checkout Procedure.

### FRONT-PANEL CONTROLS & INDICATORS

The following is a brief description of the function or operation of the front-panel controls and indicators. Use the encircled numbers in this text to locate the controls and indicators shown in Fig. 2-1.

The front-panel controls consist of momentary contact push-button switches and variable controls. Indicators consist of LEDs located adjacent to the button or control. When selecting the line and field, the read-out is located in the upper area of the crt screen.

There are five push-button switch functions that are accessed by holding the appropriate button down for approximately one second. These hold functions are: CALIBRATE, BOWTIE, MENU, STORE, and 15 Line. To exit a held mode, push the button again and the selection will revert to the next-in-line position.

- ① **POWER** — The POWER push-button switch toggles the instrument between a powered up state and a standby state. Portions of the power supply circuit board still have mains potential on them. A mechanical indicator in the center of the switch shows the status of the POWER switch.

#### WARNING

*Mains power is still applied to the WFM 300A power supply circuit board, regardless of the POWER switch state. To totally remove the shock hazard it is necessary to unplug the instrument and wait for the capacitors to discharge.*

- ② **V CAL** — The V CAL screwdriver adjustment provides calibration of the vertical display when the V GAIN control is in detent.
- ③ **V GAIN** — The V GAIN variable control provides adjustment of the vertical gain in all modes. Clockwise rotation increases the gain. When the control is in detent (fully clockwise), it provides a calibrated gain which is set by the V CAL adjustment.
- ④ **UNCAL** — The UNCAL LED indicates when the V GAIN or H GAIN control is out of the detent position.

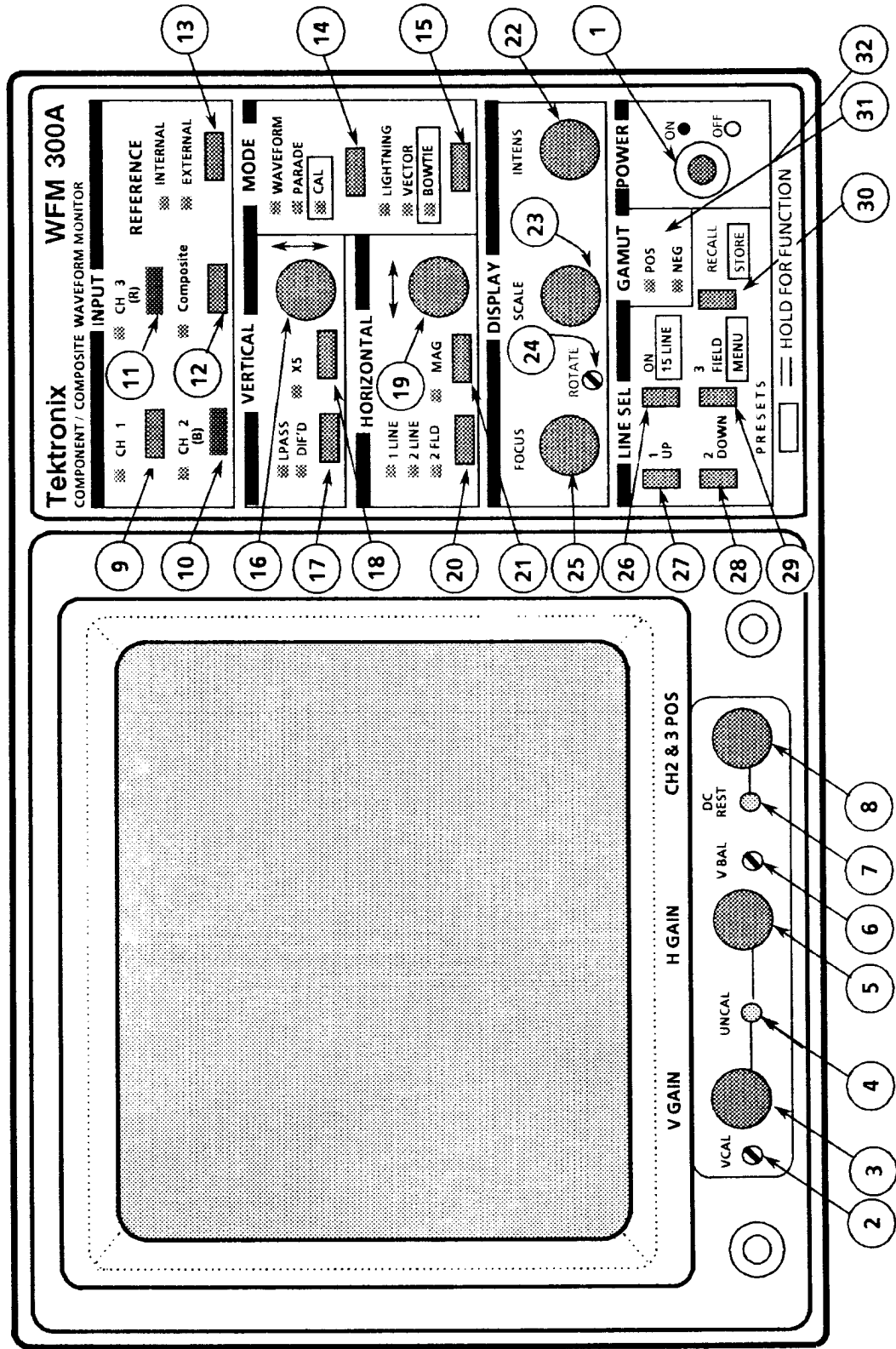


Fig. 2-1. WFM 300A front-panel controls and indicators.

- ⑤ H GAIN — The H GAIN variable control adjusts horizontal gain in the Vector and Lightning modes. Clockwise rotation increases the gain. When the knob is in detent (fully clockwise), it provides an internally set calibrated gain.
- ⑥ V BAL — The V BAL screwdriver adjustment allows the operator to bring the upper and lower halves of the Lightning display together so the center dots are superimposed.
- ⑦ DC REST — An LED that indicates the status of the DC RESTorer. The LED is 'on' when the CH 2&3 POS control is out of the detent position. This condition indicates that the inputs are ac coupled and the display is back-porch clamped. When the CH 2&3 POS control is in the detent position, the DC RESTorer LED turns off, the dc restorer is disabled, and the inputs are dc coupled if the internal jumper is set to DC (factory position). If the jumper is set to AC, the inputs will then be ac coupled in all modes. DC restoration is automatic in the Lightning and Vector modes.
- ⑧ CH 2&3 POS (Component Only) — The CH 2 & 3 POS variable control moves the CH 2 and CH 3 displays vertically. During component operation, the detent position disables the DC RESTorer function. When the Ch 2&3 POS control is out of the detent position, the DC RESTorer LED is on, the inputs are ac coupled, and the display is back-porch clamped. When the CH 2&3 POS control is in the detent position and the internal jumper is set to DC (factory position), the DC RESTorer LED turns off, the dc restorer is disabled, and the inputs are dc coupled. If the jumper is set to AC, the inputs are ac coupled in all modes.

#### INPUT Push Buttons

##### NOTE

*CH 1, CH 2, and CH 3 INPUT buttons allow any combination of channels to be selected in either the Waveform or Parade mode. In the Lightning, Vector, and*

*Bowtie modes, the input signals remain connected to the input channels and cannot be turned off using the INPUT buttons.*

- ⑨ CH 1 (Component Only) — The Channel 1 push button is used to select the CH 1 input signal, which is indicated by the LED. In Lightning or Vector mode, pushing and holding CH 1 selects the electronic 100% Graticule. This is not stored in memory; when instrument power is turned off, the graticule reverts to the last selection made through the Graticule Menu.
- ⑩ CH 2 (B) (Component Only) — The Channel 2 push button is used to select the CH 2 input signal, which is indicated by the LED. In Lightning or Vector mode, pushing and holding CH 2 selects the electronic 75% Graticule. This is not stored in memory; when instrument power is turned off, the graticule reverts to the last selection made through the Graticule Menu.
- ⑪ CH 3 (R) (Component Only) — An On/Off push button that selects the CH 3 input signal. An LED indicates when this signal is selected. In Lightning or Vector mode, pushing and holding CH 3 turns off the electronic Graticule. This is not stored in memory; when instrument power is turned off, the graticule reverts to the last selection made through the Graticule Menu.
- ⑫ COMPOSITE — The Composite push button toggles between Composite and Component Input. Composite mode is indicated by the illumination of the LED. Composite is always back-porch restored.
- ⑬ REFERENCE — This push button toggles between internal and external reference signal. LEDs indicate which reference signal is selected. Internal reference is CH 1.

### MODE Push Buttons

#### NOTE

*Since these buttons have a long name, they are usually referred to as the 'MODE buttons' in this manual.*

- ⑭ WAVEFORM/PARADE/CAL — This push button toggles between Waveform and Parade modes. Calibrate mode is selected by holding the button in for about one second. LEDs are present for all modes. (Parade and Cal modes are valid only for component operation.)
- ⑮ LIGHTNING/VECTOR/BOWTIE — This push button toggles to select Lightning and Vector modes. Bowtie mode is selected by holding the button in for about one second. LEDs are present for all modes. (Lightning, Vector and Bowtie modes are valid only for component operation.)

### VERTICAL Push Buttons and Control

- ⑯ Vertical Position — This three-turn variable control is used to vertically position the display in all operating modes. Clockwise rotation moves the display up.
- ⑰ LPASS/DIF'D — This three-way toggle push button is used to select differentiated step filter, luminance filter, or flat. LEDs light when in diff'd step or luminance filter modes. Low-pass and Diff'd step filters are available only when operating in the Waveform or Parade modes. The filter is automatically switched to flat when operating in the other modes.
- ⑱ X5 — The X5 push button is used to select five times gain in the vertical amplifier output stage. An LED lights when X5 is selected. When X5 gain is not selected, the instrument returns to calibrated full-scale vertical gain.

### HORIZONTAL Push Buttons and Control

- ⑲ Horizontal Position — This three-turn variable control is used to horizontally position the display in the Parade or Bowtie mode. Clockwise rotation moves the display to the right. This control has a reduced effect in the Vector or Lightning mode.
- ⑳ 1 LINE/2 LINE/2 FIELD Sweep — This push button is used to select 1 LINE, 2 LINE or 2 FLD (FIELD) horizontal sweep. LEDs indicate which sweep is selected. 2 FLD sweep starts with Field 1. **NOTE:** *The Sweep and MAG buttons are disabled when operating in the Lightning or Vector mode.*
- ㉑ MAG — The MAG push button is used to select the horizontal magnifier, indicated by an LED. When Magnifier is on, 1 LINE sweep equals 0.2  $\mu\text{s}/\text{div}$ ; 2 LINE sweep equals 0.1  $\mu\text{s}/\text{div}$ ; 2 FLD sweep is magnified 20 times.

### DISPLAY Controls and Adjustment

- ㉒ INTENS — The INTENS variable control is used to adjust the crt beam brightness. Clockwise rotation increases brightness.
- ㉓ SCALE — The SCALE variable control is used to adjust internal graticule illumination or electronic graticule intensity, depending on the graticule selected. Clockwise rotation increases illumination or intensity.
- ㉔ ROTATE (Trace Rotation) — This screwdriver adjustment is used to align the display with the horizontal graticule lines.
- ㉕ FOCUS — The FOCUS variable control is used to adjust the crt beam for optimum definition.



**LINE SEL Push Buttons****NOTE**

*These buttons are operational in the Waveform and Vector modes only. In the Waveform mode with the LINE SEL ON button set to ON, there is a crt readout in the upper area of the screen when using the 1 LINE and 2 LINE sweeps. No readout occurs when using the 2 FLD sweep; instead, there is a bright-up of the selected lines in both fields of the two-field display. In the Vector mode the SWEEP buttons are disabled and there is a crt readout when the LINE SEL ON button is set to ON.*

- ②⑥ ON/15 LINE — This push button is used to enable the Line Select mode. Crt readout indicates when Line Select is enabled. Fifteen-line mode is selected when the ON button is held in for about one second.
- ②⑦ 1/UP — This push button has three functions:
- (1) While the instrument is in Line Select mode, pushing the 1/UP button increases the selected line number. (Crt readout identifies the selected line.)
  - (2) During Menu operation, it is used to move the menu selection cursor up.
  - (3) In Store/Recall operation, it is used to store or recall front-panel setups at memory location #1.
- ②⑧ 2/DOWN — This push button has three functions:
- (1) While the instrument is in Line Select mode, pushing the 2/DOWN button increases the selected line number. (Crt readout identifies the selected line.)
  - (2) During Menu operation, it is used to move the menu selection cursor down.
  - (3) In Store/Recall operation, it is used to store or recall front-panel setups at memory location #2.

- ②⑨ 3/FIELD/MENU — This push button has three functions:

- (1) While the instrument is in Line Select mode, pushing the 2/FIELD/MENU button selects Field 1, Field 2, or Both Fields. (Crt readout identifies the selected field. When Both Fields are selected, the readout indicates 'BOTH' and the selected line number will be for Field 1 only.)
- (2) In Store/Recall operation, it is used to store or recall front-panel setups at memory location #3.
- (3) Menu operation is accessed by pushing and holding the button. The 1/UP and 2/DOWN buttons are then used to move the menu cursor. Items that may be selected through the menu are:

FORMAT, GRATICULE (75%, 100%, OFF), GAMUT STROBE (ON/OFF), FRAME RATE (50 HZ, 60 HZ).

- ③⑩ RECALL/STORE — This push button places the instrument in recall mode. All front-panel LEDs will flash. The 1/UP, 2/DOWN, or 3/FIELD button is then used to select which setup is recalled. Once RECALL is pushed, and the LEDs are flashing, pushing any front-panel button other than 1/UP, 2/DOWN, or 3/FIELD will cancel the recall command.

**GAMUT Indicator Lights**

- ③① POS — This LED lights when the GBR signal exceeds the positive legal limit.
- ③② NEG — This LED lights when the GBR signal goes below the negative legal limit.

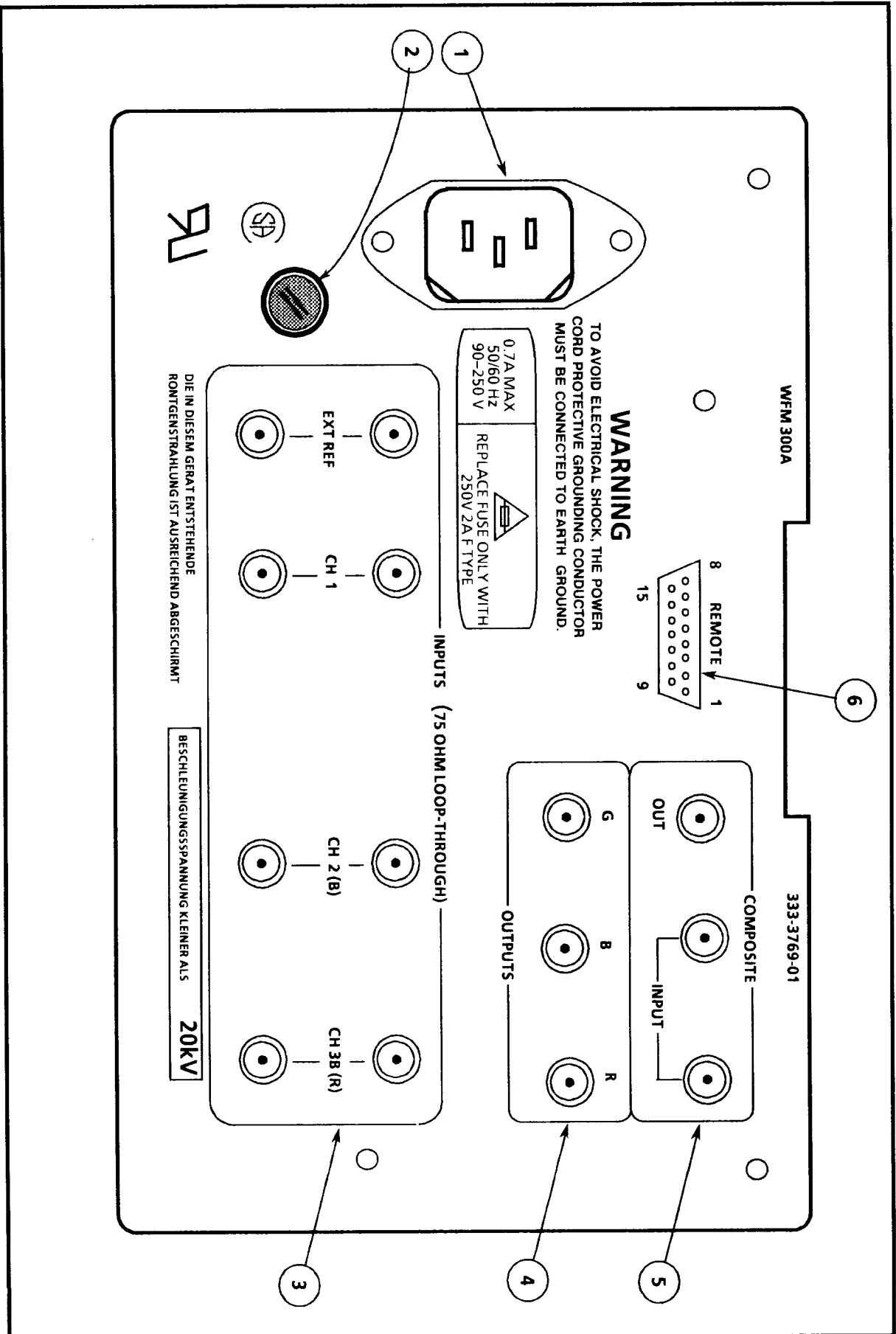


Fig. 2-2. Rear-panel connectors and fuse.

## REAR-PANEL CONNECTORS, FUSE, & LINE VOLTAGE SELECTOR SETTING (See Fig. 2-2)

- ① Line Voltage Input — A standard ac plug receptacle for 120V or 240Vac power mains. Plug is compatible with any of the three power cord options available for the WFM 300A.
- ② Fuse Holder — This is the holder for the instrument's mains fuse. Fuse type is 3AG, 2 A, 250 V, Fast Blow.
- ③ EXT REF and CH 1, CH 2, and CH 3 INPUTS
 

EXT REF — This high impedance loop-through is compensated for 75 $\Omega$  impedance but is not internally terminated. EXT REF input is ac-coupled.

CH 1, CH 2, AND CH 3 (Component Only) — These three high impedance loop-through video inputs are compensated for 75 $\Omega$ , but are not internally terminated. They are ac-coupled when the DC RESTorer LED is on. They are dc-coupled when the DC RESTorer is disabled and the internal jumper is set to the factory preset position (DC).
- ④ G, B, R PIX MON OUTPUTS — These three 75 $\Omega$  outputs are used to drive a picture monitor. Invalid signals cause a blinking bright-up display on the monitor. The strobe can be turned on and off via WFM 300A menu selection.
- ⑤ COMPOSITE IN/OUT — The COMPOSITE high impedance loop-through video input is compensated for 75 $\Omega$ , but is not internally terminated. This input is always DC RESTored.
- ⑥ REMOTE — Remote control functions are activated by polled ground closure. The REMOTE connector is a 15-pin D-type sub-miniature connector, providing the following remote control functions:
  - (1) Selects any one of three front-panel setups stored by the operator. (These setups can be changed and stored by the operator via the front panel.)
  - (2) Selects either of two front-panel factory-preset setups. (These setups are permanently stored in an EPROM and cannot be changed.)

### NOTE

*When connecting the picture monitor to the WFM 300A PIX MON OUTPUTS, also connect external sync to the picture monitor. Operate the picture monitor in the external sync mode.*

## OPERATOR'S CHECKOUT PROCEDURE

The following procedure is provided as an aid in obtaining a display on the WFM 300A Component / Composite Waveform Monitor. This procedure may be used for operator familiarization and as a check of basic instrument operation. Only the instrument functions, not measurement quantities or specifications, are checked in this procedure. Therefore, a minimum amount of test equipment is required.



*BE SURE THAT THE CABINET IS INSTALLED ON THE INSTRUMENT TO AVOID PERSONAL INJURY.*

All checks are made with the cabinet installed and all the internal jumpers set to their factory position. (The cabinet, an optional accessory, must be installed on the instrument to avoid personal injury. Maintain proper environment for the instrument, keep the dust out, and provide proper EMI shielding.)

Unless otherwise noted, the waveforms shown in this procedure are representations of actual displays on the WFM 300A.

If performing the Operator's Checkout Procedure reveals improper operation or instrument malfunction, first check the operation of the associated equipment. If the associated equipment is operating normally but the WFM 300A is not, then refer the instrument to qualified service personnel for repair or adjustment.

When a complete check of the instrument performance to specification is desired, refer qualified service personnel to the Performance Check procedure provided in Section 5 of this manual.

The Operator's Checkout Procedure requires a source of component video and composite sync signals. The TEKTRONIX TSG-300 Component Test Signal Generator and the 1410-Series Television Test Signal Generator were used in preparing this procedure. The TEKTRONIX 650HR-1 Color Picture Monitor was added later when performing steps 17 and 18.

### 1. Initial Equipment Setup

#### Equipment Connections

Connect the Component Generator Ch 1 (Y), Ch 2 (B-Y), and Ch 3 (R-Y) Outputs to the corresponding CH 1, CH 2, and CH 3 INPUTs on the WFM 300A. Terminate the WFM 300A CH 1, 2, and 3 INPUTs into 75Ω.

Connect the Composite Color Bar signal from the Television Test Signal Generator to the WFM 300A COMPOSITE INPUT. See Fig. 2-3.

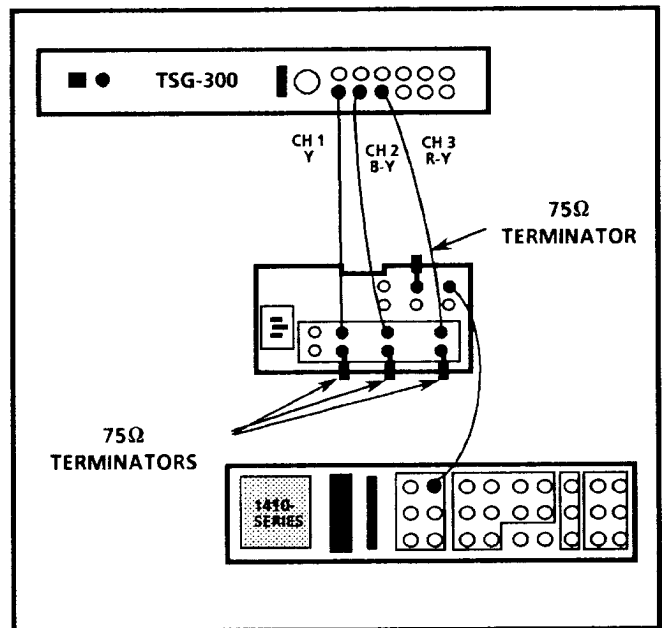


Fig. 2-3. Initial equipment setup.

No connections are made to the WFM 300A EXT REF Input and the REMOTE connector at this time.

Connect both instruments to a suitable ac power source and set the POWER switches to ON.

**Test Signal Generator**

Set for 100% Composite Color Bar signal.

**Component Test Signal Generator**

Set for 100% Color Bars in the SMPTE Parallel Format.

**WFM 300A**

Set the WFM 300A controls as shown in Table 2-1.

**Table 2-1**  
Initial Settings for Operator's Checkout Procedure

Front Panel Control	Setting
POWER	ON
V GAIN, H GAIN	Detent
CH 2&3 POS	Detent
INPUT	
CH 1	On
CH 2	Off
CH 3	Off
COMPOSITE	Off
MODE	WAVEFORM
FORMAT MENU	GBR not selected
REFERENCE	INTERNAL
VERTICAL	
FILTER	Off
GAIN	Off (X1)
Position	Midrange
HORIZONTAL	
SWEEP	2 LINE
MAG	Off (X1)
Position	Midrange
LINE SEL ON	Off
Line Rate	As desired

2. Obtaining a Display on the WFM 300A

- a. Adjust the INTENS and FOCUS controls so the CH 1 waveform display is the desired brightness and focus.
- b. Adjust the SCALE control to illuminate the internally-scribed graticule.

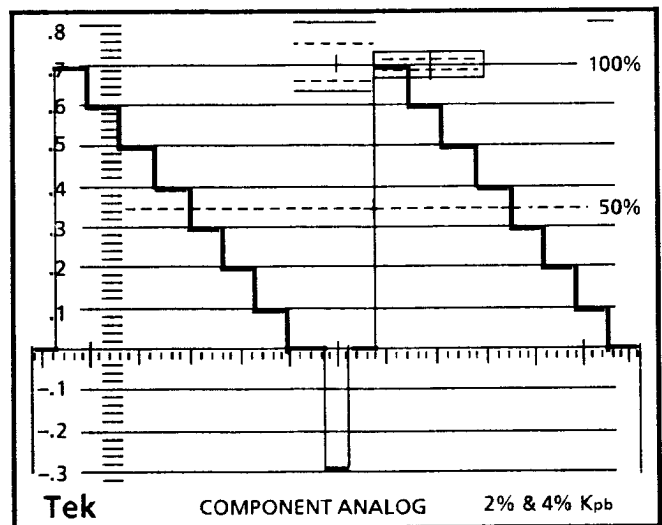
- c. Use the VERTICAL and HORIZONTAL Position controls to position the waveform blanking level to the zero or base line and center the display horizontally. The display should appear similar to that shown in Fig. 2-4.
- d. Select COMPOSITE INPUT. Check for a Two Line Color Bar display. Select CH 1 INPUT (COMPOSITE INPUT Off).

**NOTE**

*Do not adjust any of the WFM 300A screwdriver controls until after the instrument warms up (approximately 20 minutes).*

3. Check Rotation of Display

- a. Variations in the earth's magnetic field may make adjustment of the TRACE ROTATION control necessary at the time the instrument is installed or whenever the instrument is moved to a position that causes the waveform blanking level or sweep trace not to be parallel with the graticule base line.
- b. If necessary, adjust the TRACE ROTATION screwdriver adjustment so the blanking level is parallel with the graticule base line. (Alternately, turn off all INPUTs and align trace to graticule base line.)



**Fig. 2-4. CH 1 Y (Luminance) Component. Mode: WAVEFORM; Sweep: 2 LINE.**

## WFM 300A — OPERATING INSTRUCTIONS

### 4. Using the Calibrate Mode

- a. Set the WAVEFORM/PARADE/CAL button to CAL. This is accomplished by holding the button in until the CAL mode LED turns on.

#### NOTE

*Either the 1 LINE or 2 LINE positions can be used when operating the instrument in the CAL mode. The 2 FLD position is disabled.*

- b. Check that CH 1, 2 and 3 are Off.
- c. Rotate the VERTICAL Position control so the bottom of the calibrator signal is positioned to the graticule base line as shown in Fig. 2-5. Check that the amplitude of the signal is 700 mV. If necessary, adjust the V CAL screwdriver adjustment so the calibrator waveform display is 700 mV in amplitude.

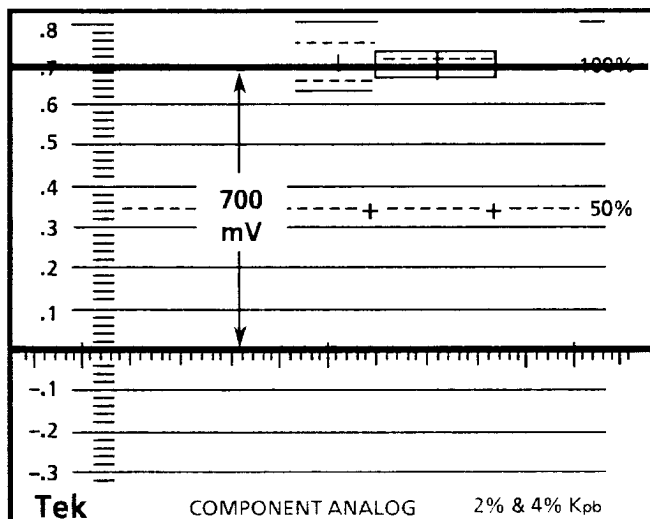


Fig. 2-5. Calibrator signal.

- d. Select CH 1 INPUT.
- e. Check that the CH 1 display is offset 700 mV by the Calibrator signal (see Fig. 2-6). The white bar should be 700 mV in amplitude if the generator output signal is the correct amplitude. (The top of the white

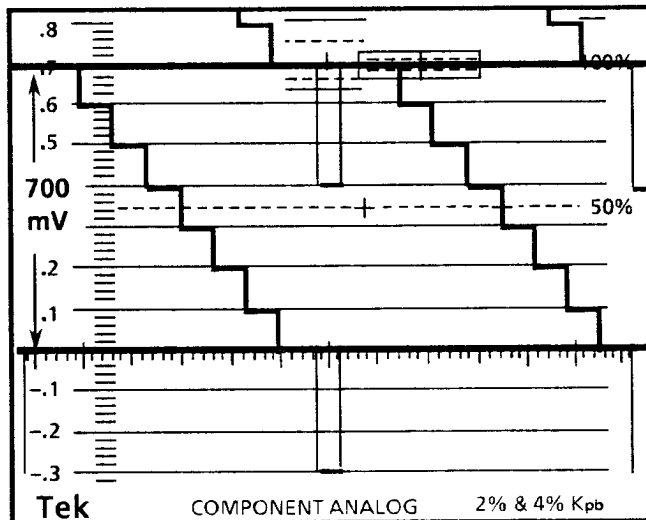


Fig. 2-6. Calibrator added to input signal.

bar for the lower waveform should match the blanking level of the upper waveform.)

### 5. Selecting the Timing Reference

- a. Select the Waveform mode. Check that CH 1 is On.
- b. Set the SWEEP button to the 2 LINE position.
- c. Vertically position the waveform blanking level to the base line.
- d. Set the REFERENCE button to EXTERNAL. With the button set to EXT and no external reference signal applied to the instrument, the sweep will be free running (not synchronized).
- e. Connect a coaxial cable from the TSG-300 Ext Sync Output connector to the WFM 300A EXT REF connector. Terminate the EXT REF loop-through connector into 75Ω.
- f. Check that the WFM 300A sweep locks to the external reference signal.

- g. Return the WFM 300A REFERENCE button to the Int position. Use the Int position for the rest of the procedure.

6. Waveform Mode Signal Selection

- a. Check that the SWEEP button is set to the 2 LINE position.
- b. Check that the Waveform mode is selected. In this mode of operation, the CH 1, CH 2, and CH 3 INPUT buttons are used to select the components of the video signal.
- c. Check that the CH 1 INPUT button is set to On; check that the CH 2 and 3 buttons are set to Off.
- d. The Y (Luminance) component should be displayed as shown previously in Fig. 2-4.
- e. Set CH 2 INPUT button to On; set CH 1 button to Off.
- f. The B-Y (Blue) signal (see Fig. 2-7) should be displayed.
- g. Set CH 3 INPUT button to On; set CH 2 button to Off.

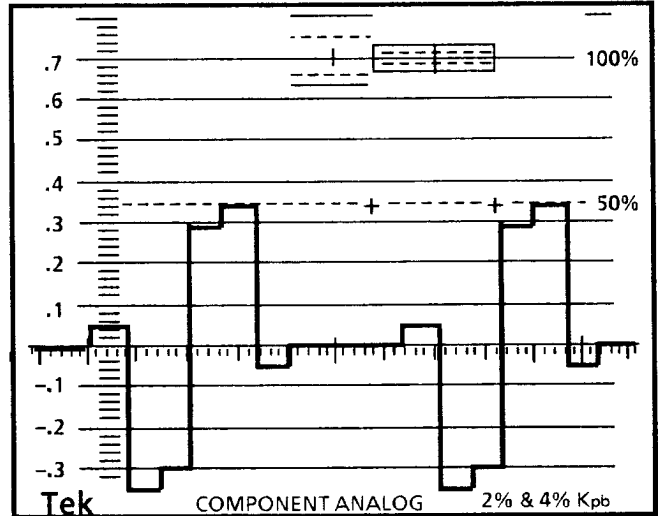


Fig. 2-8. CH 3 R-Y (Red) component.

- h. The R-Y (Red) signal (see Fig. 2-8) should be displayed.
- i. Set CH 1 and CH 2 INPUT buttons to On. Check that the CH 3 button is On.
- j. CH 1, 2, and 3 component waveforms should be overlaid as shown in Fig. 2-9.

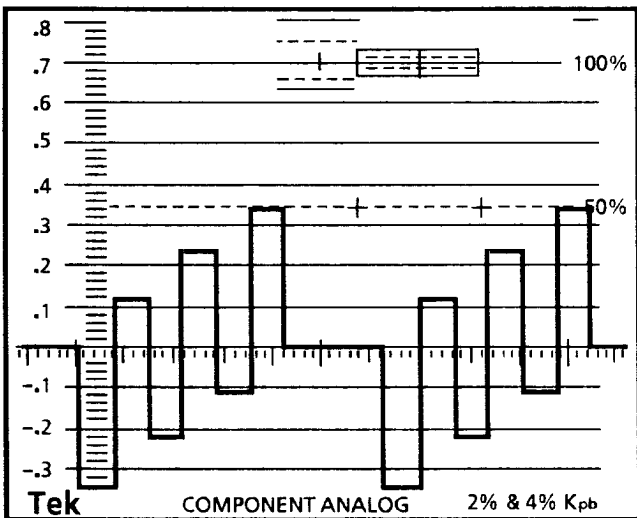


Fig. 2-7. CH 2 B-Y (Blue) component.

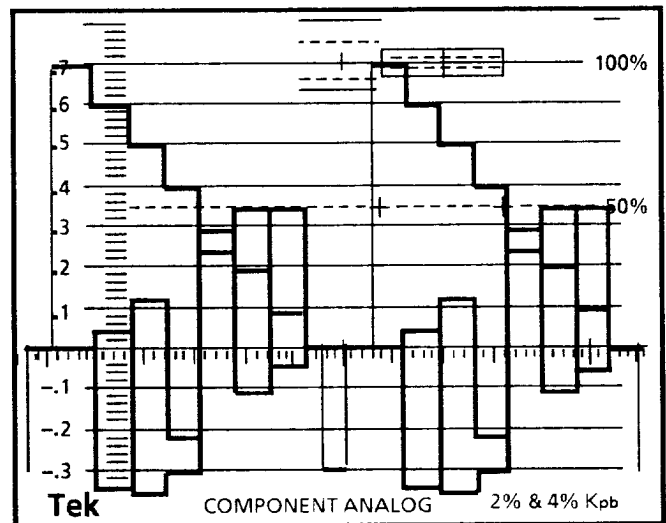


Fig. 2-9. CH 1, 2, and 3 components overlaid.

## WFM 300A — OPERATING INSTRUCTIONS

### 7. Parade Mode

- a. Select the Parade mode. Check that the PARADE LED is illuminated.

#### NOTE

*In Parade mode, the SWEEP automatically goes to the 1 LINE position and all three INPUT switches turn On.*

- b. Check that the CH 1, 2, and 3 component waveforms are displayed side by side as shown in Fig. 2-10.

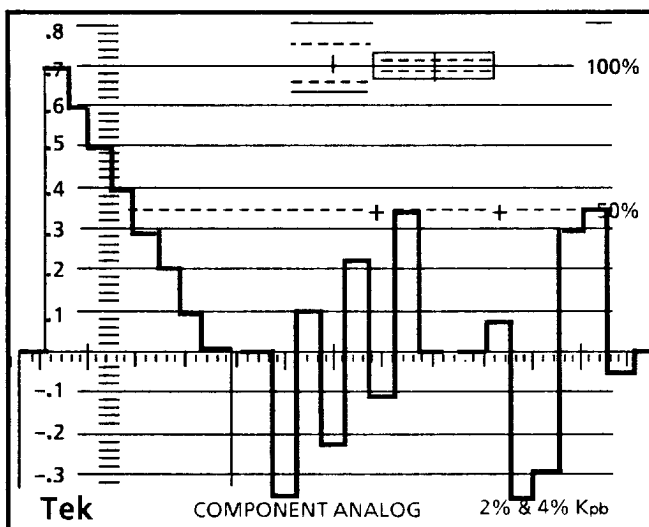


Fig. 2-10. Parade display.

- c. Leave the WFM 300A operating in the Parade mode.

### 8. Channel 2 & 3 Positioning

- a. Rotate the WFM 300A CH 2&3 POS control counterclockwise out of its detent position.
- b. Note that the CH 2&3 POS control can be used to move the CH 2 and 3 waveforms up and down to compare them to the CH 1 waveform. This control is also operational in the Waveform mode so that any combination of the three signals can be overlaid and compared.

- c. Turn the CH 2&3 POS control to its detent position.

### 9. Check Differential Mode and Vertical Magnification

- a. Set the generator controls to provide an unmodulated 5-step linearity staircase signal.

- b. Set the WFM 300A controls as follows:

MODE	WAVEFORM
CH 1	On
CH 2 & 3	Off
COMPOSITE	Off
SWEEP	1 LINE
FILTER	DIF'D

- c. Check that a group of five pulses (spikes) appear as a result of the differentiation of the staircase transitions. See Fig. 2-11.

- d. Press the VERTICAL X5 GAIN button to magnify the display vertically.

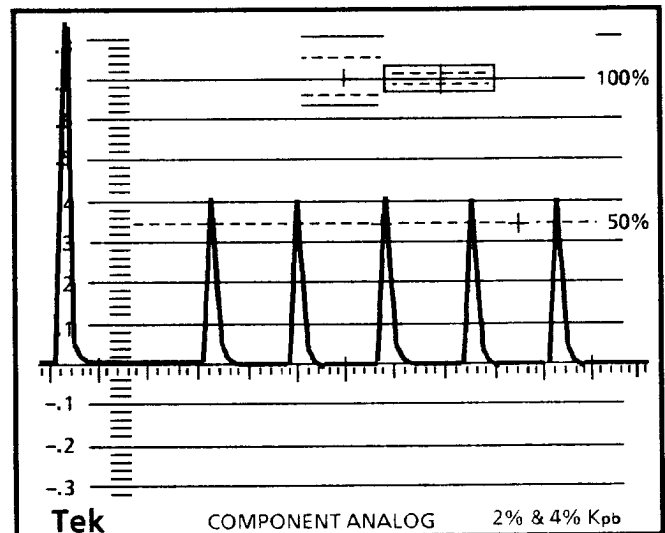


Fig. 2-11. 1 Line Sweep Mode with X5 Gain Off.



- e. Use the VERTICAL Position control to position the top of the spikes into view as shown in Fig. 2-12. Line time luminance nonlinearity is a measurement in which the relative amplitudes of the five differentiated step risers (spikes) are compared. The differentiation of the risers provides a sensitive measurement of nonlinear distortions affecting the luminance signal. This distortion is defined as follows:

$$1 - \frac{m}{M}$$

where m equals the amplitude of the lowest spike and M equals the amplitude of the highest spike.

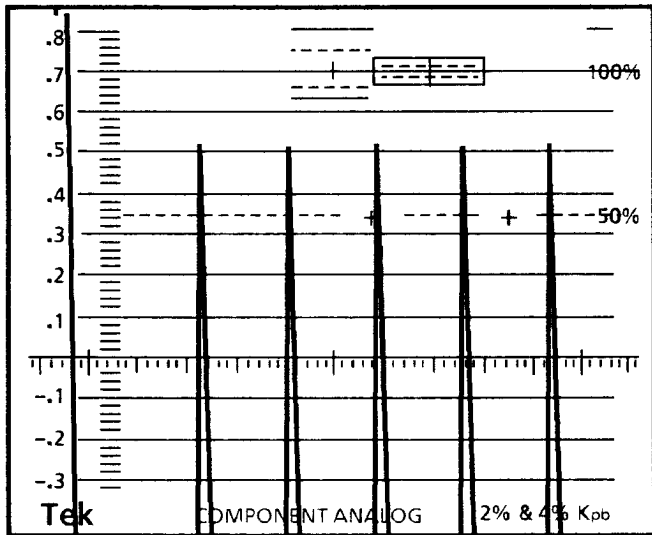


Fig. 2-12. 1 Line Sweep Mode with X5 Gain On.

**NOTE**

*This same check can be performed for CH 2 and 3.*

- 10. Checking the 2 Field Horizontal Sweep and Magnification
  - a. Leave the generator set for an unmodulated 5-step staircase signal.
  - b. Check that CH 1 only is On and the WAVEFORM mode is selected.
  - c. Set the WFM 300A controls as follows:

FILTER	Off
VERTICAL X5 GAIN	Off
SWEEP	2 FLD

- d. Vertically position the waveform blanking level to the base line.
- e. Use the HORIZONTAL Position control to position the center of the vertical blanking interval to the center major division on the graticule base line. See Fig. 2-13.

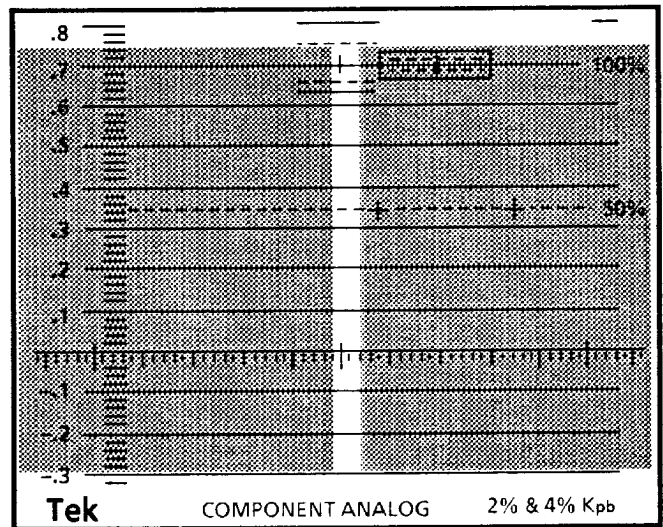


Fig. 2-13. 2 Field Sweep Mode with Mag Off.

- f. Press the HORIZONTAL MAG button to illuminate the MAG LED and magnify the display horizontally.
- g. Check that the vertical blanking interval is magnified as shown in Fig. 2-14.
- h. Press the MAG button to return to the unmagnified (MAG Off) position.

11. Line Selection

- a. Leave the generator controls set for producing an unmodulated 5-step staircase signal.
- b. Set the WFM 300A controls as follows:

SWEEP	1 LINE
LINE SEL ON	On

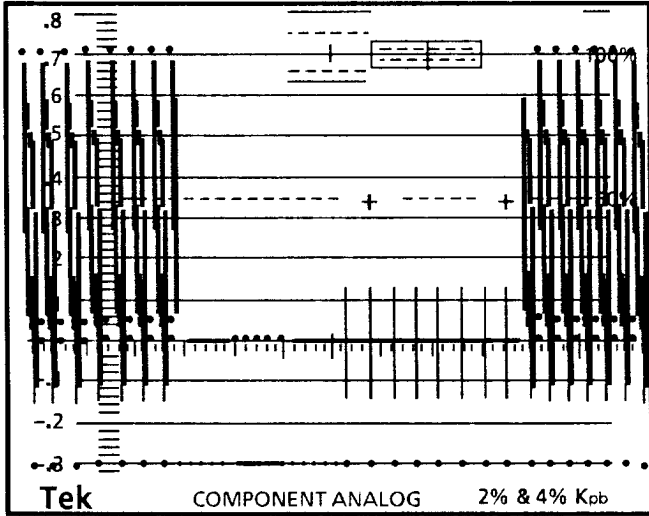


Fig. 2-14. 2 Field Sweep Mode with Mag On.

**NOTE**

*The waveform display will be dim because only one line out of every other field is displayed.*

- c. Adjust the SCALE and INTENS controls to suitable brightness for the readout and one-line waveform display. Center the waveform display horizontally using the HORIZONTAL Position control.
- d. Check that the readout for the line number and field appears in the upper area of the WFM 300A screen (see Fig. 2-15).

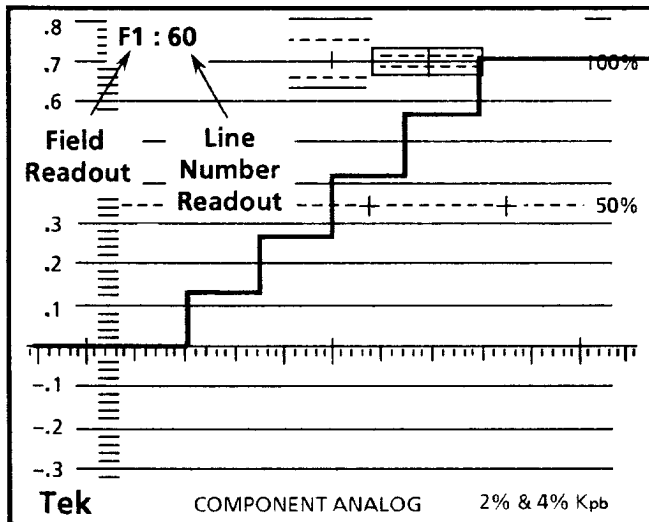


Fig. 2-15. Field and line readout.

- e. Press the FIELD button, if necessary, to obtain an 'F1' readout on the screen. F1 signifies that Field 1 has been selected.
- f. Press the UP button. Note that the line number increases while the button is held in.
- g. Release the UP button and press the DOWN button. Note that the line number decreases as the button is held in. Release the DOWN button.
- h. Use the UP/DOWN buttons to obtain a line readout of 60.
- i. Press the FIELD button to select Field 2; that is, the readout will be 'F2' on the screen. Leave the selection at Field 2.
- j. Check that the line readout is 323. Using this Field 2 line number as an example, the number can be verified by adding 263 to 60. Thus, when the line number for Field 1 is known, it is easy to determine what the line number for Field 2 should be.
- k. Press the FIELD button again to obtain a readout that indicates 'BOTH: 60'. This readout indicates that Line 60 in Field 1 and Line 323 in Field 2 are overlaid. (In this mode of operation, the line number readout will be for Field 1 even though Line 323 in Field 2 is also being displayed.)
- l. Press the SWEEP button to select the 2 LINE position. Line selection operates the same as described in parts d through k in this step.
- m. Push the SWEEP button to select the 2 FLD position.
- n. Check for a bright-up of the selected line in each field of the two-field display. (No readout occurs in the 2 FLD SWEEP position.) Use the UP and DOWN buttons to move the bright-up line to the right and to the left.

12. 15-Line Mode

- a. Continuing from the previous step, press the SWEEP button to select the 1 LINE position.
- b. Depress the LINE SEL ON button for about one second to display the 15-Line mode.
- c. Check for a one-line sweep display and a readout of '15L' located just to the right of the field and line number readout. The 15L indicates that the 15-Line mode has been selected.
- d. Press the SWEEP button to select the 2 FLD position.
- e. Check that a bright-up display of 15 consecutive lines, starting with the selected line appears in each field. The UP and DOWN buttons will move the brightened 15 lines to the right and left when pressed. There is no readout during this mode of operation.
- f. Press the LINE SEL ON button to turn off the 15-Line and Line Selection modes.
- g. Leave the WFM 300A control settings as they are.

**NOTE**

*The remaining steps demonstrate Gamut operation and the following modes: Lightning, Vector, Bowtie, and GBR Format.*

13. Check Lightning Mode and Vertical Balance

- a. Set the generator controls to generate 100% color bars in the SMPTE Parallel Format.

**NOTE**

*If 75% color bars are displayed, select the 75% Graticule by pressing and holding the CH 2 button. This procedure assumes that 100% color bars are displayed.*

- b. Select the Lightning mode. Note that the SWEEP and HORIZONTAL MAG buttons are disabled.

**NOTE**

*It is normal for the DC REST LED to turn on for the Lightning and Vector modes of operation. The LED indicates that the inputs are ac coupled and the signals are back-porch clamped.*

- c. At this point in the procedure, check that the WFM 300A controls are as shown in Table 2-2.

**Table 2-2  
Lightning Display Settings**

Front Panel Control	Setting
POWER	ON
V GAIN, H GAIN	Detent
CH 2&3 POS	Detent
GRATICULE	100% (CH1 or Menu)
MODE	LIGHTNING
FORMAT MENU	GBR not selected
REFERENCE	INTERNAL
VERTICAL FILTER GAIN Position	Off Off (X1) Midrange
HORIZONTAL SWEEP MAG Position	Disabled Off (X1) Midrange
DISPLAY Focus Trace Rotation Scale  INTENS	Trace in focus As is Suitable brightness for electronic graticule. Suitable intensity for electronic graticule.
LINE SEL ON	Off

- d. Check that a lightning display is obtained and the dots are located within the Lightning graticule targets. Check that display appears similar to the one shown in Fig. 2-16.

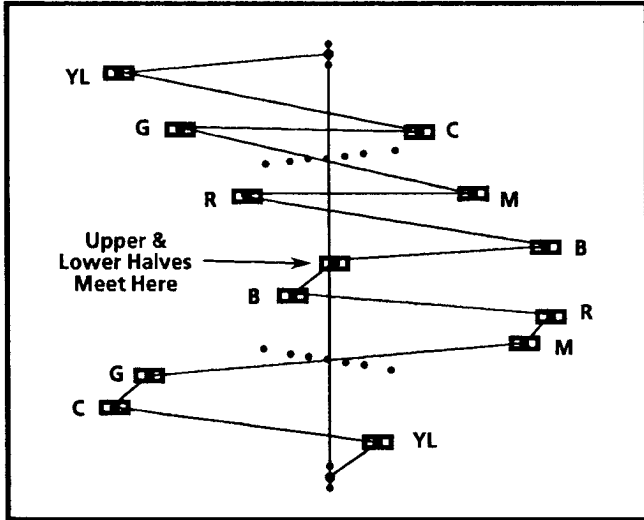


Fig. 2-16. Lightning display.

- e. Check that the two halves of the display meet at the center of the display. If necessary, adjust the front-panel V BAL control so the two halves meet as shown in Fig. 2-16. For better resolution, press the VERTICAL GAIN button to magnify the display vertically and recheck that the center dots are superimposed. Readjust the V BAL control, if necessary, to superimpose the center dots.
- f. Press the VERTICAL GAIN button to return to the Normal (X1) operation.

14. Check Gamut Operation

- a. Continuing from the previous step, check that the color bars are displayed in the Lightning mode.
- b. Check that the POS and NEG GAMUT LEDs are Off. The turned-off LEDs indicate that the signal is not exceeding the legal limit of +745 mV (within a tolerance of  $\pm 5$  mV) and/or -45 mV (within a tolerance of  $\pm 5$  mV). If one or both of the GAMUT LEDs are on, then turn up the intensity to see if part of the signal is extending outside of an imaginary boundary that is formed by the Lightning mode graticule targets. When a legal signal is applied to the instrument, the GAMUT LEDs will be extinguished.

NOTE

The gamut strobe can be turned off via the GAMUT STROBE menu. The GAMUT LEDs can not be disabled.

15. Vector Mode

- a. Select the Vector mode. Check that the VECTOR LED is on. Check that the 100% Graticule is selected.

NOTE

In the Vector mode, CH1 button selects the 100% Graticule, CH2 button selects the 75% Graticule, and CH3 button is used to turn off the graticule. These selections can also be made via the MENU.

- b. Check that a vector display is obtained. A typical display is shown in Fig. 2-17.

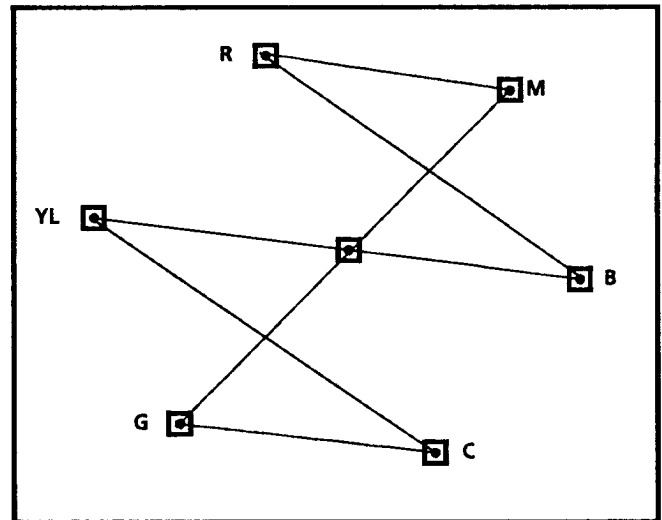


Fig. 2-17. Vector display.

16. Bowtie Mode

- a. Set the generator controls to produce a Bowtie signal.
- b. Press in and hold down the LIGHTNING/VECTOR/BOWTIE button for about one second to illuminate the BOWTIE LED.

- c. Note that CH 1, CH 2, and CH 3 are turned on automatically for this mode of operation. Also, note that the 2 LINE SWEEP is automatically selected.
- d. Check that two bowties are displayed on the crt as shown in Fig. 2-18. The left bowtie shows Channel 1 versus Channel 2 timing (Y versus B-Y), the right bowtie shows Channel 1 versus Channel 3 (Y versus R-Y). If the timing between channels is matched, the center of the bowties will be centered as shown in Fig. 2-18 and not skewed (off center). If Channel 2, for example, is delayed with respect to Channel 1, the skew moves to the right. If Channel 2 is advanced with respect to Channel 1, the skew moves to the left. The timing marks below the bowties are used to measure color difference signal timing delay. The markers are spaced 20 ns apart.

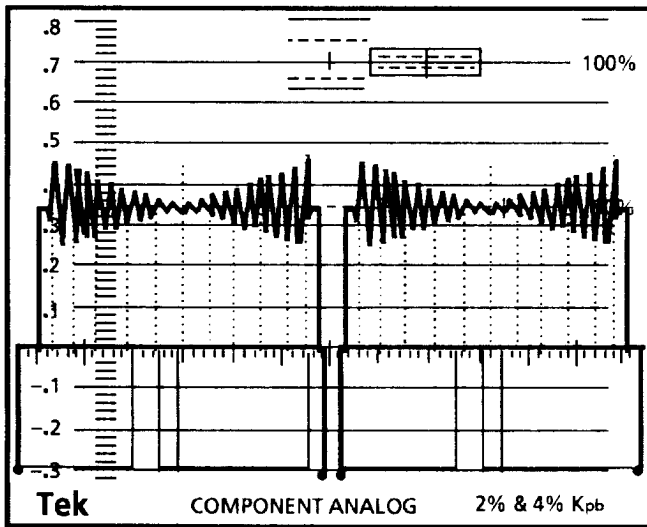


Fig. 2-18. Bowtie display.

**NOTE**

*Adjusting the front-panel V CAL control affects Bowtie common-mode rejection, but not timing.*

17. Check GBR Format

- a. If a TEKTRONIX 650HR-1 Color Picture Monitor, or a similar monitor capable of accepting GBR signals and external sync, is available, connect the GBR OUTPUT sig-

nals from the WFM 300A to the corresponding GBR Non-Encoded Input connectors on the color picture monitor. Terminate the picture monitor GBR loop-through connectors into 75Ω if they are not already terminated. Disconnect the termination from the WFM 300A EXT REF connector; connect this termination to the picture monitor Ext Sync Input connector. Move the coaxial cable from the WFM 300A EXT REF connector to the picture monitor Ext Sync Input connector. Fig. 2-19 shows the equipment connections.

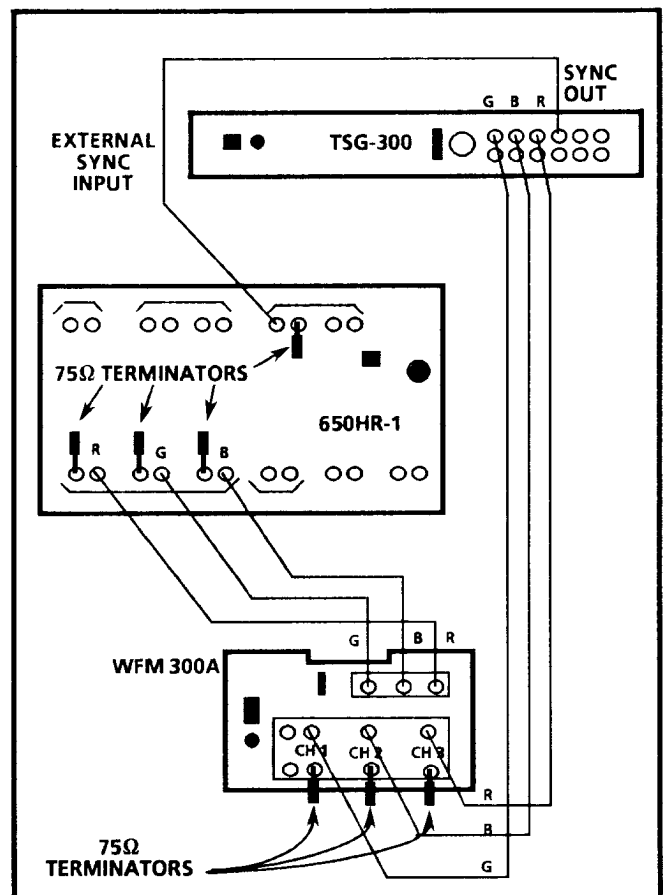


Fig. 2-19. Equipment setup for checking GBR format.

**NOTE**

*When using a picture monitor with the WFM 300A, it is always good practice to externally sync the picture monitor. Use internal sync for the WFM 300A.*

- b. Set the generator controls to produce a GBR Format 100% Amplitude Color Bar component signal.
- c. Use the Format Menu to select GBR Format. The instrument will be operating in the GBR Format mode with the internal Color Difference to GBR Transcoder bypassed. The bypassed transcoder allows the incoming GBR signals to go directly to the GBR PIX MON OUTPUT connectors for properly driving the color picture monitor.
- d. Set the picture monitor controls to display the color bar signal. Check that the picture monitor Sync switch is set to Ext.
- e. Select Parade mode.
- f. Check that the GBR Format parade waveform display appears similar to the one shown in Fig. 2-20.

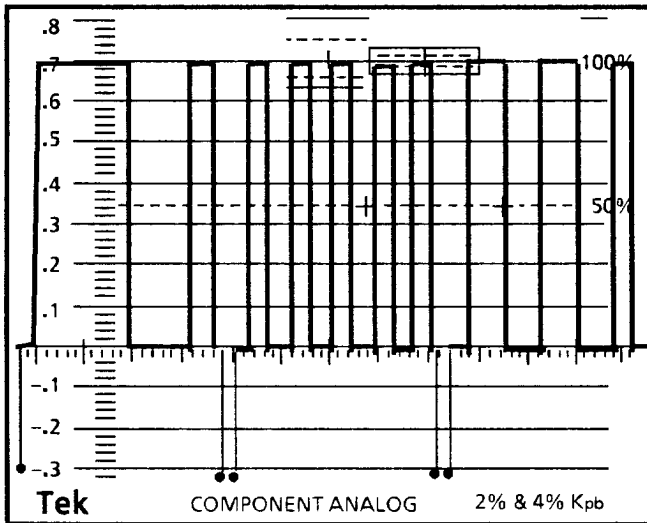


Fig. 2-20. GBR Format Parade display.

- g. Select Lightning mode. Select 100% graticule (CH 1 or Menu selection).
- h. Check that the Lightning mode display appears within the targets of the electronic graticule as shown in Fig. 2-21.
- i. Select Vector mode.

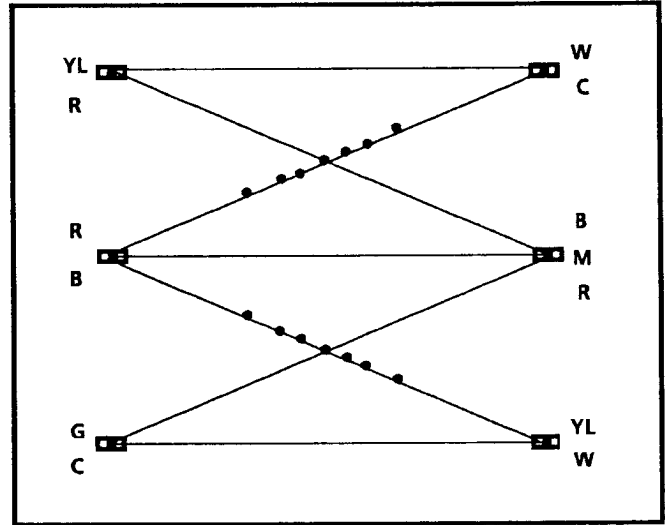


Fig. 2-21. GBR Format Lightning display.

- j. Check that a Vector mode display is obtained, and the vectors lie within their targets as shown in Fig. 2-22.

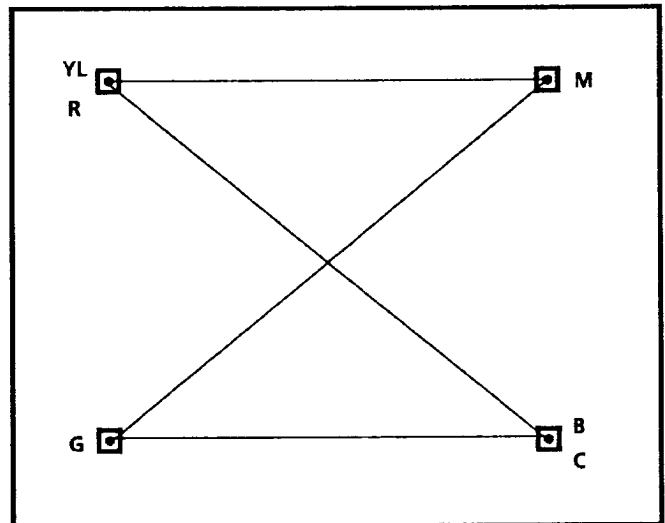


Fig. 2-22. GBR Format Vector display.

- k. Use the Format Menu to return to desired operating standard (GBR not selected).
- l. This concludes the Operator's Checkout Procedure.

## MENUS

The WFM 300A can be configured easily through the use of menus. Push and hold the FIELD/MENU button until the Main Menu (shown in Fig. 23) appears. This is the only time the FIELD button must be held. All other pushes are momentary pushes.

To enter individual menus, use the Up/Down buttons to move the cursor to desired menu (FORMAT, GRATICULE, GAMUT STROBE or FRAME RATE), then push FIELD. Once in the individual menu, again use the Up/Down buttons to move the cursor to desired selection, then push FIELD. This will make the desired selection and return to the Main Menu screen, with the cursor automatically set to EXIT. To exit the menu, push FIELD again. To enter another menu, move the cursor to desired menu and then push FIELD.

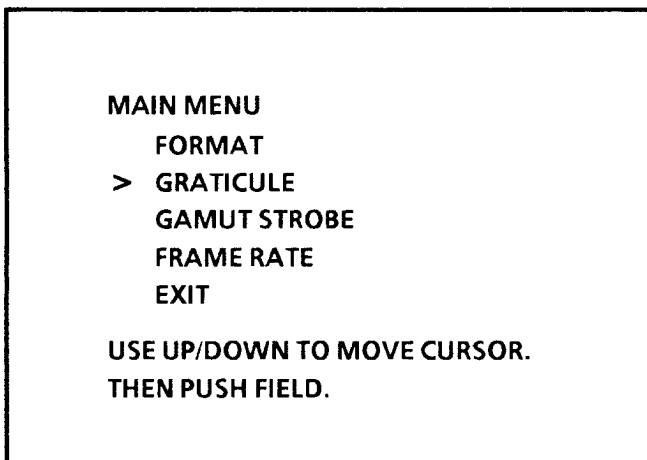


Fig. 2-23. Main Menu screen with Graticule Menu selected.

### Format Menu

The Format Menu, shown in Fig. 2-24, provides selection of desired operating standard. It is not necessary to move a plug jumper, however, the appropriate transcoder must be installed. The transcoder that is factory installed in Standard instruments is for SMPTE, EBU, and MII standards. The Option 10 transcoder is used for BETA.

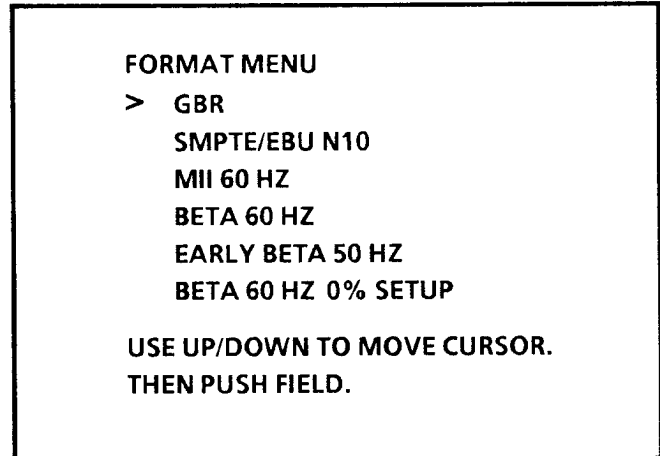


Fig. 2-24. Format Menu screen with GBR Format selected.

When a change is made in the Format Menu, the Frame Rate selection is automatically changed to the frame rate required by the chosen format. The user can override this decision by entering the Frame Rate Menu, moving the cursor, and pushing FIELD.

The WFM 300A can also be operated in GBR format. Specialized Lightning and Vector electronic graticules are automatically provided for GBR format. These are illustrated in Figs. 2-21 and 2-22.

### Graticule Menu

The Graticule Menu, shown in Fig. 2-25, allows selection of 75% graticule, 100% graticule, or graticule Off. Graticule selections can also be made using the front-panel INPUT buttons. Pushing CH 1 provides the 100% graticule, CH 2 the 75%, and CH 3 turns the graticule Off. The corresponding front-panel LEDs do not respond to these selections because they denote the input channels currently in use. If a change in graticule selection is made through the front-panel buttons, that selection will be reflected by the cursor position next time the Graticule Menu is accessed.

The 100% graticules are not available for all formats. Refer to Table 2-3 for details.

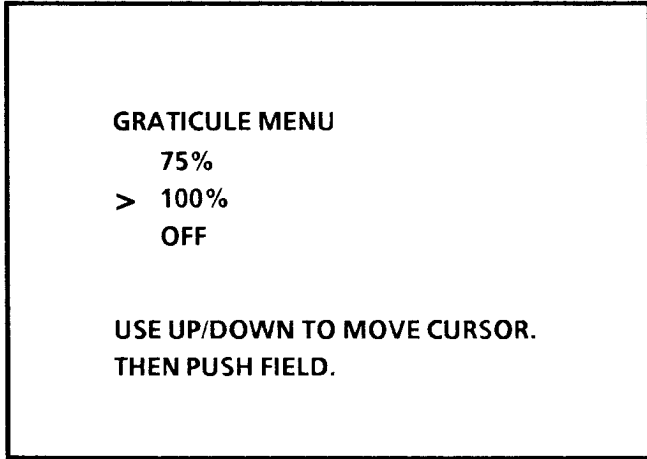


Fig. 2-25. Graticule Menu screen with 100% graticule selected.

#### Gamut Strobe Menu

The Gamut Strobe Menu (shown in Fig. 2-26) is used to turn the gamut strobe on and off. The gamut strobe is used to indicated invalid component signals, and is only viewed in the GBR output. The strobe must be On when performing calibration or performance checks involving the gamut trip point.

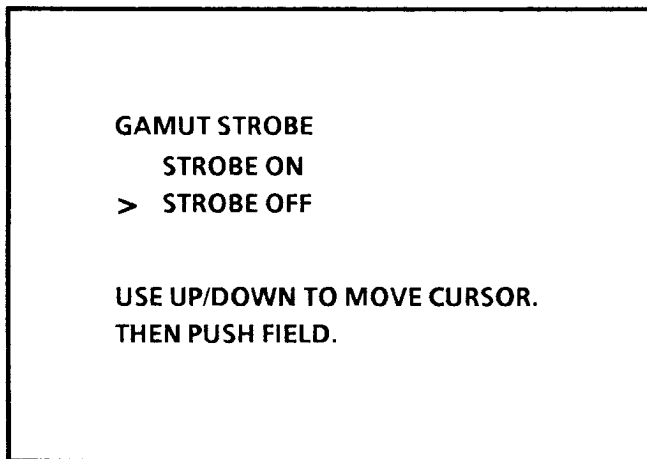


Fig. 2-26. Gamut Strobe Menu screen with Gamut Strobe turned off.

#### Frame Rate Menu

The Frame Rate Menu (shown in Fig. 2-27) provides a choice of 50 Hz or 60 Hz operating standard. It will be changed automatically if a format is selected through the Format Menu that requires a frame rate

other than that currently selected. The operator can override this change by entering the Frame Rate Menu and changing the selection.

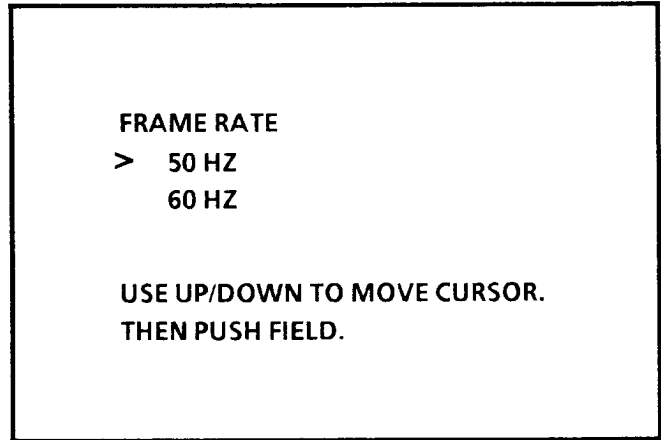


Fig. 2-27. Frame Rate Menu screen with 50 Hz operating standard selected.

## GRATICULES

There are internally-scribed graticules available for the WFM 300A: one scaled in millivolts and one scaled in IRE units. There are also four electronic graticules, which are available in 100% and 75% sizes to comply with the 100% and 75% amplitude color bar test signals.

Since all of the graticules (internal and external) are on the same plane as the crt phosphor, parallax errors are eliminated when viewing or photographing the displays.

#### Millivolt Graticule Vertical Scale

This graticule has two main vertical scales to facilitate Waveform, Parade, and Calibrate mode measurements. See Fig. 2-28. The left side scale is marked in millivolts (mV) and extends from -300 mV to 800 mV in 100 mV increments, using the major division marks. The minor divisions equal 20 mV each.

The scale on the right side of the graticule is used for measuring signal amplitude as a percentage instead of millivolts. The scale extends from 0% to 115%.



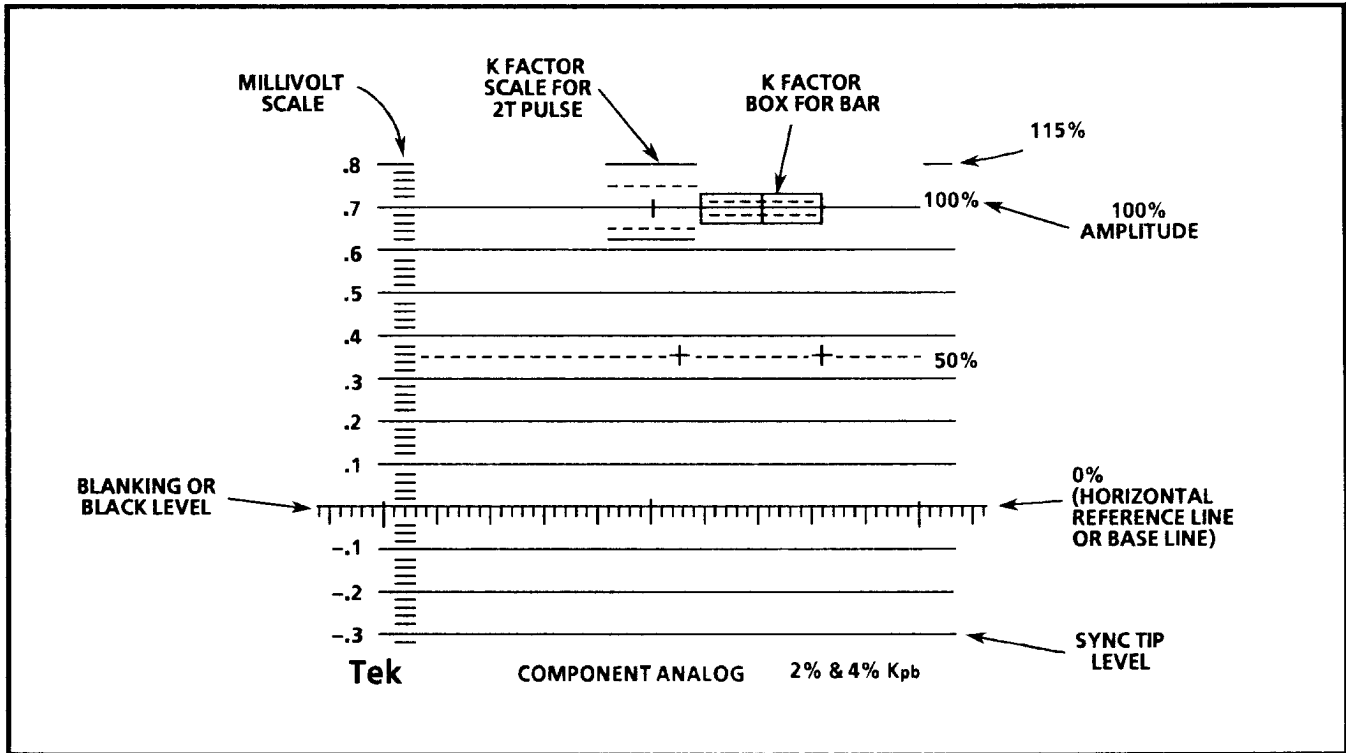


Fig. 2-28. Internal Millivolt Scale Graticule.

### IRE Graticule Vertical Scale

The IRE graticule, shown in Fig. 2-29, has two main vertical scales to facilitate typical measurements. The left side scale is marked in IRE units and extends from -50 to +120 IRE in 10-IRE increments. An IRE unit is equal to 7.14 millivolts. Black level setup is denoted by a dashed line at 7.5 IRE.

There are  $\pm 2$  IRE and  $\pm 4$  IRE markings at the center of the -40 IRE line (sync tip) to assist in measuring sync amplitude. This scale is designed to be used with the 2 Line or 2 Field Sweep rate.

The scale on the right side of the graticule is for measuring depth of modulation. The scale extends from 0% at the 120 IRE line to 100% at sync tip (-40 IRE line).

The boxed area slightly to the right of center at the 100 IRE level is scaled in 2% and 4% increments for precise tilt measurements. This structure is designed to work with an  $18 \mu\text{s}$ , half-amplitude duration (HAD) 2T Bar. The set of solid and short dashed lines to the left of the Bar tilt measurement structure is used to measure pulse-to-bar ratio; they are weighted to include K-Factor ratings of 2% and 4%.

To use the IRE vertical scale to make line-time distortion and pulse-to-bar ratio measurements, set the signal blanking level at the graticule blanking line (0 IRE) and position the leading edge of the Composite Test Signal bar to the ascending arrow (just right of graticule center). Check to see if insertion gain is unity. If it is not, adjust the variable gain for exactly 100 IRE of signal amplitude from baseline to the middle of the white bar. Check to see that the negative-going bar transition passes through the descending arrow.

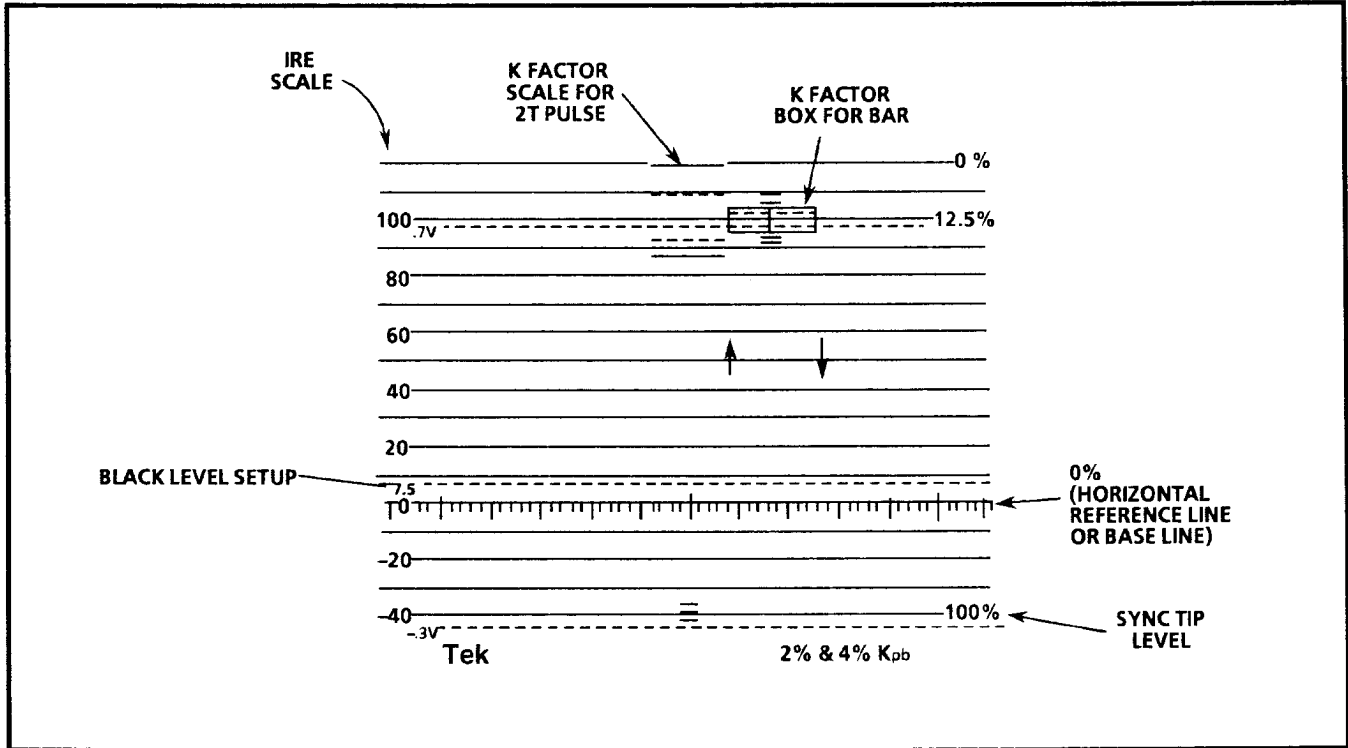


Fig. 2-29. Internal IRE Graticule.

**Millivolt and IRE Graticule K-Factor Scale**

To measure the K-Factor line-time distortion, measure the largest deviation of the bar top (tilt or rounding) within the structure. The structure is designed to ignore the first and last 1 μs of the bar where short-time distortions (ringing, overshoot, undershoot, etc.) occur. The solid outer box equals a 4% K Factor, while the dashed line inner box equals a 2% K Factor. (For signals with a bar half-amplitude duration that exceeds 18 μs, simply measure the bar top in increments by positioning the bar to the left or right from the leading or trailing edge. Note that when the leading or trailing edge is on the appropriate arrow, the first or last 1 μs is automatically excluded from the measurement.)

2T pulse-to-bar measurements are made using the solid and dashed lines located to the left of K Factor box. These lines are scaled according to the following formulas:

$$\frac{1}{(1-4K)} \quad \text{and} \quad \frac{1}{(1+4K)}$$

Where:

K = 0.02 for 2% K Factor (using the dashed lines)

K = 0.04 for 4% K Factor (using the solid lines)

Using the VERTICAL X5 GAIN increases the resolution to 0.4% and 0.8%, respectively.

**Millivolt and IRE Horizontal Scale**

The horizontal reference line is also referred to as the reference line, base line, 0% line, 0 mV, zero line, blanking level, and black level. The reference line is 12 major divisions long with main marks at the 1<sup>st</sup>, 6<sup>th</sup>, and 11<sup>th</sup> divisions for timing and linearity measurements within the center ten divisions on the scale. When the HORIZONTAL SWEEP button is set to 1 LINE, each major division represents 5 milliseconds (ms); when set to 2 LINE SWEEP, each major division represents 10 ms.

**Electronic Graticules**

As mentioned previously, there are four different electronic graticules and each is available in two sizes: 100% and 75%. These sizes are selected by means of the CH 1 and CH 2 INPUT buttons, respectively, or through the GRATICULE MENU. The 100% graticule is not used in all formats; these are listed in Table 2-3. The four 100% graticules (Lightning, Lightning with GBR selected, Vector, and Vector with GBR selected) are shown in Figs. 2-30 through 2-33. The 75% size graticules (not shown) are identical in appearance but are slightly smaller to match 75% amplitude color bar component signals.

**Table 2-3  
Electronic Graticule Sizes**

FORMAT MENU Selection	Graticule Sizes Available
GBR	100% and 75%
SMPTE/EBU N10	100% and 75%
MII 60 HZ	100% and 75%
BETA 60 HZ	75% Only
Early BETA 50 HZ	75% Only
BETA 60 Hz, 0% Setup	75% Only

Fig. 2-30 shows the Lightning graticule that is present when operating the WFM 300A in the Lightning mode and viewing color difference component signals. For these signals, be sure that GBR is not selected (FORMAT Menu). The box-shaped targets indicate a tolerance of  $\pm 14$  mV. The small dots spaced close together indicate a transition tolerance of 40 ns (nanoseconds); the dots spaced further apart represent 80 ns.

Fig. 2-31 shows the graticule that is present when operating in the Vector mode with GBR Format not selected. This mode is used for viewing color difference component signals. The graticule targets indicate a  $\pm 14$  mV tolerance.

Fig. 2-32 shows the graticule that appears when the WFM 300A is operating in the Lightning mode with GBR Format selected. This graticule matches a GBR

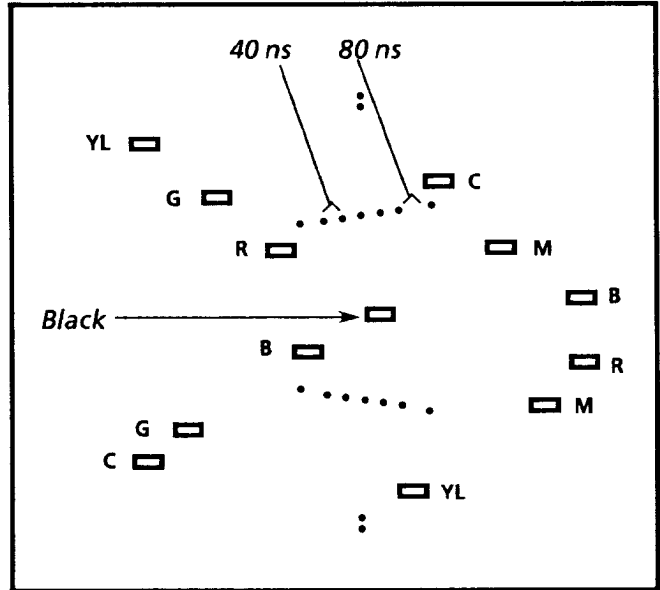


Fig. 2-30. Lightning graticule for checking color difference signals.

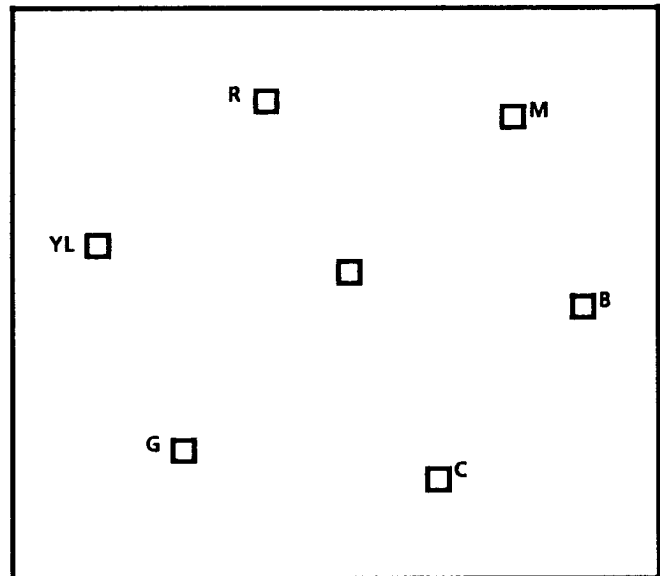


Fig. 2-31. Vector graticule for checking color difference signals.

format display when GBR component signals are applied to the instrument. The graticule targets indicate a tolerance of  $\pm 14$  mV. The closely-spaced small dots provide a guide for checking transitions. These dots are spaced 40 ns apart while the dots that are spaced further apart represent 80 ns.

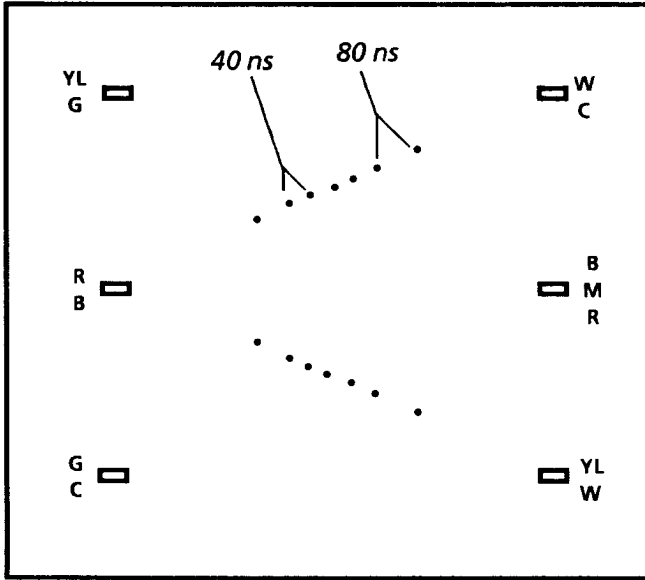


Fig. 2-32. Lightning graticule for checking GBR format signals.

Fig. 2-33 is a Vector graticule that is obtained when operating the WFM 300A in the Vector mode with GBR Format selected. This graticule is useful when checking GBR format signals applied to the instrument. The graticule targets represent  $\pm 14$  mV.

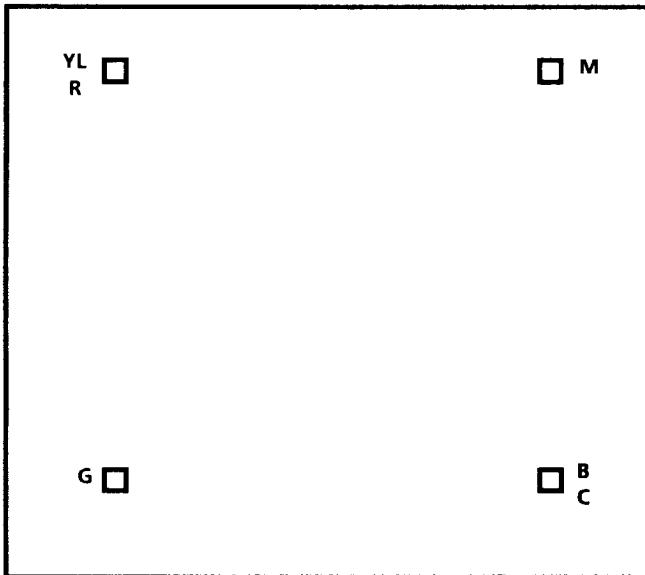


Fig. 2-33. Vector graticule for checking GBR format signals.

**REMOTE Connector**

This 15-pin D-type female connector is located on the rear panel of the WFM 300A.

Preset Front-Panel Setups. The WFM 300A has two front-panel setups stored in an EPROM at the factory. A TTL low (or ground closure) on one of the PRESET control lines (pin 13 or 14) of the REMOTE connector selects one of these pre-programmed front-panel setups. Table 2-4 shows the preset control settings that are stored in memory.

**Table 2-4**  
**Preset Control Settings**

Front-Panel Controls	Preset 1 (pin 13)	Preset 2 (pin 14)
INPUT		
CH 1/GRATICULE	On/Disabled	On/100%
CH 2	On	On
CH 3	On	On
REFERENCE	Int	Int
MODE	PARADE	LIGHTNING
VERTICAL		
FILTER	Off	Off
GAIN	Off	Off
HORIZONTAL		
SWEEP	1 LINE	Disabled
MAG	Off	Disabled

**NOTE**

*For further information concerning the remaining remote control functions, refer to the topic Rear-Panel Connectors in this section and to the topic REMOTE Connector, in Section 3 of this manual.*

## **WARNING**

THE FOLLOWING SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO. REFER TO OPERATORS SAFETY SUMMARY AND SERVICE SAFETY SUMMARY PRIOR TO PERFORMING ANY SERVICE.





# Service Safety Summary

Only qualified personnel should perform service procedures. Read this *Service Safety Summary* and the *General Safety Summary* before performing any service procedures.

**Do Not Service Alone.** Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

**Disconnect Power.** To avoid electric shock, switch off the instrument power, then disconnect the power cord from the mains power.

**Use Caution When Servicing the CRT.** To avoid electric shock or injury, use extreme caution when handling the CRT. Only qualified personnel familiar with CRT servicing procedures and precautions should remove or install the CRT.

CRTs retain hazardous voltages for long periods of time after power is turned off. Before attempting any servicing, discharge the CRT by shorting the anode to chassis ground. When discharging the CRT, connect the discharge path to ground and then the anode. Rough handling may cause the CRT to implode. Do not nick or scratch the glass or subject it to undue pressure when removing or installing it. When handling the CRT, wear safety goggles and heavy gloves for protection.

**Use Care When Servicing With Power On.** Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

To avoid electric shock, do not touch exposed connections.

**X-Radiation.** To avoid x-radiation exposure, do not modify or otherwise alter the high-voltage circuitry or the CRT enclosure. X-ray emissions generated within this product have been sufficiently shielded.





# PART II

## SERVICE INFORMATION

### SECTION 3

## INSTALLATION

### Packaging

The shipping carton and pads provide protection for the instrument during transit, and should be retained in case subsequent shipment becomes necessary. Repackaging instructions can be found in Section 6.

## ELECTRICAL INSTALLATION

### Power Source

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

### Mains Frequency and Voltage Ranges

The WFM 300A operates over a frequency range of 48 to 66 Hz, at any mains voltage between 90 Vac and 250 Vac. The power supply does not require any internal changes to select the operating voltage range.

### Jumper Placement

Jumper placement options are shown in Table 3-1. If jumpers are placed in the optional position, be sure that all personnel are aware of the changes.

### REMOTE Connector

The rear-panel REMOTE connector is a subminiature 15-pin D-type receptacle with female contacts. All the active REMOTE control lines are enabled by remote ground closures or TTL levels (0 V to +0.8 V). Pin assignments for the REMOTE connector are shown in Fig. 3-1 and Table 3-2.

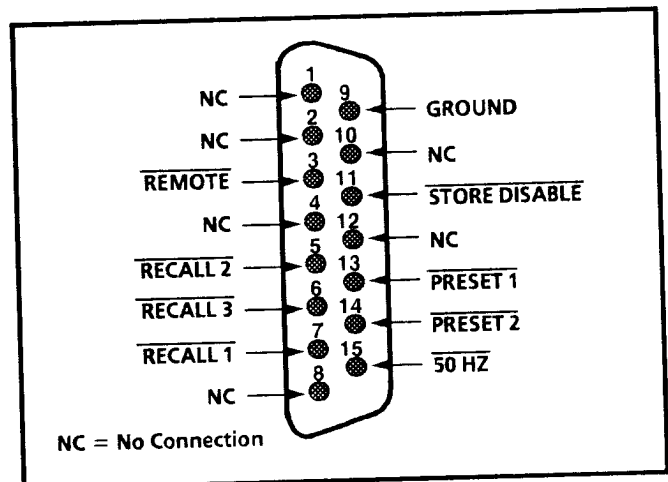


Fig. 3-1. REMOTE connector.

### REMOTE Operation

All front-panel controls operate in their usual manner during REMOTE operation. Functions selected through remote ground closures may be changed with the front-panel controls. For a remote selection to be effective once it has been deselected with the front-panel control, it is either selected again with the front-

**Table 3-1**  
Internal Jumper Selection

Jumper	Name	Position	Function
A3J897	CH 1-2-3 Input Coupling	1-2	DC coupling enabled (factory set)
		Stored	AC coupled
A3A1J100	Light Enable	1-2	Graticule lights disabled
		2-3	Graticule Lights enabled (factory set)

panel control, or the ground closure is removed and reattached. Front-panel LED indicators light to show the current selection in all cases.

All qualification testing for the WFM 300A was performed with a 1700F00 cabinet installed. To guarantee compliance with specifications, the instrument should be operated in a cabinet. The plain cabinet, 1700F00, is shown in Fig. 3-2. The portable cabinet, 1700F02, is shown in Fig. 3-3. The 1700F02 has a handle, four feet, a flipstand, and has different hole sizes and spacing than the 1700F00.

### MECHANICAL INSTALLATION

#### Cabinet Options

**NOTE**

*Cabinet drawings are provided for installation information only, and are not to scale. All dimensions are in inches.*

All of the 1700-Series metal cabinets available from Tektronix as Optional Accessories provide the proper electrical environment for the instrument, supply adequate shielding, minimize handling damage, and reduce dust collection within the instrument.

**Table 3-2**  
Remote Connector Pin Assignments

Pin No.	Name	Remarks
1-2	NC	
3	REMOTE	This pin is not used.
4	NC	
5-6-7	RECALL 1,2,3	Recalls user-programmed front-panel presets. Once a front-panel configuration has been stored, it can be recalled by momentarily forcing the appropriate RECALL line low.
8	NC	
9	Ground	
10	NC	
11	STORE DISABLE	When low, will not allow any front panel storage to be made.
12	NC	
13-14	PRESET 1,2	Recalls factory-programmed front-panel presets stored in an EPROM. These presets can be recalled by momentarily forcing the appropriate PRESET line low.
15	50 HZ	Selects TV standard: Low is 625/50; high defaults to menu selection.

NC = No Connection.

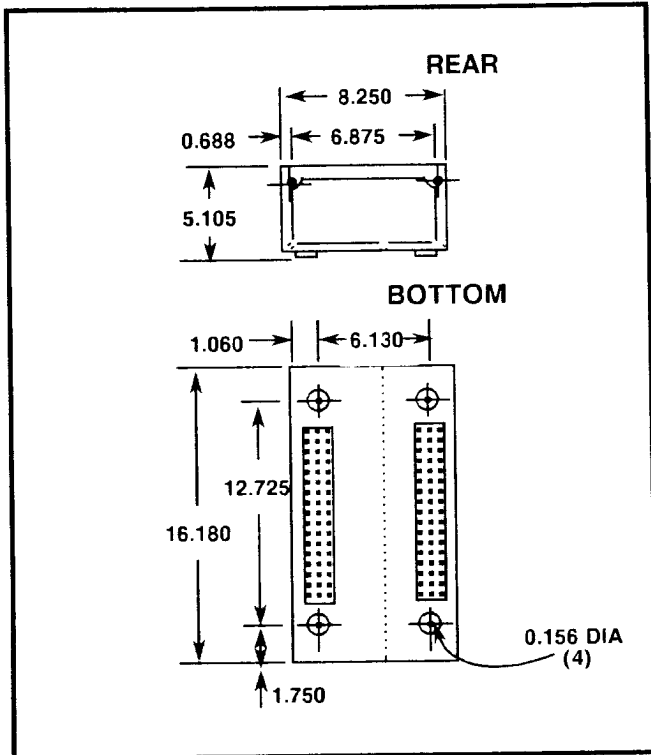


Fig. 3-2. 1700F00 plain cabinet.

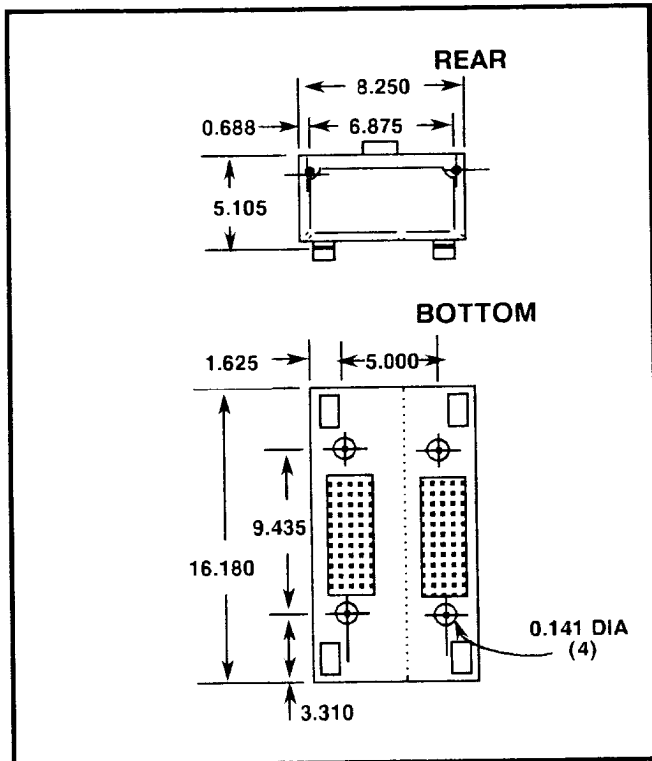


Fig. 3-3. 1700F02 portable cabinet.

### Cabinetizing

#### WARNING

*Do not attempt to carry a cabinetized instrument without installing the mounting screws. There is nothing to hold the instrument in the cabinet if it is tipped forward.*

The instrument is secured to the cabinet by two 6-32 Pozidrive® screws, located in the upper corners of the rear panel. See Fig. 3-4.

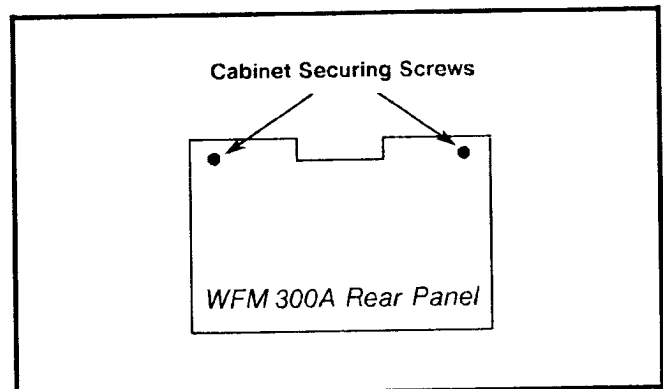


Fig. 3-4. Cabinet securing screws.

### Rackmounting

The optional 1700F05 Side-by-Side Rack Adapter shown in Fig. 3-5 includes two attached cabinets, and can be used to mount the WFM 300A in a standard 19-inch rack with another half-rack-sized instrument.

The rack adapter is adjustable, so the WFM 300A can be more closely aligned with other equipment in the rack. See Fig. 3-6.

If only one section of the rack adapter is used, a 1700F06 Blank Panel can be inserted in the unused section. See Fig. 3-7. The rack adapter and panel are available through your local Tektronix field office or representative.

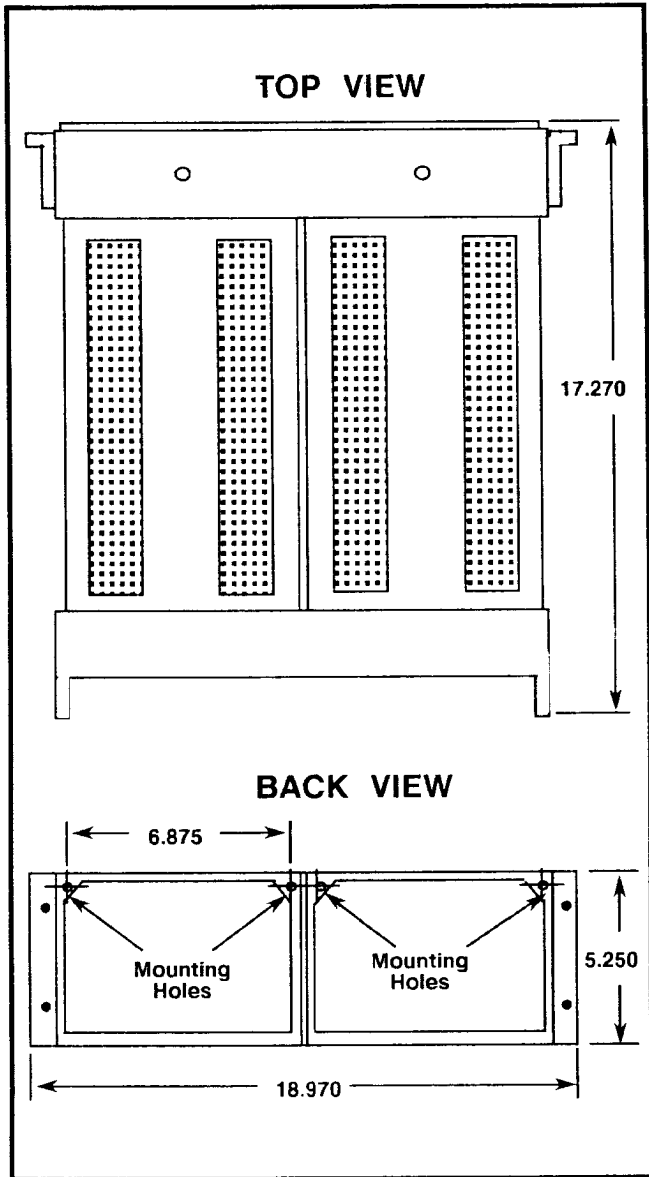


Fig. 3-5. 1700F05 Rack Adapter.

**Custom Installation**

For applications such as consoles, shown in Fig. 3-8, the instrument can be mounted with front molding flush or protruding from the console. In both cases, allow approximately 3 inches of rear clearance for BNC and power-cord connections.

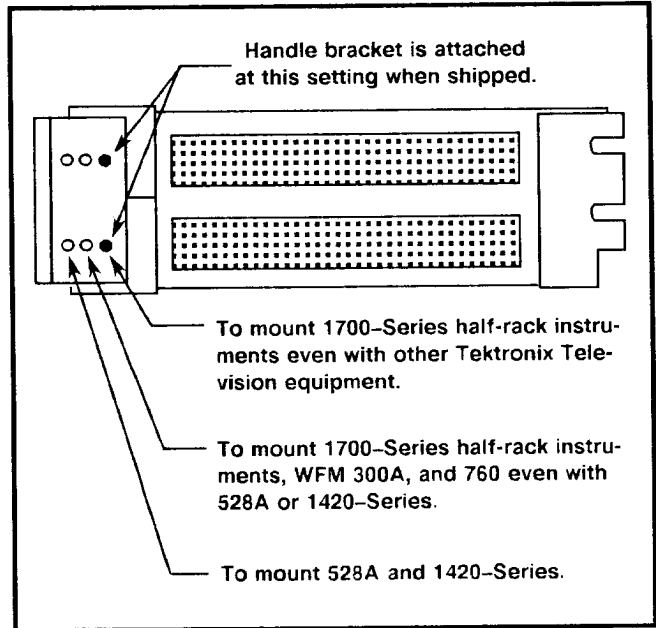


Fig. 3-6. 1700F05 Rack Adapter adjustment.

To mount the WFM 300A safely, attach it to a shelf strong enough to hold its weight, using the four 0.156-inch diameter holes in the bottom of the 1700F00 cabinet. See Fig. 3-9.

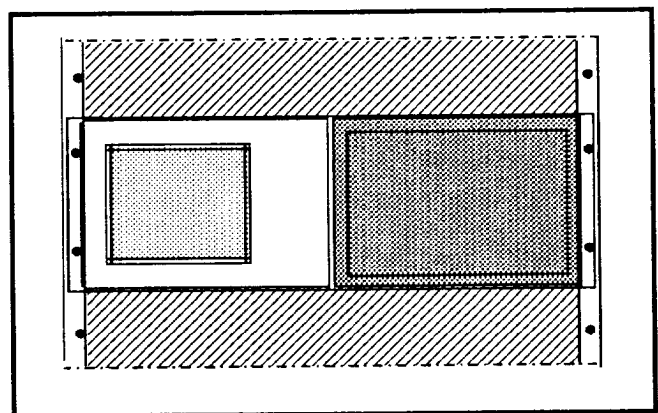


Fig. 3-7. WFM 300A and 1700F06 blank panel.

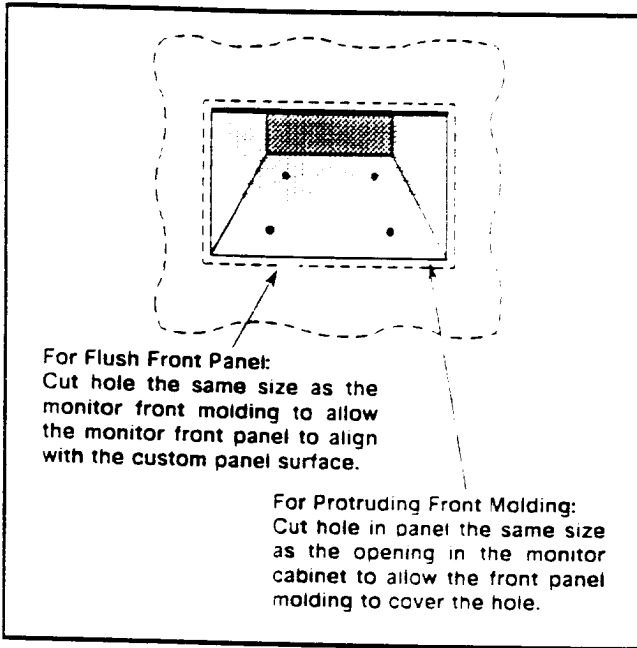


Fig. 3-8. Typical custom installation — front view of console.

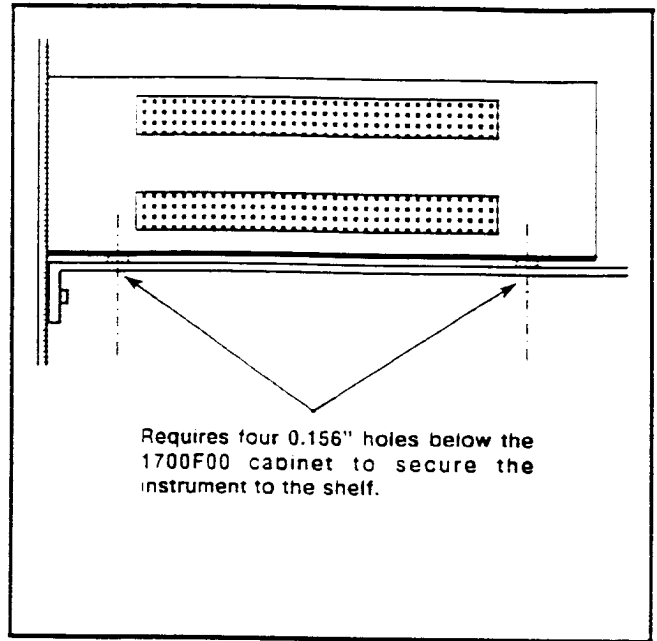


Fig. 3-9. Typical custom installation — inside view of console.



# SECTION 4

## THEORY OF OPERATION

### DOCUMENTATION OVERVIEW

The material in this section is subdivided into a general instrument description and detailed circuit descriptions. The general description is supported by two simplified block diagrams provided in this section and a main block diagram located on a pullout page in Section 9. The detailed circuit descriptions are based on the schematic diagrams and supported by simplified block diagrams.

A thorough understanding of the instrument starts with knowing how the major circuit blocks fit together, followed by an understanding of the individual circuits. The Theory of Operation for the WFM 300A Component Waveform Monitor begins with a brief description of the instrument, followed by an outline of the main block diagram, and concludes with individual circuit descriptions.

### INSTRUMENT DESCRIPTION

The versatile WFM 300A Component / Composite Television Waveform Monitor provides a comprehensive set of signal monitoring capabilities for use in component television environments. Additionally, composite waveforms can be monitored with the WFM 300A, and composite vectors displayed on a

companion 1720-Series composite vectorscope. The WFM 300A provides one composite and three component inputs, with a composite picture monitor output and a set of three component outputs. Six operating modes are provided: Waveform and Parade modes (used for both component and composite operation), and Lightning, Vector, and Bowtie modes (used for component operation only).

The new Lightning display provides amplitude and timing information for all three channels simultaneously, allowing the operator to set up equipment accurately and efficiently.

The new Bowtie display uses the special Bowtie timing signal from the TEKTRONIX TSG-300 Component Television Signal Generator to check the timing of three-wire component television systems.

**Microcontroller** — Front-panel mode switching is accomplished by a series of push-button switches whose status is constantly polled by an 8051 Microprocessor. In turn, the Microprocessor controls the switching functions that enable the monitor to make specific displays. The Microprocessor also provides the necessary timing gates and pulses that drive the electronic graticule generator, color shutter, horizontal timing circuit, ramp generator, and line counter. Fig. 4-1 is a simplified block diagram showing the Microprocessor and control functions.

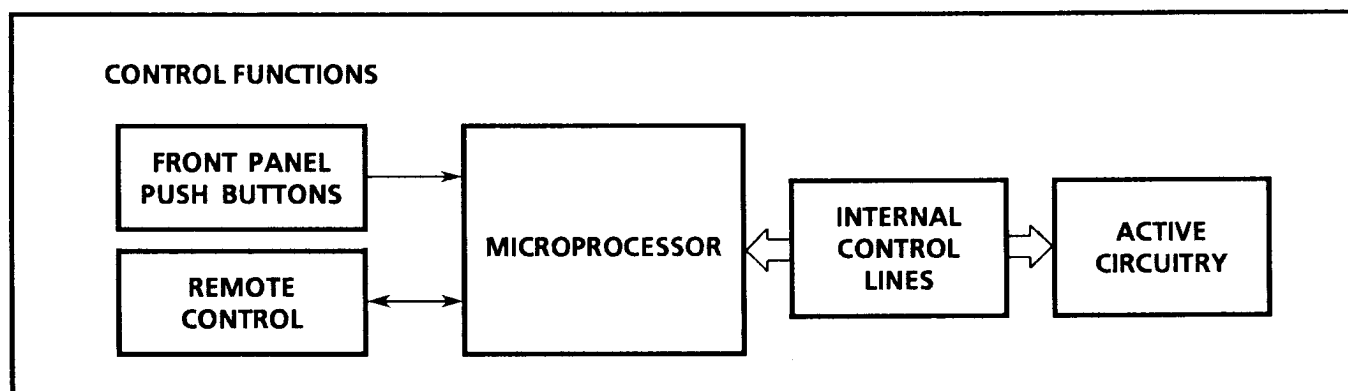


Fig. 4-1. Control functions block diagram.

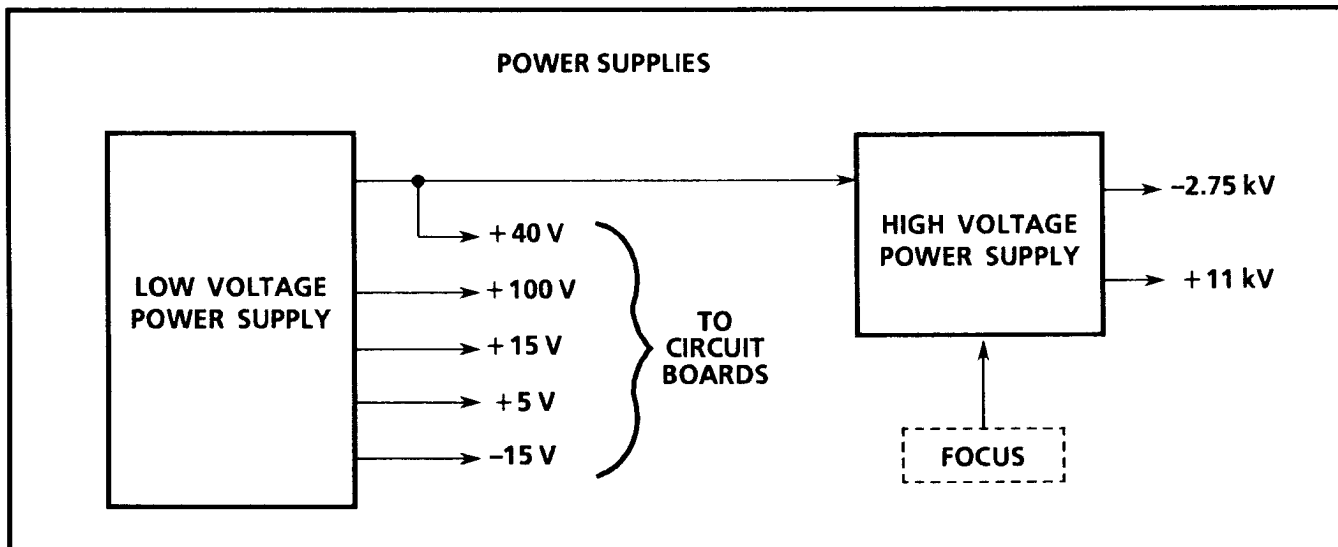


Fig. 4-2. Power supplies block diagram.

**Power Supplies** — The low-voltage power supply is a high-efficiency type. The high-voltage power supply provides 13.75 kV (-2.75 kV + 11.00 kV) acceleration potential. See Fig. 4-2.

### BLOCK DIAGRAM

The main block diagram for the WFM 300A is located on a pullout page in Section 9 of this manual. Refer to this diagram when reading the following description.

The block diagram shows the important functional blocks and their interconnections.

### Vertical Deflection System

Component video signals are applied to the CH 1, CH 2, and CH 3 loop-through INPUT connectors. The signals at these connectors are applied to three identical non-inverting unity-gain Input Amplifiers with dc restoration. The amplifiers are shunted by sample-and-hold clamps that are timed by the back-porch clamp pulse from the Field Identification & Timing Logic circuits.

The dc reference for Channels 2 and 3 can be varied using the front-panel CH 2&3 POSition control. If the CH 2&3 POSition Control is in the detent position (fully clockwise), the dc restorer is disabled and the input signals are dc coupled if the internal jumper is in the factory set DC position. (If the jumper is set to AC, then the input signals will be ac coupled in all modes.) If the CH 2&3 POSition control is out of the detent position, the DC Resorer LED is on, the input signals are ac coupled, and the dc restorer is enabled to back-porch clamp the incoming signals.

The output of the four Input Amplifiers (CH1, CH2, CH3, and Composite) goes to the INPUT and MODE switches. The output also goes to the color difference to GBR transcoder. The standard instrument is configured to accept the SMPTE Format(Y, Pb, Pr). Option 10 accepts the BetaCam® format, and Option 14 accepts the MII format. The resistors in the transcoder and a ROM in the Electronic Graticule Generator circuit have to be changed to accommodate the various formats.

The operator can select CH 1, CH 2, or CH 3 input signals via front-panel push-buttons. In Waveform mode, these signals are viewed singly or time-multiplexed between two or three signals to provide an overlay display. In the Parade mode, all three signals are displayed in sequence. The CH 1 waveform occupies the left third of the screen, CH 2 is in the center of the screen, and CH 3 occupies the right third of the screen.



The Calibrator block is located near the Vertical Amplifier on the block diagram. When the CAL mode is selected, a line-rate calibrator signal from the Microcontroller is applied to the summing junction at the input to the Vertical Amplifier. The calibrator signal is 700 mV in amplitude as displayed on the crt. This signal can be used for amplitude verification in the vertical deflection system. With one input channel on, the calibrator signal is added to the signal so their amplitudes can be compared.

In Waveform or Parade mode of operation, the LPASS/DIF'D switch can be used to insert a Differentiated Step or Low Pass Filter into the signal path to the Variable Gain stage. An LED turns on to indicate if the Luminance or Dif'd Step filter has been inserted.

The Variable Gain stage is active in all six operating modes: Waveform, Parade, Calibrate, Lightning, Vector, and Bowtie. Variable Gain (VGAIN) and Vertical Calibrate (VCAL) are functional in all these modes. In the Waveform, Parade, Calibrate, and Bowtie modes, the Low Pass Filter & Clamp are bypassed to provide a wide bandwidth path for the signal going to the Vertical Deflection Amplifier. In the Lightning and Vector modes, the signal goes through the Low Pass Filter & Clamp to the Vertical Deflection Amplifier. The Low Pass Filter controls the rise times and is identical to the one used in the Horizontal Deflection System.

In the Lightning mode, the Microprocessor causes the switch at the input to the Low Pass Filter & Clamp stage to invert and non-invert the signal at a line rate. As a result, the signal has two halves. These two halves are brought together at the center of the screen by the Clamp in the Low Pass Filter & Clamp block. The Clamp also keeps the Lightning display stationary so the operator can evaluate the display. The Low Pass Filter in this block is identical to the filter at the output to the Horizontal Amplifier. These filters are used in both the Lightning and Vector modes to provide controlled rise times so the transitions on the display can be viewed.

The Bowtie mode is accomplished by applying the CH 2 (R-Y) and CH 3 (B-Y) signals from the output of the Horizontal Variable Amplifier via the BOWTIE switch to the summing junction at the input to the Vertical Deflection Amplifier. There CH 2 and CH 3 are summed with CH 1. In this mode, the Low Pass Filters are bypassed to provide wide bandwidth for the Bowtie test signal that originates from the

TEKTRONIX TSG-300 Component Test Signal Generator.

The WFM 300A can transcode a color difference signal to GBR for driving a picture monitor. This signal is available at the G, B, and R PIX MON OUTPUTs shown in the center area of the block diagram.

The transcoded GBR signals (or components of a signal) are also useful for monitoring color gamut violations. If any of these signals go above 700 mV or below zero during the active video window, there is a violation that can be detected by the Gamut Limit Detector. This circuit consists of two comparators that monitor the GBR signals. One comparator detects signal excursions below zero and lights the NEG GAMUT indicator; the other detects signal violations above 700 mV and lights the POS GAMUT indicator.

When the GBR signals are driving the picture monitor and either comparator trips, the signals at the G, B, and R PIX MON OUTPUTs will cause the picture monitor display to bright up and blink at the point of violation. This display helps the operator determine whether the problem is due to the black level or white level.

### **Horizontal Deflection System**

The front-panel REFERENCE switch selects either INTERNAL or EXTERNAL sync to control timing circuits. When INTERNAL sync is selected, the signal is obtained from Channel 1 because sync is always present on the luminance or green signal in this channel for component television. The other two channels may not have sync.

The Sync Stripper extracts sync information from either the internal or external reference signal. The Field Recognition & Timing Logic circuits separate composite sync into vertical and horizontal timing pulses. If no internal or external sync is present, the Timing Logic circuit will free run.

The Field Recognition circuit detects the vertical sync pulse interval, determines whether the field starts with a half line or whole line, and then uses this information to generate the field identification pulse (FIELD).

The Timing Logic circuit generates H sync (HSYNC) that is applied to the Microprocessor. The HSYNC signal, along with the FIELD identification pulse, go to the Microprocessor to develop the necessary timing signals required by many of the other circuits in the instrument.

The back porch clamp pulses are applied to all the Clamp circuits so these circuits can provide back porch clamping when needed. U422D combines /VGAMUT and HBLANK to provide a signal which inhibits the Gamut limit detection during the vertical interval and horizontal sync time.

The following Microprocessor signals drive the Ramp Generator: /RATE 1, /PARADE, Field Gate (FLDGATE), and Line Gate (LINEGATE). Another signal, Ramp Select (/RAMPSEL), drives the Horizontal Position circuitry. The signals that drive the ramp are selected by the front-panel HORIZONTAL switches and are used to start and stop the ramp. The ramp is positioned horizontally by means of the HORIZONTAL Position control.

Gain of the Magnifier Amplifier circuit is determined by the front-panel MAG switch and the three sweep modes: 1 LINE, 2 LINE, and 2 FLD. The Horizontal Deflection Amplifier amplifies the ramp so it will drive the crt horizontal deflection plates, producing a horizontal trace across the screen.

### Electronic Graticule Generator

There are ten control lines that the Microcontroller uses to control the Electronic Graticule Generator. These are: GRATADD 1 through GRATADD 7, GRATSEL, BLANK, and the 187.5 kHz signal.

GRATADD 1 through GRATADD 7 control lines determine which electronic graticule and/or readout will be displayed. The GRATSEL and BLANK signals are used to control the operation of the Electronic Graticule Generator.

The Electronic Graticule Generator is driven by the 187.5 kHz clock signal, which it divides by two so that a 93.750 kHz signal can be applied to the Color Shutter Driver circuit.

The Electronic Graticule Generator sends a VDAC signal (via a Sample & Hold and Error Amplifier) to the summing junction at the input to the Vertical Deflection Amplifier. It also sends an HDAC signal (also via a Sample & Hold and Error Amplifier) to the summing junction at the input to the Horizontal Deflection Amplifier. The VDAC and HDAC signals cause the beam to display the graticule on the screen.

### Z-Axis Control and Grid Drive

Blanking signals from the Electronic Graticule Generator and Microprocessor drive the Z-Axis Control to blank and unblank the crt beam.

In Lightning and Vector modes, the output of the Electronic Graticule Generator circuit is applied via the Grid Drive circuit to the crt control grid. The INTENSITY control is time-shared with the SCALE control. The INTENSITY control varies the crt beam intensity for the signal display and the SCALE control varies the intensity for the electronic graticule.

In all the other modes, the Electronic Graticule Generator is turned off and the SCALE control varies the brightness of the graticule lights to illuminate the internally-scribed graticule. The INTENSITY control operates the same as described for the Lightning and Vector modes.

### Color Shutter Driver

The Microprocessor in the Microcontroller circuit controls the Color Shutter Driver (if installed). The Color Shutter is located in front of the crt faceplate and is used to differentiate between the electronic graticule and the displayed signal when operating in Lightning, Vector, and GBR Format modes. Both modes have their own electronic graticule to match the displayed signal. Two sizes of graticule, 100% and 75%, can be selected through the menu. If the menu selection is set at 100%, the graticule can also be changed to 75% or Off by pushing the front-panel CH 2 or CH 3 push buttons, respectively. Since all the input signals are being used for the display, the CH 1, CH 2, and CH 3 LEDs are always on during Lightning and Vector operation, whether the graticule is set for 100%, 75%, or Off.

The Color Shutter Driver divides the 93.750 kHz signal by 32 to provide a 2.93 kHz drive signal for the Color Shutter. The 2.93 kHz signal is + and -15 V in amplitude and is present when the instrument is operating in the Waveform, Parade, Calibrate, and Bowtie modes. In these modes, presence of the drive signal causes the Color Shutter to be charged and appear transparent. As a result, the white color of the (P4) phosphor passes through the Color Shutter to the viewer and there is no filtering.

In the Lightning and Vector modes, the drive signal to the Color Shutter is turned off. The blue light filters through the Color Shutter, causing the electronic graticule to appear blue.

When operating in the Lightning and Vector modes, the SCALE control varies the brightness of the electronic graticule, and the INTENSity control varies the intensity of the displayed signal. In the remaining modes (Waveform, Parade, Cal, and Bowtie), an internally-scribed graticule is used in place of the electronic graticule.

### Remote Connector

The remote is a 15-pin female connector (see Section 3 for remote connector illustration) which provides the following remote control functions via ground closure:

1. /RECALL 1, 2, and 3 (pins 7, 5, 6) — Allows selection of front-panel setups that were stored by the operator.
2. /STORE DISABLE (pin 11) — When pin 11 is low, the front-panel storage function is disabled.
3. /PRESET 1 and 2 (pins 13, 14) — Selects one of two front-panel setups that were preset at the factory. These setups are permanently stored in an EPROM and cannot be changed.

## VERTICAL INPUT DIAGRAM 1

### Vertical Input Buffers

The three component signal inputs are buffered by unity-gain amplifiers. These amplifiers are either dc coupled or ac coupled and clamped. When the CH 2&3 POSition control is in detent, the input ampli-

fiers are dc coupled. When the control is out of its detent position, the input amplifiers are ac coupled and clamped. They are also ac coupled and clamped when the instrument is operating in the Lightning mode whether the CH 2&3 POSition control is in detent or not.

Since all three channels are identical, only Channel 1 (Green) is described. Dc coupling is accomplished by turning on Q397, which shunts the input coupling capacitor, C297. The input amplifier consists of U293 (a five-transistor array), Q393 (a pnp transistor), and associated components. Pins 2 and 4 of U293 are the inputs; pins 7 and 10 are connected together and serve as the output.

The output of U293 is connected to the inverting input via R295 to produce unity gain. The input amplifier has a Ch 1 Offset adjustment, R288. With a 37.5Ω terminator connected to the CH 1 INPUT connector, CH 2&3 POSition control set to detent, and no signal applied, R288 is adjusted to zero volts.

The dc restorer, Q490 and U495 with associated circuitry, uses the sample-and-hold method for clamping the back porch to zero volts. A clamp pulse from Q257 turns on Q490 only at back porch time. When Q490 turns on, C487 charges to the amplitude of the back porch on the signal. U495 with associated components drive U293 input with a dc signal that will correct for any dc offset present on the back porch of the signal that is applied to the CH 1 INPUT connector.

U588A is a switch that shunts the output of the dc restorer to ground (pins 2 and 3) when the instrument is dc coupled. The Ch 1 DC Restorer Offset control (R496) is adjusted for zero volts at the output of the amplifier (U293 and Q393) when no signal is applied, the DC RESTorer is on, and all the input channels are terminated into 37.5Ω. The Ch 2 Offset control (R490) is adjusted for zero volts output when the CH 2&3 POSition control is in the detent position and the CH 2 INPUT connector is terminated into 37.5Ω.

The CH 2 DC Restorer Offset control (R689) is adjusted so that CH 2 trace matches CH 3 when the CH 2&3 POS control is out of its detent position. Also, when adjusting R689, use the Parade mode, X5 vertical gain, and external sync; terminate all three input channels into 37.5Ω (no signals are applied to these channels).

## VERTICAL GAIN DIAGRAM 2

### Vertical Gain Cell

U479 is a four-quadrant multiplier Gain Cell. Pin 1 is the signal input and is connected to six signal sources, including ground, via CMOS switches. Only one switch can be on at once, and never are all switches off at once. The gain of the amplifier is adjusted by driving the gain cell (pin 10) with a voltage. CR483 is a dual diode which serves to modify the gain port voltage, thus linearizing the effect of the front-panel V GAIN control, R728.

### Y Invert Amplifier

U574 is a transistor array. It serves as an inverter switch, allowing either the + or - outputs of the gain cell, U479, to be switched to the input of the gain output amplifier. This output amplifier consists of Q470, Q471, and Q570. The inverter switch is necessary because the Y signal has to be dynamically inverted for the Lightning mode. The 0 V Registration control, R580, adjusts the output dc level at the emitter of Q570 to zero volts. The front-panel V BAL adjustment, R500, overlays the back porch of both the inverted and non-inverted signals when the WFM 300A is operating in the Lightning mode.

### Calibrator

The Calibrator drives pin 4 of U479. U683 is a shunt regulator that serves as a stable +8 V reference. The CALTIME signal is present only when the calibrator is on. Q579 drives Q581 when the CALTIME signal is present at the base of Q579. Q581 is a saturating switch that provides an accurate calibrator signal at its collector. C582 couples the calibrator signal to pin 4 of the gain cell, U479. Cal Ampl control, R584, is adjusted to obtain 0.7 V at pin 4 of U479.

## VERTICAL OUTPUT DIAGRAM 3

### Lightning and Vector Low Pass Filter

Q568 and Q466 form a four-pole Sallen-and-Key low pass filter with a cutoff frequency of 2 MHz. Q463,

Q464, and Q465 form the amplifier. R462 is the input resistor; R458 and R461 are the feedback resistors. When Lightning mode is selected, the gain is reduced by closing the switch contacts (pins 14 and 15 of U458D). When Vector mode is selected, the feedback switch is open (pins 14 and 15) and Q553 is saturated, helping to reduce crosstalk due to the switch. The low pass filter is dc restored with a sample-and-hold switch, Q352, and error amplifier, U452. Q562 is a saturating switch that reduces crosstalk problems associated with U458C CMOS switch, pins 10 and 11.

Q673 is turned on when the VERTICAL GAIN push button is set to X1, and is turned off when the GAIN button is set to X5. The purpose of Q466 is to equalize the transient response of the Lightning and Vector displays when the VERTICAL GAIN push button is switched between high (X5) and low (X1) gain.

### Differentiated Step Filter

U544 is a five-transistor array connected as a differentiated step filter. This circuit consists of a two-transistor low pass filter which is connected to a three-transistor amplifier via the high pass network, C547 and R644. Pin 5 of U544 is biased to -3.6 V by Q548 to keep U544 operating properly. Q555 and Q556 are complementary saturating switches which either connect the differentiated step filter to the magnifier amplifier or Q764, or shunt the signal to ground for reduced crosstalk.

### Vertical Times 5

The heart of the magnifier amplifier is a three-transistor operational amplifier consisting of Q859, Q860, and Q961. Q764 is a saturating switch used to increase the gain of the amplifier in the Vertical X5 mode. When Q764 is saturated, gain is increased by reducing the amount of negative feedback. Several signals are applied to the magnifier amplifier. CMOS switches and saturating transistors are used to switch the various signals. To reduce crosstalk, the switches all use two devices, one to shunt the signal to ground and the other to disconnect the signal from the input. The graticule signal is a digitally-generated signal which is always connected to the magnifier amplifier input.

The graticule signal also serves as a digitally-controlled position control, allowing different operating modes to have a properly centered display. The front-panel VERTICAL Position control is connected to the input circuit of the magnifier amplifier to move the display vertically.

### Vertical Output Amplifier

Two dual diodes, CR865 and CR965, serve as a limiter for the peak-to-peak signal voltage applied to the output amplifier. The output amplifier consists of the following active components: Q772 and Q971, which operate as a differential amplifier; Q771 and Q972, which improve the apparent betas of Q772 and Q971; and Q773 and Q973, which are grounded-base transistors that drive the crt vertical deflection plates. L776 and L876 improve the high frequency response.

### Color Difference to GBR Transcoder

The Color Difference to GBR Transcoder (U883A, U883B, U883C, and Q878 with associated components) transcodes the video signal from a three-channel, color difference format into the GBR format. The GBR signals are then monitored by the Gamut Limit Detector (shown on Diagram 10) to detect video signal levels that exceed the legal signal range of zero to 700 mV. The Gamut Limit Detector consists of Q411, U313A, U313B, Q210, Q211, U213A, B, C, and D, U202A and B. The GBR signals are also available at the PIX MON OUTPUTs to drive a GBR picture monitor.

The inputs to the Color Difference to GBR Transcoder come from the outputs of the CH 1, CH 2, and CH 3 Input Amplifiers (shown on Diagram 2). The signal for each color is developed by mixing the proper proportions of the color difference components according to the following SMPTE Standard formulas:

$$G = Y - 0.3441Pb - 0.7141Pr$$

$$B = Y + 1.772Pb$$

$$R = Y + 1.402Pr$$

The operational amplifiers (shown on Diagram 2), U883A, B, and C, with their resistor networks, perform the signal mixing. Subtraction and addition is accomplished by presenting the color difference components to either the inverting or non-inverting inputs of the amplifiers. The resistors that are connected between the inverting and non-inverting inputs (R785,

R884, and R987) compensate the high frequency response of the amplifiers and can be omitted for low frequency analysis of the networks.

The outputs of the Color Difference to GBR Transcoder (shown on Diagram 2) are sent to the GBR Output Amplifiers through the following analog switches: U781A, B, C, D, and U981B, C. In the GBR Format mode, the transcoder is bypassed by closing analog switches U781A, U781B, U981B and opening U781C, U781D, and U981C.

## HORIZONTAL DIAGRAM 4

### Sweep Generator

The action of the Sweep Generator is controlled by the Microcontroller (U343, shown on Diagram 7). There are two independent integrators, one for line ramps and the other for field ramps. Line rate ramps are generated by the integrator consisting of amplifier U419A, input resistor R415, and integrating capacitor C516. The DAC, U615, outputs a dc voltage which produces the integrating current (corresponding to the desired line rate) through R415. When RATE 1 and /PARADE are both high, the DAC output is -3 V and the integrator generates a steep, 1-line rate ramp. When RATE 1 is low and /PARADE is high, the DAC output is -1.5 V and the integrator generates a 2-line rate ramp that is one-half as steep. When RATE 1 and /PARADE are both low, the DAC output is -1 V and the integrator generates a slower, 3-line rate ramp used in the Parade mode.

When /LINEGATE is high, Q415 is saturated, holding the output of the integrator at 0 V. When /LINEGATE goes low, the integrator ramps until /LINEGATE goes high again, saturating Q415 which resets the integrator output to 0 V. The ramps are about 8 V at the output of U419A.

Field rate ramps are generated by the integrator (U419B, R416, and C424). The integrator is gated by the /FLDGATE through Q421. The ramps at the output of U419B are 8 V for 60 Hz fields and 9.6 V for 50 Hz fields. When 50 Hz operation is selected via the Menu, the /60HZSEL line is high, saturating Q513 and forming an attenuator with R522, R524, and R515. The attenuator reduces the current input to the Horizontal Mag Amplifier for the larger ramp.

### Horizontal Mag Amplifier

The Horizontal Mag Amplifier (Q525, Q632, and associated circuitry) controls the gain of the sweep ramps. The non-grounded base of Q525 is the summing junction of the Horizontal Mag Amplifier, summing the outputs of the Sweep Generator and Horizontal Position circuits. Feedback current through R526 and R533 is shunted by Q432, Q433, and Q434 to provide magnified gain. The 10X magnification ( $1 \mu\text{s}/\text{div}$ ) in 2 LINE MAG display is achieved by turning on Q432 and adjusting R435. Approximately X20 magnification in 2 FLD MAG display is achieved by turning on Q432 and Q433. The X25 magnification ( $.2 \mu\text{s}/\text{div}$ ) in 1 LINE MAG display is achieved by turning on Q432, Q433, and Q434, and adjusting R434. A reference voltage for biasing the Horizontal Mag Amplifier switching transistors is provided by U619A.

### Offscreen Blanking

U535A and U535B sense the output of the Horizontal Mag Amplifier. If the output transistor, Q632, is saturated or cutoff (which would correspond to the crt beam being off screen to the right or left), the output of U535A and U535B will go low, resulting in blanking of the crt.

### Horizontal Output Amplifier

The Horizontal Output Amplifier (Q751, Q755, Q851, Q857, and associated circuitry) drives the horizontal plates of the crt differentially. The non-grounded base of Q753 is the summing junction for the outputs of the following: Horizontal Mag Amplifier, Horizontal Graticule Generator (see Diagram 9), and the horizontal 1.5 MHz low-pass filter (when the analog switch between pins 2 and 3 of U658A is closed). Q753 is a differential pair which converts the input signal into paraphase to drive the output transistors (Q751 and Q755). Q851 and Q857 are current sources. The deflection plates are a capacitive load to the amplifier, and, at higher slew rates, the charging and discharging currents increase. During the higher slew rates, the current through the sources is changed by the signal coupled through C851 and C857 to aid in the charging and discharging.

### Horizontal Variable Gain Amplifier

The heart of the Horizontal Variable Gain Amplifier is a four-quadrant multiplier gain cell, U742. The gain cell input, pin 4, can be connected to one of four inputs via CMOS switches. Normally, in the Vector mode, the input is connected to the output of the Ch 2 input amplifier (BLUE line). In the Lightning and Bowtie modes, the input is toggled between the Ch 2 (BLUE line) and Ch 3 (RED line) amplifiers.

In Lightning mode, the input to U742 is toggled between the Pb and Pr outputs of the transcoder.

The gain of U742 is a function of the differential voltage between pins 6 and 8. This differential voltage is developed across the dual diode, CR737, by altering the current through the diodes. The output of the gain cell is a signal current. Transistors Q840 and Q842 comprise an amplifier that converts the signal current to a voltage at the emitter of Q840. The feedback resistor is R841.

In Bowtie mode, the Ch 2 and Ch 3 signals are sent to the vertical section to be summed with Ch 1 through the analog switch between pins 12 and 13 of U658B. When the instrument is not in the Bowtie mode and the switch between pins 12 and 13 is open, the switch between pins 10 and 11 closes, shorting pin 12 to ground and preventing signal feed-through across the open switch.

### Lightning and Vector Low Pass Filter

The output of the Horizontal Gain Cell, U742, is passed through a low-pass filter identical to the one in the vertical channel. Transistors Q747 and Q846, with associated resistors and capacitors, form the filter. The output of the filter is dc restored with the sample-and-hold switch, Q351, and the error amplifier, U452A.

In Lightning and Vector modes, the output of the filter is sent to the summing input of the Horizontal Output Amplifier, U443, through the analog switch, U658A.

### Transition Intensifier

The Transition Intensifier increases the intensity of only the fast transitions for the Lightning mode display so that channel timing measurements using the transitions can be easily viewed without increasing the intensity of the entire display and enlarging the color bar dots. The Transition Intensifier circuitry detects the fast  $dv/dt$  portions of the video signal that is present in the low-pass filter during the Lightning, Vector, and Bowtie modes.

The Transition Intensifier consists of the four-quadrant multiplier, U443, and associated circuitry. The transistors, whose bases are connected to pins 1 and 4 of U443, form a differential pair. Their collector currents change only during fast  $dv/dt$  changes on pin 4 input because of the differentiating capacitor, C438. The upper four transistors in U443 provide signal routing determined by the polarity of the video signal's  $dv/dt$  that was differentiated by C438. The result is that the output signal at pin 12 is always positive to intensify the transitions, even though the video signal's  $dv/dt$  was positive and negative. Q445 turns off the Transition Intensifier circuit during Bowtie mode.

## CONTROL CIRCUIT & FRONT PANEL

### DIAGRAM 5

#### Graticule Light Control

U115 is a triangle generator whose output is compared to a voltage determined by the SCALE control. U121 is a current mirror. Pin 3 of U121 is two diode drops above the voltage at pin 2. The SCALE control, (operating through Q297, shown on Diagram 9), determines the voltage at the J131-7 end of R120 and thereby determines the current into pin 1 of U121. The current into pin 1 determines the threshold voltage at which comparator U115 will switch.

The waveform at pin 7 of U115 is a pulse whose duration is determined by the SCALE control (pulse-width modulation). Q116 is connected in series with lamps DS500 and DS800 and pulse width modulates the current through the lamps while being controlled by U115. Q214 provides a path for the base current to Q116. By turning Q214 off, Q116 cannot turn on and the lamps will be off regardless of the SCALE control setting.

### Post Regulators

The + and -15 V supplies generated on the Power Supply circuit board are further regulated to meet the on-board needs of the WFM 300A Main (A3) circuit board. U139 and U146 are the post regulators for the -11.8 V and +11.8 V supplies. R142 is the -11.8 V Adjust and R143 is the +11.8 V Adjust.

### Front Panel

Key detection circuit is described with Diagram 7.

## GBR & COMPOSITE OUT DIAGRAM 6

### GBR Output Amplifiers and Clamps

The GBR Output Amplifiers provide a non-inverted voltage gain of two because one-half of the amplifiers' output voltage is dropped across the  $75\Omega$  series output resistors (R305, R405, and R505) when the GBR PIX MON OUTPUTs are terminated with  $75\Omega$  loads.

The GBR Output Amplifiers are in a non-inverting configuration with the signal applied to the plus (+) input of the amplifiers. In the G amplifier, the feedback resistor is R210, the input resistor is R209. Resistor R311 is needed for high frequency compensation but can be omitted for low frequency analysis. The output of the G amplifier is dc restored with the sample-and-hold switch, U418D, and error amplifier, U213B. The output of U213B provides the dc voltage needed to dc restore amplifier U213A and also provides a virtual ground for the end of input resistor, R209.

### Composite

Most of the composite circuitry is found on the GBR Board (Assembly A5). This circuitry consists of a high impedance loop through, buffer amplifier, dc restorer, and composite output picture monitor amplifier. There are two pick-off points to drive the waveform monitor; one is to drive the display, and the other for internal composite sync.

The Rear-Panel COMPOSITE loop-through input connectors (J300 and J400) drive non-inverting wide-band amplifier U600. R603 is a frequency adjustment. The output from U600 pin 6 drives a shunt dc restorer consisting of C500 and U418B. Timing is such that the clamp is on during the back porch for approximately  $2.5\ \mu\text{s}$ . The restored signal is then buffered by complementary emitter followers Q300 and Q310 to provide the signal at P600 and P610. P600 is the video signal to the Main Board (A3) for display in Waveform mode, and P610 is the video signal to the Control Board (A4) for internal Composite Sync.

The Picture Monitor Output consists of U200 and associated circuitry. This amplifier runs at a fixed voltage gain of 2, with gain set by R202 and R203. The rear-panel COMPOSITE Output connector (J200) is source-terminated at  $75\ \Omega$  by R204.

The Picture Monitor Output also provides a bright-up step when the WFM 300A is in Line Select. This is accomplished by components Q200, C200, R206, and R208. /STROBE, a negative pulse, is generated by the Control Board and is connected to the GBR board via J115 pin 3. When this strobe signal goes low, it turns on Q200 for this time period, which puts current through the load termination and R204. This current is such that an approximate 80 mV positive signal offset will be produced across the output load. The result, if viewed on a picture monitor, is an increase in brightness during this period of time.

### CONTROLLER DIAGRAM 7

Microprocessor U343 (also called 'Controller') controls the WFM 300A. The Controller consists of four 8-bit ports that are configurable inputs or outputs, eight kilobytes of memory, a serial port, two 16-bit counter/timers, and two interrupts. The Controller is clocked by a 12 MHz crystal. Fig. 4-3 is a simplified block diagram of the microprocessor and its interfaces.

### Front-Panel Interface

The Front-Panel Interface consists of an LED Driver, U288, and the Row/Column lines. The Controller indicates the status of the instrument through the 'On/Off' state of the LEDs. The Controller writes to the LED Driver, U288, via the data bus and the chip select lines (A0, A1, A2, and /WR). U288 sequentially displays each of its four registers by placing the data bits at pins Sa-Se and driving either D1, D2, D3, or D4 high. The series resistors on the outputs of Sa-Se are series limiting resistors to limit the current through the LEDs and control the brightness. The outputs of D1-D4 drive NPN transistors U485A, B, C, and D through resistors R382, R383, R384, and R385 to enable one of four banks of LEDs on the LED Board. R297 and C297 form a low-pass filter to filter the noise caused by U288.

### Key Detection (Shown on Diagram 5)

The front-panel push buttons are directly monitored by Port 1. Key condition (depressed front-panel switch) is detected using the Row/Column lines (ROW0-ROW3 and COL0-COL3). These lines, and their connections to the front-panel switches, are shown in Fig. 4-4. For this example, suppose that the CH2 front-panel switch is depressed. To poll the switches, the Controller resets all of the Row lines low and sets all of the Column lines high. It then monitors the Column lines, waiting for one of them to be pulled low (indicating a depressed key condition).

To determine which key is depressed, the Controller first sets all Row/Column lines high except ROW0, which is reset low. Next, the Controller looks at the Column lines again. Since the MODE 0, MODE 1, SWEEP, or DOWN keys are tied to ROW0, and ROW0 is low, if one of those keys were depressed, the corresponding Column line would be pulled low. In this case, the Controller does not find a low on any of the Column lines, so it is known that the depressed key is not MODE 0, MODE 1, SWEEP, or DOWN.

The Controller next sets ROW0 high and resets ROW1 low. Again it looks at the Column lines. Since ROW1 is low, if one of the keys tied to it (MAG, COMPOSITE, REF, or UP) were depressed, the Controller would find a low on the corresponding Column line. It does not find a low, so it is known that the depressed key is not MAG, COMPOSITE, REF, or UP.



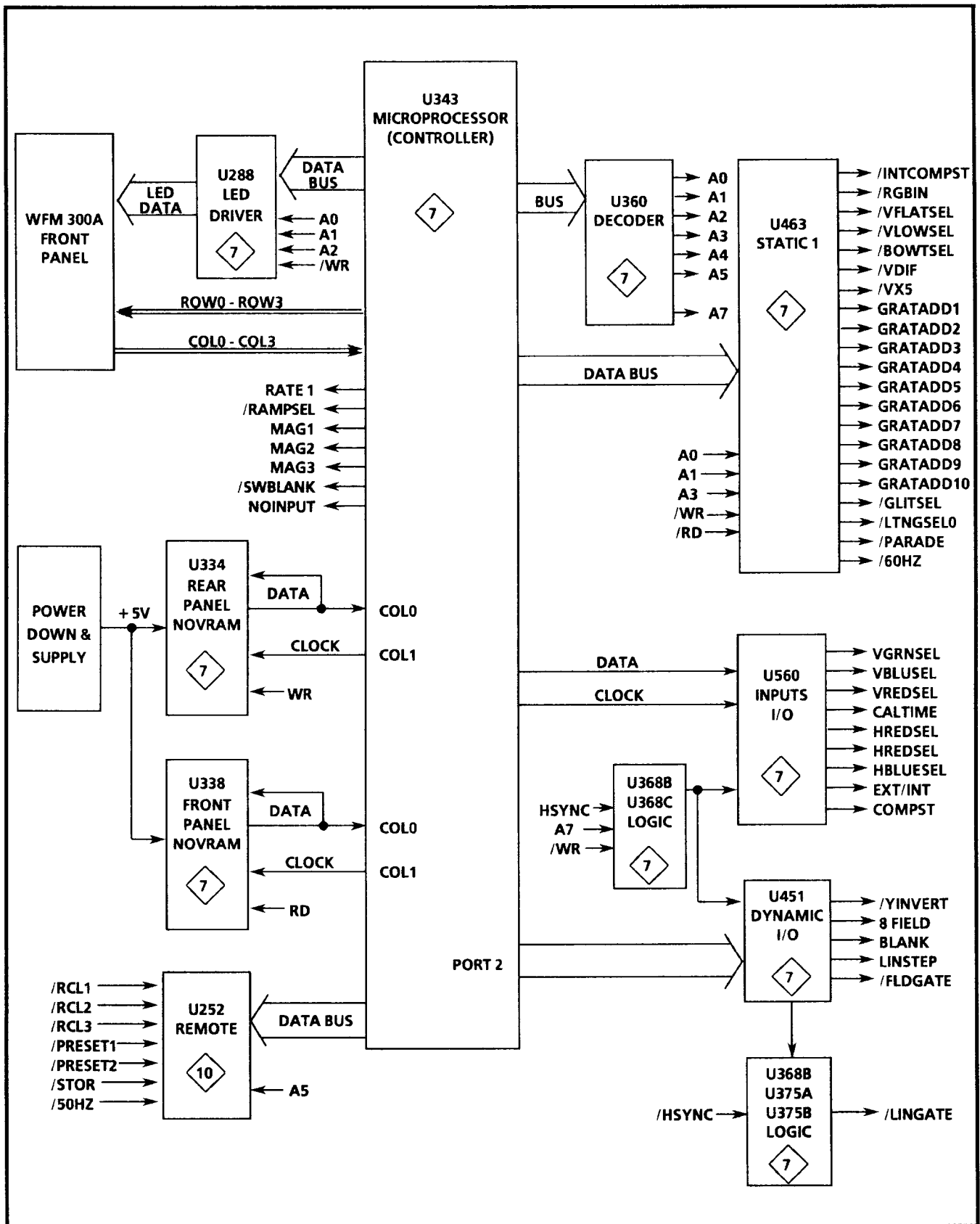


Fig. 4-3. Simplified block diagram of Processor.

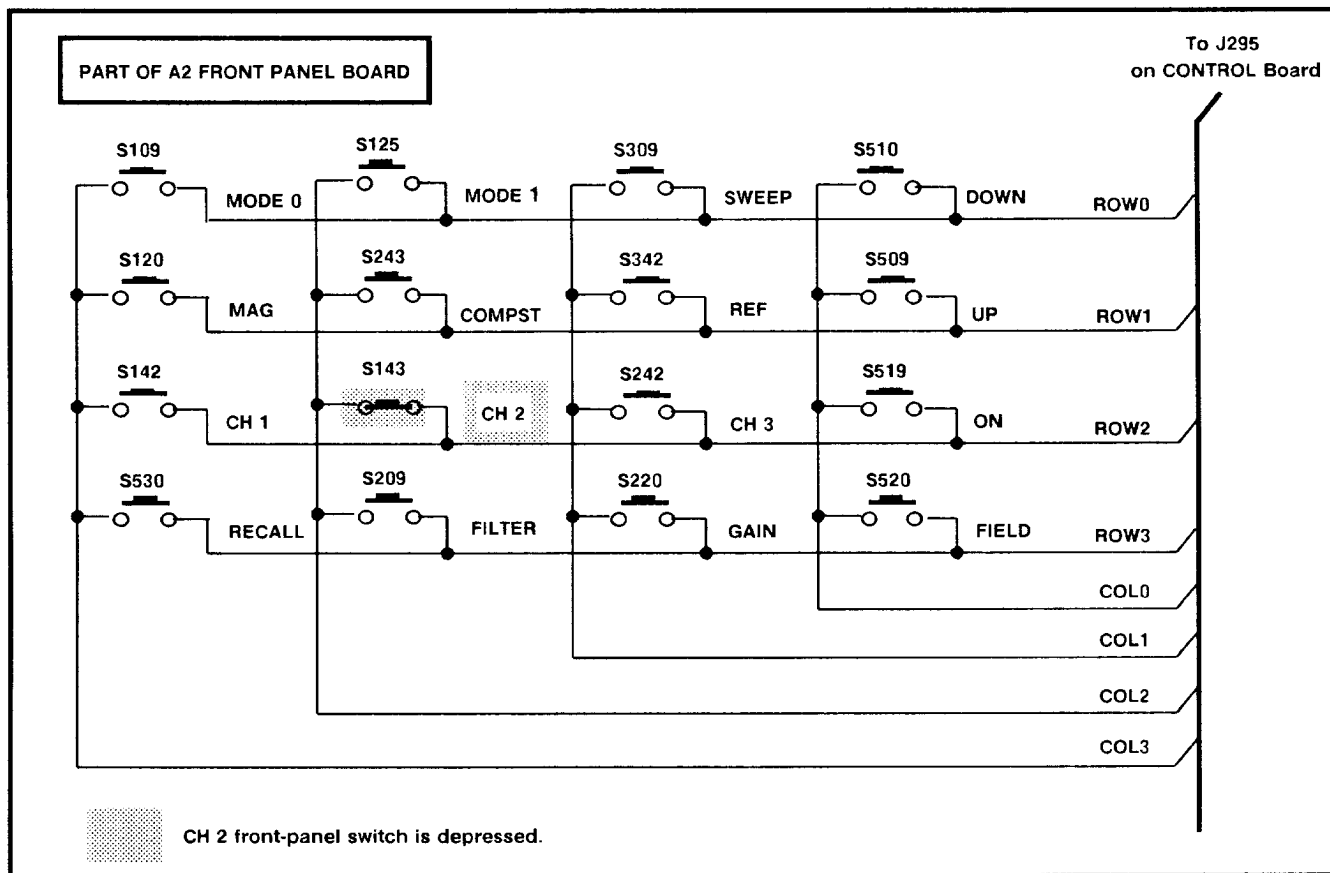


Fig. 4-4. Front-panel switches connected to Row/Control lines.

Next, the Controller sets ROW1 high and resets ROW2 low. Since one of the switches connected to ROW2 is depressed (CH2), the Controller finds that the corresponding Column line (COL2) has now been forced low. The Controller now knows that the depressed key is CH2, and responds by turning on the CH2 front-panel LED and the associated Control I/O.

After finding a key condition, the controller debounces and checks again.

**Rear-Panel Interface**

The Rear-Panel Interface includes three /RECALL lines, one /STORE DISABLE line, and one /ENABLE line that are capable of recalling and storing up to three user-definable front-panel settings. There are two /PRESET lines that are factory pre-programmed. /PRESET1 is programmed for the Parade mode and /PRESET2 is programmed for the Lightning mode.

The Rear-Panel Interface is continuously monitored to check for changes in the ground closures at the REMOTE connector. If, for example, /PRESET1 line goes low for the Parade mode, then, since /RECALL1 is already low, whatever was stored in /RECALL1 will control the instrument only as long as /RECALL1 remains low. If /RECALL1 returns high, the instrument will return to the /PRESET1 Parade mode. All front-panel controls remain fully operational.

**Static Control Registers**

The Static Control Registers are Static 1 (U463) and Static 2 (contained within U343). These lines are static in the sense that once a front-panel push button is depressed and processed, the lines are set accordingly and remain in that state until there is another Key closure. Some of the static control lines, however, are more active (such as GRATADD1-GRATSEL when the instrument is operating in the Line Select mode).

A Static Control Register is normally updated when a Key closure is detected. The Controller, U343, looks up the definition for the given LED data. The data for each register is applied to the bus to be sent to the appropriate register to be latched. For example, if the instrument was set to the Waveform, Parade, Calibrator, or Bowtie mode, one of the corresponding LEDs would be turned on.

### Dynamic Control Registers

The Dynamic Control Registers are the registers that may be toggling at some periodic rate. These registers consist of Inputs (U560) and Dynamic I/O registers (U451). Some of the other static registers can be considered to be dynamic if the instrument is operating in the Line Select mode.

### Sweep

During Composite operation, the WFM 300A provides a choice of 1 Line, 2 Line, or 2 Field sweep, accessed through the front-panel buttons. If the instrument is operating in a Component Parade mode, selecting 1 LINE will provide a 3 line display of CH 1, CH 2, and CH 3. Selecting 2 FIELD will provide a 3 field display.

If the instrument is set for 1 Line sweep, /FLDGATE is high and this condition places the Field Sweep Generator in retrace. When LGATEN is set high, it allows /HSYNC to pass through U368B, U375B, and U375A to set /LINGATE high for 1  $\mu$ s during retrace time, and low during sweep time. In 2 Line sweep, LGATEN toggles at the correct time to block out every other positive pulse from /HSYNC. As a result, one positive pulse is present every two lines to retrace the sweep. The remaining time occurs during 2 Line sweep. In 2 Field sweep, /LINGATE is set high and the line sweep generator remains in retrace. The /FLDGATE line goes high for retrace and resets low for the remaining lines in the frame to provide a 2 Field or 3 Field sweep.

### Line Select

Line Select is a full-field line select with a 15-line capability. Line Select is available during the Waveform or Vector mode of operation. The selected line number is displayed on the crt when operating in these modes when using 1 Line or 2 Line sweep. In

2 Field sweep, no line number is displayed but there is a bright-up of the selected line. The selected line is brightened in Field 1, Field 2, or Both Fields.

The 15-Line mode is selected by pushing the LINE SELECT ON button and holding it in for approximately one second. This mode is turned off by repushing the button and holding it in for about the same time.

In Line Select mode, the GRATADD1-GRATADD10 lines are dynamically controlled. They provide the Graticule State Machine (A4U152, shown on Diagram 9) with the data addresses needed to display a given character. The GRATSEL (U343 pin 37) and BLANK (U451 pin 17) lines provide control for the Graticule State Machine and the selected line unblanking.

### Readout

The Readout consists of alpha and numeric characters. The Readout is controlled via the following control lines: GRATADD1-GRATADD10, GRATSEL, and BLANK. The GRATADD lines are addresses for the Graticule State Machine. This state machine recognizes the addresses and displays the appropriate character or number.

### Non-Volatile Memory

There are two non-volatile RAMs: U338 and U334. These devices have a 16-word size RAM layered with a 16-word size EEPROM. The EEPROM can be written approximately 10,000 times. It is written only if a key is selected and the instrument power is turned Off.

When front-panel key selection has been made and the instrument control lines are all set in the proper state for the function selected, the keyboard is checked again. This time it is looking for no keys to be selected. Port 1 then updates either U334 or U338. COL0 is the data control, COL1 is the clock control, and NOVACE/NOVBCE are used to enable the NOVRAMs.

The data read and written to U334 is: LED data (containing all the modes of the instrument), Line Select data (current line number selected), and instrument status data (Field, 15 Line Mode, RGB Mode, Gamut Strobe, and flag information).

## WFM 300A — THEORY OF OPERATION

The data read and written to U338 is: Store/Recall information for the three user-definable Store/Recall functions, and FORMAT information from the MENU selection.

The 15V Power Supply provides power to the NOVRAMs, through CR238, regulated to +5V through U137. C135 acts as a power storage device when instrument power is disabled. This charge on the capacitor remains long enough for the NOVRAMs' RAM to be copied to the EEPROM. The power-down circuitry is sensed by U238. R234, R235, and C133 form a voltage divider and a storage element. R232, R233, and C232 form another divider and storage element. The positive side of U238 is slightly greater than the negative side, causing the output to be positive. When the instrument power is disabled, the positive side of U238 drops below the negative side, causing the output to drive negative. The output driving negative to the /STO input of the NOVRAMs causes the RAM to be written to the EEPROM. In the event that the Front-Panel NOVRAM, U338, wears out before the Rear-Panel NOVRAM, U334, these RAMs can be interchanged if you prefer to get the front-panel controls working again. Of course, if the opposite situation arises, interchanging the RAMs will get the rear-panel Recall selections working again.

### TIMING DIAGRAM 8

The WFM 300A attempts to use the Processor to perform as many functions as possible. However, the Processor cannot reliably control events faster than a video line time. Since the Processor is not locked to sync, it cannot generate timing edges with fixed relationships to sync. Therefore, peripheral circuitry must handle these signal requirements.

#### Timing Circuits General Description

The equation used for determining 96LS02 delay is  $T = 0.47RC$ . (The 96LS02 microcircuits are U202, U218, U223, U226, and U317.)

The timing circuits receive video as an input, and output TTL pulses with fixed relationships to sync. There are seven outputs from the timing circuits:

1. HSYNC (horizontal sync true high)
2. /HSYNC (horizontal sync true low)
3. /SWBLNK (switch blanking true low)
4. HBLANK (horizontal blanking true high)
5. /CLMPULSE (back porch clamp pulse true low)
7. /FIELD (identifies Field 1 and Field 2; low during 60 Hz Field 1 and 50 Hz Field 2)

#### Sync Stripper

Video is ac coupled into the Sync Stripper, U514. The Sync Stripper is a hybrid version of the sync stripper used in the TEKTRONIX 1740 Waveform Monitor. A high gain inverting amplifier output within U514 is sync-tip clamped to about 5 V. The amplifier output feeds a fixed threshold detector that is set just below 5 V. The detector output is stripped sync compatible with TTL loads.

#### H/2 Lockout

A 56  $\mu$ s one shot, U226B, is used to prevent triggering on equalizers or serrations. The output of U226B is a 56  $\mu$ s pulse that starts with the leading edge of sync. U226B is configured to be non-retriggerable, so equalizers and serrations that occur in the center of a video line have no effect on the output of U226B.

#### HSYNC (Horizontal Sync)

The leading edge of horizontal sync (HSYNC) is gated through by the Processor to start retrace during modes of operation that require a horizontal ramp. The trailing edge of HSYNC is gated through by the Processor to start the sweep. HSYNC is a 1  $\mu$ s pulse that occurs 0.3  $\mu$ s after the leading edge of sync (or, more precisely, the leading edge of the 56  $\mu$ s pulse from U226B). The position of HSYNC is determined by U226A. Duration of HSYNC is determined by U223B.

### SWBLANK (Switch Blanking)

All synchronous switching operations in the WFM 300A are initiated by the leading edge of HSYNC. Any switching transients caused during HSYNC are blanked by SWBLANK. SWBLANK is a  $3\ \mu\text{s}$  pulse that is triggered by the leading edge of sync which coincides with the leading edge of the  $56\ \mu\text{s}$  pulse). Q509, R404, and C404 comprise a  $3\ \mu\text{s}$  half shot whose output is gated by SWBLKEN (Switch Blank Enable) from the Processor. During the center of 2 LINE sweep modes, SWBLANK is not desired. The Processor decides whether SWBLANK is required during the next sync or not, and sets SWBLKEN accordingly. The SWBLKEN for the next sync is made valid from the Processor on this sync edge because SWBLANK needs to start before the next HSYNC. U428B ensures that this SWBLANK is not cut short by SWBLKEN going false for the next sync pulse.

### /CLMPULSE (Clamp Pulse)

/CLMPULSE is a  $2\ \mu\text{s}$  pulse that occurs during the back porch to activate the various clamp circuits in the WFM 300A. One shot U317A, triggered by the leading edge of sync, determines the position of /CLMPULSE. One shot U317B determines the width. U422B inhibits the clamp pulse generator during vertical sync. When U218A detects loss of sync, U422B is gated off, which allows U317B to generate clamp pulses in the absence of sync at the free-running frequency of U230.

### HBLANK (Horizontal Blanking)

HBLANK is a  $9.5\ \mu\text{s}$  pulse that inhibits gamut limit detection during sync and back porch. HBLANK is also used to blank the crt in Vector or Lightning modes to reduce the intensity of sync information. The only sync information left in the Lightning or Vector displays is equalizer and serration pulses. HBLANK should start during front porch to eliminate displaying the leading edge of sync. The start of HBLANK is controlled by U218B. U218B is triggered by the trailing edge of the  $56\ \mu\text{s}$  pulse from U226B. The duration of U218B output is adjusted by R218. The circuit tolerances make an adjustment necessary to ensure that no video is lost and no sync information is displayed in either 60 Hz or 50 Hz standards with one value of resistance. The duration of HBLANK is controlled by U223A.

### Loss of Sync Detector

In the absence of video, the /CLMPULSE output must free run to keep some analog amplifiers within their active region. HSYNC must also be free running. If HSYNC is absent, the Processor will not generate sweep and retrace signals.

U218A is a loss of sync detector. U218A is configured in the retriggerable mode, so that while sync is occurring within a period of less than  $220\ \mu\text{s}$ , pin 7 of U218A will be low. If U226B does not trigger for  $220\ \mu\text{s}$ , pin 7 of U218A will go high.

U230 is a phase-lock loop circuit that locks a square wave output to sync with no phase shift. This means that the square wave is high during the first half of a line and low during the second half. If U218A has detected loss of sync, U422A will pass this square wave to U226A. Since pin 10 of U226B is low during a loss-of-sync condition, U226A will trigger on the square wave and generate HSYNC outputs at the free running period of U230. U317A responds in a manner similar to U226A to generate /CLMPULSE outputs with no sync input.

### Field Detector

The Field Detector circuit uses an integrator, U510, to detect vertical sync. U417 is a voltage comparator with hysteresis that converts the integrator output to TTL thresholds. U428A is clocked by the integrator's response to the end of vertical sync. If the integrator clocks U428A during the first half of the line, while U230 square wave is high, U428A output will go high. If the integrator clocks U428A during the second half of the line, while U230 square wave is low, U428A output will go low. Since vertical sync only occurs once a field, U428A decision will remain for one field. Since the relationship between line rate information and field rate information changes by a half line per field, U428A output will change at a field rate with positive field identification.

### Gamut Limit Detector

Refer to the Diagram 10 circuit description.

## GRATICULE DIAGRAM 9

### Electronic Graticule Generator

The electronic graticule is drawn in a manner analogous to the way a pen is used to make a drawing. The pen is the electron beam of the crt. When the crt is blanked, the pen is up and may be moved without leaving a trace on the screen. When the crt is unblanked, the pen is down and draws a line when it is moved. The implementation that was chosen requires that the beam move from its present location to its next destination within  $40\ \mu\text{s}$ . For a given intensity setting, the electron beam imparts a fixed amount of energy to the screen phosphor every  $40\ \mu\text{s}$ . Long lines will spread this energy out over a larger area and will appear dimmer than short lines. To partially compensate for this difference, an attempt has been made to construct the graticule from equal line segments.

The H DAC and V DAC (U275 and U283, shown in Fig. 4-5), provide voltage outputs that define the beam destination. An Error Amplifier, A3U826, produces an output voltage equal to the difference between where the beam is now and where it will go next. This error voltage is sampled every  $40\ \mu\text{s}$  by the H and V Sample-and-Holds, A3U733 and A3U833 on Diagrams 3 and 4, respectively. The Sample-and-Hold outputs remain constant for  $40\ \mu\text{s}$ , causing the H and V integrators to change in a linear manner. The H and V integrators are calibrated to arrive at the desired destination exactly as the Sample-and-Holds are updated with new instructions about how fast and in which direction to move next. Direction is determined by polarity; speed is determined by amplitude. For example, to make a dot, the next destination is made equal to the current destination. This will cause a zero voltage output from the Error Amplifiers and the Sample-and-Holds. With no current through the integrator capacitor, the graticule generator output will not change.

H DAC and V DAC are 12-bit DACs, while the EPROM (U268, containing both the H and V data) has only eight outputs. As a result, data must be time demultiplexed into each DAC and also between DACs. This demultiplexing function is performed by the Graticule State Machine, U152. This circuit requires four bytes of data to update both the H and V DACs. The first two bytes go to the HDAC; the most significant four bits of H data are not used. The third and fourth bytes update the VDAC. When both DACs are loaded, the Sample-and-Holds are pulsed. One byte is loaded every  $10\ \mu\text{s}$ ; four bytes require  $40\ \mu\text{s}$ . The  $40\ \mu\text{s}$  time is chosen to be relatively long compared to the required Sample-and-Hold pulse width, yet short enough to finish the longest graticule in less than two-thirds of a field.

Two of the most significant four bits of V data contain programmed blank and programmed stop information for the State Machine. If the blank bit is set when the VDAC is loaded with its most significant data, the beam is blanked while proceeding to the destination just loaded into the DACs. If the programmed stop bit is set, the DACs will not be updated again until the Processor selects the next graticule pattern and initiates the State Machine.

The Electronic Graticule Generator outputs are summed with any signal driving the crt. This allows the DACs' output to control the display position relative to the electronic graticule. The Processor controls the display position relative to the graticules or other displays by executing graticule patterns whose only functions are to end with the desired H and V outputs. These are called centering graticules. Another use of the Electronic Graticule Generator is to generate the readout for line select. Each character of the readout is a separate graticule pattern ending with the stop bit set. When the Graticule State Machine has completed a pattern, it will set the /GSTOP bit true. The Processor can then load a new graticule pattern address and reinitiate the Graticule State Machine, or reset the State Machine to enable the INTENSity Z-axis control. The State Machine automatically inhibits the INTENSity Z-axis control and enables the SCALE Z-axis control during graticule generation.

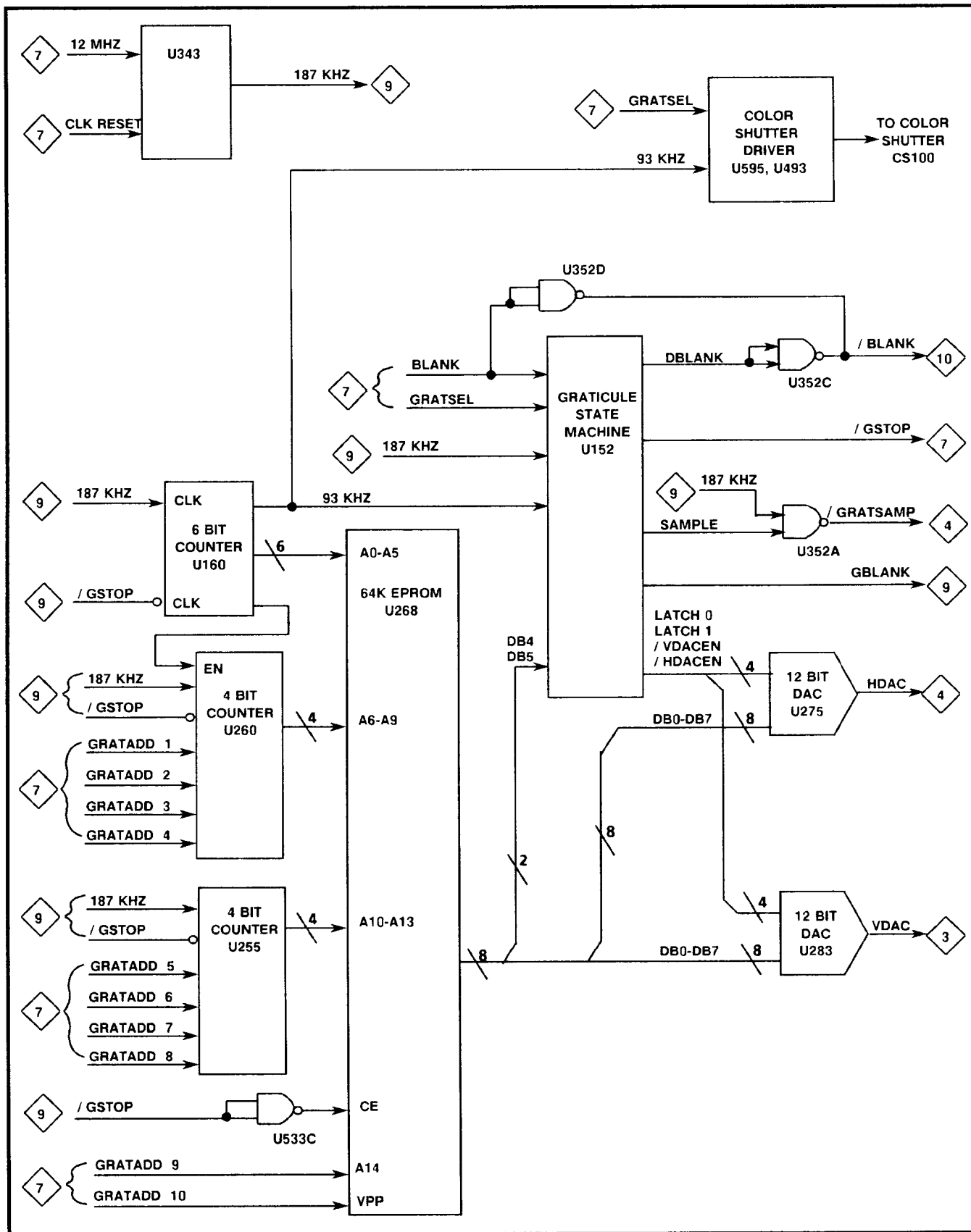


Fig. 4-5. Electronic Graticule (Schematic 9) block diagram.

The GRATSEL (Graticule Select) and BLANK lines are inputs to the Graticule State Machine, U152, from the Processor. The color shutter takes several milliseconds to switch to the blue mode after GRATSEL goes true, so the Graticule State Machine must wait. The crt is blanked by the Processor during this color shutter transition time. After sufficient time has elapsed, the Processor sets the BLANK line false. From its reset state the Graticule State Machine will recognize the GRATSEL and BLANK true, BLANK false sequence and proceed to execute the graticule pattern currently selected by the Processor. The Processor may select another graticule in response to /GSTOP and then reinitiate the Graticule State Machine without color shutter wait states by toggling the BLANK line. The Graticule State Machine will always run until a programmed stop bit is encountered regardless of what /GRATSEL or BLANK is doing. After finishing a pattern, the State Machine will reset if /GRATSEL is false and BLANK is true.

U434 divides the 12 MHz crystal clock by 64 to obtain the 187 kHz clock for the Graticule State Machine. The 187 kHz clock determines the sample pulse width. U160 divides the 187 kHz clock by 2 to obtain the 93 kHz input for the Graticule State Machine. The 93 kHz input determines the time per byte out of the EPROM. U160 and U260 comprise a loadable up counter that functions as the address counter for the graticule EPROM. While /GSTOP is true, the counter outputs will follow the inputs. The smallest graticule addressable by the Processor consumes 64 bytes. Since it takes four bytes per destination, the smallest graticule is 16 line segments. The largest graticule that may be executed by the Graticule State Machine is 4096 line segments. There are 18 graticules within the address space of C0-C13. C14 selects the MENU readout, and has an equal amount of address space.

### Color Shutter Driver

The Color Shutter, CS100, is transparent in the driven (ac) state, and allows blue light to pass through in the undriven (dc) state. The driver for CS100 consists of U595 and U493 with associated circuitry. U493 comprises a double-pole, double-throw switch that provides a 30 V peak-to-peak square wave in a bipolar manner to both terminals of the Color Shutter. C497 is a dc-blocking capacitor whose impedance is small compared to that of the Color Shutter, allowing nearly

all of the signal to appear across the Color Shutter. R397 provides a discharge path for any dc charge build up across the plates of the Color Shutter. Dc voltages cause long-term degradation of the Color Shutter and must be avoided.

Diodes CR489, CR488, and CR598 provide over voltage protection for U493 when transitioning from the driven to the undriven state. U595 divides the 93 kHz clock to derive the timing to control U493. U595 also goes through a turn on and turn off sequence in response to GRATSEL from the Processor. When GRATSEL is true, U595 will drive CS100 via U493 to cause the electronic graticule to appear blue.

### Z-Axis Control

U423, U525, and U526 are current mirrors. The current in pin 1 of these ICs is equal to the current going into pin 3. The voltage on pin 3 is equal to two diode drops above the voltage on pin 2. With a fixed voltage on pin 3, the input resistors (R423, R525, and R528) and the voltage on the center terminal of the SCALE and INTENSity controls determine the current going into pin 1.

The three current mirrors each drive a current switch that directs the current into the +5 V supply or into the input of the Z-Axis Amplifier (base of Q516, shown on Diagram 13). If no current is going into the Z-Axis Amplifier, the crt will be blanked (no trace).

U523A is controlled by the Electronic Graticule State Machine, U152, to blank selected line segments. Q428 is controlled by the Processor during Line Select mode of operation to boost the trace brightness. CR525 allows /GLTBLANK (Glitch Blank) to completely blank the trace during line select. U523(A) is controlled by several circuits via the /BLANK line to blank the normal display trace for off-screen blanking, retrace blanking, and display blanking during graticule time. Blanking transients, caused by internal switching, are controlled by /GLTBLNK.

### Line Select Focus

During Line Select mode of operation, the beam current is much greater and requires a different focus



voltage for optimum trace definition. To minimize manual refocusing when going in and out of line select, the focus voltage is modified every time the Line Select mode is enabled.

The Processor, via LINESTEP and U565, turns on Q572 to raise the focus voltage during line select. R571 is adjusted for optimum focus of the display when operating the instrument in the 15-Line mode and a given INTENSity control setting.

## GAMUT & REMOTE DIAGRAM 10

The Gamut Limit Detector monitors the GBR signals during the active video window and lights the red NEG GAMUT or POS GAMUT indicator if a violation occurs due to the signal extending below the  $-45\text{ mV}$  limit or above the  $745\text{ mV}$  limit. The GBR signals are taken from the outputs of the GBR Output Amplifiers. The Gamut Limit Detector can be turned off and on while in non-LINE SELECT operation via Menu selection.

The gamut limit detection circuitry is inhibited during the vertical interval and horizontal sync time. U422D generates the inhibiting signal by combining  $\sqrt{\text{GAMUT}}$  from the Processor and HBLANK from U223A.

The comparator, U313A, monitors for positive gamut violations. The voltage at the cathodes of the diodes, pins 3 and 14 of U309, are one diode voltage drop less than the most positive of the G, B, and R signals. Current through the diode, connected between pins 2 and 3 of U309, shifts the signal by its voltage drop so that the voltage at its anode is essentially the most positive voltage of the GBR Output Amplifiers. When the voltage at pin 5 of U313A exceeds the voltage at pin 4, the output of the comparator switches low.

The + Gamut adjustment, R206, is set at the factory to detect signals at the GBR PIX MON OUTPUTs

reaching  $745\text{ mV}$ . This is equivalent to setting the center arm of R206 at about  $+1.49\text{ V}$  because the signals being monitored at the outputs of the GBR Output Amplifiers are twice the amplitude of the signals at the GBR PIX MON OUTPUTs when these bnc connectors are terminated with a  $75\Omega$  load. The user can adjust R206 to set the trip point of the + Gamut between a range of about  $670\text{ mV}$  to  $870\text{ mV}$ .

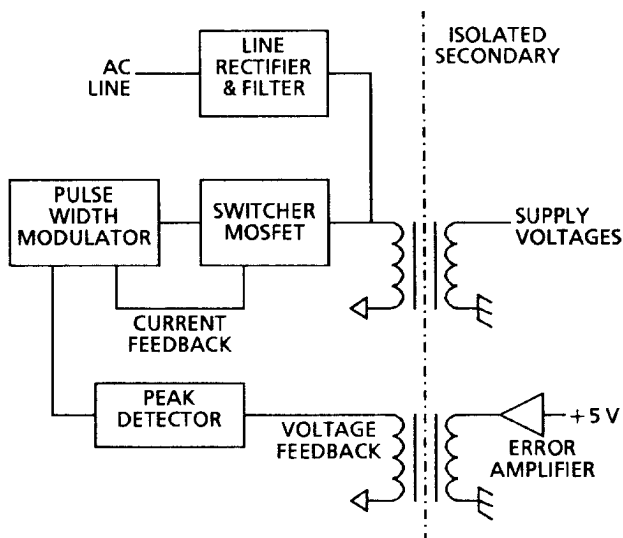
The -Gamut trip point is set to  $-45\text{ mV}$  at the factory. This is equivalent to setting the center arm of R207 at about  $-0.09\text{ V}$ . The user can adjust R207 to set the trip point of the -Gamut between a range of about zero to  $-150\text{ mV}$ .

The Gamut Limit Detector monitors the GBR outputs only when the output of U422D is low. During horizontal retrace time and during the vertical interval, the output of U422D is high and the voltage at the input on pin 4 of U313A is held near ground by the saturation of Q411. Also, the voltage at the input on pin 9 is held above zero volts by the current through R411.

When the comparator output of U313A goes low, U313A triggers one-shot U202A, sending its  $/Q$  output low and turning on the POS GAMUT LED. The  $/Q$  output remains low for about 0.43 second longer than the time the gamut limit violation is present so that the LED will be on about one-half a second even for a brief violation. Also, when the comparator output goes low, the output is combined within U213 with a logic signal, 8FIELD, which toggles at a rate of every eight fields.

When either the + or - Gamut Comparator outputs are low and 8FIELD signal is low, the output of U213A at pin 1 will be high. The high at U213A output turns Q211 off and Q210 on. A current of about  $12\text{ mA}$  is sent to resistors R306, R406, and R506 (shown on Diagram 6). This current is divided about equally by the resistors and added to the G, B, and R outputs to produce an intensified area on the picture monitor display that corresponds to the gamut limit violation. The intensified area blinks or flashes at a rate of eight fields on and eight fields off due to the gating in U213.

## LOW VOLTAGE POWER SUPPLY DIAGRAM 11



The Low Voltage Power Supply converts the mains line voltage (90–250 VAC) to supply the power requirements of the instrument. The Low Voltage Power Supply provides +40 V,  $\pm 15$  V, and +5 V to the instrument.

This type of supply is called a flyback switching supply. When switcher MOSFET Q9 is turned on, its drain voltage drops to approximately 0 volts. The current through the 350  $\mu$ H primary winding of transformer T3 begins ramping positive. The voltages present at all secondaries is such that the rectifier diodes are reverse biased. Energy is being stored in the magnetic field of T3. When Q9 turns off, the drain voltage “flies back” in a positive direction. Current now flows in all of the secondary windings and supplies power to the instrument.

### Line Rectifier and Filter

The input line voltage is filtered by the rear-panel connector to reduce the electrical noise conducted into or out of the instrument. R89 limits the initial charging current through the rectifier diodes and capacitor C54.

Diodes CR21, CR22, CR23, and CR24 form a bridge rectifier. Capacitor C54 filters the 110 to 350 VDC rectifier output, while coil L4 filters noise produced by

the switcher. R102 reduces the circulating current in the parallel circuit consisting of L4 and C44. DS4, R93, and R94 form a line voltage indicator. R91 and R92 charge C42, which provides power to U5 until the primary housekeeping winding provides power through CR17.

### Pulse Width Modulator

U5 is a current-mode pulse width modulator (PWM). A current-mode PWM uses two feedback loops. The inner current-feedback loop directly controls the switcher MOSFET peak current. The outer voltage-feedback loop programs the inner loop peak current trip point.

U5 pin 2 is the inverting input of an internal op-amp (See Fig. 4–6). The non-inverting input is set to 2.5 V by an internal voltage reference. Current from the peak detector flows through R83 and R79. R84 provides a 100  $\mu$ A offset. The voltage at U5 pin 1 will vary in order to maintain U5 pin 2 at 2.5 V.

The voltage at U5 pin 1 is modified by an internal circuit and sets the trip point of the internal comparator. U5 pin 3 is the external input to the comparator. R89 and C52, connected to U5 pin 4, set the internal oscillator to 80 kHz.

The circuit works as follows: The oscillator sets the latch and U5 pin 6 goes high, turning the switcher MOSFET on. The current through the switcher MOSFET increases, causing the voltage across R96 to increase. This voltage is divided by R87 and R101, and is applied to the comparator input (pin 3). When the voltage at U5 pin 3 reaches the comparator trip point, the latch toggles and the switcher MOSFET is turned off. This process is repeated at an 80 kHz rate.

C58 increases the PWM noise immunity by rolling off the internal op-amp frequency response. R82 holds the switcher MOSFET off as the circuit is powering up. R81 slows the turn-on of the switcher MOSFET while CR27 speeds up the turn-off.

### Output Filters

The three output windings supply four output voltages. Each output is rectified by a single diode and filtered by an LC pi filter.

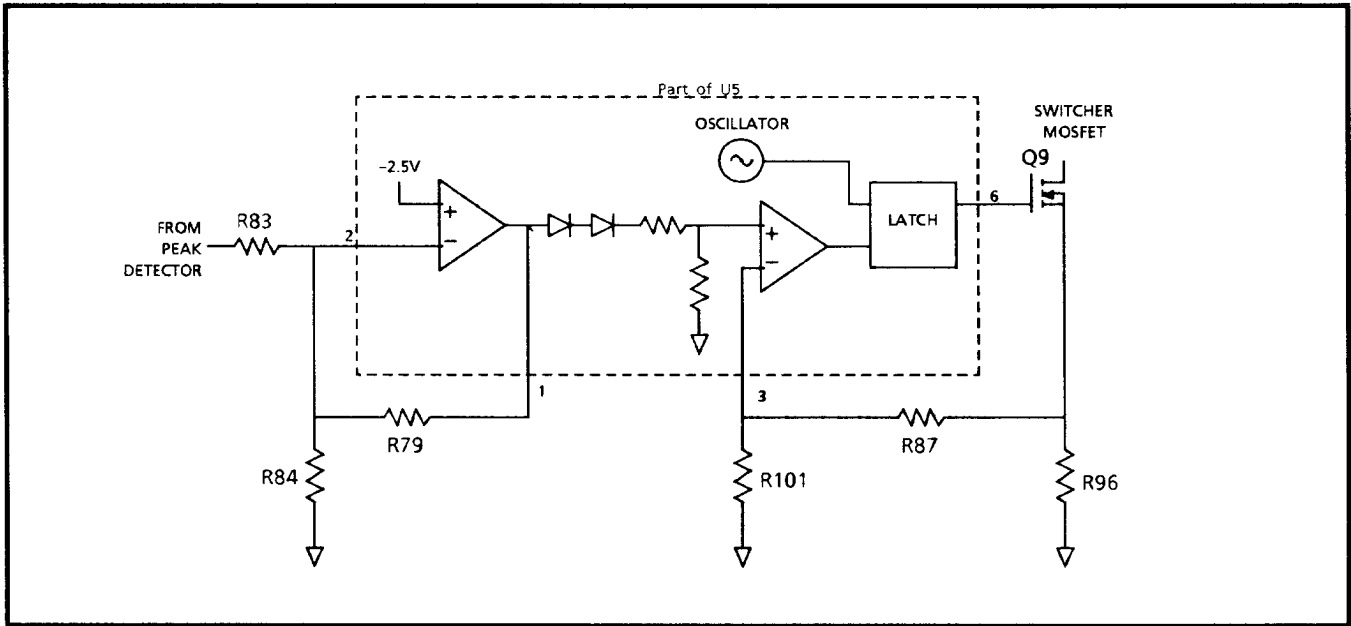


FIG. 4-6. Simplified Pulse Width Modulator circuitry.

### Error Amplifier

The Error Amplifier regulates the +5 V output by feeding an error signal to the Pulse Width Modulator. VR1 is a 2.5 V shunt regulator containing an op-amp and a voltage reference. The +5 V is divided by R69 and R70 to provide 2.5 V to VR1. C40 and R71 determine the gain and frequency response of VR1. C64, CR28, and R85 control overshoot of the +5 V at power up. R98 and CR26 provide a minimum operating current for VR1. R68 decouples C39 from VR1.

### Error Amplifier (671-2890-07 & Above)

The Error Amplifier regulates the +5 V output by feeding an error signal to the Pulse Width Modulator. VR1 is a 2.5 V shunt regulator containing an op-amp and a voltage reference. The +5 V is divided by R69 and R70 to provide 2.5 V to VR1, with fine adjustment provided by R99. C40 and R71 determine the gain and frequency response of VR1. VR4 controls overshoot of the +5 V at power up. R98 and CR26 provide a minimum operating current for VR1. R68 decouples C39 from VR1. Overvoltage protection for the +5 V supply is provided by a crowbar circuit formed by Q11, VR3, R13, and R14.

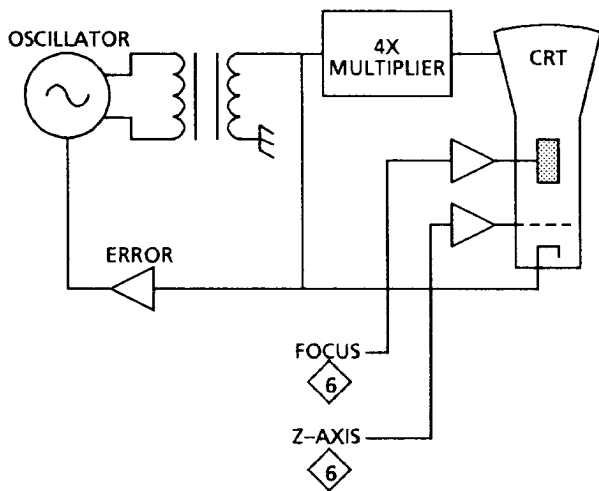
### Feedback Transformer Driver and Peak Detector

The 80 kHz sawtooth waveform at U3 pin 3 trips comparator U3. U3 pin 1 then feeds a trigger pulse to one-shot U4. U4 pin 13 outputs a 300 nS pulse to the 130 mA current source consisting of Q7 and Q8. When Q8 turns on, T2 pin 2 is pulled down until CR15 (Error Amplifier) is forward biased. The negative going pulse at T2 pin 2 is peak detected by CR16 and C46. The dc voltage present at the anode of CR16 feeds the pulse-width modulator and the Output Under Voltage Shutdown circuit. CR29 resets T2 between pulses.

### Output Under-Voltage Shutdown

If the +5 V is below +4.9 V, the Error Amplifier will cause the Peak Detector to go below 2.9 V. The output of comparator U3B will pull low and shut down Pulse Width Modulator U5. C47 and R96 delay the operation of U3B long enough for the power supply to power up. If the +5 V does not reach 4.9 V within 50 mS of power up, U3B will shut down the switcher. The power supply will then cycle on and off every couple of seconds.

## HIGH VOLTAGE POWER SUPPLY DIAGRAM 12



The High Voltage Power Supply generates the heater, cathode, control grid, focus anode, and post accelerating potentials required to display the outputs of the Vertical and Horizontal Output Amplifiers.

### HV Osc and Error Amp

The High Voltage Power Supply is generated by a sine-wave oscillator and step-up transformer. Q6 and T1 are the principal elements of an Armstrong oscillator running at about 22 kHz. Error Amplifier U2 regulates the +100 V output, and keeps the High Voltage Power Supply constant under varying load conditions by controlling the base current to Q6. The +100 V output is regulated directly, while the High Voltage Power Supply is regulated through a current feedback circuit.

R48, C16, R60, and R64 form the High Voltage Power Supply current feedback circuit. As the current from the High Voltage Power Supply is increased, the voltage to the + side of the Error Amplifier (U2) increases, which reduces the base drive to Q6, the HV Oscillator. This current feedback comprises the regulation of the 100 V supply to keep the high voltage constant with varying intensities.

C66 and Q10 are a start delay circuit that holds the Error Amplifier output low, through CR30, until C66 is charged. Delaying the start of the high voltage oscillator allows the Low Voltage Power Supply to

start, un-encumbered by the load from the high voltage oscillator.

### Power Supply Outputs

CR4 is the high voltage rectifier. Filter capacitors C3, C4, and C8 work with CR4 to provide -2750 volts to the CRT cathode. U1 is a four-times multiplier, providing +11 kV to the CRT anode.

### Focus Amplifier

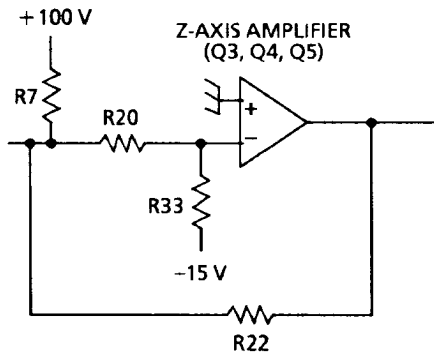
Q1 and Q2 form an operational amplifier that sets the voltage at the bottom of the focus divider. The front panel FOCUS pot determines the voltage at the bottom of the focus divider. The CENTER Focus control (R11) is set for optimum beam focus, as viewed on the CRT, with the front-panel FOCUS control set to mid range. Once the CENTER Focus adjustment has been set, adjusting the front-panel FOCUS control changes the voltage at the bottom end of the divider, and, consequently, the voltage on the CRT focus anode.

### Grid Drive Circuit

The cathode of the CRT is at a -2750 V potential with the grid coupled to the Z-Axis Amplifier by the grid drive circuit. The grid is approximately 75 volts negative with respect to the cathode. The 200 V<sub>P-P</sub> sine wave present at the cathode of CR8 is input to the Grid Drive circuit, where it is clipped for use as CRT control grid bias.

The sine wave from the 100 V supply winding of T332 cathode of CR8 is coupled through R47 to a clipping circuit consisting of CR5 and CR6. Clipping level for the positive excursion of the sine wave is set by the CRT Bias adjustment, R58. The negative clipping level is set by the front-panel INTENSITY control through the Z-Axis Amplifier. The clipped sine wave is coupled through C11 to a rectifier made up of CR1 and CR3. The rectified, clipped sine wave is the CRT control grid bias voltage. C9 couples the blanking signal from the Z-Axis Amplifier to the CRT control grid. DS1 and DS2 limit the CRT grid-to-cathode voltage at instrument turn on and off. DS3 limits the CRT heater to cathode voltage.

**Z-Axis Amplifier**



This is an inverting amplifier with negative feedback. R22 is the feedback resistor while R7, R20, and R33 act to maintain the summing junction at +5 V. Without any Z-Axis input current, the amplifier output is approximately +10 V. Negative Z-Axis current will cause the output to go positive.

Q5 is a current amplifier feeding the output stage. Q3 and Q4 form a push-pull output stage. Q3 acts as a 2.7 mA constant current pull-up, while Q4 is the pull-down transistor. C6 speeds up the amplifier by coupling AC signals to the base of Q3. CR2 and R41 protect the amplifier during CRT arcing.



# SECTION 5

## CHECKS AND ADJUSTMENTS

This section consists of two separate procedures. The first procedure, the Performance Check, checks the operation of the instrument to the Performance Requirements listed in the Specification section of this manual, Section 1. The second procedure, the Adjustment Procedure, gives instructions for performing the adjustments in the instrument that will return its operation within specification.

In the procedures, WFM 300A front- and rear-panel control and connector names are fully capitalized (e.g., VGAIN) as they appear on the instrument. If there is no name, a name is given and its first letter is capitalized; for example, there are two Position controls: VERTICAL Position and HORIZONTAL Position.

Control and connector names on the test equipment, and internal controls and adjustments on the WFM 300A under test, have only the first letter capitalized (e.g., Astigmatism; see Step 4c in the Adjustment Procedure).

Limits, tolerances, and waveforms given in this section are guides to adjustments and checks, and are not instrument specifications except as listed under the Performance Requirements column of the Specification section in this manual.

### RECOMMENDED EQUIPMENT LIST

#### Electrical Equipment

##### 1. Test Oscilloscope

Vertical Amplifier: 30 MHz bandwidth, 10 mV sensitivity.

Time Base: 500 ns/div to 5 ms/div sweep rates, triggering to 5 MHz.

For example: TEKTRONIX 7603 Oscilloscope with a 7A13 Differential Comparator (optional unit for adjusting Gamut Limit), a 7A18A Dual-Trace Amplifier, and a 7B53A Dual Time Base. Also, one P6106 10X probe is needed; Tektronix Part No. 010-6106-03.

##### 2. Component Television Test Signal Generator

Color test signals for the television standard of the WFM 300A being tested:

Signals needed: 100% Color Bars in the SMPTE (Y,B-Y,R-Y) Format, 100% Color Bars in the GBR Format, and 100% Color Bars in the SMPTE Format with Level Reference. The first two signals are used to check Transcoder Accuracy. The third signal is used to check and adjust Gamut Limit threshold levels.

Equipment Example: TEKTRONIX NTSC TSG-300.

##### 3. Television Test Signal Generator

Signals needed: Composite sync, black burst, color bars, 1T and 2T pulse and bar, multiburst, manual and field swept frequency signals to 20 MHz, and markers for frequency reference.

For example: TEKTRONIX 1410/1411, SPG2/SPG12, TSG5/TSG15, TSG6/TSG16, TSG7/TSG17.

##### 4. Sine wave Generator

Frequency Range: 250 kHz to 10 MHz.

Amplitude: 0.1 V to 5 V p-p when loaded by 75 $\Omega$ .

Flatness: Within 1% from 250 kHz to 10 MHz of the value at 50 kHz.

For example: TEKTRONIX SG 503 Leveled Sine wave Generator installed in a TEKTRONIX TM 500 Series Power Module. The frequency can be monitored with the frequency counter (item 7).

#### NOTE

*When using the TEKTRONIX SG 503 and FG 502, a 50-to-75 $\Omega$  minimum loss attenuator (011-0057-01) is needed.*

## WFM 300A — CHECKS AND ADJUSTMENTS

### 5. Function Generator

Sine wave frequencies: 100 kHz, 1 MHz, and 5 MHz.

Amplitude: 0.1 V to 1 V p-p when loaded by 75 $\Omega$ .

Purpose: For adjusting timing calibration.

For example: TEKTRONIX FG 502 Function Generator installed in a TEKTRONIX TM 500 Series Power Module.

### 6. Video Amplitude Calibrator (VAC)

Signal: Adjustable amplitude square wave 0.0 mV to 999.9 mV p-p with a resolution of 0.1 mV and an accuracy of 0.05%.

Frequency: Approximately 270 Hz.

For example: TEKTRONIX 067-0916-00 used in a TM 500 Series Power Module.

### 7. Frequency Counter

Frequency Range: 100 kHz to 10 MHz.

Accuracy: +0.001%.

For example: TEKTRONIX DC 503A used in a TM 500 Series Power Module.

### 8. Voltmeter

Accuracy: 0.05% over a range of 1 mV to 12 V.

For example: TEKTRONIX DM 501A used in a TM 500 Series Power Module.

### 9. Power Module

For powering and accommodating the TEKTRONIX DM 501A, FG 502, DC 503A, SG 503, and VAC.

For example: TEKTRONIX TM 506 Power Module Mainframe.

### 10. Vectorscope

Capable of Diff Gain Accuracy equal to or less than 0.25% at 10% to 90% APL.

For example: TEKTRONIX 1780R-Series Video Measurement Set.

### 11. Variable Autotransformer

For example: General Radio Metered Autotransformer W10MT3W. If 220 Volt operation must be checked, a conversion transformer or appropriate 220 Volt autotransformer is needed.

## Auxiliary Equipment and Accessories

### 12. 75 $\Omega$ End-Line Terminations

At least seven are needed.

For example: 75 $\Omega$  end-line termination (011-0102-00).

### 13. 75 $\Omega$ Feed-Through Termination

One is needed. For example: Tektronix Part No. 011-0055-01.

### 14. 75 $\Omega$ Coaxial Cables

At least eight are needed.

For example: 42-inch RG-59U (012-0074-00).

### 15. 50 $\Omega$ Precision Coaxial Cable

One is needed.

For example: 42-inch with male BNC connectors (012-0482-00).

### 16. 50 $\Omega$ 5X Feed-Through Attenuator

One is needed. For example: Tektronix Part No. 015-1002-00.

### 17. Dual-Input Coupler

Matched BNC cable to T connector for making phase comparisons between two inputs. Matched length of the two arms within  $\pm 0.1$  inch.

For example: Tektronix Part No. 067-0525-02.

### 18. 50 $\Omega$ to 75 $\Omega$ Minimum Loss Attenuator

Needed for use with the TEKTRONIX SG 503 and FG 502. For Example: Tektronix Part No. 011-0057-01.



## PERFORMANCE CHECK

The Short-Form Performance Check Procedure is intended for those who are familiar with the complete long-form Performance Check Procedure. Step numbers in the short form correlate directly to the steps in the long form. This arrangement makes it possible to use the short form as a table of contents for the long form.

The Performance Check Procedure requires the following items from the Recommended Equipment List on page 5-1: Items 1, 2, 3, 4, 6, 7, 9, 10, 11, 12, 13, 14, 15, 17, and 18.

### SHORT-FORM PERFORMANCE CHECK PROCEDURE

1. **CHECK POWER SUPPLY OPERATION**  
 REQUIREMENT – Stable operation over an ac input range of 90 – 250 V.
2. **CHECK TRACE ROTATION RANGE**  
 REQUIREMENT – Adjustment range should be  $\pm 1^\circ$  or more from horizontal.
3. **CHECK X1 GAIN VERTICAL DEFLECTION ACCURACY**  
 REQUIREMENT – With V GAIN control in detent and 1 V signal applied, the vertical deflection of the displayed signal should be 1 V peak to peak within a tolerance of  $\pm 2\%$ .
4. **CHECK CALIBRATOR AMPLITUDE**  
 REQUIREMENT – Amplitude should be 0.7 V within a tolerance of  $\pm 1\%$ .
5. **CHECK X5 GAIN VERTICAL DEFLECTION ACCURACY**  
 REQUIREMENT – In Waveform mode, V GAIN control in detent, VERTICAL GAIN set to X5, and a 0.2 V signal applied, the vertical deflection of the display should be 1 V peak to peak within a tolerance of  $\pm 3\%$ .
6. **CHECK VERTICAL GAIN RANGE**  
 REQUIREMENT – A 1 V input signal can be adjusted to provide a 2.5 division display. A 666 mV input signal can be adjusted to provide a 10 division display.
7. **CHECK COMPOSITE FLAT GAIN**  
 REQUIREMENT – With V GAIN control in detent and 1 V signal applied, the vertical deflection of the displayed signal should be 1 V peak to peak within a tolerance of  $\pm 2\%$ .
8. **CHECK TRANSIENT RESPONSE**  
 REQUIREMENT – X1 Gain: 1T pulse-to-bar transient response is 0.99:1.00 to 1.01:1.00. X5 Gain: Same as for X1 Gain except use a 2T pulse-and-bar signal.
9. **CHECK LOW PASS FILTER**  
 REQUIREMENT – Frequency response of Lum Filter is within 1% of Flat response at 15 kHz, and  $> 25$  dB attenuation at 3.58 MHz (4.43 MHz).
10. **CHECK FREQUENCY RESPONSE**  
 REQUIREMENT – X1 Gain: Flat response is from 250 kHz to 6.0 MHz within  $\pm 2\%$  of the response at 50 kHz. X5 Gain: 250 kHz to 5.0 MHz within  $\pm 2\%$  of response at 50 kHz.
11. **CHECK COMPOSITE FLAT RESPONSE**  
 REQUIREMENT – X1 response, from 50 kHz to 6 MHz, is within 2% of response at 50 kHz. X5 response, from 50 kHz to 5 MHz, is within 2% of response at 50 kHz.
12. **CHECK COMPOSITE OUTPUT**  
 REQUIREMENT – Frequency response is within 5% of Flat, from 50 kHz to 6 MHz. DC level of blanking  $\pm .1$  V. Line Select Bright-Up Pulse is approximately 140 mV when driving a 75 $\Omega$  load.

**13. CHECK HORIZONTAL SWEEP TIMING ACCURACIES AND LINEARITY**

REQUIREMENT – 1  $\mu$ s/Div (2 LINE SWEEP with MAG ON): Within  $\pm 2\%$ . Linearity (including differential linearity): Within  $\pm 2\%$ . 0.2  $\mu$ s/Div (1 LINE SWEEP with MAG ON): Within  $\pm 2\%$ . Linearity (including differential linearity): Within  $\pm 2\%$ .

**14. CHECK HORIZONTAL SWEEP**

REQUIREMENT – Sweep occurs in all horizontal sweep modes with or without synchronization. 2 FLD sweep repetition rate is equal to frame rate of applied video or external sync. Synchronization: Sweep will synchronize to a sync amplitude of 0.3 V peak to peak,  $\pm 6$  dB. Equivalent to an amplitude range of 150 mV to 600 mV. Sweep Length: Unmagnified sweeps shall be the same length within 1/2 major division.

**15. CHECK 2 LINE MAG REGISTRATION**

REQUIREMENT – Some portion of the horizontal blanking interval is visible when the unmagnified 2 LINE SWEEP display is centered.

**16. CHECK PARADE MODE SWEEP REPETITION RATE**

REQUIREMENT – Field or line rate of selected reference.

**17. CHECK VECTOR MODE BANDWIDTH**

REQUIREMENT – Vertical Bandwidth: 1 MHz  $\pm 100$  kHz. Horizontal-to-Vertical Bandwidth Matching: No loop opening at 500 kHz or 2 MHz.

**18. CHECK BOWTIE MODE**

REQUIREMENT – Common-Mode Rejection Ratio:  $> 34$  dB at 3 MHz.

**19. CHECK VECTOR MODE GAIN & ELECTRONIC GRATICULE**

REQUIREMENT – Vertical Gain, Horizontal Gain, and Electronic Graticule Accuracies:  $\pm 1\%$ . Display-to-Graticule Registration:  $\pm 1/4$  box. Electronic Graticule Shape: No visible gaps or tails at corners of target boxes.

**20. CHECK LIGHTNING MODE**

REQUIREMENT – Vertical Balance Range: +1.5 and  $-0.5$  divisions vertically. Vertical Gain Accuracy:  $\pm 2\%$ .

**21. CHECK GAMUT LIMIT**

REQUIREMENT – Factory preset threshold settings are nominally +745 mV and  $-45$  mV within  $\pm 5$  mV.

**22. CHECK GBR OUTPUT GAINS**

REQUIREMENT – Designed for better than 1%. Check to 3% to catch obvious errors.

**23. CHECK DIFFERENTIAL GAIN**

REQUIREMENT – Differential Gain  $< 1\%$  with a 1.0 V display.

**24. CHECK RETURN LOSS OF COMPOSITE, COMPONENT, AND EXT REF INPUTS**

REQUIREMENT – 40 dB from 50 kHz to 6 MHz, power on or off.

**25. CHECK RETURN LOSS OF COMPOSITE PIX MON OUT**

REQUIREMENT – 30 dB from 50 kHz to 6 MHz, power on only.

## LONG-FORM PERFORMANCE CHECK PROCEDURE

The following preparations should be made before attempting the Performance Check Procedure.

- (1) Connect the WFM 300A power cord to the Variable Autotransformer . Set the Autotransformer to the local nominal mains voltage, then turn on the WFM 300A.
- (2) Set the WFM 300A front-panel controls as shown in Table 5-1.

**Table 5-1**  
**Initial Settings for Performance Check Procedure**

Front Panel Control	Setting
POWER	ON
V GAIN, H GAIN	Detent
CH 2&3 POS	Detent
INPUT	
CH 1	On
CH 2	On
CH 3	On
Composite	Off
MODE	WAVEFORM
FORMAT MENU	GBR Not selected
REFERENCE	INT
VERTICAL	
FILTER	Off
GAIN	Off (X1)
Position	Midrange
HORIZONTAL	
SWEEP	2 LINE
MAG	Off (X1)
Position	Midrange
DISPLAY	
Focus	Trace in focus
Trace Rotation	Trace parallel w/baseline
Scale	Desired brightness
INTENS	Desired trace brightness
LINE SEL ON	Off
Line Rate	As desired

### 1. CHECK POWER SUPPLY OPERATION

**REQUIREMENT** – AC input range of 90 to 250 V.

- a. Vary the autotransformer from low-line to high-line voltage (90 – 132 V for 110 V, or 180 – 250 V for 220 V operation).
- b. **CHECK** – for stable instrument operation over the prescribed voltage range.
- c. Return the autotransformer to the local nominal mains voltage.

### 2. CHECK TRACE ROTATION RANGE

**REQUIREMENT** – Adjustment range should be  $\pm 1^\circ$  or more from horizontal.

- a. Set CH 1 to Off. Do not apply a signal to the WFM 300A.
- b. **CHECK** – that the trace rotates more than  $\pm 1^\circ$  from the base line as the front-panel TRACE ROTATION control is turned throughout its range.
- c. Set the TRACE ROTATION control so the trace is aligned parallel to the graticule base line.

### 3. CHECK X1 GAIN VERTICAL DEFLECTION ACCURACY

**REQUIREMENT** – With V GAIN control in detent and 1 V signal applied, the vertical deflection of the displayed signal should be 1 V peak to peak within a tolerance of  $\pm 2\%$ .

- a. Connect a 1 V calibrator signal from the Video Amplitude Calibrator to the WFM 300A CH3 INPUT connector. Leave the CH3 loop-through connector unterminated.
- b. Connect sync (or black burst) from a television test signal generator to the WFM 300A EXT REF INPUT connector. Terminate the loop-through in  $75\Omega$ . See Fig. 5-1.

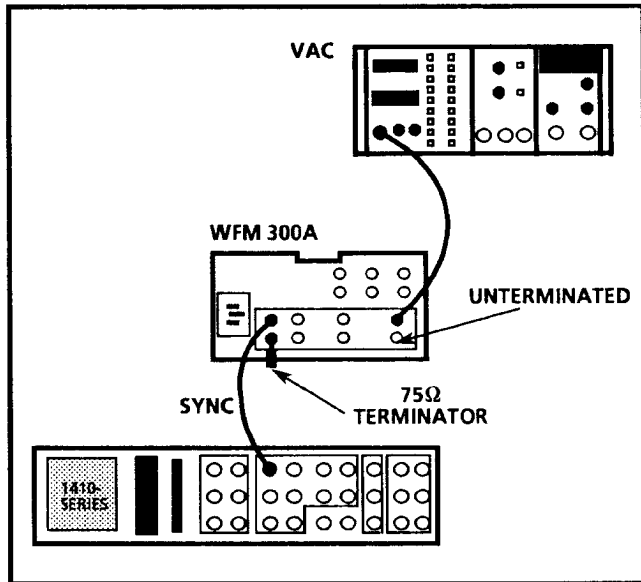


Fig. 5-1. Equipment setup for checking vertical deflection accuracy and calibrator amplitude.

**NOTE**

*Either sync or black burst can be used for Steps 3 through 8, 18 through 19(o), and 20g through 20m.*

- c. Select the CHR P-P button (in) setting on the Video Amplitude Calibrator.
- d. Set the WFM 300A front-panel controls as follows:

CH 3	On
REFERENCE	EXTERNAL

- e. Check that CH 1 and CH 2 are Off.
- f. **CHECK** – that the peak to peak amplitude of the display is 1 V. Measure from the -0.3 graticule line to the 0.7 graticule line. The tolerance is  $\pm 2\%$  ( $\pm 20$  mV).

**4. CHECK CALIBRATOR AMPLITUDE**

**REQUIREMENT** – Amplitude should be 0.7 V within a tolerance of  $\pm 1\%$ .

- a. Using the same procedure and WFM 300A control settings as given in Step 3, set the Video Amplitude Calibrator controls for 700 mV output.

- b. Select the CAL mode.
- c. **CHECK** – that the WFM 300A calibrator signal matches the amplitude of the CH 3 Video Amplitude Calibrator input signal within  $\pm 1\%$  ( $\pm 7$  mV). For better resolution, select X5 Gain and recheck the display matching.

**5. CHECK X5 GAIN VERTICAL DEFLECTION ACCURACY**

**REQUIREMENT** – In Waveform mode, V GAIN control in detent, VERTICAL Gain set to X5, and a 0.2 V signal applied, the vertical deflection of the display should be 1 V peak to peak within a tolerance of  $\pm 3\%$ .

- a. Use the same equipment setup as given in Step 3.
- b. Set the Video Amplitude Calibrator controls for 200 mV output.
- c. Check that the WFM 300A controls are set as follows:

MODE	WAVEFORM
CH 1	Off
CH 3	On
REFERENCE	EXTERNAL
VERTICAL Gain	X5 On

- d. **CHECK** – that the displayed amplitude is 140 IRE (1 V), within a tolerance of  $\pm 3\%$  (4.2 IRE or 30 mV).
- e. Set the VERTICAL GAIN button to Off (X1).

**6. CHECK VERTICAL GAIN RANGE**

**REQUIREMENT** – A 1 V input signal can be adjusted to provide a 2.5 division display. A 666 mV input signal can be adjusted to provide a 10 division display.

- a. Continuing from Step 5, check that the Video Amplitude Calibrator signal is displayed on the WFM 300A screen.

- b. Set the Video Amplitude Calibrator controls for 999.9 mV output.
- c. **CHECK** – Using the front-panel V GAIN control, decrease the amplitude of the display until it is 2.5 Div (250 mV) for standard instruments, or 3.5 Div (35 IRE) for Options 10 and 14.
- d. Set the Video Amplitude Calibrator controls for 666 mV output.
- e. **CHECK** – using the front-panel V GAIN control, increase the amplitude of the display until it is 10 divisions.
- f. Return the V GAIN control to its detent position.
- g. Disconnect the Video Amplitude Calibrator from the WFM 300A.

**7. CHECK COMPOSITE FLAT GAIN**

**REQUIREMENT** – With V GAIN control in detent and a 1 V signal applied, the vertical deflection of the displayed signal should be 1 V peak to peak within a tolerance of  $\pm 2\%$ .

- a. Connect the color bar signal from the television test signal generator to the WFM 300A COMPOSITE Input. Terminate the loop-through in 75 $\Omega$ . See Fig. 5-2.

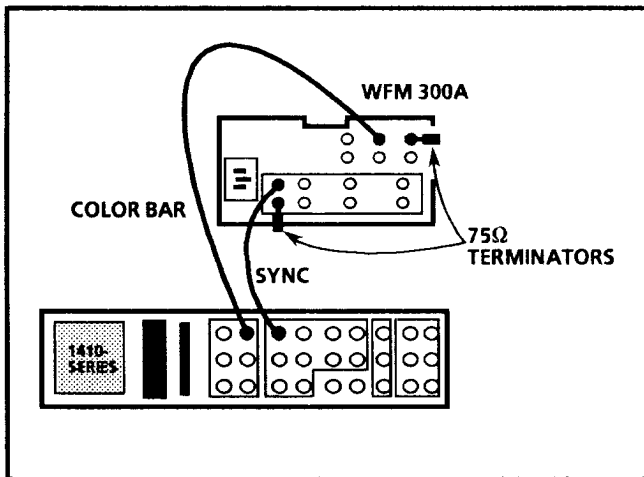


Fig. 5-2. Equipment connections for checking composite flat gain.

- b. Select COMPOSITE Input on the WFM 300A.
- c. **CHECK** – that the overall amplitude of the signal from sync tip to peak is 140 IRE (1 V),  $\pm 2\%$  (2.8 IRE or 20 mV).
- d. Disconnect the color bar signal from the WFM 300A.

**8. CHECK TRANSIENT RESPONSE**

**REQUIREMENT** – X1 Gain: 1T pulse-to-bar transient response is 0.99:1.00 to 1.01:1.00. X5 Gain: Same as for X1 Gain except use a 2T pulse-and-bar signal.

- a. Apply a 1T pulse-and-bar signal from a television test signal generator to the WFM300A CH 1 INPUT connector. Terminate the CH 1 loop-through connector into 75 $\Omega$ . See Fig. 5-3.

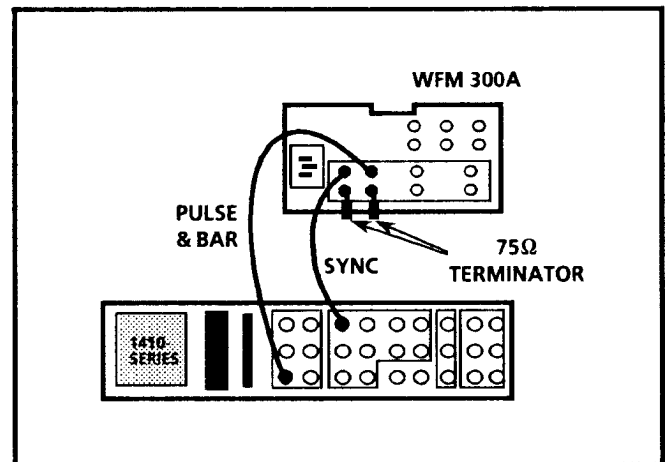


Fig. 5-3. Setup for Transient Response check.

- b. Set the WFM 300A as follows:
 

Sweep	1 LINE
INPUT	CH 1
REF	EXTERNAL
- c. **CHECK** – for a pulse-to-bar ratio that is within 1% of unity.
- d. Select X5 Gain and MAG On.

## WFM 300A — CHECKS AND ADJUSTMENTS

- e. Set the generator for a 2T pulse-and-bar output signal.
- f. **CHECK** – for a pulse-to-bar ratio that is within 1% of unity.
- g. Set the VERTICAL Gain button to Off (X1).
- h. Disconnect the pulse-and-bar and sync signals from the WFM 300A.

### 9. CHECK LOW PASS FILTER

**REQUIREMENT** – Frequency response of Lum Filter is within 1% of Flat response at 15 kHz, and >25 dB attenuation at 3.58 MHz (4.43 MHz).

- a. Connect the function generator to the CH1 input on the WFM 300A. Terminate the loop-through in 75Ω. Remove A3J453.
- b. Set the function generator to 15 kHz and adjust the amplitude for a 100 IRE (700 mV) display on the WFM 300A.
- c. Select LPASS (Low Pass) Filter.
- d. **CHECK** – that the display amplitude on the WFM 300A does not change more than 1% between flat and low pass. Turn off the LPASS Filter.
- e. Set the function generator to 4 MHz. Select LPASS and check that the signal is attenuated by better than 40 mV or 5.6 IRE.
- f. Turn off the LPASS Filter. Replace A3J453.
- g. Disconnect the function generator signal.

### 10. CHECK FREQUENCY RESPONSE

**REQUIREMENT** – X1 Gain: Flat response is from 250 kHz to 6.0 MHz within  $\pm 2\%$  of the response at 50 kHz. X5 Gain: 250 kHz to 5.0 MHz within  $\pm 2\%$  of response at 50 kHz.

- a. Set the WFM 300A REFERENCE button to INTERNAL.

- b. Connect the sine wave generator signal via a coaxial cable and a 50Ω to 75Ω minimum loss attenuator to the WFM 300A CH 1 INPUT connector. Terminate CH 1 loop-through connector into 75Ω. See Fig. 5-4.
- c. Set the generator output frequency and amplitude controls so the reference frequency is 50 kHz and the displayed amplitude is 700 mV peak to peak.

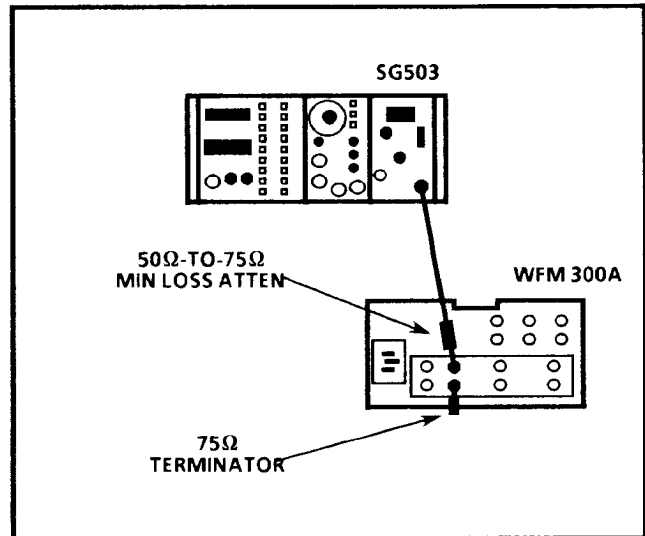


Fig. 5-4. Setup for checking frequency response .

- d. **CHECK** – that the response is within  $\pm 2\%$  from 250 kHz to 6.0 MHz, compared to the 50 kHz reference.
- e. Repeat parts b, c, and d of this step for CH 2 and CH 3.
- f. Set the WFM 300A VERTICAL Gain to X5 On.
- g. Move the sine wave generator signal to CH 1. Terminate the CH 1 loop-through connector into 75Ω.
- h. Set the generator output frequency and amplitude controls so the reference frequency is 50 kHz and the displayed amplitude is 700 mV peak to peak.
- i. **CHECK** – that the response is within  $\pm 2\%$  from 250 kHz to 5.0 MHz when 50 kHz is used as a reference.

- j. Repeat parts g, h, and i of this step for CH 2 and CH 3.
- k. Set the VERTICAL GAIN button to Off (X1).

11. CHECK COMPOSITE FLAT RESPONSE

**REQUIREMENT** – X1 response, from 50 kHz to 6 MHz, is within 2% of response at 50 kHz. X5 response, from 50 kHz to 5 MHz, is within 2% of response at 50 kHz.

- a. Connect the sine wave generator signal, via a 50Ω Precision cable, a 50-to-75Ω minimum loss attenuator, a 75Ω in-line terminator, and a dual-input coupler, to the WFM 300A CH 1 and COMPOSITE Inputs. See Fig. 5-5.

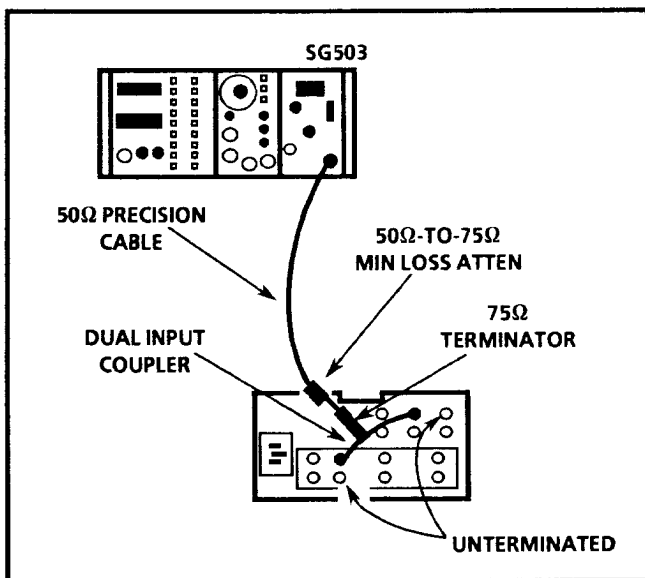


Fig. 5-5. Setup for checking composite flat response.

- b. Select the CH 1 Input and EXTERNAL REFERENCE on the WFM 300A.
- c. Set the sine wave generator frequency to 50 kHz and adjust the amplitude for a 700 mV display on the WFM 300A.
- d. Select the WFM 300A COMPOSITE INPUT.

- e. **CHECK** – while varying the sine wave generator frequency from 250 kHz to 6 MHz, for flat response within 2% (700 mV ± 14 mV).
- f. Select the WFM 300A X5 Gain and repeat parts b through e of this step, checking for a flat response within 2% from 50 kHz to 5 MHz.

12. CHECK COMPOSITE OUT FREQUENCY RESPONSE, DC LEVEL, AND GAIN

**REQUIREMENT** – Frequency response is Flat ± 5%, from 50 kHz to 6 MHz. DC level is 0 V ± 0.1 V.

- a. Connect a 75Ω cable, through a 75Ω feed-through terminator, from the COMPOSITE OUT connector to the CH 1 Input on the test oscilloscope Vertical Input. Leave the sine wave generator connected as in the previous step.

- b. Set the test oscilloscope as follows:

Deflection Factor	0.1 V/Div
Input Coupling	DC
Sweep Rate	10 μs
Trig. Slope	+
Trig. Mode	Auto

- c. Set the WFM 300A as follows:

VERTICAL Gain	Off (X1)
REFERENCE	EXTERNAL
INPUT	CH 1 (COMPOSITE Off)

- d. Set the sine wave generator frequency to 50 kHz and adjust the amplitude for a 700 mV display on the WFM 300A.
- e. **CHECK** – that the amplitude on the test oscilloscope is 700 mV, ± 35 mV.
- f. **CHECK** – while varying the sine wave generator frequency from 250 kHz to 6 MHz, that the COMPOSITE OUT Flat Response is 700 mV, ± 35 mV.
- g. Remove the sine wave generator input from the COMPOSITE INPUT.

- h. **CHECK** — that the COMPOSITE OUT DC level is within  $\pm 0.1$  V of 0 V.
- i. Disconnect the COMPOSITE OUTPUT from the test oscilloscope.

**13. CHECK HORIZONTAL SWEEP TIMING ACCURACIES AND LINEARITY**

**REQUIREMENT** —  $1 \mu\text{s}/\text{Div}$  (2 LINE SWEEP with MAG ON): Within  $\pm 2\%$ . Linearity (including differential linearity): Within  $\pm 2\%$ .  $0.2 \mu\text{s}/\text{Div}$  (1 LINE SWEEP with MAG ON): Within  $\pm 2\%$ . Linearity (including differential linearity): Within  $\pm 2\%$ .

**NOTE**

*Some double-triggering may occur during this step.*

- a. Connect the sine wave generator signal to the WFM 300A CH 1 Input. Terminate the loop-through in  $75\Omega$ . See Fig. 5-4.
- b. Select the CH 1 Input and INTERNAL REFERENCE.
- b. Set the sine wave generator for a 1 MHz output signal.
- c. Set the WFM 300A HORIZONTAL MAG button to ON. Check that a 2 LINE SWEEP is selected. Use the HORIZONTAL Position control to set the display so that a sine wave crosses the baseline at the second major division.
- d. **CHECK** — that there is a sine wave for each major division within the central 10 division area along the base line. Check that each sine wave is located within 0.2 division of a major division mark to meet the linearity requirements.
- e. Set the HORIZONTAL SWEEP button to 1 LINE.
- f. Set the sine wave generator for a 5 MHz output signal.
- g. **CHECK** — that the sine waves within the central 10 divisions are located within 0.2

division of a major division mark as described in part d.

- h. Set the HORIZONTAL MAG button to Off (X1).
- i. Disconnect the sine wave signal and minimum loss attenuator from the WFM 300A.

**14. CHECK HORIZONTAL SWEEP**

**REQUIREMENT** — Sweep occurs in all horizontal sweep modes with or without synchronization. 2 FLD sweep repetition rate is equal to frame rate of applied video or external sync. Synchronization: Sweep will synchronize to a sync amplitude of 0.3 V peak to peak  $\pm 6$  dB. Equivalent to an amplitude range of 150 mV to 600 mV. Sweep Length: Unmagnified sweeps shall be the same length within 1/2 major division.

- a. Set the CH 1 button to Off. Check the settings of the following front-panel controls:
 

CH 2, CH 3	Off
MODE	WAVEFORM
REFERENCE	INTERNAL
- b. **CHECK** — that a sweep occurs in all the horizontal sweep modes with no signals or external reference applied to the instrument.
- c. Apply a color bar signal to the WFM 300A CH1 Input and a black burst signal to the EXT REF Input. Black burst sync amplitude should be 300 mV when loaded by  $75\Omega$ . Check that these connectors are terminated into  $75\Omega$ . See Fig. 5-6.

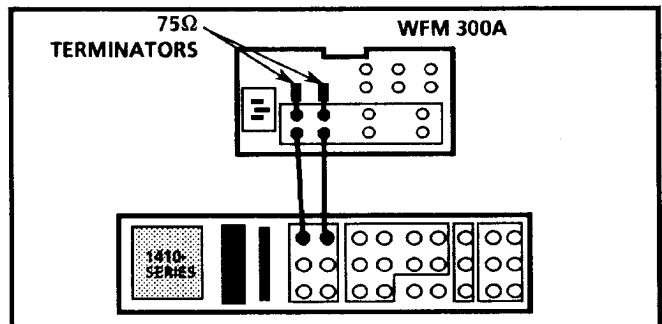


Fig. 5-6. Equipment setup for checking horizontal sweep operation.



- d. Set the CH 1 button to On and the REFERENCE button to EXT.
- e. **CHECK** — that a sweep occurs in all the unmagnified horizontal sweep modes (1 LINE, 2 LINE, 2 FLD). When checking the unmagnified sweeps, the sweep lengths should be the same within  $\pm 0.5$  major division.  
  
When checking the 2 FLD sweep rate, the sweep should be equal to the frame rate of the applied video or external sync.
- f. Remove the termination from the EXT REF connector.
- g. **CHECK** — that the waveform display stays locked.
- h. Connect three 75 $\Omega$  terminators to the EXT REF connector. (Use two in-line terminators and one end-line terminator.)
- i. **CHECK** — that the waveform display is locked.
- j. Remove two of the terminators from the EXT REF connector.

**15. CHECK 2 LINE MAG REGISTRATION**

**REQUIREMENT** — Some portion of the magnified horizontal blanking interval is visible when the unmagnified 2 LINE SWEEP display is centered.

- a. Continuing from Step 14, select the 2 LINE SWEEP mode. Use the HORIZONTAL Position control to center the horizontal sync pulse.
- b. Set the HORIZONTAL MAG button to ON.
- c. **CHECK** — that some portion of the horizontal blanking is visible.
- d. Set the HORIZONTAL MAG button to Off (X1).

**16. CHECK PARADE MODE SWEEP REPETITION RATE**

**REQUIREMENT** — Field or line rate of selected reference.

- a. Select the Parade mode.
- b. **CHECK** — that field rate and line rate displays are obtained when the 1 LINE and 2 FLD sweep modes are selected. The first line segment displays CH 1 signal; the next two line segments will have no signal.
- c. Disconnect the color bar and black burst signals from the WFM 300A. Remove the terminators.

**17. CHECK VECTOR MODE BANDWIDTH**

**REQUIREMENT** — Vertical Bandwidth: 1 MHz  $\pm$  100 kHz. Horizontal-to-Vertical Bandwidth Matching: No loop opening at 500 kHz or 2 MHz.

- a. Connect the sine wave generator signal, via a coaxial cable, 50 $\Omega$  to 75 $\Omega$  minimum loss attenuator and 75 $\Omega$  in-line terminator, to the WFM 300A CH 3 Input. Check that CH 3 is not terminated. See Fig. 5-7A.
- b. Set the generator frequency to 50 kHz for use as a reference.
- c. Set the WFM 300A as follows:

Front-Panel Controls

MODE	VECTOR
GRATICULE	Off (CH 3 or Menu)

Menu Selection

FORMAT	GBR Selected
--------	--------------

- d. Check that no signal is applied to the EXT REF connector.
- e. Move jumpers J158 and J453 on the Main board so they are stored on one pin, to disable the clamps.

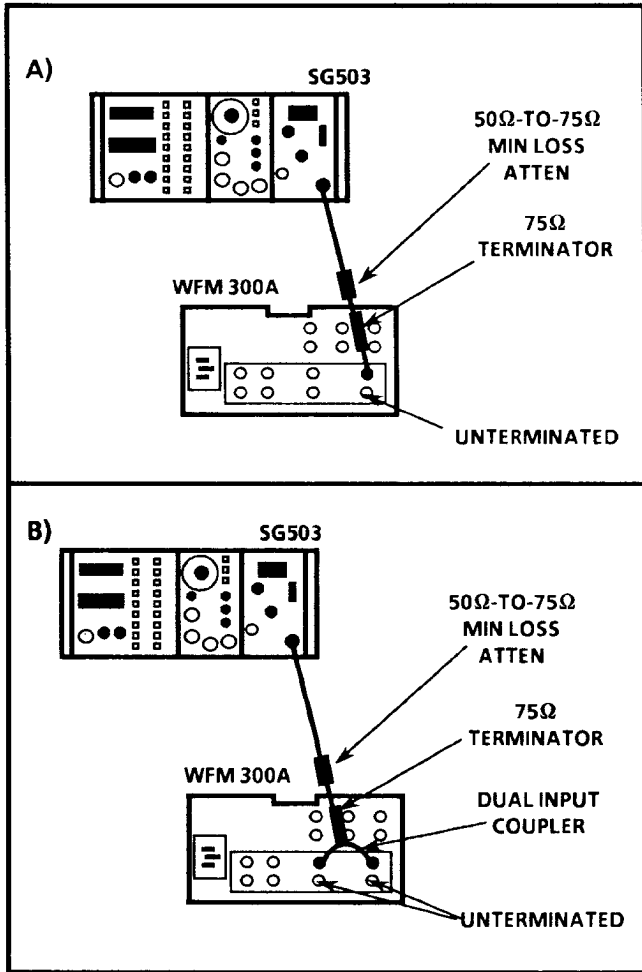


Fig. 5-7. Setup for checking Vector Mode: A) vertical bandwidth. B) horizontal to vertical bandwidth matching.

**NOTE**

Leave jumpers J158 and J453 stored on one pin for Step 17e through 19o.

- f. Ground pin 1 of J453 on the Main board. Pin 1 is the upper pin shown in Fig. 5-16b. Use a short (4" to 8") clip-lead jumper to make the connections. (Grounding pin 1 prevents hum from being picked up and applied via R359 to the base of Q643; see Diagram 2.) Leave the grounding jumper connected through Step 19n.
- g. Set the generator Output Amplitude control so the vertical trace is 10 divisions (1 V) in amplitude. Leave the INTENSity control at the desired display brightness.

- h. Increase the generator frequency until the vertical trace is 7.07 divisions (707 mV) in amplitude.
- i. **CHECK** — that the frequency reading is 1.0 MHz within  $\pm 100$  kHz.
- j. Use a dual-input cable connector to apply the sine wave generator signal (with 50Ω-to-75Ω Minimum Loss Attenuator and 75Ω in-line terminator) to the CH 2 and CH 3 Inputs. Leave these loop-throughs unterminated. See Fig. 5-7B.
- k. Use the FORMAT MENU to return to the desired operating standard (GBR not selected).
- l. Set the generator frequency to 500 kHz and adjust the amplitude so the WFM 300A display (diagonal trace) is 7 divisions (700 mV) in amplitude.
- m. **CHECK** — that there is no loop opening in the trace.
- n. Increase the generator output frequency to 2 MHz. **NOTE:** The display amplitude will reduce to about 2 divisions.
- o. **CHECK** — that the displayed trace has no loop opening.

**18. CHECK BOWTIE MODE**

**REQUIREMENT** — Common-Mode Rejection Ratio: >34 dB at 3 MHz.

- a. Move the dual-input coupler so the sine wave signal is applied to CH 1 and CH 2. Leave these connectors unterminated. Terminate CH 3 into 75Ω.
- b. Connect sync from a test signal generator to the WFM 300A EXT REF INPUT connector. Terminate this loop-through connector into 75Ω. See Fig. 5-8.
- c. Select the Bowtie mode. Check that the REFERENCE button is set to EXTERNAL.

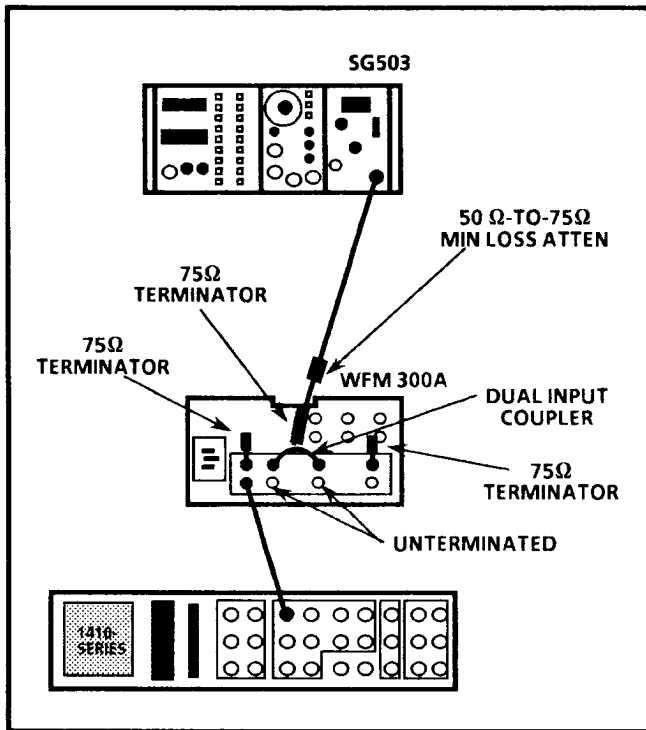


Fig. 5-8. Setup for checking Bowtie mode common mode rejection.

- d. Set the generator output frequency to 3 MHz and the amplitude so the right side display is 400 mV.
- e. Select the WFM 300A X5 Gain.
- f. **CHECK** — that the left side display is less than 5.6 IRE (8 mV) in amplitude.

**NOTE**

*Adjustment of the front-panel V CAL control affects Bowtie common-mode rejection. If this control has been adjusted, perform Step 24, Adjust Bowtie Gain and Timing, in the Adjustment Procedure to meet the performance requirement.*

- g. Set the VERTICAL Gain button to Off (X1).
- h. Disconnect the sine wave signal from the instrument. Remove the terminator from CH3. Leave sync connected.

**19. CHECK VECTOR MODE GAIN & ELECTRONIC GRATICULE**

**REQUIREMENT** — Vertical Gain, Horizontal Gain, and Electronic Graticule Accuracies:  $\pm 1\%$ . Display-to-Graticule Registration:  $\pm 1/4$  box. Electronic Graticule Shape: No visible gaps or tails at corners of target boxes.

- a. Connect a 700 mV calibrator signal from the Video Amplitude Calibrator via a coaxial cable to the WFM 300A CH3 INPUT connector. Leave CH3 unterminated. See Fig. 5-9.
- b. Check that sync is applied to the WFM 300A EXT REF connector.
- c. Select the Video Amplitude Calibrator CHR P-P button (in) setting.
- d. Set the WFM 300A as follows:

Front-Panel Controls

MODE VECTOR  
GRATICULE Off (CH 3 or Menu)

Menu Selection

FORMAT Desired operating format (GBR not selected)

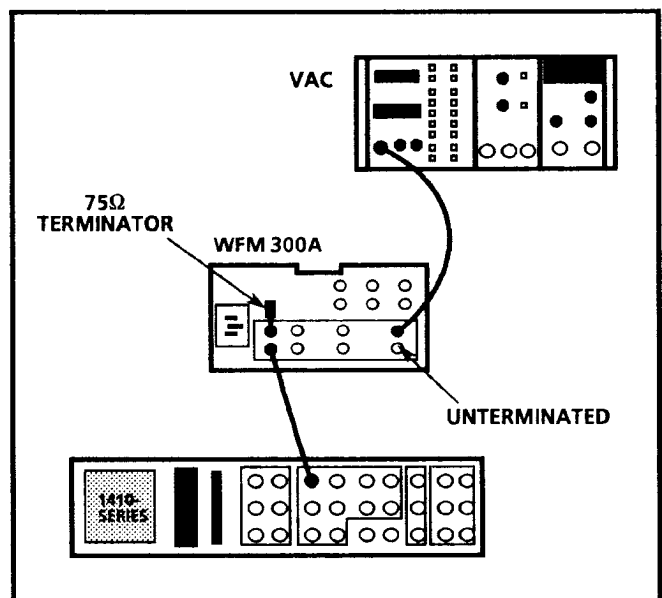


Fig. 5-9. Equipment setup for checking Vector mode gain.

## WFM 300A — CHECKS AND ADJUSTMENTS

- e. **CHECK** — that the two dots are vertically spaced 10 divisions apart. Tolerance is  $\pm 1\%$ .
- f. Move the calibrator signal so that it is applied to the CH 2 INPUT connector. Select the CHR P-P button (in) setting on the Video Amplitude Calibrator.
- g. Remove jumper J843 from the Main board and store it on one pin.
- h. **CHECK** — that the dots are positioned 9 divisions apart horizontally. Tolerance is  $\pm 1\%$ . Use the center 9 divisions of the graticule base line as a guide when verifying this distance.
- i. Set the H GAIN control fully counterclockwise. Check that the display amplitude is  $\leq 6.4$  major divisions.
- j. Move the H GAIN control just out of detent.
- k. Set the Video Amplitude Calibrator to 500 mV.
- l. **CHECK** — that the display amplitude is  $\geq 9$  major divisions. Return H GAIN Control to detent.
- m. Disconnect the Video Amplitude Calibrator signal from the WFM 300A. Leave sync connected to the instrument.
- n. Remove the grounding jumper from pin 1 of J453.
- o. Put J158, J453, and J843 Main board jumpers back to their original positions.
- p. Set the INTENSity control fully counterclockwise and select the 100% Graticule (CH 1). Turn the SCALE control so the 100% Vector electronic graticule is the desired brightness. Use the POSITION controls to center the graticule within the viewing area.
- q. **CHECK** — electronic graticule targets for a box shape with no visible gaps. Check the targets for no visible tails at the corners of the boxes.

### NOTE

X5 Gain can be selected when checking boxes. Be sure to return to X1 Gain before proceeding.

- r. **CHECK** — that the YL/R and G targets are located 10 divisions apart. Measure from the bottom of the lower target to the bottom of the upper target. Tolerance is  $\pm 1\%$ .
- s. **CHECK** — that the G and B/C targets are located 9 divisions apart. Tolerance is  $\pm 1\%$ . Measure from right sides of the box-shaped targets. Use the center 9 divisions of the graticule base line when checking the distance.
- t. Disconnect sync from the WFM 300A.
- u. Connect 75 $\Omega$  terminators to each of the WFM 300A CH 1, CH 2, and CH 3 Input connectors.
- v. Set the WFM 300A as follows:

#### Menu Selection

FORMAT	Desired operating format (GBR not selected)
--------	------------------------------------------------

#### Front-Panel Controls

REFERENCE	INTERNAL
INTENS	Desired display brightness

- w. **CHECK** — that the color bar 'black' display dot is centered within its target. Tolerance for the centered dot is within a  $\pm 1/4$  box area.
- x. Leave the terminators connected to the instrument.

## 20. CHECK LIGHTNING MODE

**REQUIREMENT** — Vertical Balance Range: +1.5 and -0.5 divisions vertically. Vertical Gain Accuracy:  $\pm 2\%$ .

- a. Select the Lightning mode and turn the Graticule Off (push CH 3 or use menu). Check that the CH 1, CH 2, and CH 3 INPUT connectors are terminated.

- b. Turn the front-panel VBAL control fully clockwise. Use the VERTICAL Position control to place the lower dot on the 0.350 V dashed line of the internal graticule.
- c. **CHECK** — that the upper dot is located at or above the 0.5 V internal graticule line.
- d. Rotate the VBAL control fully counterclockwise. Position the upper dot on the 0.350 V graticule line.
- e. **CHECK** — that the lower dot is located at or below the 0.3 V graticule line.
- f. Set the VBAL control so the two dots are superimposed.
- g. Apply a 700 mV calibrator signal from the Video Amplitude Calibrator via a coaxial cable to the WFM 300A CH 1 INPUT connector. Remove the CH 1 terminator. Check that CH 2 and CH 3 are terminated. Connect sync to the EXT REF INPUT connector. See Fig. 5-10.
- h. Select the Video Amplitude Calibrator LUM/SYNC button (out) setting.
- i. Move jumpers J158 and J453 (located on the Main board) so they are stored on one pin.
- j. Set the WFM 300A REFERENCE button to EXT and the VERTICAL Gain button to X5. Check that the Lightning mode is selected.
- k. Check that the center dots are overlayed. If they are not, readjust the front-panel VBAL control to overlay the dots.
- l. Set the VERTICAL Gain button to Off (X1).
- m. **CHECK** — that the upper and lower dots are vertically spaced 10 divisions apart within a tolerance of  $\pm 2\%$ . (Ignore the center overlayed dots.)
- n. Put jumpers J158 and J453 back to their original position.
- o. Disconnect the Video Amplitude Calibrator and sync signals from the instrument.

## 21. CHECK GAMUT LIMIT

**REQUIREMENT** — Factory preset threshold settings are nominally +745 mV and -45 mV within  $\pm 5$  mV.

- a. Connect the Y input from the component television test signal generator to the CH 1 Input connector. Connect sync from the component generator to the WFM 300A EXT REF INPUT connector. Connect another cable from the EXT REF connector via a 75 $\Omega$  in-line terminator to the test oscilloscope Ext Trig input connector.
- b. Connect the WFM 300A G OUTPUT connector, via a 75 $\Omega$  coaxial cable and 75 $\Omega$  in-line terminator, to the + Input of the test oscilloscope Differential Comparator. See Fig. 5-11.
- c. Set the component generator as follows:

Output: 100% Color Bars in SMPTE Parallel Format with Level Reference (Y, B-Y, R-Y Color Difference Signal; see Fig. 5-12A).

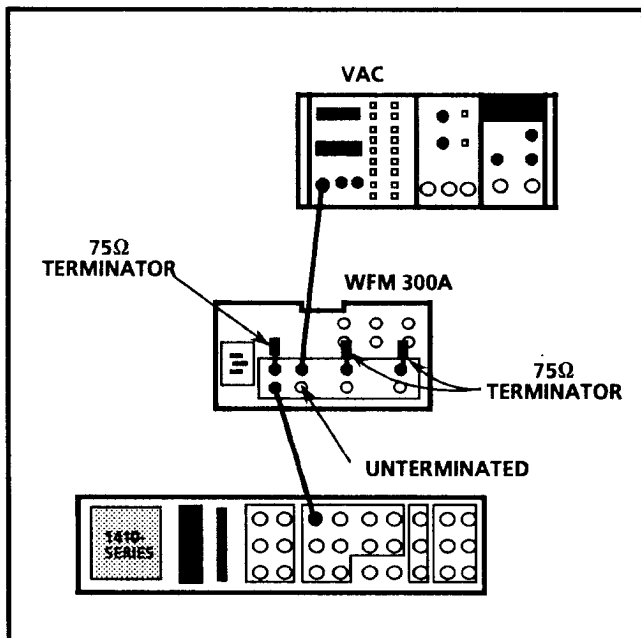


Fig. 5-10. Equipment setup for checking Lightning mode vertical gain accuracy.

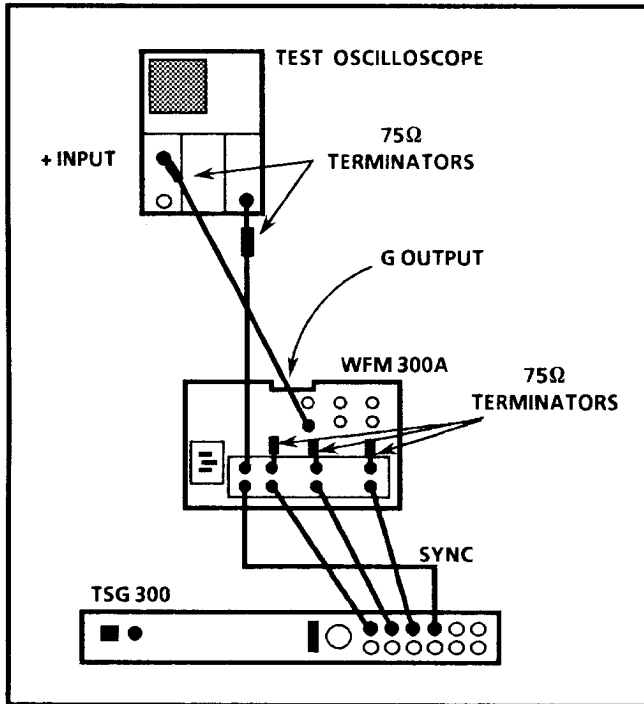


Fig. 5-11. Equipment setup for checking Gamut Limit threshold levels.

d. Set the WFM 300A as follows:

Front-Panel Controls

MODE	WAVEFORM
SWEEP	2 LINE
REF	EXTERNAL
LINE SELECT	OFF

Menu Selection

GAMUT STROBE	ON
FORMAT	GBR Selected

e. Set the test oscilloscope as follows:

+ Input Coupling	DC
-Input Coupling	Gnd
Deflection Factor	10 mV/Div
Bandwidth	5 MHz
Sweep Rate	10 $\mu$ s/Div
Triggering Source	Ext

f. Use the test oscilloscope VERTICAL Position control to position the back porch of the signal to graticule center.

g. **CHECK** – that the -Gamut trip point occurs at -45 mV,  $\pm$ 5 mV, with respect to the back porch level. See Fig. 5-12B.

h. Set the test oscilloscope -Input Coupling switch to Vc and the Comparison Voltage polarity switch to + (plus). Use the Comparison Voltage control to position the +Gamut trip point into view. See Fig. 5-12C.

i. **CHECK** – that the + Gamut trip point occurs at +745 mV,  $\pm$ 5 mV, with respect to the back porch level.

22. CHECK GBR OUTPUT GAINS

**REQUIREMENT** – Designed for better than 1%. Check to 3% to catch obvious errors.

a. Check that the Y input from the Component Television Test Signal Generator is connected to the WFM 300A CH 1 Input. Connect the B-Y signal to the WFM 300A CH 2 Input connector, and the R-Y signal to CH 3. Terminate the loop-throughs in 75 $\Omega$ .

b. Connect a 75 $\Omega$  cable with a 75 $\Omega$  in-line terminator from the WFM 300A G OUTPUT to the + Input on the test oscilloscope.

c. Set the test oscilloscope as follows:

Vert	Right
Trig Source	Right

Differential Comparator

+ Input Coupling	DC
- Input Coupling	Vc
Bandwidth	5 MHz

Dual-Trace Amplifier

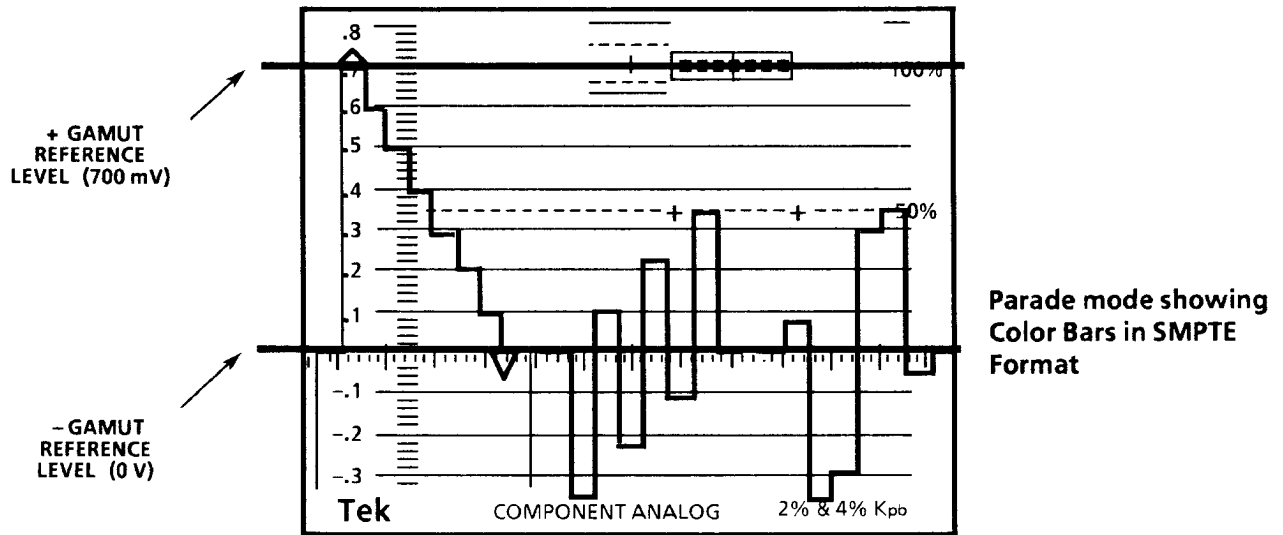
Volts/Div	10 mV
Mode	Auto

Dual Time Base

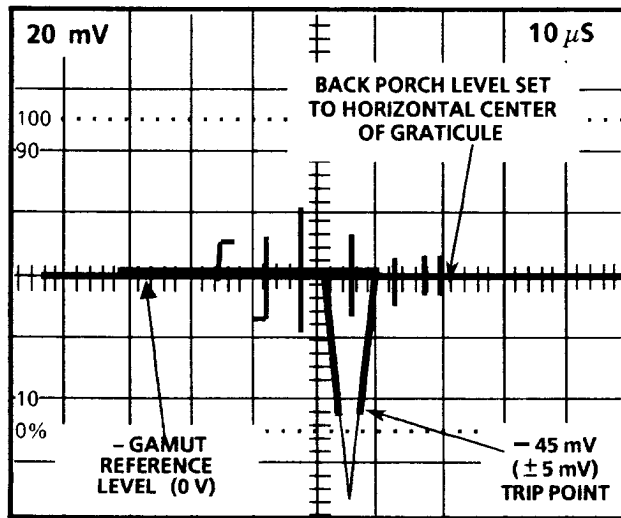
Coupling	DC
Trigger Source	Int
Time/Div	10 $\mu$ s

d. Select the correct format on the Component Television Test Signal Generator.

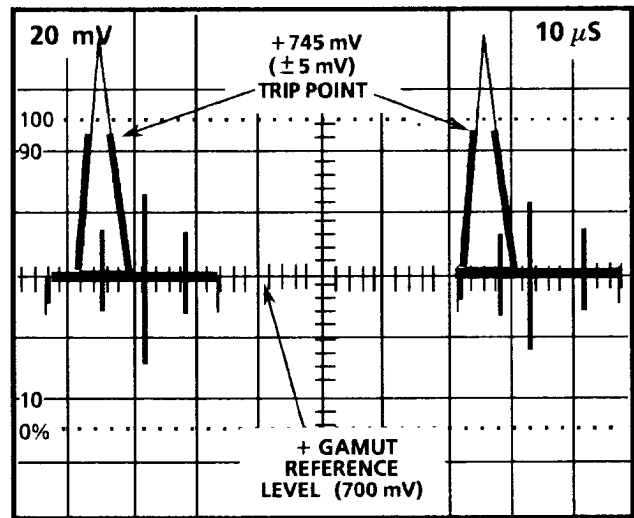
e. Use the WFM 300A menu to be sure that GBR is not selected.



(A) Reference levels for checking the + and - Gamut trip points.



(B) - Gamut Trip Point.



(C) + Gamut Trip Point.

Fig. 5-12. Typical waveforms obtained when checking Gamut Limit.

## WFM 300A — CHECKS AND ADJUSTMENTS

- f. Set the voltage comparator to 0.000.
  - g. **CHECK** — that the back porch level is clamped to within  $\pm 10$  mV.
  - h. **CHECK** — that the trailing edge of the transcoded signals are clamped to within  $\pm 3.5$  mV of the back porch level. For Options 10 and 12, check that the setup level is 52.5 mV,  $\pm 3.5$  mV, using the Voltage Comparison control.
  - i. Press the Ref Ident on the test oscilloscope and position the trace to the center of the crt.
  - j. Set the Voltage Comparison control to 700 mV.
  - k. **CHECK** — that the peak white is 700 mV,  $\pm 15$  mV. For Options 10 and 12, check that the transcoded signal is 538 mV,  $\pm 15$  mV.
  - l. Repeat parts f. through k. of this step for the B and R OUTPUTs.
- e. Use the 1780R-Series Horizontal and Vertical position controls to place the center dot at center screen.
  - f. Use the Vectorscope Variable Gain Control to place the burst dot on the Compass rose.
  - g. Use the 1780R-Series large knob to overlay the left edge of the two Differential Gain bars. (The  $\pm$  increment buttons may be used for fine adjustment.)
  - h. Push the REF SET to reset the DIFF GAIN readout to 0.00°.
  - i. Use the  $\pm$  increment buttons to overlay the right edge of the two displays.
  - j. **CHECK** — for less than 1% differential gain.

### 23. CHECK DIFFERENTIAL GAIN

**REQUIREMENT** — Differential Gain  $< 1\%$  with a 1.0 V display.

- a. Connect a modified ramp with 40 mV sub-carrier to the COMPOSITE Input of the WFM 300A. Terminate the loop-through in 75 $\Omega$ . Connect a 75 $\Omega$  cable from the WFM 300A PIX MON OUT to the CH A input on the 1780R-Series and terminate the 1780R-Series loop-through.
  - b. Select the WFM 300A COMPOSITE INPUT AND X5 Gain.
  - c. Select the 1780R-Series CH A input and enter the MEASURE menu.
  - d. On the MEASURE menu touch screen, touch **DIFF GAIN**. On the DIFF GAIN screen, select **DOUBLE** and **NOISE REDUCTION ON**.
- a. Set the test oscilloscope as follows:

Amplitude	100 mV/Div
+ Input	DC
- Input	DC
Bandwidth	Full
  - b. Connect the output from the leveled sine wave generator, through a 50 $\Omega$  precision cable and 50-to-75 $\Omega$  minimum loss attenuator, to the input of the Return Loss Bridge. Set the leveled sine wave generator to 50 kHz. Connect the output of the Bridge to the test oscilloscope and set the amplitude of the display to 500 mV p-p with the terminator removed from the Unknown arm of the Bridge. See Fig. 5-13.
  - c. Change the leveled sine wave generator frequency to 6 MHz. Reconnect the terminator to the Unknown arm, set the test oscilloscope for 1 mV per division, and balance (null) the bridge. See Fig. 5-13b. Note residual amplitude for use in a later step.

### 24. CHECK RETURN LOSS OF COMPOSITE, COMPONENT, AND EXT REF INPUTS

**REQUIREMENT** — 40 dB from 50 kHz to 6 MHz, power on or off.



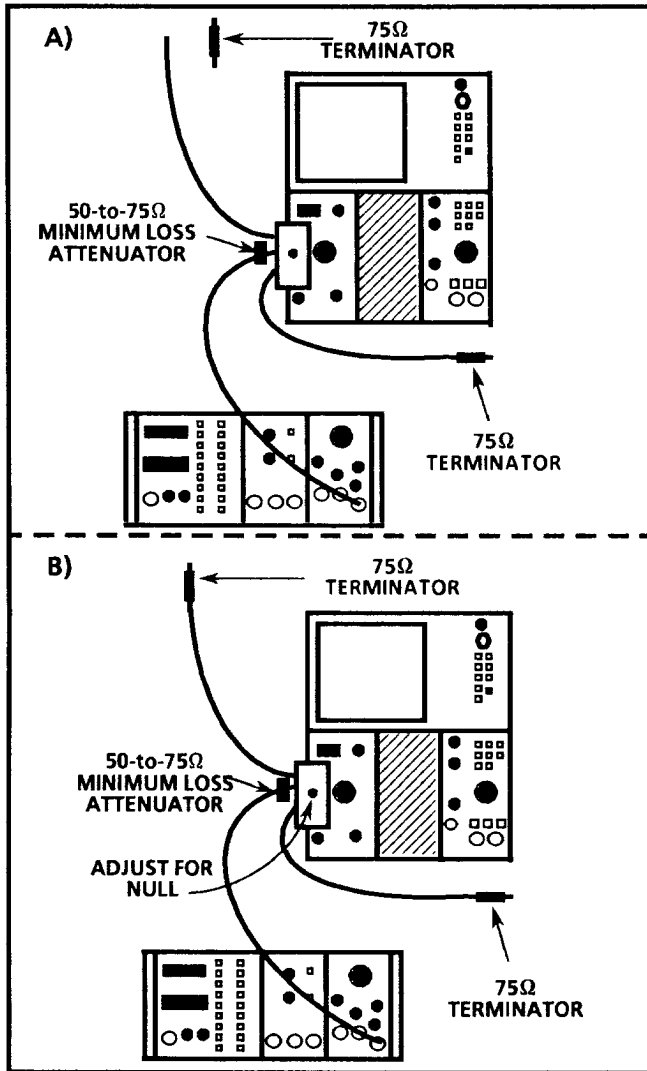


Fig. 5-13. Return-Loss Bridge Set-up: a) 500 mV amplitude. b) Null bridge.

- d. Remove the terminator from the Unknown arm and connect the Unknown arm to the CH 1 INPUT on the WFM 300A. Terminate the loop-through with the precision terminator from the unknown arm. See Fig. 5-14.
- e. Set the test oscilloscope to 5 mV/Div.
- f. **CHECK** — that the return loss of the CH 1 INPUT, minus the residual noted in step c, is better than 40 dB (5 mV), from 50 kHz to 6 MHz. This measurement is made with instrument power on and off.

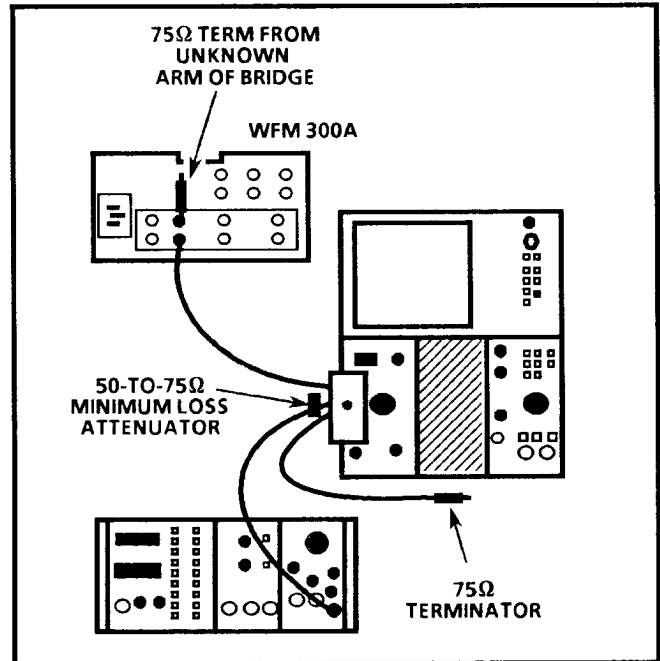


Fig. 5-14. Measuring return loss.

- g. Connect the Unknown arm of the Return Loss Bridge to the WFM 300A CH2 INPUT and repeat step f.
- h. Repeat steps f and g for the CH3, EXT REF, and COMPOSITE inputs.
- i. Remove the Unknown arm of the Return Loss Bridge from the COMPOSITE Input and connect it to the COMPOSITE PIX MON OUTPUT.

**25. CHECK RETURN LOSS OF COMPOSITE PIX MON OUTPUT**

**REQUIREMENT** — 30 dB from 50 kHz to 6 MHz, power on only.

- a. **CHECK** — that the Return Loss of the COMPOSITE OUT minus the residual amplitude noted in step 24c is better than 30 dB (15.8 mV) from 50 kHz to 6 MHz. This measurement is made with instrument power on and no signal output

**This completes the Performance Check Procedure.**

## ADJUSTMENT PROCEDURE

The Adjustment Procedure covers only adjustments. Checks, other than those that must be made to ensure a step is completed, are in the Performance Check Procedure. There are actually two Adjustment Procedures, the short-form version is provided for those familiar with adjustments, while the longer (more detailed) standard procedure is provided for those who need it. Referring to the Recommended Equipment List, given on page 5-1, the following items are needed for this Adjustment Procedure: Items 2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, and 16.

Allow 20 minutes of warm-up time, at normal room temperature (approximately 25°C) before making any adjustments to the instrument.

### Short-Form Adjustment Procedure

The Short-Form Adjustment Procedure has the adjustment steps in the same order as the longer standard form of procedure. These same step numbers correspond to the step numbers in the Standard Adjustment Procedure and those shown in Figs. 5-13 and 5-14. Adjustment circuit numbers are included in the title of the step.

#### A1 POWER SUPPLY BOARD

1. ADJUST +5 V (R99)

#### A3 MAIN BOARD

2. ADJUST +11.8 V (R143) AND -11.8 V (R142) SUPPLIES

#### A1 POWER SUPPLY BOARD

3. ADJUST CRT BIAS (R58)
4. ADJUST CTR FOCUS (R11) AND ASTIGMATISM (R49)

#### A4 CONTROL BOARD

5. ADJUST LINE SELECT FOCUS (R571)

#### A1 POWER SUPPLY BOARD

6. ADJUST TRACE ROTATION AND GEOMETRY (R45)

#### A3 MAIN BOARD

7. ADJUST CH 1, 2, AND 3 OFFSETS (R288, R490, R890)
8. ADJUST CH 1 AND CH 2 DC RESTORER OFFSETS (R496, R689)
9. ADJUST VERTICAL AND HORIZONTAL GRATICULE TARGET SHAPE (R830, R930)
10. ADJUST VERTICAL AND HORIZONTAL GRATICULE SIZE (R929, R735)
11. ADJUST VERTICAL BALANCE (R500)
12. ADJUST VERTICAL AND HORIZONTAL SIGNAL TO GRATICULE REGISTRATION (R550, R551)
13. ADJUST VERTICAL AMPLIFIER CENTERING (R773)
14. ADJUST VERTICAL GAIN (R479), V CAL (R800), AND LIGHTNING AMPLITUDE (R457)
15. ADJUST HORIZONTAL DISPLAY GAIN (R834)
16. ADJUST FLAT GAIN (R763)
17. ADJUST LOW PASS GAIN (R365)
18. ADJUST CALIBRATOR AMPLITUDE (R584)
19. ADJUST 0 VOLT REGISTRATION (R580)
20. ADJUST X5 HIGH FREQUENCY COMPENSATION (C862, R862)

- 21. ADJUST X1 HIGH FREQUENCY COMPENSATION (C864, R872)
- 22. CHECK FREQUENCY RESPONSE
- 23. ADJUST BOWTIE GAIN (R654) AND TIMING (C652, C840)
- 24. ADJUST VECTOR TIMING (C856)
- 25. ADJUST LIGHTNING TIMING (C460)
- 26. ADJUST TIMING CALIBRATION (R534)
- 27. ADJUST HORIZONTAL TIMING (R435, R434)

- 28. ADJUST MAG REGISTRATION (R655)

**A4 CONTROL BOARD**

- 29. ADJUST HORIZONTAL BLANKING (R218)
- 30. ADJUST + AND -GAMUT (R206, R207)

**A5 GBR BOARD**

- 31. ADJUST COMPOSITE DC LEVEL (R320), FREQUENCY RESPONSE (R603, C600), AND GAIN (R606)
- 32. CHECK COMPOSITE RESPONSE
- 33. CHECK COMPOSITE OUT RESPONSE

**STANDARD ADJUSTMENT PROCEDURE**

Before starting this procedure, set the WFM 300A front-panel controls as shown in Table 5-2. Adjustment and test point locations are shown in Fig. 5-15 for A1 (Power Supply board), Fig. 5-16 for A3 (Main board), and Fig. 5-17 for A4 (Control board).

**Option 10 Instruments**

Instructions in this procedure are for standard instruments. Since the 100% electronic graticule is not available for Option 10, substitute 75% input signals in place of 100% when adjusting Option 10 instruments.

**Table 5-2  
Initial Settings for Adjustment Procedure**

Front Panel Control	Setting
POWER	ON
V GAIN, H GAIN	Detent
CH 2&3 POS	Detent
INPUT	
CH 1	Off
CH 2	Off
CH 3	Off
COMPOSITE	Off
MODE	WAVEFORM
FORMAT	As desired
REFERENCE	EXTERNAL
VERTICAL	
FILTER	Off
GAIN	Off (X1)
Position	Midrange
HORIZONTAL	
SWEEP	2 LINE
MAG	Off (X1)
Position	Midrange
DISPLAY	
Focus	Trace in focus
Trace Rotation	As is
Scale	Desired brightness
INTENS	Desired intensity
LINE SEL ON	Off
Line Rate	As desired

**NOTE**

*No signals are applied to the WFM 300A CH 1, CH 2, or CH 3 INPUTs, until Step 13.*

**A1 POWER SUPPLY BOARD**

**1. ADJUST +5V**

- a. Connect the DMM negative lead to TP1 (GND) and the positive lead to W1 (+5V).
- b. **ADJUST** – R99 (+5V ADJ) for +5.0 V ±0.5 V.

**A3 MAIN BOARD**

**2. ADJUST +11.8V (R143) and -11.8V (R142) SUPPLIES**

- a. Connect the voltmeter to the +11.8V test point (mounting nut for U146, pin 2 of U146, or the anode end of CR345).
- b. **ADJUST** – R143 (+11.8V Adj) for +11.8V.
- c. Connect the voltmeter to the -11.8V test point (pin 3 of U139 or the anode end of CR238).
- d. **ADJUST** – R142 (-11.8V Adj) for -11.8V.
- e. Disconnect the voltmeter from the test point.

**A1 POWER SUPPLY BOARD**

**3. ADJUST CRT BIAS (R58)**

- a. Select Vector mode on the WFM 300A.
- b. Turn the front-panel SCALE and INTENS controls fully counterclockwise.
- c. **ADJUST** – R58 (CRT Bias) until the display just becomes extinguished.

**4. ADJUST CTR FOCUS (R11) AND ASTIGMATISM (R49)**

- a. Set the INTENS control so the dot display is the desired brightness.

- b. Set the front-panel FOCUS control to approximately the center of its range.
- c. **ADJUST** – R11 (CTR Focus) and R49 (Astigmatism) for the most clearly-defined dot.

#### A4 CONTROL BOARD

##### 5. ADJUST LINE SELECT FOCUS (R571)

- a. Check that the Vector mode is selected. Push CH 1 or use the GRATICULE MENU to select the 100% Graticule.
- b. Turn the SCALE control so the Vector mode electronic graticule is the desired brightness.
- c. Press the WFM 300A LINE SEL ON push button and hold it in until the 15-Line mode is obtained. (You may need to use the VERTICAL Position control to move the readout into view. The readout will indicate '15L' when the 15-Line mode has been selected.) The remaining LINE SEL push buttons can remain as they are.
- d. Set the SCALE control to reduce the graticule brightness while adjusting R571 in part e of this step.
- e. **ADJUST** – R571 (Line Select Focus) for best focus of the dot display. Ignore the electronic graticule and readout. See Fig. 5-17 for Adjustment location.
- f. Set the LINE SEL ON push button to Off.

#### A1 POWER SUPPLY BOARD

##### 6. ADJUST TRACE ROTATION AND GEOMETRY (R45)

- a. Select the Waveform mode. Set the CH 1 INPUT to Off and check that CH 2 and CH 3 are Off.
- b. Turn the SCALE control for best visibility of the graticule.
- c. Set the VERTICAL Position control so the trace is located on the graticule base line.

- d. **ADJUST** – the front-panel TRACE ROTATION control so the sweep trace is aligned parallel to the base line.
- e. Use the VERTICAL Position control to move the trace to the top of the graticule.
- f. **ADJUST** – R45 (Geometry) so the trace is aligned parallel with the top graticule line; adjust for minimum bowing.
- g. Move the trace to the bottom of the graticule and check that the trace is aligned with the bottom graticule line.

#### A3 MAIN BOARD

##### 7. ADJUST CH 1, CH 2, AND CH 3 OFFSETS (R288, R490, R890)

- a. Double terminate the WFM 300A CH 1, CH 2, and CH 3 INPUTs by applying a 75 $\Omega$  terminator to each of the six input connectors.
- b. Set the WFM 300A controls as follows:  
  
VERTICAL GAIN X5  
HORIZONTAL SWEEP 1 LINE
- c. Check that the Waveform mode is selected, and that CH 1, CH 2, and CH 3 are Off.
- d. Rotate the VERTICAL Position control to move the trace to the graticule base line.
- e. Select the CH 1 INPUT, then push the CH 1 push button Off and On. If the trace shifts, adjust R288 (Ch 1 Offset) to return the trace to the graticule base line.
- f. Select the CH 2 INPUT. Leave CH 1 On.
- g. **ADJUST** – R490 (Ch 2 Offset) so that the CH 2 trace overlays the CH 1 trace.
- h. Select the CH 3 INPUT. Check that CH 1 and CH 2 are On.
- i. **ADJUST** – R890 (Ch 3 Offset) so that the CH 3 trace overlays the CH 1 and 2 traces.
- j. Leave the CH 1, CH 2, and CH 3 connectors double terminated.



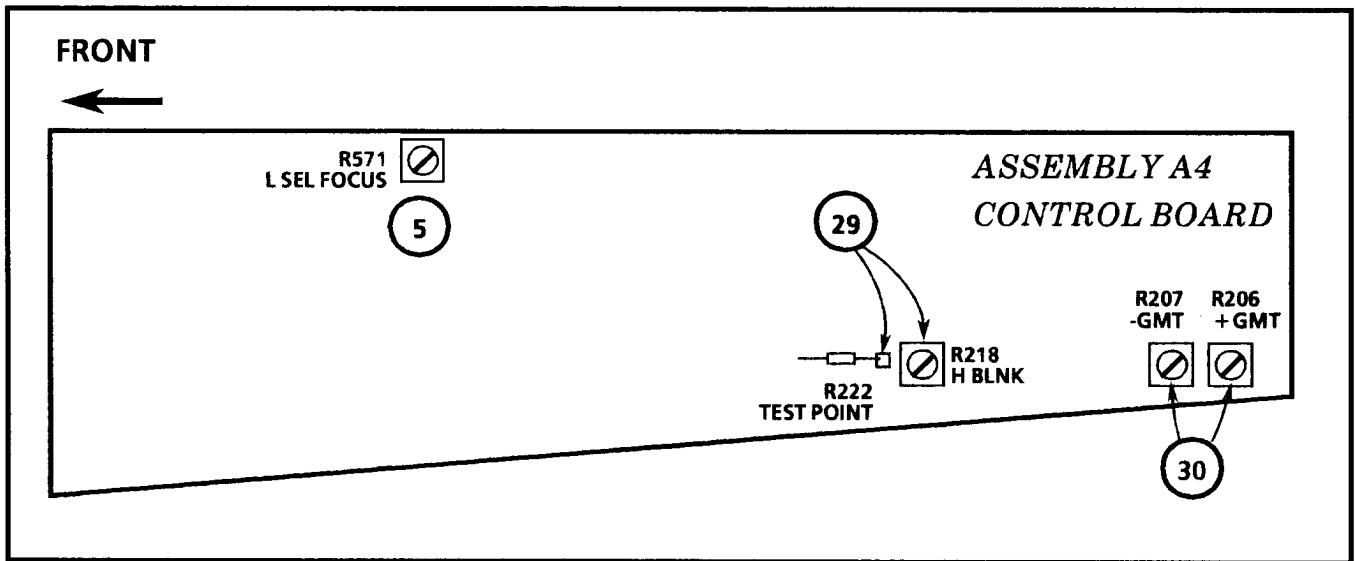


Fig. 5-17. CONTROL board, showing adjustment, jumper, and test point locations. Adjustment Procedure step numbers are shown in circles.

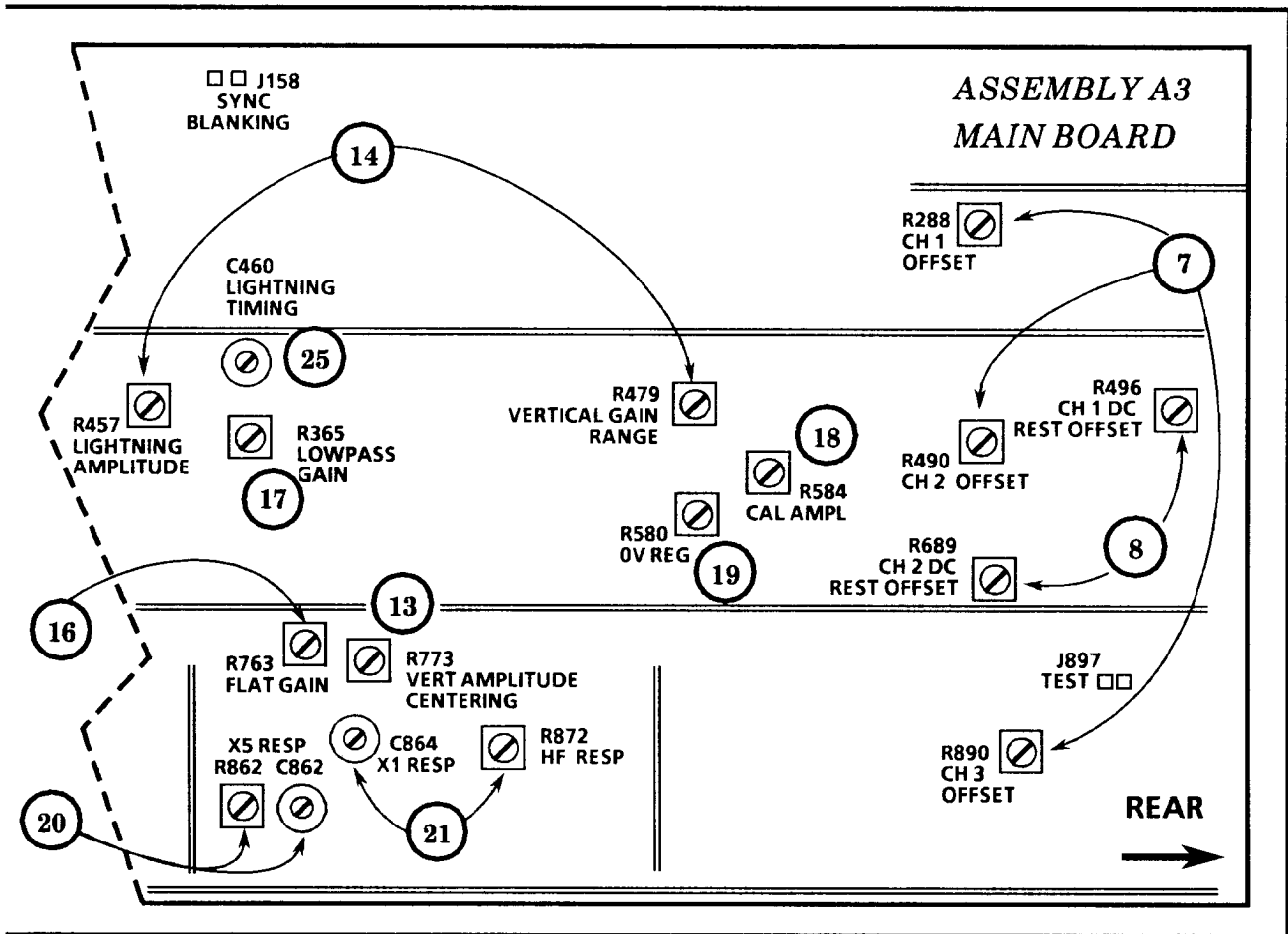


Fig. 5-16B. Right portion of MAIN board, showing adjustment, jumper, and test point locations. Adjustment Procedure step numbers are shown in circles.

**8. ADJUST CH 1 AND CH 2 DC RESTORER OFFSETS (R496, R689)**

- a. Check that the black burst signal is applied to the EXT REF INPUT connector.
- b. Set the WFM 300A controls as follows:
 

CH 2&3 POS	Out of detent
CH 2	Off
CH 3	Off
SWEEP	2 LINE
- c. Check that the Waveform mode is selected, CH 1 is On, the VERTICAL Gain button is set to X5, and the REFERENCE button is set to EXTERNAL.
- d. **ADJUST** – R496 (Ch 1 DC Rest Offset) for no trace shift as the CH 2&3 POS control is switched in and out of its detent position.
- e. Use the VERTICAL Position control to move the trace to the base line.
- f. Select the Parade mode.
- g. Turn the CH 2&3 POS control so the CH 2 and CH 3 traces are positioned to the base line.
- h. **ADJUST** – R689 (Ch 2 DC Rest Offset) so that the CH 2 trace level matches the CH 3 trace level.
- i. Set the CH 2&3 POS control to its detent position.

**NOTE**

*Leave the WFM 300A double terminated through Step 12a. Leave the black burst signal connected to the EXT REF INPUT connector through Step 18.*

**9. ADJUST VERTICAL AND HORIZONTAL GRATICULE TARGET SHAPE (R830, R930)**

- a. Set the WFM 300A as follows:

<u>Front-Panel Controls</u>	
MODE	VECTOR
INTENS	Fully counterclockwise
GRATICULE	100% (CH 1 or Menu)

Menu Selection

FORMAT                      GBR Off

- b. Use the VERTICAL Position control to position the vector targets into view. Use the SCALE control to adjust for desired electronic graticule brightness.
- c. **ADJUST** – R830 (Vertical Graticule Shape) and R930 (Horizontal Graticule Shape) for optimum square-shaped targets.

**10. ADJUST VERTICAL AND HORIZONTAL GRATICULE SIZE (R929, R735)**

- a. Use the GRATICULE MENU or push CH 1 to select 100% graticule. Use the FORMAT MENU to select GBR format.
- b. **ADJUST** – R929 (V Graticule Size) so that the YL-R and G targets are 1 V (140 IRE) apart. Measure from the bottom of the lower target to the bottom of the upper target.
- c. **ADJUST** – R735 (Horizontal Graticule Size) so the G and B-C targets are 9 divisions apart. Measure from the right sides of the box-shaped targets. Use the center 9 divisions of the graticule base line as a guide to check the distance.

**11. ADJUST VERTICAL BALANCE (R500)**

- a. Select the Lightning mode.
- b. Check that the 100% Graticule is selected (Push CH 1 or use the GRATICULE MENU). Check that the VERTICAL Gain button is set to Off (X1).
- c. Set the SCALE and INTENS controls so the electronic graticule and the dots in the R-B target are the desired brightness. (The two dots may appear as one if they are overlaid.)
- d. Select X5 GAIN.
- e. **ADJUST** – R500 (front-panel V BAL) so the dots in the R-B target are overlaid.



**12. ADJUST VERTICAL AND HORIZONTAL SIGNAL TO GRATICULE REGISTRATION (R550, R551)**

- a. **ADJUST** – R550 (Vertical Signal to Graticule Registration) so that the dot is vertically centered within the R-B box-shaped target of the electronic graticule.
- b. **ADJUST** – R551 (Horizontal Signal to Graticule Registration) to center the dot horizontally within the R-B target.
- c. Remove one of the terminators from each of the WFM 300A CH 1, CH 2, and CH 3 INPUTs. Leave the black burst signal applied to the EXT REF INPUT connector.

**13. ADJUST VERTICAL AMPLIFIER CENTERING (R773)**

- a. Select WFM 300A X5 Gain and Cal mode. Move the Vertical Gain Control just out of detent position.
- b. Connect 10X probes from the Dual Trace Vertical Amplifier to the vertical outputs on the WFM 300A (brown and blue crt leads). Select 10  $\mu$ s Sweep and Internal Trigger Source. Set both channels to 5 V/Div. Ground both inputs, switch to ALT mode, and position the test oscilloscope traces so that they are overlaid on the bottom graticule line. Return both Vertical Amplifier inputs to dc coupling.
- c. Adjust the VERTICAL Position control until there is no movement on the test oscilloscope display.
- d. **ADJUST** – R773 so that the dc levels are matched on the test oscilloscope display.
- e. Return the Vertical Gain Control to the detent position and remove the probes from the vertical outputs.

**14. ADJUST VERTICAL GAIN (R479), V CAL (R800), AND LIGHTNING AMPLITUDE (R457)**

- a. Connect a 700 mV calibrator signal from the VAC to the WFM 300A CH 3 INPUT connec-

tor. Leave the CH 3 loop-through connector unterminated.

- b. Select the VAC CHR P-P button (in) setting.
- c. Remove jumpers J158 and J453 from the Main board to disable the clamps.

**NOTE**

*Store the removed jumpers on one of their pins while performing Steps 13c through 17f.*

- d. Set the WFM 300A controls as follows:

Front-Panel Controls

MODE	VECTOR
SCALE	Fully counterclockwise
LINE SEL ON	Off
V GAIN	Fully counterclockwise
VERTICAL GAIN	Off (X1)
CH 2&3 POS	Detent
REFERENCE	EXT

Menu Selections

GRATICULE	Off (or push CH 3)
FORMAT	Select desired operating format (not GBR)

- e. **ADJUST** – R479 for a 2.5 division (250 mV) display (or adjust for a display that extends from the 20 IRE graticule mark to the tip of the arrow).
- f. Return V GAIN to its detent position.
- g. **ADJUST** – R800 (front-panel V CAL) so the two dots are vertically spaced 1 V (140 IRE) apart.
- h. Move the VAC signal to the CH 1 INPUT connector. Terminate CH 2 and CH 3 into 75 $\Omega$ . Select the LUM/SYNC button (out) setting on the VAC.
- i. Select the Lightning mode.
- j. Select X5 Gain.
- k. Check that the center dots are overlaid. If they are not, readjust the front-panel V BAL control to overlay the dots.

## WFM 300A — CHECKS AND ADJUSTMENTS

- l. Set the VERTICAL Gain button to Off (X1).
- m. **ADJUST** – R457 (Lightning Amplitude) so the upper and lower dots are vertically spaced 1 V (140 IRE) apart. (Ignore the center overlaid dots.)
- b. Adjust R365 for a 1 Volt display.
- c. Turn LPASS filter off .

### 15. ADJUST HORIZONTAL DISPLAY GAIN (R834)

- a. Proceeding from the previous step, move the VAC signal to the CH2 INPUT and move the 75 $\Omega$  terminator from CH 2 to CH 1.
- b. Select the CHR P-P, –sync or +sync setting on the VAC, to position the display to horizontal center screen.
- c. Remove jumper J843 from the Main board and store it on one pin.
- d. Select the VECTOR mode.
- e. Use the FORMAT MENU to select GBR format. Check that the REFERENCE button is set to EXTERNAL.
- f. **ADJUST** – R834 (Horizontal Display Gain) so the dots are positioned 9 divisions apart horizontally. Use the center 9 divisions of the graticule as a guide to verify the distance.

### 16. ADJUST FLAT GAIN (R763)

- a. Proceeding from the previous step, set the VAC output to 999.9 (equivalent to 1 V).
- b. Select CH 2 INPUT and WAVEFORM MODE.
- c. **ADJUST** – R763 (Flat Gain) so the display is 1 volt in amplitude, measured from the -0.3 graticule line to the 0.7 graticule line (-40 to +100 IRE).

### 17. ADJUST LOW PASS GAIN (R365)

- a. Proceeding from the previous step, select the LPASS filter on the WFM 300A.

### 18. ADJUST CALIBRATOR AMPLITUDE (R584)

- a. Set the VAC controls for 700 mV output.
- b. Select the WFM 300A CAL MODE. Check that CH 2 is On and that CH 1 and CH 3 are Off.
- c. **ADJUST** – R584 (Calibrator Amplitude) so the WFM 300A calibrator signal matches the amplitude of the CH2 VAC input signal. Select X5 Gain. If necessary, readjust R584 so the amplitude of the upper and lower displays match. (The center two traces will be overlaid.)
- d. Set the VERTICAL Gain button to Off (X1). Leave CH 1 and CH 3 terminated. Disconnect the VAC from the WFM 300A.

### 19. ADJUST 0 VOLT REGISTRATION (R580)

- a. Apply a full amplitude, low frequency range, composite multiburst signal from the test signal generator to the WFM 300A CH 1 INPUT. Check that CH 1 is terminated.
- b. Set the WFM 300A controls as follows:

MODE	WAVEFORM
CH 1	On
CH 2	Off
SWEEP	1 LINE
SCALE	Desired readout intensity
LINE SEL ON	ON, 15L
FIELD	1
UP-DOWN	Line 19

- c. Check that CH 3 is Off. Use the VERTICAL Position control to move the display so the vertical center of the readout letter 'F' in FIELD is located on the 0.8 graticule line of the mV graticule, and the top of the "F" is on the 110 IRE mark of the IRE graticule.

- d. **ADJUST** – R580 (0 V Registration) to position the back porch of the multiburst waveform on the graticule base line.
- e. Disconnect the multiburst signal and terminators from CH 1.
- f. Put J158, J453, and J843 Main board jumpers back to their original position.

**20. ADJUST X5 HIGH FREQUENCY COMPENSATION (C862, R862)**

- a. Apply a full amplitude, low frequency range, composite sweep signal from the Multiburst Signal Generator via a coaxial cable to the WFM 300A EXT REF INPUT. Connect a cable from this loop-through connector via a 50Ω 5X attenuator to the WFM 300A CH 1 INPUT connector. Check that CH 1 is terminated into 75Ω. See Fig. 5-18.

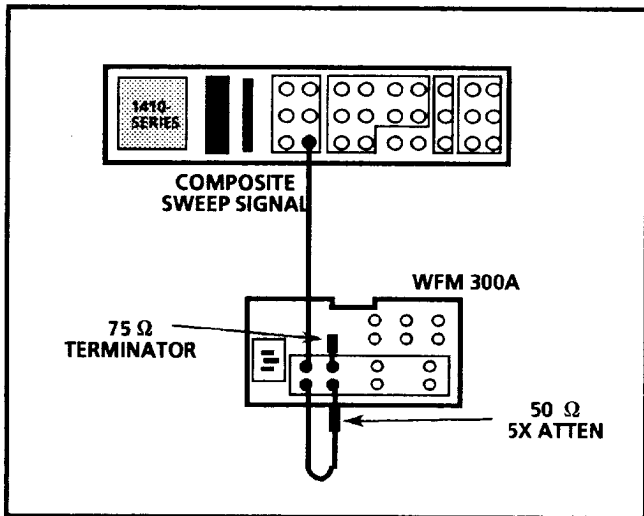


Fig. 5-18. Equipment setup for adjusting X5 high frequency compensation.

- b. Set the WFM 300A controls as follows:

MODE	WAVEFORM
CH 1 INPUT	On
CH 3 INPUT	Off
VERTICAL GAIN	X5 On
SWEEP	2 FLD
LINE SELECT	OFF

- c. Check that CH 2 is Off and that the REFERENCE button is set to EXTERNAL.
- d. **ADJUST** – C862 and R862 (X5 High Frequency Compensation) for optimum flat frequency response up to 6 MHz. See Fig. 5-19.

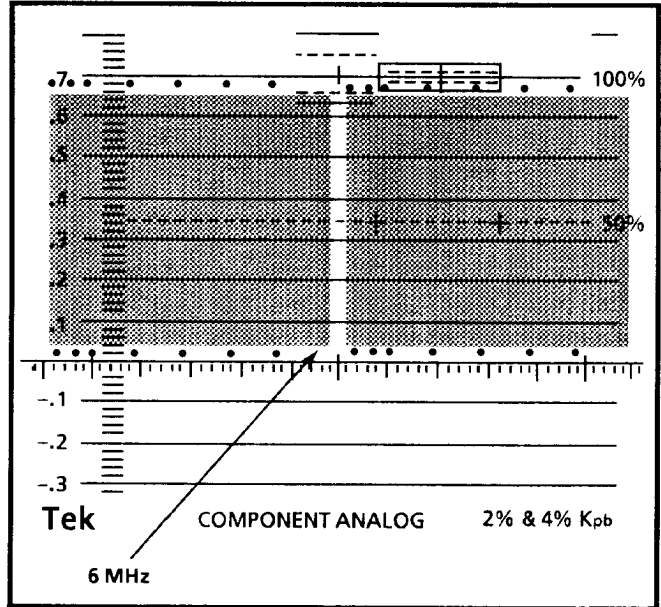


Fig. 5-19. X5 High Frequency Response. Low frequency range composite sweep with markers is displayed.

**21. ADJUST X1 HIGH FREQUENCY COMPENSATION (C864, R872)**

- a. Set the Multiburst Signal Generator for a full amplitude, high frequency range, composite sweep output.
- b. Set the WFM 300A VERTICAL GAIN button to Off (X1).
- c. Remove the 5X attenuator and connect the coaxial cable directly to the WFM 300A CH 1 INPUT (check that the signal is looped-through the EXT REF INPUT connectors to CH 1 INPUT. Check that CH 1 is terminated into 75Ω.)
- d. **ADJUST** – C864 and R872 (X1 High Frequency Compensation) to obtain optimum flat frequency response up to the 10 MHz marker. See Fig. 5-20.

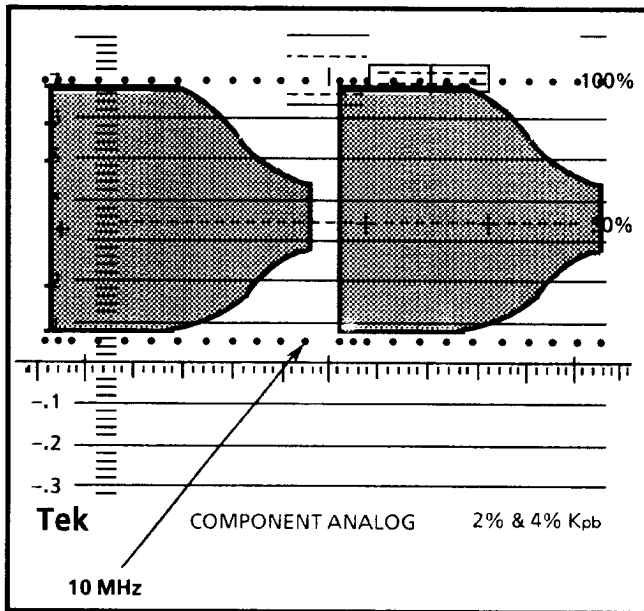


Fig. 5-20. X1 High Frequency Response. High frequency range composite sweep with markers is displayed.

- e. Set the generator for a full amplitude, low frequency range, composite sweep output.
- f. If necessary, readjust C864 and R872 for best compromise flat frequency response.
- g. Repeat the previous step (**ADJUST X5 HIGH FREQUENCY COMPENSATION**).
- h. Repeat parts a through f of this step (**ADJUST X1 HIGH FREQUENCY COMPENSATION**).
- i. Disconnect the composite sweep signal from the instrument.

## 22. CHECK FREQUENCY RESPONSE

- a. Connect a sine wave generator signal through a 50Ω to 75Ω minimum loss attenuator to the WFM 300A CH 1 INPUT. Check that the CH 1 loop-through is terminated.
- b. Set the WFM 300A REFERENCE button to EXTERNAL.
- c. Set the generator output frequency and amplitude controls so the reference fre-

quency is 50 kHz and the displayed amplitude is 700 mV (100 IRE) peak-to-peak.

- d. **CHECK** – the flat frequency response using 50 kHz as the reference. Check that the response is within  $\pm 2\%$  from 250 kHz to 6.0 MHz.
- e. Select X5 Gain.
- f. Repeat part c of this step, except the displayed amplitude should be 7 divisions.
- g. **CHECK** – that the response is within  $\pm 2\%$  from 250 kHz to 5.0 MHz.
- h. If the WFM 300A meets the frequency response requirements, go to the next step. If not, repeat the following three steps:

- **ADJUST X5 HIGH FREQUENCY COMPENSATION**

- **ADJUST X1 HIGH FREQUENCY COMPENSATION**

- **CHECK FREQUENCY RESPONSE**

- i. Remove the input signal and terminator from CH 1.

## 23. ADJUST BOWTIE GAIN (R654) AND TIMING (C652, C840)

- a. Apply a full amplitude, low frequency range, composite, multiburst signal from the test signal generator via a coaxial cable to the WFM 300A EXT REF connector. Connect another cable from the EXT REF loop-through via a 75Ω in-line terminator and a dual-input cable connector to the CH 1 and CH 2 INPUTs. See Fig. 5-21.

- b. Set the WFM 300A controls as follows:

MODE	BOWTIE
REFERENCE	EXTERNAL
VERTICAL GAIN	X5

- c. **ADJUST** – R654 (Bowtie Gain) to null the dc portion of the left display line. The dc portion includes sync, backporch, white flag, and black flag. See Fig. 5-22.

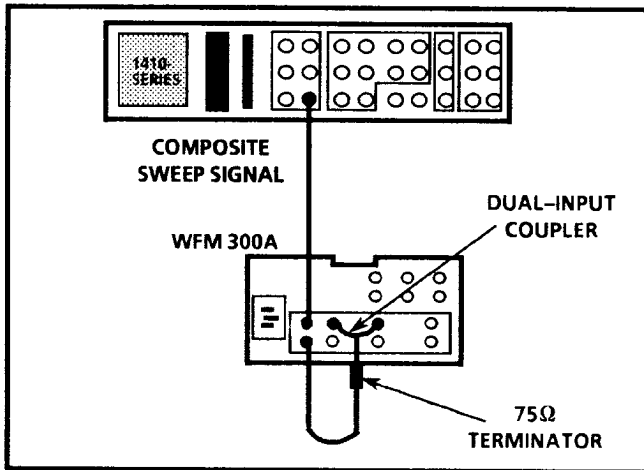


Fig. 5-21. Equipment setup for adjusting Bowtie gain and timing.

**NOTE**

Ignore the vertically magnified multiburst signal on the second sweep line when adjusting R654 and C652.

- d. **ADJUST** - C652 and C840 (Bowtie Timing) to null the multiburst packets located on the left sweep display line. See Fig. 5-22. These variable capacitors interact, so it is necessary to adjust them carefully in small increments until optimum null is obtained. Note the amplitude of the nulled packets.

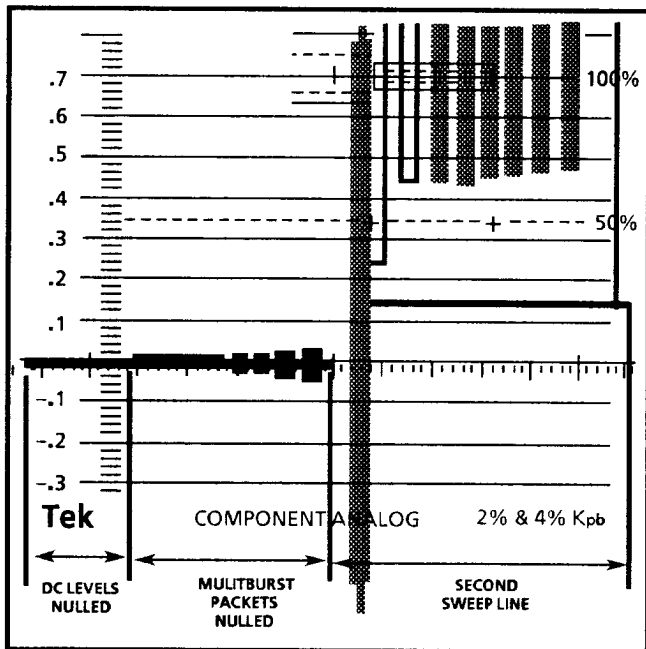


Fig. 5-21. Nulling the left portion of Bowtie display.

- e. Move the dual-input coupler so the multiburst signal is applied to the CH 1 and CH 3 INPUTS.
- f. Note the amplitude of the nulled multiburst packets located on the right sweep display line. If the packet amplitudes are greater than that noted in part d of this step, re-adjust C652 and C840 to obtain the best compromise display.

**24. ADJUST LIGHTNING TIMING (C460)**

- a. Move the dual-input cable connector so the generator low frequency range multiburst signal is applied to the WFM 300A CH 1 and CH 2 INPUTS.
- b. Select LIGHTNING MODE. Check that the REFERENCE button is set to EXTERNAL and the Graticule is Off (GRATICULE MENU).
- c. **ADJUST** - C460 (Lightning Timing) for best closed loops along the diagonal line display.
- d. Move the dual-input connector so the generator signal is applied to the WFM 300A CH 1 and CH 3 INPUT connectors.
- e. If necessary, readjust C460 for best compromise display when compared with the one obtained in part c.
- f. Disconnect the multiburst signal, dual-input connector, and 75Ω in-line terminator from the WFM 300A.

**25. ADJUST VECTOR TIMING (C856)**

- a. Connect the sine wave generator signal, through a 50-to-75Ω minimum loss attenuator, a 75Ω in-line terminator, and a dual-input coupler, to the WFM 300A CH 2 and CH 3 INPUTS.
- b. Remove J158 and J453. Ground pin 1 of J453.

## WFM 300A — CHECKS AND ADJUSTMENTS

- c. Set the WFM 300A controls as follows:

### Front-Panel Controls

MODE	VECTOR
VERTICAL GAIN	Off (X1)
REFERENCE	EXTERNAL

### Menu Selections

GRATICULE	Off (or CH 3)
FORMAT	Select desired operating format (not GBR)

- d. Set the leveled sine-wave generator to 500 kHz and 700 mV (100 IRE) display on the WFM 300A. Use the VERTICAL and HORIZONTAL Position controls to center the display on the WFM 300A.
- e. **ADJUST** – C852 (Vector Bandwidth LF) for no loop opening in the trace.
- f. Set the leveled sine wave generator frequency to 2 MHz. The display will reduce to about 200 mV (28 IRE).
- g. **ADJUST** – C856 (Vector Timing) for no loop opening in the trace.
- h. Repeat parts d, e, f, and g of this step until there is no loop opening at 500 kHz or 2 MHz.
- i. Remove the ground clip from J453–1 and replace the jumpers on J453 and J158.

## 26. ADJUST TIMING CALIBRATION (R534)

- a. Apply 100 kHz sine waves from a function generator via a coaxial cable and a 50 $\Omega$  to 75 $\Omega$  minimum loss attenuator to the WFM 300A CH 1 INPUT. Connect a coaxial cable from the CH 1 loop-through connector via a 75 $\Omega$  in-line terminator to the frequency counter.
- b. Set the WFM 300A controls as follows:

MODE	WAVEFORM
CH 1	On
CH 2, CH 3	Off
REFERENCE	Int
VERTICAL GAIN	Off (X1)
SWEEP	2 LINE

### **NOTE**

*Some double triggering may occur during this step.*

- c. Set the generator Amplitude control so the sine wave display is 700 mV (100 IRE) peak-to-peak in amplitude.
- d. Position the display so each sine wave cycle is aligned with the major division marks along the base line.
- e. **ADJUST** – R534 (Timing Calibration) so that a sine wave is aligned with the beginning and end of the central 10 major divisions (2<sup>nd</sup> and 12<sup>th</sup> major marks). All of the sine waves within the central 10 divisions should be located within 0.2 division of a major baseline mark.
- f. Leave the equipment setup as is.

## 27. ADJUST HORIZONTAL TIMING (R435, R434)

- a. Set the function generator controls for a 1 MHz output signal.
- b. Set the WFM 300A HORIZONTAL MAG button to ON. Check that 2 LINE SWEEP is selected.

### **NOTE**

*Some double triggering may occur during this step.*

- c. **ADJUST** – R435 (1  $\mu$ s Horizontal Timing) so that a sine wave is aligned with the beginning and end of the central 10 major divisions. Check that the sine waves within the central 10 divisions are located within 0.2 division of a major mark to meet the linearity requirement.
- d. Set the HORIZONTAL SWEEP button to 1 LINE.
- e. Change the function generator frequency to 5 MHz. Check that the generator Amplitude control is set to obtain a 700 mV display.
- f. **ADJUST** – R434 (0.2  $\mu$ s Horizontal Timing) so that a sine wave is aligned with the beginning and end of the central 10 major

- divisions. Check that the sine waves within the central 10 divisions are located within 0.2 division of a major division mark.
- g. Set the HORIZONTAL MAG button to Off.
- h. Disconnect the function generator signal from the WFM 300A.

**28. ADJUST MAG REGISTRATION (R655)**

- a. Apply a color bar signal to the WFM 300A CH 1 INPUT connector. Terminate this loop-through connector in 75Ω.
- b. Set the WFM 300A front-panel controls as follows:
 

MODE	WAVEFORM
SWEEP	2 FLD
CH 1	ON
CH 2	OFF
CH 3	OFF
- c. Set the HORIZONTAL MAG button to On.
- d. Use the HORIZONTAL Position control to position the vertical blanking interval to the center of the screen.
- e. Set the HORIZONTAL MAG button to Off.
- f. Adjust R655 to position the display to the center of the screen.
- g. It may be necessary to repeat steps c. through f. to achieve optimum magnifier registration.

**A4 CONTROL BOARD**

**29. ADJUST HORIZONTAL BLANKING (R218)**

- a. Apply a black burst signal from a test signal generator via a coaxial cable to the WFM 300A EXT REF INPUT. Connect another cable from the EXT REF loop-through connector via a 75Ω in-line terminator to the Channel 1 Input of the test oscilloscope's dual-trace vertical amplifier.

- b. Connect the test oscilloscope's Channel 2 10X probe to the end of C222 that faces toward the rear of the instrument. The horizontal blanking pulse is present at this test point and is also located at pin 2 of U223.
- c. Select EXTERNAL REFERENCE.
- d. Set the test oscilloscope controls as follows:
 

Ch 1 Deflection Factor	100 mV/div
Ch 2 Deflection Factor	500 mV/div
Mode	Alternate
Triggering	Ch 1
Sweep Rate	10 μs/div
- e. Position the waveform so the 50% level of the horizontal blanking pulse is aligned with the 50% level of the black burst sync pulse leading edge.
- f. Set the oscilloscope sweep rate to 500 ns/div using delayed sweep.
- g. **ADJUST** – R218 (Horizontal Blanking) so the horizontal blanking pulse leads the sync pulse by 500 ns for the 525/60 TV standard. See Fig. 5-23. (Timing for the 625/60 TV standard is 1 μs.)

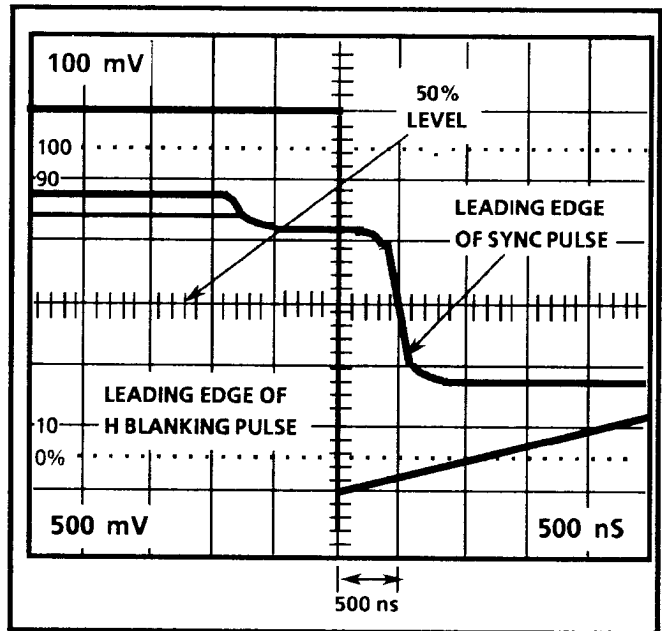


Fig. 5-23. Correct horizontal blanking pulse timing for 525/60 TV standard. Timing for 625/50 TV standard is 1 μs.

## WFM 300A — CHECKS AND ADJUSTMENTS

- h. Disconnect the oscilloscope Channel 2 10X probe from the test point.
- i. Disconnect the black burst signal from the WFM 300A and the test oscilloscope.

Bandwidth	5 MHz
Sweep Rate	10 $\mu$ s/Div
Triggering Source	Ext

### 30. ADJUST + and -GAMUT (R206, R207)

#### NOTE

A TSG-300 Component Television Generator is needed for setting the Gamut Limit threshold levels or trip points in this step.

- a. Apply 100% Color Bars in the SMPTE Parallel Format from the TSG-300 Y output to the CH 1 INPUT on the WFM 300A. Terminate the CH 1 loop-through connector into 75 $\Omega$ .
- b. Connect sync from the TSG-300 to the WFM 300A EXT REF INPUT. Connect another cable from the EXT REF loop-through via a 75 $\Omega$  in-line terminator to the test oscilloscope Ext Trig input connector.
- c. Connect a 75 $\Omega$  coaxial cable from the WFM 300A G OUTPUT via a 75 $\Omega$  in-line terminator to the +Input of the test oscilloscope Differential Comparator. See Fig. 5-11 in the Performance Check Procedure.
- d. Set the WFM 300A as follows:

#### Front Panel Controls

MODE	WAVEFORM
SWEEP	2 LINE
LINE SELECT	OFF

#### Menu Selection

GAMUT STROBE	ON
FORMAT	GBR

Set the TSG-300 as follows:

Select the 100% Color Bar with Reference Level; see Fig. 5-12A in the Performance Check Procedure.

Set the test oscilloscope as follows:

+ Input Coupling	DC
-Input Coupling	Gnd

- e. Check that the WFM 300A REFERENCE button is set to EXTERNAL and the FORMAT button is set to GBR On.
- f. Use the test oscilloscope Vertical Position control to position the back porch of the signal to graticule center.
- g. **ADJUST** – R207 (-Gamut) so the trip point occurs at -45 mV,  $\pm$ 5 mV, on the -Gamut reference level when measured with respect to the back porch. See Fig. 5-12B in the Performance Check Procedure.
- h. Set the test oscilloscope -Input Coupling switch to Vc and the Comparison Voltage polarity switch to + (plus). Use the Comparison Voltage control to position the + Gamut reference level into view. See Fig. 5-12C in the Performance Check Procedure.
- i. **ADJUST** – R206 (+ Gamut) so the trip point occurs at +745 mV,  $\pm$ 5 mV, with respect to the back porch level.
- j. Remove the input signals and terminators from the WFM 300A.

### A5 GBR BOARD

#### 31. ADJUST COMPOSITE DC LEVEL (R320), FREQUENCY RESPONSE (R603, C600), AND GAIN (R606)

- a. Apply a high-frequency range Multiburst signal, via a 75 $\Omega$  in-line terminator and dual-input connector, to the WFM 300A CH 1 and COMPOSITE INPUTs.
  - b. Select the following WFM 300A controls:
- |            |                    |
|------------|--------------------|
| MODE       | PARADE             |
| COMPOSITE  | ON                 |
| REF        | INT                |
| SWEEP      | ONE LINE           |
| CH 2&3 POS | Just out of detent |



**DC Level**

- c. Select X5 Gain.
- d. Use the VERTICAL Position control to place blanking level at mid-screen.
- e. **ADJUST** – R320 (Comp Match) so the dc levels of the Composite and Component baselines match.

**Response and Gain**

- f. Select X1 Gain.
- g. **ADJUST** – R603 and C600 (Comp Resp) so the Multiburst packets are flat.
- h. **ADJUST** – R606 (Comp Gain) so the Composite gain matches the Component gain.
- i. Repeat parts c. through h. of this step as needed to obtain best gain and response.
- j. Return the CH 2&3 POS control to detent.

**32. CHECK COMPOSITE RESPONSE**

**REQUIREMENTS** – X1 Gain: Flat response from 250 kHz to 6.0 MHz is within 2% of the response at 50 kHz. X5 Gain: 250 kHz to 5.0 MHz within  $\pm 2\%$  of response at 50 kHz.

- a. Set the WFM 300A REFERENCE button to EXTERNAL. Select WAVEFORM MODE.
- b. Connect the sine wave generator signal, via a 50 $\Omega$  precision cable, a 50-to-75 $\Omega$  minimum loss attenuator, a 75 $\Omega$  in-line terminator, and a dual-input coupler, to the WFM 300A CH 1 and COMPOSITE INPUTs. Terminate the CH 1 loop-through connector in 75 $\Omega$ . See Fig. 5-5.
- c. Select the WFM 300A CH 1 INPUT.
- d. Set the generator output frequency and amplitude controls so the reference frequency is 50 kHz and the displayed amplitude is 700 mV (100 IRE) peak-to-peak.
- e. Select COMPOSITE INPUT.

- f. **CHECK** – that the flat frequency response is within  $\pm 2\%$  from 250 kHz to 6.0 MHz, using 50 kHz as the reference.
- g. Select X5 Gain.
- h. Set the generator output frequency and amplitude controls so the reference frequency is 50 kHz and the displayed amplitude is 700 mV (100 IRE) peak to peak.
- i. **CHECK** – that the response is within  $\pm 2\%$  from 250 kHz to 5.0 MHz, using 50 kHz as the reference. If the response is not within this specification, repeat the step entitled, ADJUST COMPOSITE DC LEVEL, FREQUENCY RESPONSE AND GAIN.
- j. Leave the connections in place for the next step.

**33. CHECK COMPOSITE OUT RESPONSE**

**REQUIREMENTS** – 50 kHz to 6 MHz, within 5% of response at 50 kHz.

- a. Connect a 75 $\Omega$  cable, through a 75 $\Omega$  feed-through terminator, from the COMPOSITE OUT to the CH 1 Input on the test oscilloscope Vertical Input.
- b. Set the test oscilloscope as follows:
 

Deflection Factor	0.1 V/Div
Input Coupling	DC
Sweep Rate	+
Trig. Slope	+
Trig. Mode	Auto
- c. Select X1 GAIN and CH 1 INPUT on the WFM 300A.
- d. Set the sine wave generator frequency to 50 kHz and adjust the amplitude for a 700 mV display on the WFM 300A.
- e. **CHECK** – that the amplitude on the test oscilloscope is 700 mV,  $\pm 35$  mV.
- f. **CHECK** – while varying the sine wave generator frequency from 250 kHz to 6 MHz, that the COMPOSITE OUT Flat Response is 700 mV,  $\pm 35$  mV.

**This completes the adjustment portion of the procedure. For a complete calibration, return to the beginning of this section and go through the performance check, to verify all specifications.**

# SECTION 6

## MAINTENANCE

This section contains instructions for preventive maintenance, general troubleshooting, Serial Port and LED Driver diagnostics, and corrective maintenance. If the instrument does not function properly, troubleshooting and corrective measures should be taken immediately to circumvent additional problems.

### PREVENTIVE MAINTENANCE

Preventive maintenance consists of cleaning, visual inspection, performance checks, and (if needed) re-adjustment. The preventive maintenance schedule established for the instrument should be based on the amount of use it receives and the environment in which it is operated. Under average conditions, scheduled preventive maintenance should be performed every 2000 hours of operation.

### Performance Checks and Readjustments

Instrument performance should be checked after each 2000 hours of operation, or every 12 months if used intermittently. This will help ensure maximum performance and assist in locating defects that may not be apparent during regular operation. The Performance Check Procedure and the Adjustment Procedure are in Section 5.

#### CAUTION

*Do not allow water to get inside any enclosed assembly or component. Do not clean any plastic materials with benzene, toluene, xylene, acetone, or similar compounds, because they may damage the plastic.*

### Cleaning

#### CAUTION

*A 2% RMA flux content solder is recommended for making repairs in this instrument. Cleaning of rosin residue is not recommended. Most cleaning solvents tend to reactivate the rosin and spread it under components where it may cause corrosion under humid conditions. The rosin residue, if left alone, does not exhibit these corrosive properties.*

The instrument should be cleaned often enough to prevent dust and dirt from accumulating. Dirt acts as a thermal insulator, preventing effective heat dissipation, and can also provide high-resistance electrical leakage paths between conductors or components in a humid environment.

**Exterior.** Clean the dust from the outside of the instrument with a soft cloth or small brush. A brush is especially useful for removing dust from around the selector buttons, knobs, and connectors. Hardened dirt may be removed using a cloth dampened with a mild detergent and water solution. Abrasive cleaners should not be used.

**Color Shutter (not installed in Option 05).** Clean the face of the color shutter and both sides of the clear plastic light filter located in front of the color shutter. Use a soft, non-abrasive cloth (preferably designated for cleaning glass or glass lenses) dampened with a 50% denatured alcohol and water solution. Dampen cloth with alcohol solution and clean the surface with light to moderate pressure until adequately free of fingerprints or other films and lint.

**CRT.** Clean the face of the crt with a soft, lint-free cloth dampened in isopropyl alcohol or glass cleaner solution. Abrasive cleaners should not be used.

**Interior.** Loosen dust with a soft, dry brush and remove it with low-pressure air (high-velocity air can damage some parts). Hardened dirt or grease can be removed with a cotton-tipped applicator dampened with a mild detergent and water solution. Abrasive cleaners should not be used.

If the circuit board assemblies must be removed for cleaning, follow the instructions for removal/ replacement under the heading of Corrective Maintenance.

After cleaning, allow the interior to dry thoroughly before applying power to the instrument.

**Visual Inspection**

After cleaning, check the instrument carefully for improperly seated transistors or integrated circuits, defective connections, and damaged parts. To prevent additional damage in the case of heat-damaged parts, determine the cause of overheating before replacing the damaged part.

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.

**STATIC-SENSITIVE COMPONENTS**

This instrument contains electrical components that are susceptible to damage from static discharge. Static voltages from 1 kV to 30 kV are common in unprotected environments. Table 6-1 shows the relative static discharge susceptibility of various semiconductor classes.

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 components or assemblies.

**Table 6-1  
Static Susceptibility**

Relative Susceptibility Levels		Voltage
1	MOS and CMOS	100 to 500 V
2	ECL	200 to 500 V
3	SCHOTTKY SIGNAL DIODES	250 V
4	SCHOTTKY TTL	500 V
5	HF BIPOLAR TRANSISTORS	400 to 600 V
6	JFETS	600 to 800 V
7	LINEAR $\mu$ CIRCUITS	400 to 1000 V est.
8	LOW POWER SCHOTTKY TTL	900 V
9	TTL	1200 V

**\*Voltage equivalent for levels (voltage discharged from a 100-pF capacitor through a resistance of 100 $\Omega$ ).**

3. Discharge the static voltage from your body by wearing a grounding wrist strap while handling these components. Static-sensitive assemblies or components should be serviced only at a static-free work station by qualified personnel.
4. Nothing capable of generating or holding a static charge should be allowed on the work station surface.
5. Keep component leads shorted together whenever possible.
6. Handle components by the body, never by the leads.
7. Do not slide 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 wick-type or special antistatic suction desoldering tools.

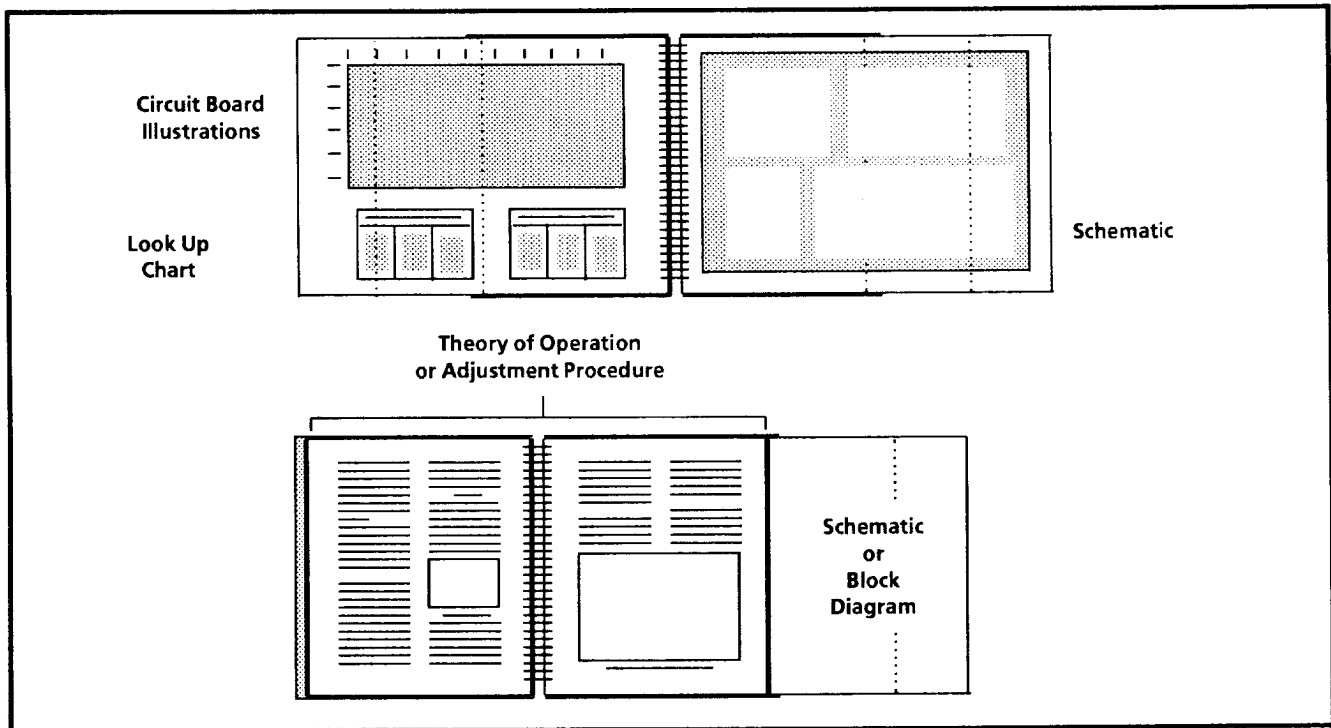


Fig. 6-1. Using foldout pages.

## TROUBLESHOOTING

Since this manual is a troubleshooting aid, its organization is described here. This material is general, and does not cover specific cases.

### Troubleshooting Aids

#### Foldout Pages

The foldout pages at the back of the manual contain block and schematic diagrams, circuit board illustrations, and look-up charts. See Fig. 6-1.

**Diagrams.** Schematic diagrams show the circuit number and electrical value of each component. Symbols used on these diagrams are defined on the first page of Section 9. Circuit boards are indicated by a heavy border.

Refer to the Replaceable Electrical Parts List for a complete description of each component.

#### NOTE

*Check the Change Information section in the rear of the manual for corrections and*

*modifications to the instrument and the manual.*

**Look Up Charts.** Each schematic diagram is assigned an alpha-numeric grid and a look-up chart which lists the grid location of components on that schematic.

**Circuit Board Illustrations.** Electrical components, connectors, and test points are identified on circuit board illustrations, which are located on the back of the schematic diagrams.

Components on some of the circuit boards are sequentially numbered, with the lowest number in the upper left corner and the highest number in the lower right. Other circuit boards, which have randomly assigned component numbers, are accompanied by a component locator chart.

**Assembly and Circuit Numbering.** All circuit board assemblies are assigned assembly or "A" numbers. Fig. 6-2 shows the assembly numbers and their locations for this instrument.

**NOTE**

*Always check the parts list for part numbers and descriptions when ordering replacement parts. Some parts may have been replaced or have a different value in an individual instrument.*

**Parts Lists**

There are two separate parts lists in this manual. The Replaceable Electrical Parts List precedes the schematic diagrams, and the Replaceable Mechanical Parts List follows them.

**Replaceable Electrical Parts.** This list is arranged by assembly (as designated in ANSI Standard Y32.16-1975), beginning with the etched circuit board assemblies. These are followed by the individual components, which combine the assembly number with the individual circuit number.

EXAMPLE: R445 on the Power Supply board (A1) would be shown in the Replaceable Electrical Parts List as A1R445.

**Replaceable Mechanical Parts List and Exploded View Drawing.** Parts listed in the Replaceable Mechanical Parts List are assigned index numbers which correspond to circled numbers on the exploded view drawing(s).

**Accessories List.** Standard accessories are illustrated in the exploded view drawing. Part numbers of standard and optional accessories are given at the end of the Replaceable Mechanical Parts List.

**Major Assembly Interconnection**

Signals and power supply voltages are passed through the instrument using a system of interconnecting cables.

**24 & 32 Pin Connectors.** The male connectors on the cables fit into the connectors that are mounted on the circuit boards. A triangular symbol identifies pin 1 on both connectors, and the remaining pins are numbered. See Fig. 6-3.

**Square Pin Connectors.** Pin 1 is marked by a triangular symbol on the circuit board and on the connector.

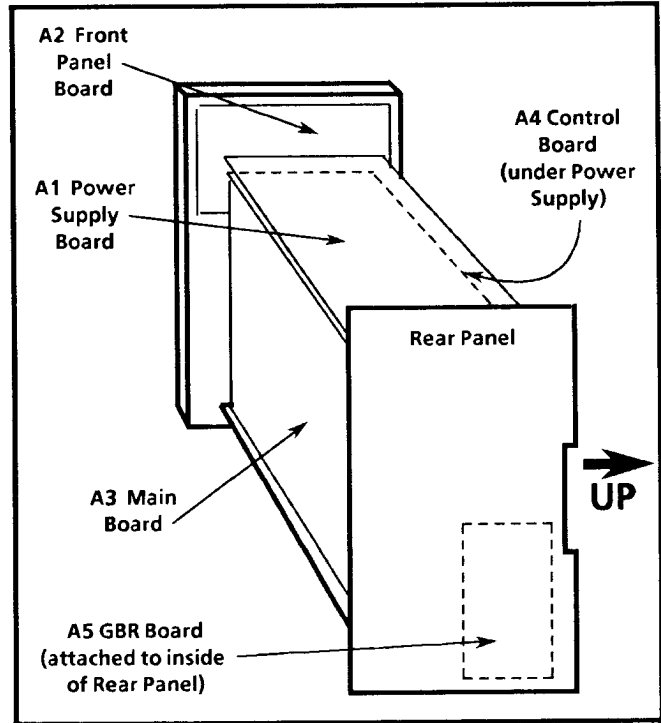


Fig. 6-2. Circuit board assembly locations.

**Connectors with Center Polarizers.** These polarizers serve as a key for proper mating with the connector on the circuit board. Pin 1 is also marked with a triangular symbol on both connectors.

**General Troubleshooting Techniques**

1. **Be sure the instrument is malfunctioning.** See Section 2 to determine whether the instrument is operating properly. Check the operation of front-panel controls, associated equipment, and input signal connections.

**CAUTION**

*Use extreme care when probing with meter leads or probes, because of the high component density and limited access within the instrument. The inadvertent movement of leads or a probe could cause a short circuit or transient voltages capable of destroying components.*

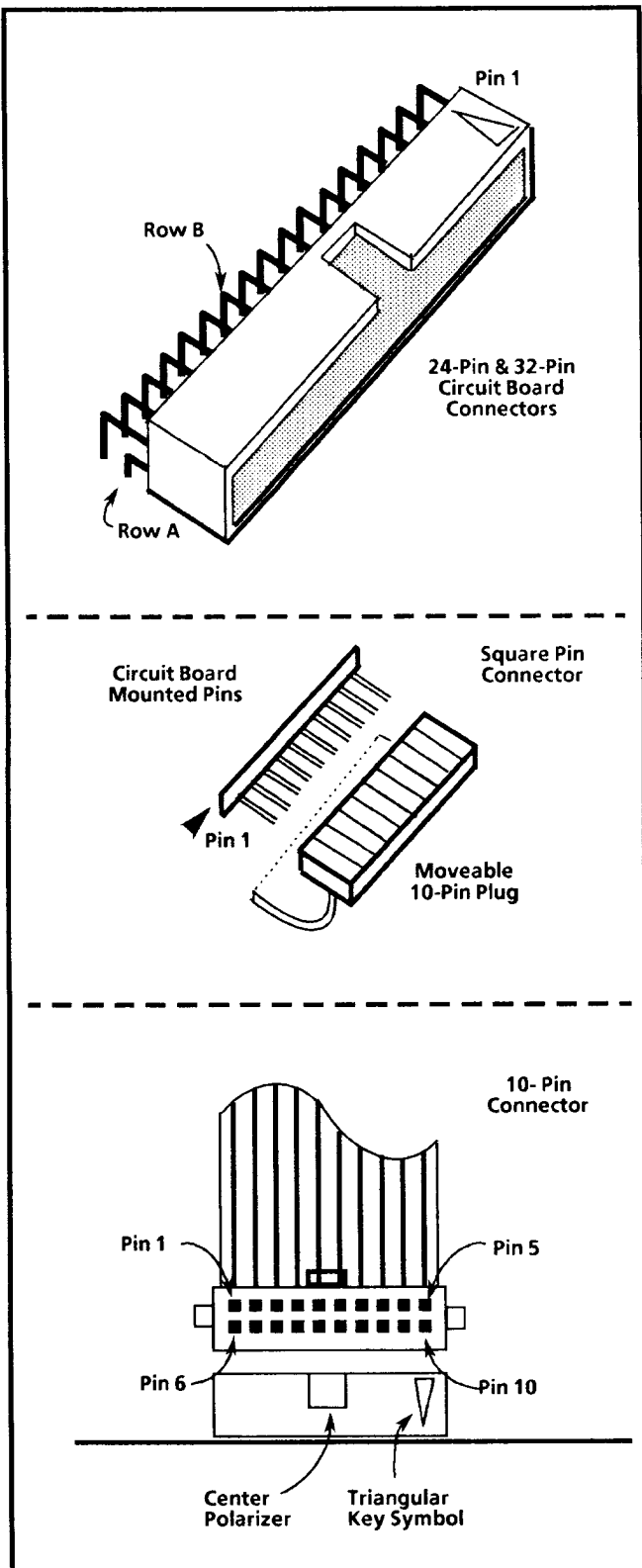


Fig. 6-3. Multiple pin connectors.

2. **Determine the nature of the problem.** Determine whether the instrument is out of calibration or there has been a component failure. Once the type of failure has been determined, identify the functional area most likely at fault.
3. **Isolate the problem to a circuit or assembly.** Use the block diagram as an aid to signal tracing and circuit isolation.

**CAUTION**

*Always remove the assembly from the instrument before replacing a soldered-in component. See Corrective Maintenance for the disassembly procedure.*

4. **Visually inspect the suspect assembly for obvious defects.** Look for chafed insulation, components that are broken, loose, improperly seated, overheated or burned, etc. Repair or replace all obvious defects. In the case of overheated components, determine and correct the cause of overheating before re-applying power.
5. **Use successive electrical checks to locate the source of the problem.** The primary tool for problem isolation is the oscilloscope. Use the Performance Check Procedure in Section 5 to determine if a circuit is operating within specifications. It may be necessary to change a calibration adjustment to determine if a circuit is operational. Use caution, since this can destroy instrument calibration. Note the adjustment position before making changes, so that it can be returned to the same position.
6. **Determine the extent of the repair.** If the necessary repair is complex, it may be advisable to contact your local Tektronix field office or representative before continuing. If the repair is minor, such as replacing a component, see the parts list for replacement information. Removal and replacement procedures for the assemblies can be found under Corrective Maintenance.

## Power Supply Troubleshooting Procedure

**NOTE**

*A review of the power supply theory of operation is recommended before attempting repairs.*

The equipment needed to troubleshoot the power supply

- Digital Multimeter (DMM) with diode check function
- Oscilloscope
- 0 to 20 VDC variable power supply
- Clip Lead – to short across a component
- High Voltage Probe,  $\geq 1\text{ G}\Omega$  input resistance

### Introduction

The Troubleshooting Procedure for the Power Supply (Assembly A1) is split into two sections: the Low Volts and the High Volts supplies. Start the procedure by determining which section of the power supply the problem is in. Apply ac power and turn on the power supply. From Table 6-2, determine which symptom the power supply exhibits and refer to the corresponding procedure.

### Low Volts Supply

**NOTE**

*A 20 $\Omega$ , 2 watt resistor should be used as a load for the Low Volts Supply. Disconnect J4 and connect the 20 $\Omega$  resistor between W1 (+5 V) and TP1 (secondary ground).*

#### 1. Preliminary Checks

- a. A properly functioning and loaded Low Volts supply will output the voltages listed in Table

6-3. Use the DMM to measure the voltages between TP1 and the voltage test points. If the supply is not regulating properly, continue with the procedure.

**Table 6-3**  
Low Volts Supply Voltages

Test Point	Voltage
W1 - (+5 V)	+4.88 to +5.12 V
W4 - (+15 V)	+14.0 to +16.0 V
W3 - (-15 V)	-14.0 to -16.0 V
W2 - (+40 V)	+39.0 to +41.0 V

**NOTE**

*The Low Volts power supply troubleshooting is performed without applying ac power.*

- b. Disconnect ac power from the instrument. Disconnect the instrument from the Power Supply by removing the jumper from J4.
- c. Use the digital multimeter to measure the voltage between TP2 and the tab (drain) of Q9. Be sure the voltage is near 0 V before proceeding.

**CAUTION**

*Do not proceed until the the drain of Q9 is near 0 V. Dangerous voltage potentials are present in the circuit until the capacitors discharge.*

**Table 6-2**  
Power Supply Fault Symptoms

Symptom	Procedure
Line fuse open	Rectifier/Switcher Check (Low Volts)
Power supply cycles OFF/ON	Output Check (Low Volts), or High Voltage Oscillator Check (High Volts)
Does not power up	Control Circuit Check (Low Volts)
5 V not regulating	Error Amplifier Check (Low Volts)
Improper crt display	High Volts Supply



**2. Rectifier/Switcher Check**

- a. Use the digital multimeter to measure the voltage between TP2 and the tab (drain) of Q9. Be sure the voltage is near 0 V before proceeding.
- b. Unsolder and lift one end of R102.
- c. With the negative lead of the digital multimeter connected to TP2 and the positive lead connected to the tab of Q9, measure the circuit resistance. A resistance of less than 20 kΩ indicates a shorted mosfet (Q9). If the mosfet is shorted, replace it and perform the Control Circuit Check.
- d. Using the digital multimeter diode test function, test CR21, CR22, CR23, and CR24 for shorts. Diode replacements must be fast reverse recovery (300 ns) types to reduce conducted noise.
- e. Reconnect the lifted end of R102.

**3. Output Check**

- a. Connect the negative output from the 20 VDC Power Supply to TP1. Connect the positive output to W4 (+15 V). The circuit should draw less than 20 mA. Excessive current draw can be caused by CR11 or U2 (High Volts power supply).
- b. Connect the negative output from the 20 V DC Power Supply to TP1. Connect the positive output to W2 (+40 V). The circuit should draw less than 20 mA. Excessive current draw can be caused by CR14 or Q6 (High Volts power supply).
- c. Connect the positive output from the 20 V DC Power Supply to TP1. Connect the negative output to W3 (-15 V). The circuit should draw less than 20 mA. Excessive current draw can be caused by CR12.
- d. Connect the negative output from the 5 V DC Power Supply to TP1. Connect the positive output to W1 (+5 V). The circuit should draw less than 20 mA. Excessive current draw can be caused by CR13 or Q1 and Q2 (High Volts power supply).

**4. Control Circuit Check**

- a. Connect the negative output from the 20 V DC Power Supply to TP2. Connect the positive output to the cathode of CR17. Short C47 with a clip lead. Connect the oscilloscope probe ground to TP2.
- b. Table 6-4 lists the signal present in a properly functioning control circuit.

**Table 6-4  
Control Circuit Test Points**

Circuit Location	Signal
U5, pin 1	Approximately 5 VDC
U5, pin 2	Approximately 2 VDC
U5, pin 3	0 V
U5, pin 4	80 kHz triangle wave, 2 V p-p
U5, pin 6	80 kHz square wave, 18 V p-p
U3, pin 1	80 kHz square wave, 5 V p-p
U3, pin 2	2.1 VDC
U3, pin 6	2.9 VDC
U3, pin 7	Approximately 5 VDC
U4, pin 13	80 kHz repetition rate, 300 ns width, approximately 3 V p-p
Q8, collector	80 kHz repetition rate, 400 ns width, switching from 5 V to approximately 2 V.

**5. Error Amplifier Check**

- a. Connect the negative output from the variable DC power supply to TP1. Connect the positive output to W1 (+5 V).
- b. Connect the negative output of another variable DC power supply to TP1. Connect the positive output to W4 (+15 V). Set the variable power supply to 20 VDC.
- c. Connect the digital multimeter between TP1 and the cathode of CR15.
- d. Set the variable DC power supply connected to W1 (+5 V) to 4.8 V. The cathode of CR15 should be approximately 20 V.

- e. Set the variable DC power supply connected to W1 (+5 V) to 5.2 V. The cathode of CR15 should be approximately 2 V.
- f. If this check did not reveal the cause for the +5 V supply not regulating, refer to the Output Check and the Control Circuit check.

**High Volts Supply**

Table 1-4 lists the High Volts Supply fault symptoms and procedures.

Load the Low Volts Supply with the instrument, or with the 20Ω resistor as stated at the beginning of the Troubleshooting Procedure.

**1. Focus Amplifier Check**

- a. Unsolder and lift one end of R24.
- b. Power up the power supply.
- c. Using the digital multimeter, measure the voltage between TP1 and the collector of Q1. It should be approximately -140 V.
- d. Reconnect the lifted end of R24.

**2. Z-Axis Amplifier Check**

- a. Unsolder and lift one end of R8.
- b. Power up the power supply.
- c. Using the digital multimeter, measure the voltage between TP1 and the collector of Q4. It should be approximately +10 V.
- d. Short together the base and emitter of Q5. The collector of Q4 should be approximately +100 V.

- e. Reconnect the lifted end of R8.

**3. Grid Drive Check**

- a. Turn off the power supply. Use the digital multimeter's diode check to test CR1, CR2, CR3, CR5, and CR6 for shorts.
- b. Power up the power supply.
- c. Using the digital multimeter, measure the voltage between TP1 and the cathode of CR5. It should vary between approximately +75 and +200 V as R58 (CRT Bias) is adjusted.
- d. Connect the oscilloscope probe to the anode of CR5 and the probe ground to TP1. The signal should be a clipped sine wave of +75 to +200 V p-p.

**4. High Voltage Oscillator Check**

- a. Connect the oscilloscope probe to T1 pin 3 (Q6 collector) and the probe ground to TP1. Power up the supply. The signal should be a +60 V p-p, 22 kHz sine wave.
- b. Check the voltages listed in Table 6-6, using the digital multimeter:

**5. CRT Voltage Check**

**NOTE**

*This check requires a high voltage probe with an input resistance of  $\geq 1$  GΩ.*

- a. Connect the high voltage probe ground to TP1.

**Table 6-5.  
High Volts Supply Fault Symptoms**

Symptom	Procedure
Unable to focus crt using the front-panel control	Focus Amplifier Check
Unable to adjust crt intensity using the front-panel control	Z-Axis Amplifier Check Grid Drive Check
No crt display	High Voltage Oscillator Check crt Voltage Check

**Table 6-6.**  
**High Voltage Oscillator Test Points**

Circuit Location	Voltage
T1, pin 4	Approximately +40 V.
T1, pin 13	Less than +2 V.
U2, pin 2	Approximately +4.8 V.
U2, pin 6	+4 to +11 V.
CR9, cathode	Approximately +100 V.

- b. Load the Low Volts supply with the instrument, or with a 20 $\Omega$ , 2 watt resistor loading the 5 V supply.
- c. Power up the power supply.
- d. Use the high voltage probe to measure the voltage at the anode of CR4. It should be approximately -2750 V.
- e. Measure the voltage at the anode end of CR3. It should be 50–150 V more negative than the reading from the anode of CR4.

## CORRECTIVE MAINTENANCE

### NOTE

*No repair should be attempted during the warranty period.*

### CAUTION

*A 2% RMA flux content solder is recommended for making repairs in this instrument. Cleaning of rosin residue is not recommended. Most cleaning solvents tend to reactivate the rosin and spread it under components where it may cause corrosion under humid conditions. The rosin residue, if left alone, does not exhibit these corrosive properties.*

### CAUTION

*Always remove the assembly from the instrument before replacing a soldered-in component. Disassembly/Assembly procedures follow.*

## Obtaining Replacement Parts

Replacement parts are available through the local Tektronix, Inc., field office or representative. However, many common electronic parts are available through local sources. Using a local source, where possible, will eliminate shipping delays.

Changes to Tektronix instruments are sometimes made to accommodate improved components, as they become available, and to improve circuit performance. Therefore, it is important to include the following information when ordering parts:

1. Part Number
2. Instrument Type or Number
3. Serial Number
4. Modification or Option Number (if applicable)

If a part has been replaced with a new or improved part, the new part will be shipped (if it is a direct replacement). If not directly replaceable the local Tektronix field office or representative will contact the customer concerning any changes. After any repair, circuit readjustment may be required.

### Non-Volatile RAMs (A4U338, A4U334)

If U338 (on A4, Control Board) is replaced, the new RAM may cause the CH 1 INPUT LED to blink when the POWER button is set to ON. To stop the blinking, initialize the RAM by setting the POWER button to OFF and then back to ON. If U334 is replaced, the CH 2 INPUT LED will blink. Set the POWER button to OFF and then back to ON to stop the blinking.

### Test Selected Components

Test selectable components and their values are shown in Table 6-7.

Table 6-7  
Test Selectable Components

Circuit No.	Nominal Value	Value Range	Selection Criteria
A3C857	22 pF	15 pF to 22 pF	To correct Vector Bandwidth range of adjustment

### Mechanical Disassembly/Assembly

The instructions contained here are for disassembly. Re-assembly is performed by reversing the order of the steps used to disassemble the instrument.

**WARNING**

*Before attempting any disassembly of the instrument, be sure to disconnect the power cord.*

**CAUTION**

*Do not re-insert screws in the rear panel when the instrument is removed from the cabinet.*

**NOTE**

*All screws, unless otherwise noted, are TORX® screws and can be removed with a T15 screwdriver tip (Tektronix part number 006-3461-00). The exception is #2 Pozidrive® screws which can be removed with a #1 Pozidrive® tip (003-0443-00).*

#### Bezel Assembly Removal

1. Remove the two bezel screws. See Fig. 6-4.
2. Keeping the bezel, color shutter (not installed in Option 05 instruments), and clear filter together as one assembly, grasp the bottom of the bezel

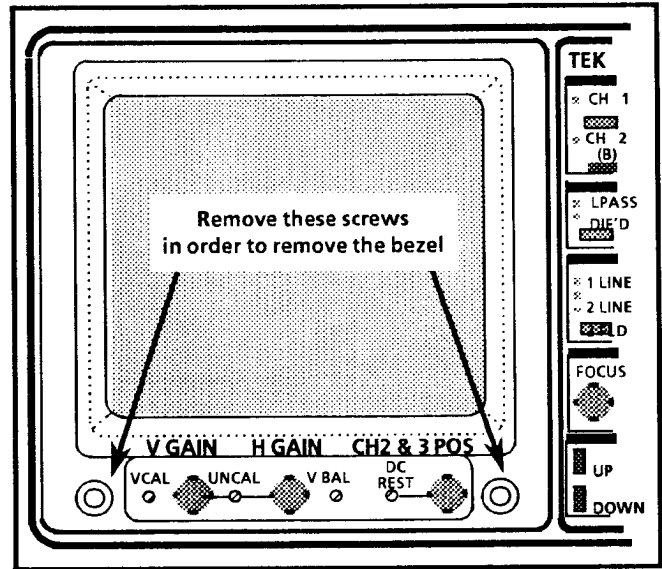


Fig. 6-4. Bezel Securing Screws

and pull straight out and upward. There are two hinges at the top of the bezel that hold it in place; once the bezel is at an approximate 45° angle with the front panel they will disengage.

3. If the bezel assembly remains close to the instrument, it is not necessary to disengage the color shutter connection, J498, from the Control board.
4. To replace, reverse the procedure.

#### Graticule Light Removal and Replacement

For graticule light removal and replacement, tweezers with curved, serrated tips are recommended. For example: Miltex PL312, 6-100 (equivalent to PL312), or PL317 (longer than PL312).

**CAUTION**

*Needle-nosed pliers are not recommended.*

Replacement bulbs are supplied with this instrument as Standard Accessories. Additional bulbs can be purchased from Tektronix (see Replaceable Electrical Parts List) or from local electronics distribution sources.

**Procedure**

1. Remove the bezel according to the preceding instructions.
2. To remove a bulb, position tweezer tips on the thin, flat portion of the bulb (close to the plastic socket). Carefully pull the bulb straight out.
3. To install a bulb, hold it with the tweezers as described in step 2, position it in front of the socket and push the bulb with your finger until it snaps into place.
4. Replace the bezel.

**CRT Removal**

1. Disconnect the color shutter connector, J498, from the Main board, A3. (Disregard step 1 for Option 05 instruments.)
2. Remove the bezel assembly (See **BEZEL ASSEMBLY REMOVAL**).
3. Disconnect the anode by separating the connector. Do not touch the exposed tip of the connector. Discharge the connector tip to the chassis.
4. Disconnect the anode, by separating the connector. Do not touch the exposed tip of the connector. Discharge the connector tip to the chassis.

**WARNING**

*The crt may retain a dangerous charge. Ground the conductor of the anode to discharge the crt. Do not allow the conductor to touch your body or any circuitry.*

5. Disconnect the Trace Rotation connector, J225, from the Main board and push the connector through the hole in the board.

**WARNING**

*The crt is a high vacuum device and must be handled with care. Safety glasses, gloves, and protective clothing should always be worn when handling crts.*

6. Hold one hand in front of the crt. Grasp the crt just behind the anode cap and push the crt straight out (some pressure is needed).

**CRT Replacement**

7. Slip the crt part way back into position and feed the wires (and plug) from the trace rotation coil back through the hole in the Main board.

**CAUTION**

*Avoid bending the crt base pins when pushing the crt into the socket.*

8. Slide the crt back toward the crt socket. Align the socket to match the crt base pins.

If there is difficulty lining up the crt pins with the socket, the crt rear mount assembly may be removed from the chassis by removing the two nuts (with captive lockwashers). Then remove the clear plastic cover from the back of the crt socket. This will make it easier to line up the crt pins to the socket. Gently push the crt until it is fully seated in its socket, being careful not to bend the pins.

9. If the crt rear mount assembly was removed, replace the clear plastic cover. Then position the mount and replace the two nuts with captive lockwashers.
10. Reconnect the anode connector and the Trace Rotation (J225 Main board) plug. (To ensure the correct orientation of J225, place the red lead toward the right side of the instrument.)
11. Install the bezel assembly.

## WFM 300A – MAINTENANCE

12. Connect the color shutter connector, J498, to the Main board, A3. (Disregard for Option 05 instruments.)
13. Install the bezel.

### Rear-Panel Assembly Removal

To remove the rear-panel assembly (including the GBR Board), proceed as follows:

1. Unsolder the center conductor and ground leads from the lower bnc connectors (EXT REF, CH 1, CH 2, and CH 3) on the rear-panel so that these connectors are freed from the Main board.
2. Disconnect the two ribbon cable connectors from J303 and J352 on the Control board.
3. Disconnect the ribbon cable connectors that connect to J501, J600, and J610 on the GBR Board.
4. Remove the two screws and nuts (with captive lockwashers) from the Power Input connector (see Fig. 6-5).
5. Remove the remaining two screws that hold the rear panel to the chassis (see Fig. 6-5).
6. Pull the rear panel and GBR Board free from the chassis.
7. To reinstall the rear-panel assembly, reverse the procedure.

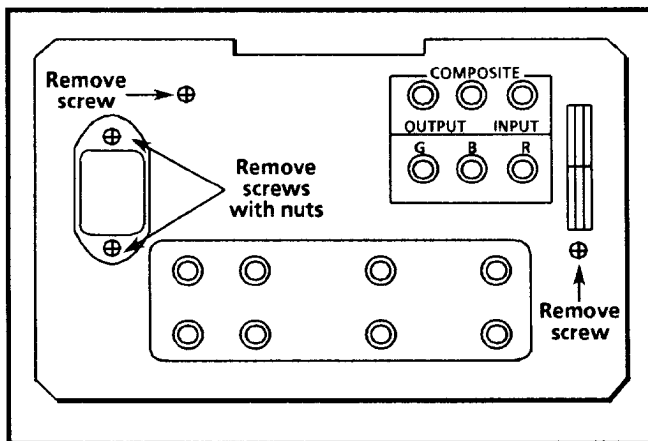


Fig. 6-5. Screws to remove when separating the rear-panel assembly from the instrument.

### GBR Board Removal

1. Remove the rear-panel assembly using the previous procedure.
2. Remove the two jack screws with nuts and lockwashers from the rear-panel REMOTE connector.
3. Remove the nuts and lockwashers from the G, B, and R PIX MON OUTPUT and COMPOSITE INPUT and OUTPUT connectors. (Remove six nuts in all.) The board is now free for removal.
4. To re-assemble, reverse the procedure.

### Front-Panel Assembly Removal

1. Disconnect the ribbon cable connector that connects to J295 on the Control board.
2. To remove the front-panel assembly that includes the Front Panel board, remove the two screws that are located above and below the center of the Front Panel board. See Fig. 6-6 for location.
3. Remove the front-panel assembly by slipping it through the front opening in the frame.
4. To separate the Front Panel board from the assembly, proceed as follows:
  - a. Remove the control knobs from the front of the instrument.
  - b. Remove the four screws from the rear side of the assembly. See Fig. 6-6 for location.
  - c. Separate the board from the assembly.
5. To re-assemble, reverse the procedure.

### Removing the Control Board

1. Remove the three screws near the top of board. These screws hold the board in place.
2. Unplug the Control board from the bottom edge connectors.

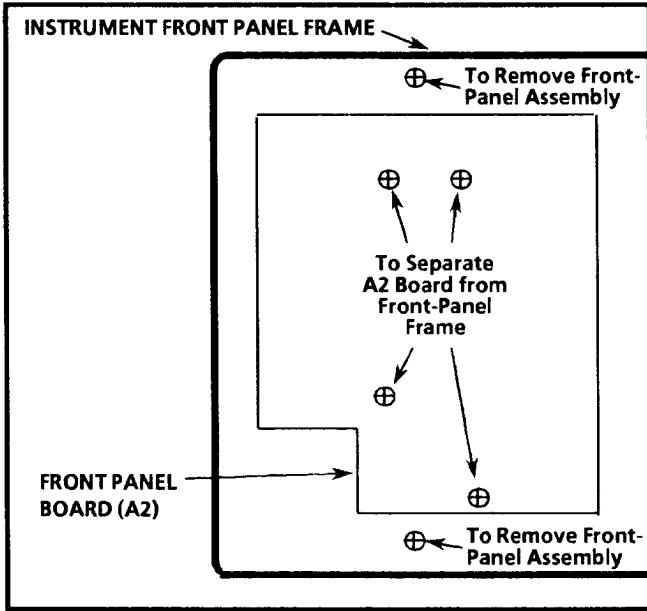


Fig. 6-6. Front Panel board (A2) securing screws.

2. Unsolder the two crt horizontal plate leads (red and green) and the two crt vertical plate leads (brown and blue) from the Main board.
3. Unplug the following connectors: Trace Rotation, P225, from J225 on the Main board; Low Voltage Power, P4, from J4 on the Power Supply board; GBR cable, P978, from J978 on the Main board.
4. Remove the following knobs: V GAIN, H GAIN, and CH 2&3 POS.
5. Remove the eight screws that are holding the Main board in place. See Fig. 6-7 for their locations.
6. Carefully unplug the Main board from the two connectors on the Control board.

**CAUTION**

*Avoid tilting or pulling the Main board outward too far because the UNCAL and DC RESTorer LEDs can be bent away from their normal position on the board and possibly damaged. (These LEDs are aligned to fit into the front panel.)*

3. Raise the Control board sufficiently to disconnect the ribbon cable connectors from the board. They are plugged into J295, J303, and J352 on the board. Also, disconnect the Color Shutter Connector, P498, from J498 on the board.
4. Remove the Control board.
5. To reinstall the board, reverse the procedure.

**Main Board Removal**

1. Unsolder the center conductor and ground leads from the lower bnc connectors (EXT REF, CH 1, CH 2, and CH 3) on the rear-panel so that these connectors are disconnected from the Main board.

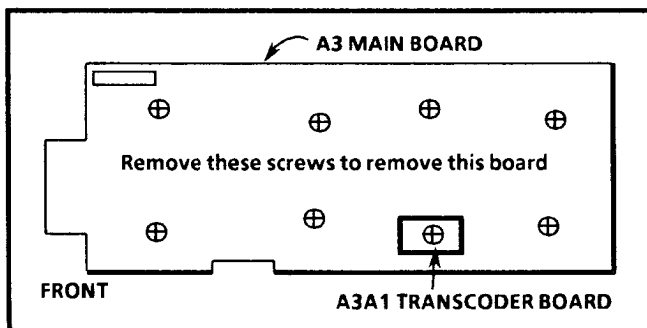


Fig. 6-7. Main board (A3) securing screws.

7. After the Main board has been pulled outward sufficiently to clear the Control board connectors and the rear panel, slide the Main board toward the rear of the instrument until the control shafts have cleared the front frame. Lift the board out.
8. To reinstall the Main board, reverse the procedure. When sliding the board into the front panel, avoid bending the LEDs away from the board.

**Power Supply Board Removal**

1. Remove the plug from J4 on the Power Supply board. This is the connection to the Main board.
2. Remove the anode connector from the crt and discharge it to ground.

**WARNING**

*The crt may retain a dangerous charge. Ground the conductor of the anode to discharge the crt. Do not allow the conductor to touch your body or any circuitry.*

3. Remove the plug from J1 and J3 (the CRT wires). Remove the plug from J2 (the power switch).
4. Detach the ac line filter assembly from the rear panel by removing the two mounting screws with their nuts and captive lockwashers.
5. Use a #1 Pozidrive® tip to disconnect the POWER ON/OFF switch from the front casting.
6. Remove the seven screws that hold the Power Supply board in place. See Fig. 6-8.

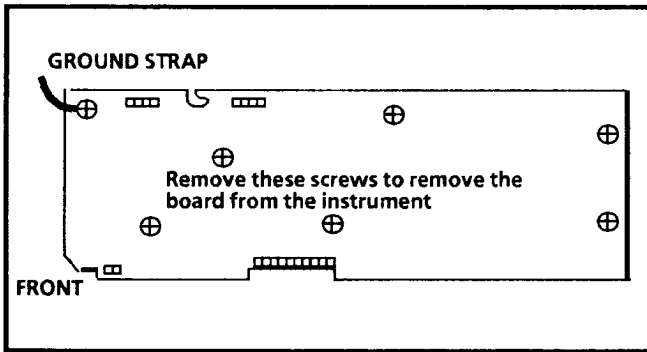


Fig. 6-8. Power Supply board (A1) securing screws.

7. Remove the board by sliding it forward and lifting it up.
8. To reinstall the board, reverse this procedure. To remount the POWER ON/OFF switch, the front panel may have to be removed in order to hold the nuts in place while the screws are tightened.

**REPACKAGING**

**Identification Tag**

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

1. Owner (with complete address) and the name of the person at your firm that can be contacted.

2. Instrument serial number and a description of the service required.

**Repackaging for Shipment**

Repackage the instrument in the original manner provides adequate protection (see Fig. 6-9). If the original packaging is not available or is unfit for use, repackage the instrument as follows:

1. Obtain a corrugated cardboard carton whose inside dimensions are at least six inches greater than the dimensions of the instrument to allow room for cushioning. The shipping carton should have a test strength of at least 275 pounds.
2. Surround the instrument with polyethylene sheeting to protect the finish.
3. Put corrugated cardboard around the instrument for protection.
4. Cushion the instrument on all sides by tightly packing dunnage or urethane foam between the carton and the instrument. Allow three inches on all sides for cushioning.
5. Seal the carton with shipping tape or industrial stapler.

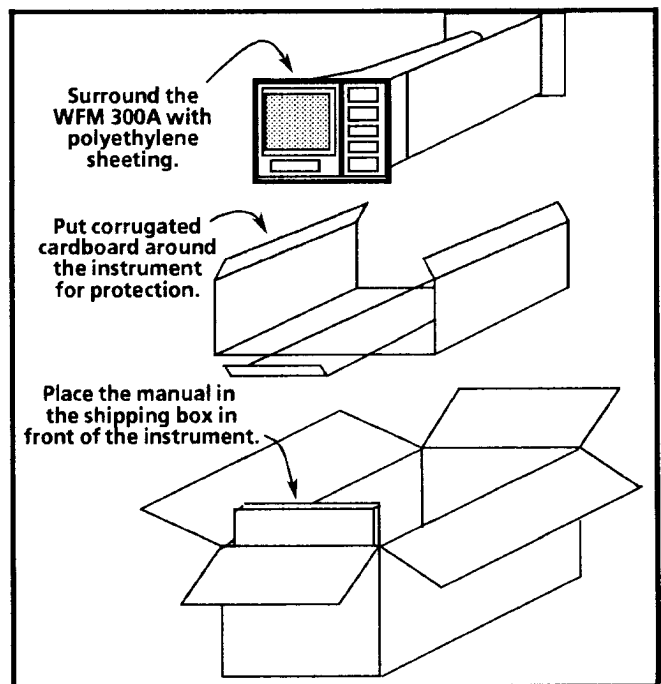


Fig. 6-9. Repackaging.



# SECTION 7

## OPTIONS

### OPTIONAL ACCESSORIES

The following accessories are available for the WFM 300A:

- a. Plain Cabinet (1700F00)
- b. Carrying Case (1700F02)
- c. Side-by-Side Rack Adapter (1700F05)
- d. Blank Panel (1700F06)

### Cabinets

All of the Safety and EMI tests used to qualify the WFM 300A were performed in a cabinet. There are two optional cabinets (plain cabinet and carrying case) and a side-by-side rack adapter available for the installation of the WFM 300A. Only a brief description is provided here; for more information contact your Tektronix field office.

#### Plain Cabinet (1700F00)

This is a plain, silver-grey cabinet that is designed for permanent mounting. The pattern of ventilating holes in the top, bottom, and sides provides adequate air circulation for any heat generated within the instrument. When permanently mounting the instrument, care must be taken to allow the free circulation of air to and from these ventilating holes. For custom installation, refer to the 1700F00 illustration in Section 3, Installation.

#### Carrying Case (1700F02)

This is a silver-grey, metal cabinet, with feet and carrying handle designed for portable applications.

#### Side-by-Side Rack Adapter (1700F05)

This is a 19-inch, rackmounting adapter that accepts two WFM 300As in a side-by-side configuration. A WFM 300A can also be mounted side-by-side with another half-rack-sized instrument, such as one of the TEKTRONIX 1700-Series half-rack instruments. This rack adapter includes the necessary cabinets for correct mounting. If only one WFM 300A is to be installed in the Side-by-Side Rack Adapter, a blank panel (1700F06) can be installed for appearance and air flow protection. Refer to the 1700F05 illustration in Section 3, Installation.

### Ordering Accessories

Any of the optional accessories described in this section can be ordered for the WFM 300A. Additional accessories are listed in Section 10, Replaceable Mechanical Parts, of this manual. All are available from your nearest Tektronix field office.

### OPTIONS

#### Operating Options

Several operating options for the WFM 300A can be selected through the MENU. For example, the instrument can be changed to operate on either the 525/60 or 625/50 standard. For more information, refer to Section 2, Operating Instructions.

#### Orderable Options

Orderable Options for the WFM 300A include: three power cord options, a delete color shutter option, and a choice for format (BetaCam® or MII). These options are detailed in Table 7-1.

## WFM 300A — OPTIONS

### Option 05 (Delete Color Shutter)

The color shutter provides the blue appearance of the electronic graticules for Lightning and Vector displays, so that the graticules may be more easily distinguished from the signals. Color shutters are installed in Standard instruments. Option 05 instruments are shipped without a color shutter.

### Option 10 (BetaCam®)

This option changes the standard WFM 300A instrument to accept the BetaCam® format. To convert a standard instrument to an Option 10, exchange the

standard transcoder for the Option 10 transcoder and select BETA 60 Hz through the FORMAT MENU. The frame rate is automatically set to 60 Hz. The external graticule uses the IRE scale.

### Option 14 (M-II Format)

The WFM 300A Option 14 converts the Vector and Lightning graticules in the standard WFM 300A to accept signals in the MII Format. This format is selected through the FORMAT MENU. Frame rate of 60 Hz is automatically selected. The external graticule uses the IRE scale.

Table 7-1  
WFM 300A Options

OPTION	FIELD RATE	DESCRIPTION	TRANSCODER INSTALLED	CRT GRATICULE UNITS
STD	50 Hz	—	SMPTE/EBU/MII	MV
OPT 05	—	Deletes Color Shutter	—	—
OPT 10	60 Hz	BetaCam®	BETA 60	IRE
OPT 14	60 Hz	MII	SMPTE/EBU/MII	IRE
OPT A1	50 Hz	European Locking Power Cord, 220 V/16A	—	—
OPT A2	50 Hz	United Kingdom Locking Power Cord, 240 V/15A	—	—
OPT A3	50 Hz	Australian Power Cord, 240 V/10A	—	—

## Section 8

# Replaceable Electrical Parts

This section contains a list of the components that are replaceable for the WFM 300A. Use this list to identify and order replacement parts. There is a separate Replaceable Electrical Parts list for each instrument.

### 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. Therefore, when ordering parts, it is important to include the following information in your order.

- Part number
- Instrument type or model number
- Instrument serial number
- Instrument 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.

### Using the Replaceable Electrical Parts List

The tabular information in the Replaceable Electrical Parts list is arranged for quick retrieval. Understanding the structure and features of the list will help you find all of the information you need for ordering replaceable parts.

#### **Cross Index–Mfr. Code Number to Manufacturer**

The Mfg. Code Number to Manufacturer Cross 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 Standards Institute (ANSI) standard Y1.1.

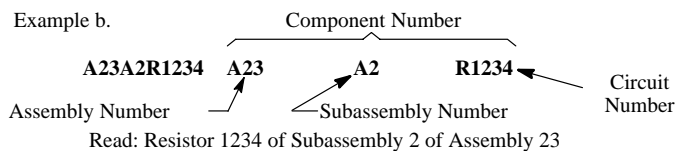
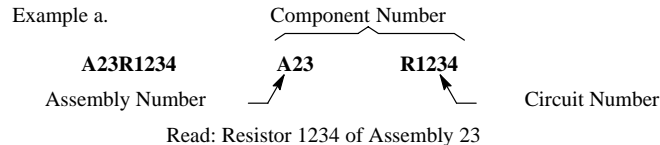
#### **List of Assemblies**

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.

## Column Descriptions

### Component No. (Column 1)

The component circuit number appears on the diagrams and circuit board illustrations, located in the diagrams section. Assembly numbers are also marked on each diagram and circuit board illustration, in the Diagram section and on the mechanical exploded views, 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 arranged by assemblies in numerical sequence (A1, with its subassemblies and parts, precedes A2, with its subassemblies and parts).

Mechanical subparts to the circuit boards are listed in the electrical parts list. These mechanical subparts are listed with their associated electrical part (for example, fuse holder follows fuse).

Chassis-mounted parts and cable assemblies have no assembly number prefix and are located at the end of the electrical parts list.

### Tektronix Part No. (Column 2)

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

### Serial/Assembly No. (Column 3 and 4)

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

### Name and Description (Column 5)

An item name is separated from the description by a colon (:). Because of space limitations, an item name may sometimes appear as incomplete. Use the U.S. Federal Catalog handbook H6-1 for further item name identification.

The mechanical subparts are shown as \*ATTACHED PARTS\* / \*END ATTACHED PARTS\* or \*MOUNTING PARTS\* / \*END MOUNTING PARTS\* in column five (5).

### Mfr. Code (Column 6)

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 No. (Column 7)

Indicates actual manufacturer's part number.

## Cross Index – Mfr. Code Number To Manufacturer

Mfr. Code.	Manufacturer	Address	City, State, Zip Code
TK0196	ALMAC-STROUM ELECTRONICS (DIST)	1885 NW 169TH PLACE	BEAVERTON OR 97006
TK0435	LEWIS SCREW CO	4300 S RACINE AVE	CHICAGO IL 60609-3320
TK0515	EVOX-RIFA INC	100 TRI-STATE INTERNATIONAL SUITE 290	LINCOLNSHIRE IL 60015
TK0891	MICONICS	1 FAIRCHILD AVE	PLAINVIEW NY 11803
TK1263	DEXTER PERMAG CORP	48460 KATO ROAD	FREEMONT, CA 94538
TK1386	PYRAMID ELECTRONICS SUPPLY INC	9757 JUANITA DRIVE NE	KIRKLAND WA 98034
TK1462	YAMAICHI ELECTRONICS CO LTD 2ND FLOOR NEW KYOEI BLDG 17-11	3-CHROME SHIBAURA MINATO-KU	TOKYO JAPAN
TK1572	RAN-ROB INC	631 85TH AVE	OAKLAND CA 94621-1254
TK1727	PHILIPS NEDERLAND BV AFD ELONCO	POSTBUS 90050	5600 PB EINDHOVEN THE NETHERLANDS
TK1743	UNITRODE (UK) LTD	6 CRESSWELL PARK BLACKHEATH	LONDON SE 3 9RD ENGLAND
TK1913	WIMA THE INTER-TECHNICAL GROUP IND	2269 SAW MILL RIVER ROAD PO BOX 127	ELMSFORD NY 10523
TK1935	ACCRA-FAB INC	11007 NE 37TH CIRCLE	VANCOUVER WA 98682
TK1947	NORTHWEST ETCH TECHNOLOGY	2601 S HOOD ST PO BOX 110610	TACOMA, WA 98411-0610
TK2058	TDK CORPORATION OF AMERICA	1600 FEEHANVILLE DRIVE	MOUNT PROSPECT, IL 60056
TK2073	TOKYO AMERICA INC	565 W GULF ROAD	ARLINGTON HEIGHTS IL 60005
TK2469	UNITREK CORPORATION	3000 LEWIS & CLARK WAY SUITE #2	VANCOUVER WA 98601
TK2562	MOLDING SPECIALITIES INC	3000 LEWIS & CLARK HWY	VANCOUVER, WA 98661-2999
TK2601	MAXTEK COMPONENTS CORPORATION	13335 SW TERMAN RD PO BOX 1480	BEAVERTON, OR 97075-1480
0GV52	SCHAFFNER EMC INC	9-B FADEM ROAD	SPRINGFIELD, NJ 07081
0H1N5	TOSHIBA MARCON ELECTRONICS AMERICA CORPORATION	998 FIRST EDGE DRIVE	VERNON HILLS IL 60061
0JR03	ZMAN MAGNETICS INC	7633 S 180th	KENT WA 98032
0JR04	TOSHIBA AMERICA INC ELECTRONICS COMPONENTS DIV	9775 TOLEDO WAY	IRVINE CA 92718
0J9R2	HARISON ELECTRIC CO LTD	ASAHIMACHI 5-CHOME IMABARI	EHIME JAPAN
0KB01	STAUFFER SUPPLY	810 SE SHERMAN	PORTLAND OR 97214
0LUA3	PHILIPS COMPONENTS	100 PROVIDENCE PIKE	SLATERSVILLE, RI 02876
00779	AMP INC	2800 FULLING MILL PO BOX 3608	HARRISBURG PA 17105
01295	TEXAS INSTRUMENTS INC SEMICONDUCTOR GROUP	13500 N CENTRAL EXPY PO BOX 655303	DALLAS TX 75262-5303
04222	AVX/KYOCERA DIV OF AVX CORP	19TH AVE SOUTH P O BOX 867	MYRTLE BEACH SC 29577
04713	MOTOROLA INC SEMICONDUCTOR PRODUCTS SECTOR	5005 E MCDOWELL RD	PHOENIX AZ 85008-4229
07716	IRC, INC	2850 MT PLEASANT AVE	BURLINGTON IA 52601
09023	CORNELL-DUBILIER ELECTRONICS DIV FEDERAL PACIFIC ELECTRIC CO	2652 DALRYMPLE ST	SANFORD NC 27330

## Replaceable Electrical Parts

Mfr. Code.	Manufacturer	Address	City, State, Zip Code
09922	BURNDY CORP	1 RICHARDS AVE	NORWALK CT 06856
09969	DALE ELECTRONICS INC	EAST HIGHWAY 50 P O BOX 180	YANKTON SD 57078
1CH66	PHILIPS SEMICONDUCTORS	811 E ARQUES AVENUE PO BOX 3409	SUNNYVALE CA 94088-3409
1ES66	MAXIM INTEGRATED PRODUCTS INC	120 SAN GABRIEL DRIVE	SUNNYVALE CA 94086
11236	CTS CORPORATION RESISTOR NETWORKS DIVISION	406 PARR ROAD	BERNE IN 46711-9506
11502	IRC, INC	PO BOX 1860	BOONE NC 28607-1860
12697	CLAROSTAT MFG CO INC	12055 ROJAS DRIVE SUITE K	EL PASO, TX 79936
12954	MICROSEMI CORP - SCOTTSDALE	8700 E THOMAS RD P O BOX 1390	SCOTTSDALE AZ 85252
12969	MICROSEMI CORPORATION WATERTOWN DIVISION	530 PLEASANT STREET	WATERTOWN MA 02172
13103	THERMALLOY CO INC	2021 W VALLEY VIEW LN PO BOX 810839	DALLAS TX 75381
14552	MICROSEMI CORP	2830 S FAIRVIEW ST	SANTA ANA CA 92704-5948
14752	ELECTRO CUBE INC	1710 S DEL MAR AVE	SAN GABRIEL CA 91776-3825
15454	KETEMA RODAN DIVISION	2900 BLUE STAR STREET	ANAHEIM CA 92806-2591
17856	SILICONIX INC	2201 LAURELWOOD RD	SANTA CLARA CA 95054-1516
18796	MURATA ELECTRONICS NORTH AMERICA INC. STATE COLLEGE OPERATIONS	1900 W COLLEGE AVE	STATE COLLEGE PA 16801-2723
19701	PHILIPS COMPONENTS DISCRETE PRODUCTS DIV RESISTIVE PRODUCTS FACILITY AIRPORT ROAD	PO BOX 760	MINERAL WELLS TX 76067-0760
22526	BERG ELECTRONICS INC (DUPONT)	857 OLD TRAIL RD	ETTERS PA 17319
24355	ANALOG DEVICES INC	1 TECHNOLOGY DRIVE	NORWOOD MA 02062
24546	DALE ELECTRONICS A VISHAY INTERTECHNOLOGY INC CO	550 HIGH ST	BRADFORD PA 16701-3737
24931	SPECIALTY CONNECTOR CO INC	2100 EARLYWOOD DR PO BOX 547	FRANKLIN IN 46131
26364	COMPONENTS CORP	6 KINSEY PLACE	DENVILLE NJ 07834-2611
27014	NATIONAL SEMICONDUCTOR CORP	2900 SEMICONDUCTOR DR	SANTA CLARA CA 95051-0606
31918	ITT SCHADOW INC	8081 WALLACE RD	EDEN PRAIRIE MN 55344-2224
32997	BOURNS INC TRIMPOT DIV	1200 COLUMBIA AVE	RIVERSIDE CA 92507-2114
34361	OMRON ELECTRONICS INC.	2105 HAMILTON AVE SUITE 160	SAN JOSE, CA 95125
34371	HARRIS CORP HARRIS SEMICONDUCTOR PRODUCTS GROUP	200 PALM BAY BLVD PO BOX 883	MELBOURNE FL 32919
48726	UNITRODE INTEGRATED CIRCUITS CORP (UICC)	7 CONTINENTAL BLVD PO BOX 399	MERRIMACK NH 03054-0399
50139	ALLEN-BRADLEY CO ELECTRONIC COMPONENTS	1414 ALLEN BRADLEY DR	EL PASO TX 79936
50434	HEWLETT-PACKARD CO OPTOELECTRONICS DIV	370 W TRIMBLE RD	SAN JOSE CA 95131-1008
51406	MURATA ELECTRONICS NORTH AMERICA INC HEADQUARTERS AND GEORGIA OPERATIONS	2200 LAKE PARK DR	SMYRNA GA 30080

<b>Mfr. Code.</b>	<b>Manufacturer</b>	<b>Address</b>	<b>City, State, Zip Code</b>
51993	INTERNATIONAL RECTIFIER	233 KANSAS STREET	EL SEGUNDO, CA 90245
52769	SPRAGUE-GOODMAN ELECTRONICS INC	134 FULTON AVE	GARDEN CITY PARK NY 11040-5352
53387	3M COMPANY ELECTRONIC PRODUCTS DIV	3M AUSTIN CENTER	AUSTIN TX 78769-2963
55322	SAMTEC INC	810 PROGRESS BLVD PO BOX 1147	NEW ALBANY IN 47150-2257
55335	JKL COMPONENTS CORP	13343 PAXTON STREET	PACOIMA CA 91331
55680	NICHICON /AMERICA/ CORP	927 E STATE PKY	SCHAUMBURG IL 60195-4526
56845	DALE ELECTRONICS INC	2300 RIVERSIDE BLVD PO BOX 74	NORFOLK NE 68701-2242
57668	ROHM CORPORATION	15375 BARRANCA PARKWAY SUITE B207	IRVINE CA 92718
58050	TEKA PRODUCTS INC	45 SALEM ST	PROVIDENCE RI 02907
60395	XICOR INC	851 BUCKEYE CT	MILPITAS CA 95035-7408
61429	FOX ELECTRONICS DIV OF FOX ELECTRONICS INC	5842 CORPORATION CIRCLE	FOR MEYERS FL 33905
61935	SCHURTER INC	1016 CLEGG COURT	PETALUMA CA 94952-1152
64762	ELANTEC INC	1996 TAROB COURT	MILPITAS CA 95035-6824
65033	ROGERS CORP BUS PRODUCTS DIV	5750 E MCKELLIPS RD	MESA AZ 85205-2740
65654	CHRISTIANA INDUSTRIES CORP	6500 N CLARK ST	CHICAGO IL 62606-4002
66182	INTERFET CORP	332 GOLD STREET	GARLAND TX 75042-6643
7X318	KASO PLSTCS INC	11015 A NE 39th	VANCOUVER WA 98662
71400	BUSSMANN DIV OF COOPER INDUSTRIES INC	114 OLD STATE RD PO BOX 14460	ST LOUIS MO 63178
73743	FISCHER SPECIAL MFG CO	111 INDUSTRIAL RD	COLD SPRING KY 41076-9749
74970	JOHNSON E F CO	299 10TH AVE S W	WASECA MN 56093-2539
75042	IRC ELECTRONIC COMPONENTS PHILADELPHIA DIV TRW FIXED RESISTORS	401 N BROAD ST	PHILADELPHIA PA 19108-1001
75498	MULTICOMP INC	3005 SW 154TH TERRACE #3	BEAVERTON OR 97006
76493	BELL INDUSTRIES INC JW MILLER DIV	306 E ALONDRA BLVD PO BOX 2859	GARDENA, CA 90247-1059
78189	ILLINOIS TOOL WORKS INC SHAKEPROOF DIV	ST CHARLES ROAD	ELGIN IL 60120
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON OR 97077-0001
83701	ELECTRONIC DEVICES INC	21 GREY OAKS AVE	YONKERS NY 10710-3205
84411	AMERICAN SHIZUKI CORP OGALLALA OPERATIONS	301 WEST O ST	OGALLALA NE 69153-1844
91637	DALE ELECTRONICS INC	2064 12TH AVE PO BOX 609	COLUMBUS NE 68601-3632
95263	LIGHTING COMPONENTS AND DESIGN INC.	3800 SOUTH CONGRESS AVE.	BOYNTON BEACH, FL 33426

## Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A1	671-2890-01	B020000	B024268	CIRCUIT BD ASSY:POWER SUPPLY	80009	671289001
A1	671-2890-02	B024269	B024313	CIRCUIT BD ASSY:POWER SUPPLY	80009	671289002
A1	671-2890-03	B024314	B024395	CIRCUIT BD ASSY:POWER SUPPLY	80009	671289003
A1	671-2890-04	B024396	B024478	CIRCUIT BD ASSY:POWER SUPPLY	80009	671289004
A1	671-2890-05	B024479	B024603	CIRCUIT BD ASSY:POWER SUPPLY	80009	671289005
A1	671-2890-06	B024604	B024877	CIRCUIT BD ASSY:POWER SUPPLY	80009	671289006
A1	671-2890-07	B024878		CIRCUIT BD ASSY:POWER SUPPLY	80009	671289007
A2	671-1354-00			CIRCUIT BD ASSY:FRONT PANEL	80009	671135400
A3	672-0278-09	B020000	B024644	CIRCUIT BD ASSY:MAIN	80009	672027809
A3	672-0278-10	B024645	B024748	CIRCUIT BD ASSY:MAIN	80009	672027810
A3	672-0278-11	B024749	B024877	CIRCUIT BD ASSY:MAIN	80009	672027811
A3	672-0278-12	B024878		CIRCUIT BD ASSY:MAIN	80009	672027812
A3A1	671-1365-00			CIRCUIT BD ASSY:TRANSCODER STD (STANDARD ONLY)	80009	671136500
A3A1	671-1358-00			CIRCUIT BD ASSY:TRANSCODER OPT 10 (OPTION 10 ONLY)	80009	671135800
A3A2	671-1796-00			CIRCUIT BD ASSY:GRATICULE LIGHT	80009	671179600
A4	671-1357-02	B020000	B024324	CIRCUIT BD ASSY:CONTROL	80009	671135702
A4	671-1357-03	B024325	B024877	CIRCUIT BD ASSY:CONTROL	80009	671135703
A4	671-1357-04	B024878		CIRCUIT BD ASSY:CONTROL	80009	671135704
A5	671-1356-04			CIRCUIT BD ASSY:GBR	80009	671135604
A1	671-2890-01	B020000	B024268	CIRCUIT BD ASSY:POWER SUPPLY	80009	671289001
A1	671-2890-02	B024269	B024313	CIRCUIT BD ASSY:POWER SUPPLY	80009	671289002
A1	671-2890-03	B024314	B024395	CIRCUIT BD ASSY:POWER SUPPLY	80009	671289003
A1	671-2890-04	B024396	B024478	CIRCUIT BD ASSY:POWER SUPPLY	80009	671289004
A1	671-2890-05	B024479	B024603	CIRCUIT BD ASSY:POWER SUPPLY	80009	671289005
A1	671-2890-06	B024604	B024877	CIRCUIT BD ASSY:POWER SUPPLY	80009	671289006
A1	671-2890-07	B024878		CIRCUIT BD ASSY:POWER SUPPLY	80009	671289007
A1C1	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A1C2	283-0021-00			CAP,FXD,CER DI:0.001UF,20%,5000V	TK2058	TCK45YS3H102M-A
A1C3	283-0261-00			CAP,FXD,CER DI:0.01UF,20%,4000V	18796	DHR28Z5U103M4KV
A1C4	283-0261-00			CAP,FXD,CER DI:0.01UF,20%,4000V	18796	DHR28Z5U103M4KV
A1C5	285-1341-01			CAP,FXD,PLSTC:MTLZD FILM;0.1UF,20%,100V,POLYESTER	TK1913	MKS 2 0.1UF 20%
A1C6	281-0771-00			CAP,FXD,CER DI:2200PF,20%,200V	04222	SA102C222MAA
A1C7	285-1470-00			CAP,FXD,PLMLTZDSTC:FILM;330PF,1600VDC/500VAC,POLY-PROPYLENE,11 X18	TK1913	FKP1 330/1600/5
A1C8	283-0261-00			CAP,FXD,CER DI:0.01UF,20%,4000V	18796	DHR28Z5U103M4KV
A1C9	283-0261-00			CAP,FXD,CER DI:0.01UF,20%,4000V	18796	DHR28Z5U103M4KV
A1C10	281-0563-00			CAP,FXD,CERAMIC:MLC:0.47UF,20%,50V,0.150 X0.290	04222	SA305E474MAA
A1C11	283-0021-00			CAP,FXD,CER DI:0.001UF,20%,5000V	TK2058	TCK45YS3H102M-A
A1C12	281-0707-00			CAP,FXD,CER DI:15000PF,10%,200V	04222	MA302C153KAA
A1C13	281-0707-00			CAP,FXD,CER DI:15000PF,10%,200V	04222	MA302C153KAA
A1C14	281-0707-00			CAP,FXD,CER DI:15000PF,10%,200V	04222	MA302C153KAA
A1C15	285-1341-01			CAP,FXD,PLSTC:MTLZD FILM;0.1UF,20%,100V,POLYESTER	TK1913	MKS 2 0.1UF 20%
A1C16	290-0974-03			CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A1C17	285-1341-01			CAP,FXD,PLSTC:MTLZD FILM;0.1UF,20%,100V,POLYESTER	TK1913	MKS 2 0.1UF 20%
A1C18	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A1C19	290-1310-00			CAP,FXD,ALUM:10UF,20%,160V,ESR=24.9 OHM(120HZ,20C),LS=0.200 INCH,13X20MM,105C,5000HRS	0H1N5	CEJSM2C100M
A1C20	281-0707-00			CAP,FXD,CER DI:15000PF,10%,200V	04222	MA302C153KAA
A1C21	281-0707-00			CAP,FXD,CER DI:15000PF,10%,200V	04222	MA302C153KAA
A1C22	281-0563-00			CAP,FXD,CERAMIC:MLC:0.47UF,20%,50V,0.150 X0.290	04222	SA305E474MAA
A1C23	285-1328-00			CAP,FXD,PLSTC:MTLZD FILM;0.01UF,5%,2000V,POLYPROPYLENE,1.25X.95	TK1913	FKP1 .01/2000/5



Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A1C24	290-1310-00			CAP,FXD,ALUM:10UF,20%,160V,ESR=24.9 OHM(120HZ,20C), LS=0.200 INCH,13X20MM,105C,5000HRS	0H1N5	CEJSM2C100M
A1C25	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A1C27	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A1C28	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A1C29	290-1267-00			CAP,FXD,ALUM:560UF,20%,50V,ESR=0.40 OHM (100KHZ,20C)	0H1N5	CEEFM1H561M7
A1C30	290-1267-00			CAP,FXD,ALUM:560UF,20%,50V,ESR=0.40 OHM (100KHZ,20C)	0H1N5	CEEFM1H561M7
A1C31	290-1267-00			CAP,FXD,ALUM:560UF,20%,50V,ESR=0.40 OHM (100KHZ,20C)	0H1N5	CEEFM1H561M7
A1C32	290-1267-00			CAP,FXD,ALUM:560UF,20%,50V,ESR=0.40 OHM (100KHZ,20C)	0H1N5	CEEFM1H561M7
A1C33	290-1310-00			CAP,FXD,ALUM:10UF,20%,160V,ESR=24.9 OHM(120HZ,20C), LS=0.200 INCH,13X20MM,105C,5000HRS	0H1N5	CEJSM2C100M
A1C34	290-1310-00			CAP,FXD,ALUM:10UF,20%,160V,ESR=24.9 OHM(120HZ,20C), LS=0.200 INCH,13X20MM,105C,5000HRS	0H1N5	CEJSM2C100M
A1C35	290-1267-00			CAP,FXD,ALUM:560UF,20%,50V,ESR=0.40 OHM (100KHZ,20C)	0H1N5	CEEFM1H561M7
A1C36	290-1267-00			CAP,FXD,ALUM:560UF,20%,50V,ESR=0.40 OHM (100KHZ,20C)	0H1N5	CEEFM1H561M7
A1C37	290-1267-00			CAP,FXD,ALUM:560UF,20%,50V,ESR=0.40 OHM (100KHZ,20C)	0H1N5	CEEFM1H561M7
A1C38	290-1267-00			CAP,FXD,ALUM:560UF,20%,50V,ESR=0.40 OHM (100KHZ,20C)	0H1N5	CEEFM1H561M7
A1C39	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A1C40	281-0772-00			CAP,FXD,CERAMIC:MLC:4700PF,10%,100V,0.100 X	04222	SA101C472KAA
A1C41	281-0563-00			CAP,FXD,CERAMIC:MLC:0.47UF,20%,50V,0.150 X0.290	04222	SA305E474MAA
A1C42	290-1267-00			CAP,FXD,ALUM:560UF,20%,50V,ESR=0.40 OHM (100KHZ,20C)	0H1N5	CEEFM1H561M7
A1C43	281-0563-00			CAP,FXD,CERAMIC:MLC:0.47UF,20%,50V,0.150 X0.290	04222	SA305E474MAA
A1C44	285-1331-00			CAP,FXD,MTLZD:0.47UF,5%,400V,	TK1913	MKS4.47/400/5
A1C45	281-0563-00			CAP,FXD,CERAMIC:MLC:0.47UF,20%,50V,0.150 X0.290	04222	SA305E474MAA
A1C46	281-0773-00			CAP,FXD,CERAMIC:MLC:0.01UF,10%,100V	TK1743	CGB103KEX
A1C47	281-0563-00			CAP,FXD,CERAMIC:MLC:0.47UF,20%,50V,0.150 X0.290	04222	SA305E474MAA
A1C48	281-0809-00			CAP,FXD,CERAMIC:MLC:200 PF,5%,100V,0.100 X0.170	04222	SA101A201JAA
A1C49	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A1C50	281-0563-00			CAP,FXD,CERAMIC:MLC:0.47UF,20%,50V,0.150 X0.290	04222	SA305E474MAA
A1C51	281-0773-00			CAP,FXD,CERAMIC:MLC:0.01UF,10%,100V	TK1743	CGB103KEX
A1C52	281-0773-00			CAP,FXD,CERAMIC:MLC:0.01UF,10%,100V	TK1743	CGB103KEX
A1C53	285-1437-00			CAP,FXD,PLSTC:100PF,5%,1600VDC/500VAC,SFTY CONT	TK1913	FKP1/100/1600/5
A1C54	290-1275-00			CAP,FXD,ALUM:330UF,20%,400V,35X35MM,105C	55680	LGQ2G331MHSC
A1C56	285-1246-00			CAP,FXD,PPR DI:0.022UF,20%,250VAC	TK0515	PME 289 MB 5220
A1C57	285-1222-00			CAP,FXD,PLSTC:0.068UF,20%,250V	TK0515	PME 271 M 568
A1C58	281-0809-00			CAP,FXD,CERAMIC:MLC:200 PF,5%,100V,0.100 X0.170	04222	SA101A201JAA
A1C59	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A1C60	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A1C61	281-0768-00	671-2890-07		CAP,FXD,CER DI:470PF,20%,100V	04222	SA101A471KAA
A1C64	281-0775-01	671-2890-01	671-2890-06	CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A1C65	281-0563-00	671-2890-01	671-2890-06	CAP,FXD,CERAMIC:MLC:0.47UF,20%,50V,0.150 X0.290	04222	SA305E474MAA
A1C65	281-0775-01	671-2890-07		CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A1C66	290-0974-03			CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A1F1	159-0021-00			FUSE,CARTRIDGE:3AG,2A,250V,FAST BLOW	71400	AGC-2
				*MOUNTING PARTS*		
	200-2264-00			CAP,FUSEHOLDER:3AG FUSES	61935	FEK 031 1666
	204-0906-00			BODY,FUSEHOLDER:3AG & 5 X 20MM FUSES	61935	TYPE FAU 031.35
				*END MOUNTING PARTS*		
A1J1	131-5338-00			CONN,HDR:PCB/WIREWRAP:MALE,STR,1 X 7,0.15CTR, 0.230 MLG X 0.285 TAIL,30 GOLD,SIDE BYSIDE STACKABLE	22526	65561-107

## Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A1J2	131-4794-00			CONN,HDR:PCB;MALE,STR,1 X 2,0.1 CTR,0.235 MLG X 0.112 TAIL,30GOLD,0.035 DIA PCB	53387	2402-6112 UB
A1J3	131-5337-00			CONN,HDR:PCB/WIREWRAP;MALE,STR,1 X 4,0.150	22526	65561-104
A1J4	131-3392-00			CONN,HDR:PCB;MALE,STR,1 X 10,0.1 CTR,0.230	00779	1-102844-1
A1J6	119-1946-00			FILTER,RFI:1A,250V,400HZ W/PC TERMINAL	0GV52	FN326-1/02-K-D-
A1L1	108-1412-00			INDUCTOR,FXD:POWER:4.7UH,20%,I<3.7A,RDC<0.017 OHM,Q>10,SRF>30MHZ,BOBBIN	TK2058	TSL0807-4R7M3R0
A1L2	108-1412-00			INDUCTOR,FXD:POWER:4.7UH,20%,I<3.7A,RDC<0.017 OHM,Q>10,SRF>30MHZ,BOBBIN	TK2058	TSL0807-4R7M3R0
A1L3	108-1412-00			INDUCTOR,FXD:POWER:4.7UH,20%,I<3.7A,RDC<0.017 OHM,Q>10,SRF>30MHZ,BOBBIN	TK2058	TSL0807-4R7M3R0
A1L4	108-0205-00			INDUCTOR,FXD:POWER:1MH,5%,IDC<400 MA,RDC<2.12 OHM,Q>47@0.25MHZ	76493	8209
A1Q1	151-0749-00			TRANSISTOR,SIG:BIPOLAR,PNP;400V,500MA,50MHZ,AMPL	04713	MPSA94
A1Q2	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ,AMPL	04713	2N3904
A1Q3	151-0350-03			XSTR,SIG:BIPOLAR,PNP;150V,600MA,100MHZ,AMPL	04713	2N5401RLRP
A1Q4	151-0347-02			XSTR,SIG:BIPOLAR,NPN;160V,600MA,100MHZ,AMPL	04713	2N5551RLRP
A1Q5	151-0350-03			XSTR,SIG:BIPOLAR,PNP;150V,600MA,100MHZ,AMPL	04713	2N5401RLRP
A1Q6	151-0476-00			TRANSISTOR,PWR:BIPOLAR,NPN;100V,3.0A,3.0MHZ,AMPL	04713	TIP31C
	214-3848-00			*ATTACHED PARTS*		
				HEAT SINK,SEMIC:TRANSISTOR,TO-220;ALUMINUM, CLIP-ON,BLACK ANODIZE	13103	6043PB
				*END ATTACHED PARTS*		
A1Q7	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ,AMPL	04713	2N3904
A1Q8	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ,AMPL	04713	2N3904
A1Q9	151-1286-00			TRANSISTOR,PWR:MOS,N-CH;800V,4.0A,3.0 OHM	0LUA3	BUK456-800A
				*ATTACHED PARTS*		
	210-0406-00			NUT,PLAIN,HEX:4-40 X 0.188,BRS CD PL	73743	12161-50
	211-0008-00			SCREW,MACHINE:4-40 X 0.25,PNH,STL	TK0435	ORDER BY DESC
	214-3841-00			HEAT SINK,SEMIC:TRANSISTOR,TO-220;VERTICAL MT,(2)SOLDERABLE TABS,ALUMINUM,BLACK ANODIZE	13103	6021PB
				*END ATTACHED PARTS*		
A1Q10	151-0350-03			XSTR,SIG:BIPOLAR,PNP;150V,600MA,100MHZ,AMPL	04713	2N5401RLRP
A1Q11	151-0528-00	671-2890-07		THYRISTOR,PWR:BIPOLAR,SCR;50V,16A RMS,PHASE	04713	2N6400
A1R1	303-0155-00			RES,FXD,CMPSN:1.5M OHM,5%,1W	50139	GB1555
A1R2	301-0225-02			RES,FXD,CMPSN:2.2M OHM,5%,0.5W	50139	EB2255
A1R3	303-0155-00			RES,FXD,CMPSN:1.5M OHM,5%,1W	50139	GB1555
A1R4	303-0155-00			RES,FXD,CMPSN:1.5M OHM,5%,1W	50139	GB1555
A1R5	303-0155-00			RES,FXD,CMPSN:1.5M OHM,5%,1W	50139	GB1555
A1R7	322-3385-00			RES,FXD:METAL FILM;100K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10002F
A1R8	322-3097-00			RES,FXD:METAL FILM;100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A1R11	311-1256-00			RES,VAR,TRMR:CERMET;2.5M OHM,10%,0.5W,0.375	32997	3386F-1-255
A1R12	315-0471-03			RES,FXD,CMPSN:470 OHM,5%,0.25W	50139	CB4715
A1R13	322-3097-00	671-2890-07		RES,FXD:METAL FILM;100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A1R14	322-3001-00	671-2890-07		RES,FXD:METAL FILM;10 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10R00F
A1R20	322-3248-00			RES,FXD,FILM:3.74K OHM,1%,0.2W,TC=T0	91637	CCF50G37400F
A1R22	322-3344-00			RES,FXD,FILM:37.4K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G37401F
A1R24	322-3097-00			RES,FXD:METAL FILM;100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A1R25	322-3097-00			RES,FXD:METAL FILM;100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A1R26	322-3452-00			RES,FXD,FILM:499K OHM,1%,0.2W,TC=TOMI,SMALL	91637	CCF50-2-G4993FT
A1R27	322-3300-02			RES,FXD,FILM:13K OHM,0.5%,0.2W,TC=T2	91637	CCF501D13001D
A1R28	322-3344-00			RES,FXD,FILM:37.4K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G37401F
A1R29	315-0470-03			RES,FXD,CMPSN:47 OHM,5%,0.25W	50139	CB4705
A1R30	315-0103-03			RES,FXD,CMPSN:10K OHM,5%,0.25W	50139	CB1035
A1R31	322-3385-00			RES,FXD:METAL FILM;100K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10002F
A1R32	322-3452-00			RES,FXD,FILM:499K OHM,1%,0.2W,TC=TOMI,SMALL	91637	CCF50-2-G4993FT
A1R33	322-3300-02			RES,FXD,FILM:13K OHM,0.5%,0.2W,TC=T2	91637	CCF501D13001D
A1R34	322-3222-00			RES,FXD:METAL FILM;2K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20000F
A1R35	322-3162-00			RES,FXD:METAL FILM;475 OHM,1%,0.2W,TC=100 PPM	91637	CCF50G475R0F

Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A1R36	322-3222-00			RES,FXD:METAL FILM;2K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20000F
A1R37	322-3034-00			RES,FXD:METAL FILM;22.1 OHM,1%,0.2W,TC=100 PPM	91637	CCF50-2-G22R10F
A1R38	315-0226-01			RES,FXD,CMPSN:22 M OHM,5%,0.25WALLEN BRADLEY ONLY	50139	CB2265
A1R39	315-0471-03			RES,FXD,CMPSN:470 OHM,5%,0.25W	50139	CB4715
A1R40	315-0103-03			RES,FXD,CMPSN:10K OHM,5%,0.25W	50139	CB1035
A1R41	322-3121-00			RES,FXD:METAL FILM;178 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G178R0F
A1R42	322-3402-00			RES,FXD:METAL FILM;150K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G15002F
A1R43	315-0471-03			RES,FXD,CMPSN:470 OHM,5%,0.25W	50139	CB4715
A1R44	315-0471-03			RES,FXD,CMPSN:470 OHM,5%,0.25W	50139	CB4715
A1R45	311-2239-00			RES,VAR,TRMR:CERMET;100K OHM,20%,0.5W,0.197	TK2073	GF06UT2 104 M L
A1R46	322-3001-00			RES,FXD:METAL FILM;10 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10R00F
A1R47	322-3385-00			RES,FXD:METAL FILM;100K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10002F
A1R48	322-3239-00			RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G30100F
A1R49	311-2239-00			RES,VAR,TRMR:CERMET;100K OHM,20%,0.5W,0.197	TK2073	GF06UT2 104 M L
A1R50	322-3001-00			RES,FXD:METAL FILM;10 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10R00F
A1R51	322-3260-00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	91637	CCF501G49900F
A1R52	322-3001-00			RES,FXD:METAL FILM;10 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10R00F
A1R53	322-3001-00			RES,FXD:METAL FILM;10 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10R00F
A1R54	322-3260-00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	91637	CCF501G49900F
A1R55	322-3344-00	671-2890-01	671-2890-01	RES,FXD,FILM:37.4K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G37401F
A1R55	322-3322-00	671-2890-02		RES,FXD:METAL FILM;22.1K OHM,1%,0.2W,TC=100	91637	CCF501G22101F
A1R56	322-3001-00			RES,FXD:METAL FILM;10 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10R00F
A1R57	322-3034-00			RES,FXD:METAL FILM;22.1 OHM,1%,0.2W,TC=100 PPM	91637	CCF50-2-G22R10F
A1R58	311-2239-00			RES,VAR,TRMR:CERMET;100K OHM,20%,0.5W,0.197	TK2073	GF06UT2 104 M L
A1R59	322-3485-07			RES,FXD,FILM:5K OHM,0.1%,0.2W,TC=T9,SMALL BODY	91637	CCF501C50000B
A1R60	322-3268-00			RES,FXD,FILM:6.04K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G60400F
A1R61	322-3034-00			RES,FXD:METAL FILM;22.1 OHM,1%,0.2W,TC=100 PPM	91637	CCF50-2-G22R10F
A1R62	322-3097-00	671-2890-07		RES,FXD:METAL FILM;100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A1R63	322-3222-00			RES,FXD:METAL FILM;2K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20000F
A1R64	322-3385-00			RES,FXD:METAL FILM;100K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10002F
A1R65	322-3385-00			RES,FXD:METAL FILM;100K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10002F
A1R66	322-3452-00			RES,FXD,FILM:499K OHM,1%,0.2W,TC=T0MI,SMALL	91637	CCF50-2-G4993FT
A1R67	322-3001-00			RES,FXD:METAL FILM;10 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10R00F
A1R68	322-3121-00			RES,FXD:METAL FILM;178 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G178R0F
A1R69	322-3289-07			RES,FXD,FILM:10K OHM,0.1%,0.2W,TC=T9,T&R,SM BODY	91637	CCF501C10001B
A1R70	322-3289-07			RES,FXD,FILM:10K OHM,0.1%,0.2W,TC=T9,T&R,SM BODY	91637	CCF501C10001B
A1R71	322-3418-00			RES,FXD:METAL FILM;221K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G22102F
A1R72	322-3001-00			RES,FXD:METAL FILM;10 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10R00F
A1R73	322-3001-00			RES,FXD:METAL FILM;10 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10R00F
A1R74	322-3260-00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	91637	CCF501G49900F
A1R75	322-3260-00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	91637	CCF501G49900F
A1R76	322-3260-00	671-2890-01	671-2890-04	RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	91637	CCF501G49900F
A1R76	322-3248-00	671-2890-05		RES,FXD,FILM:3.74K OHM,1%,0.2W,TC=T0	91637	CCF50G37400F
A1R77	322-3121-00	671-2890-01	671-2890-06	RES,FXD:METAL FILM;178 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G178R0F
A1R77	322-3097-00	671-2890-07		RES,FXD:METAL FILM;100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A1R78	322-3222-00	671-2890-01	671-2890-06	RES,FXD:METAL FILM;2K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20000F
A1R78	322-3248-00	671-2890-07		RES,FXD,FILM:3.74K OHM,1%,0.2W,TC=T0	91637	CCF50G37400F
A1R79	322-3356-00			RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G49901F
A1R80	322-3222-00			RES,FXD:METAL FILM;2K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20000F
A1R81	322-3121-00			RES,FXD:METAL FILM;178 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G178R0F
A1R82	322-3260-00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	91637	CCF501G49900F
A1R83	322-3289-07			RES,FXD,FILM:10K OHM,0.1%,0.2W,TC=T9,T&R,SM BODY	91637	CCF501C10001B
A1R84	322-3327-00	671-2890-01	671-2890-04	RES,FXD,FILM:24.9K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50-2-G24901F
A1R84	322-3315-00	671-2890-05		RES,FXD,FILM:18.7K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G18701F
A1R85	322-3452-00	671-2890-01	671-2890-06	RES,FXD,FILM:499K OHM,1%,0.2W,TC=T0MI,SMALL	91637	CCF50-2-G4993FT
A1R85	322-3385-00	671-2890-07		RES,FXD:METAL FILM;100K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10002F
A1R86	308-0793-00			RES,FXD:0.51 OHM,5%,1WTC=150PPM/DEG C,MI	75042	BW20 .51OHM 5PE

## Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A1R87	322-3034-00			RES,FXD:METAL FILM;22.1 OHM,1%,0.2W,TC=100 PPM	91637	CCF50-2-G22R10F
A1R88	322-3222-00			RES,FXD:METAL FILM;2K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20000F
A1R89	307-0746-00			RES,THERMAL:5 OHM,10%,7A/DEG C	15454	SG200-S STRAI
A1R90	305-0242-00			RES,FXD,CMPSN:2.4K OHM,5%,2W	11502	GF-3 OR GS-3 24
A1R91	306-0104-00			RES,FXD,CMPSN:100K OHM,10%,2W	24546	FP42 OR FP2 100
A1R92	306-0104-00			RES,FXD,CMPSN:100K OHM,10%,2W	24546	FP42 OR FP2 100
A1R93	322-3402-00			RES,FXD:METAL FILM;150K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G15002F
A1R94	322-3402-00			RES,FXD:METAL FILM;150K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G15002F
A1R95	322-3260-00	671-2890-01	671-2890-06	RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=TO	91637	CCF501G49900F
A1R95	322-3256-00	671-2890-07		RES,FXD,FILM:4.53K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF50-2-G4531FT
A1R96	322-3356-00			RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G49901F
A1R97	322-3222-00			RES,FXD:METAL FILM;2K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20000F
A1R98	322-3289-07			RES,FXD,FILM:10K OHM,0.1%,0.2W,TC=T9,T&R,SM BODY	91637	CCF501C10001B
A1R99	311-2239-00	671-2890-07		RES,VAR,TRMR:CERMET;100K OHM,20%,0.5W,0.197	TK2073	GF06UT2 104 M L
A1R101	322-3068-00			RES,FXD:METAL FILM;49.9 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G49R90F
A1R102	308-0290-00			RES,FXD,WW:8 OHM,5%,5W	91637	CW52-8R000J T/R
A1R103	322-3452-00			RES,FXD,FILM:499K OHM,1%,0.2W,TC=TOMI,SMALL	91637	CCF50-2-G4993FT
A1T1	120-1695-00			TRANSFORMER,PWR:HIGH VOLTAGE,FEEDBACK 3V, RESONANT 231V, 100V 1MA,2750V 3.3MA, 6.3V 86MA	75498	120-1695-00
A1T2	120-1945-00			TRANSFORMER,RF:PRI 8UH,2:7,ON-OFF,VERT MT,PC MT	OJR03	120-1945-00
A1T3	120-1944-00			TRANSFORMER,RF:PRI 88V,PRI 15V,SEC 40V AT0.385A,5V AT 2A,15V AT 0.80,IDED,PC MOUNT,1.45 X 1.7 X 1.17H	75498	129-2074-EC
A1U1	152-0900-00			MODULE,HV:7.5KVAC IN,15KVDC OUT,POTTED MODULE	51406	MSL2556
A1U2	156-0067-00			IC,LINEAR:BIPOLAR,OP-AMP	01295	UA741CP
A1U3	156-1225-00			IC,LIN:BIPOLAR,COMPARATOR;DUAL,OPEN COLL,300NS	01295	LM393P
A1U4	156-0733-04			IC,DIGITAL:LS TTL,MULTIVIBRATOR	04713	SN74LS221N
A1U5	156-2524-00			IC,LINEAR:BIPOLAR,SW-REGULATOR CONTROLLER:PWM, CURRENT MODE,SINGLE TOTEM POLE OUTPUT	48726	UC3842N
A1W1	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225L	24546	OMA0207
A1W2	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225L	24546	OMA0207
A1W3	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225L	24546	OMA0207
A1W4	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225L	24546	OMA0207
A1CR1	152-0061-00			DIODE,SIG:200V,0.1A,700NS,4.0PF	12969	PV122
A1CR2	152-0061-00			DIODE,SIG:200V,0.1A,700NS,4.0PF	12969	PV122
A1CR3	152-0061-00			DIODE,SIG:200V,0.1A,700NS,4.0PF	12969	PV122
A1CR4	152-0409-00			DIODE,RECT:FAST RCVRY;12KV,10MA,250NS	83701	CRVT150
A1CR5	152-0061-00			DIODE,SIG:200V,0.1A,700NS,4.0PF	12969	PV122
A1CR6	152-0061-00			DIODE,SIG:200V,0.1A,700NS,4.0PF	12969	PV122
A1CR7	152-0400-00			DIODE,RECT:FAST RCVRY;400V,1A,200NS	0LUA3	1N4936
A1CR8	152-0400-00			DIODE,RECT:FAST RCVRY;400V,1A,200NS	0LUA3	1N4936
A1CR9	152-0400-00			DIODE,RECT:FAST RCVRY;400V,1A,200NS	0LUA3	1N4936
A1CR10	152-0400-00			DIODE,RECT:FAST RCVRY;400V,1A,200NS	0LUA3	1N4936
A1CR11	152-0400-00			DIODE,RECT:FAST RCVRY;400V,1A,200NS	0LUA3	1N4936
A1CR12	152-0400-00			DIODE,RECT:FAST RCVRY;400V,1A,200NS	0LUA3	1N4936
A1CR13	152-0754-00	671-2890-01	671-2890-03	DIODE,RECT:SCHTKY;40V,8A,380A IFSM,AXIAL LEAD	51993	95-4421 (80SQ04
A1CR13	152-1191-00	671-2890-04		DIODE,RECT:SCHTKY;100V,10A,150A IFSM,800MV AT 10A	04713	MBR10100
A1CR14	152-0400-00			DIODE,RECT:FAST RCVRY;400V,1A,200NS	0LUA3	1N4936
A1CR15	152-0141-02	671-2890-01	671-2890-02	DIODE,SIG:ULTRA FAST:40V,150MA,4NS,2PF	27014	FDH9427
A1CR15	152-0400-00	671-2890-03		DIODE,RECT:FAST RCVRY;400V,1A,200NS	0LUA3	1N4936
A1CR16	152-0141-02			DIODE,SIG:ULTRA FAST:40V,150MA,4NS,2PF	27014	FDH9427
A1CR17	152-0400-00			DIODE,RECT:FAST RCVRY;400V,1A,200NS	0LUA3	1N4936
A1CR19	152-0141-02			DIODE,SIG:ULTRA FAST:40V,150MA,4NS,2PF	27014	FDH9427
A1CR20	152-0897-00			DIODE,RECT:FAST RCVRY;1000V,1.5A,300NS,SOFT RCVRY	0LUA3	BYV96E
A1CR21	152-0661-00	671-2890-01	671-2890-05	DIODE,RECT:FAST RCVRY;600V,3A,200NS	12954	DR850701B (40SL
A1CR21	152-1165-00	671-2890-06		DIODE,RECT:ULTRA FAST:600V,4A,50NS	04713	MUR460RL
A1CR22	152-0661-00	671-2890-01	671-2890-05	DIODE,RECT:FAST RCVRY;600V,3A,200NS	12954	DR850701B (40SL
A1CR22	152-1165-00	671-2890-06		DIODE,RECT:ULTRA FAST:600V,4A,50NS	04713	MUR460RL
A1CR23	152-0661-00	671-2890-01	671-2890-05	DIODE,RECT:FAST RCVRY;600V,3A,200NS	12954	DR850701B (40SL

Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A1CR23	152-1165-00	671-2890-06		DIODE,RECT:ULTRA FAST;600V,4A,50NS	04713	MUR460RL
A1CR24	152-0661-00	671-2890-01	671-2890-05	DIODE,RECT:FAST RCVRY;600V,3A,200NS	12954	DR850701B (40SL
A1CR24	152-1165-00	671-2890-06		DIODE,RECT:ULTRA FAST;600V,4A,50NS	04713	MUR460RL
A1CR25	152-0141-02			DIODE,SIG:ULTRA FAST;40V,150MA,4NS,2PF	27014	FDH9427
A1CR26	152-0141-02			DIODE,SIG:ULTRA FAST;40V,150MA,4NS,2PF	27014	FDH9427
A1CR27	152-0400-00			DIODE,RECT:FAST RCVRY;400V,1A,200NS	0LUA3	1N4936
A1CR28	152-0141-02	671-2890-01	671-2890-06	DIODE,SIG:ULTRA FAST;40V,150MA,4NS,2PF	27014	FDH9427
A1CR29	152-0400-00			DIODE,RECT:FAST RCVRY;400V,1A,200NS	0LUA3	1N4936
A1CR30	152-0141-02			DIODE,SIG:ULTRA FAST;40V,150MA,4NS,2PF	27014	FDH9427
A1CR31	152-0400-00			DIODE,RECT:FAST RCVRY;400V,1A,200NS	0LUA3	1N4936
A1DS1	150-0050-00			LAMP,GLOW:135V MAX,1.9MA,C2A-T,WIRE LEAD	0J9R2	NE-2Q-11R-T
A1DS2	150-0050-00			LAMP,GLOW:135V MAX,1.9MA,C2A-T,WIRE LEAD	0J9R2	NE-2Q-11R-T
A1DS3	150-0050-00			LAMP,GLOW:135V MAX,1.9MA,C2A-T,WIRE LEAD	0J9R2	NE-2Q-11R-T
A1DS4	150-0050-00			LAMP,GLOW:135V MAX,1.9MA,C2A-T,WIRE LEAD	0J9R2	NE-2Q-11R-T
A1TP1	214-4085-00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIAP CB,0.015 X 0.032 BRASS,W/RED NYLON COLLAR	26364	104-01-02
A1TP2	214-4085-00			TERM,TEST POINT:0.070 ID,0.220 H,0.063 DIAP CB,0.015 X 0.032 BRASS,W/RED NYLON COLLAR	26364	104-01-02
A1VR1	156-1631-01			IC,LINEAR:BIPOLAR,VR;ADJUST,SHUNT,100MA,2.2%	01295	TL431CLPM
A1VR2	152-0195-00			DIODE,ZENER:5.1V,5%,0.4W	14552	CD332125
A1VR3	152-0195-00	671-2890-07		DIODE,ZENER:5.1V,5%,0.4W	14552	CD332125
A1VR4	152-0149-00	671-2890-07		DIODE,ZENER:10V,5%,0.4W	04713	1N961BRL
A2	671-1354-00			CIRCUIT BD ASSY:FRONT PANEL	80009	671135400
A2J295	174-0468-00			CA ASSY,SP:RIBBON;IDC,34,28AWG,8.0L,2X17,0.1,RCPT W/STRAIN RELIEF,X 2X17,0.1,PCB W/OSTRAIN RELIEF	TK0196	ORDER BY DESC
A2R233	311-2321-00			RES,VAR,WW:CLAROSTAT,3 TURN POT	12697	CM45221
A2R233	366-1701-01			KNOB:GY,0.127 ID X 0.392 OD X 0.4 H	80009	366170101
A2R333	311-2321-00			RES,VAR,WW:CLAROSTAT,3 TURN POT	12697	CM45221
	366-1701-01			*ATTACHED PARTS*		
	366-1701-01			KNOB:GY,0.127 ID X 0.392 OD X 0.4 H	80009	366170101
	366-1701-01			*END ATTACHED PARTS*		
A2R410	311-2468-00			RES,VAR,NONWW:P/NL,20K OHM,20%,0.25W,20MMSHAFT	TK2073	RV102YP20S203
	366-1701-01			*ATTACHED PARTS*		
	366-1701-01			KNOB:GY,0.127 ID X 0.392 OD X 0.4 H	80009	366170101
	366-1701-01			*END ATTACHED PARTS*		
A2R420	311-2467-00			RES,VAR,NONWW:P/NL,20K OHM,20%,0.25W,10MMSHAFT	TK2073	RV102YP10S203
A2R430	311-2468-00			RES,VAR,NONWW:P/NL,20K OHM,20%,0.25W,20MMSHAFT	TK2073	RV102YP20S203
	366-1701-01			*ATTACHED PARTS*		
	366-1701-01			KNOB:GY,0.127 ID X 0.392 OD X 0.4 H	80009	366170101
	366-1701-01			*END ATTACHED PARTS*		
A2R445	311-2468-00			RES,VAR,NONWW:P/NL,20K OHM,20%,0.25W,20MMSHAFT	TK2073	RV102YP20S203
	366-1701-01			*ATTACHED PARTS*		
	366-1701-01			KNOB:GY,0.127 ID X 0.392 OD X 0.4 H	80009	366170101
	366-1701-01			*END ATTACHED PARTS*		
A2S109	260-2300-00			SWITCH,SIG:SPST;PUSH,MOM,NO,W/GROUND TERM, MANUAL INSERTION,100 GRAMS,SILVER,SEALED	34361	B3F1152
	366-0616-00			*ATTACHED PARTS*		
	366-0616-00			PUSH BUTTON:0.585 X 0.3 X 0.150	7X318	ORDER BY DESC
	366-0616-00			*END ATTACHED PARTS*		
A2S125	260-2300-00			SWITCH,SIG:SPST;PUSH,MOM,NO,W/GROUND TERM, MANUAL INSERTION,100 GRAMS,SILVER,SEALED	34361	B3F1152
	366-0616-00			*ATTACHED PARTS*		
	366-0616-00			PUSH BUTTON:0.585 X 0.3 X 0.150	7X318	ORDER BY DESC
	366-0616-00			*END ATTACHED PARTS*		
A2S142	260-2300-00			SWITCH,SIG:SPST;PUSH,MOM,NO,W/GROUND TERM, MANUAL INSERTION,100 GRAMS,SILVER,SEALED	34361	B3F1152
	366-0616-00			*ATTACHED PARTS*		
	366-0616-00			PUSH BUTTON:0.585 X 0.3 X 0.150	7X318	ORDER BY DESC

## Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A2S143	260-2300-00			*END ATTACHED PARTS* SWITCH,SIG:SPST;PUSH,MOM,NO,W/GROUND TERM, MANUAL INSERTION,100 GRAMS,SILVER,SEALED	34361	B3F1152
	366-0616-00			*ATTACHED PARTS* PUSH BUTTON:0.585 X 0.3 X 0.150	7X318	ORDER BY DESC
A2S209	260-2300-00			*END ATTACHED PARTS* SWITCH,SIG:SPST;PUSH,MOM,NO,W/GROUND TERM, MANUAL INSERTION,100 GRAMS,SILVER,SEALED	34361	B3F1152
	366-0616-00			*ATTACHED PARTS* PUSH BUTTON:0.585 X 0.3 X 0.150	7X318	ORDER BY DESC
A2S220	260-2300-00			*END ATTACHED PARTS* SWITCH,SIG:SPST;PUSH,MOM,NO,W/GROUND TERM, MANUAL INSERTION,100 GRAMS,SILVER,SEALED	34361	B3F1152
	366-0616-00			*ATTACHED PARTS* PUSH BUTTON:0.585 X 0.3 X 0.150	7X318	ORDER BY DESC
A2S242	260-2300-00			*END ATTACHED PARTS* SWITCH,SIG:SPST;PUSH,MOM,NO,W/GROUND TERM, MANUAL INSERTION,100 GRAMS,SILVER,SEALED	34361	B3F1152
	366-0616-00			*ATTACHED PARTS* PUSH BUTTON:0.585 X 0.3 X 0.150	7X318	ORDER BY DESC
A2S243	260-2300-00			*END ATTACHED PARTS* SWITCH,SIG:SPST;PUSH,MOM,NO,W/GROUND TERM, MANUAL INSERTION,100 GRAMS,SILVER,SEALED	34361	B3F1152
	366-0616-00			*ATTACHED PARTS* PUSH BUTTON:0.585 X 0.3 X 0.150	7X318	ORDER BY DESC
A2S309	260-2300-00			*END ATTACHED PARTS* SWITCH,SIG:SPST;PUSH,MOM,NO,W/GROUND TERM, MANUAL INSERTION,100 GRAMS,SILVER,SEALED	34361	B3F1152
	366-0616-00			*ATTACHED PARTS* PUSH BUTTON:0.585 X 0.3 X 0.150	7X318	ORDER BY DESC
A2S320	260-2300-00			*END ATTACHED PARTS* SWITCH,SIG:SPST;PUSH,MOM,NO,W/GROUND TERM, MANUAL INSERTION,100 GRAMS,SILVER,SEALED	34361	B3F1152
	366-0616-00			*ATTACHED PARTS* PUSH BUTTON:0.585 X 0.3 X 0.150	7X318	ORDER BY DESC
A2S342	260-2300-00			*END ATTACHED PARTS* SWITCH,SIG:SPST;PUSH,MOM,NO,W/GROUND TERM, MANUAL INSERTION,100 GRAMS,SILVER,SEALED	34361	B3F1152
	366-0616-00			*ATTACHED PARTS* PUSH BUTTON:0.585 X 0.3 X 0.150	7X318	ORDER BY DESC
A2S509	260-2300-00			*END ATTACHED PARTS* SWITCH,SIG:SPST;PUSH,MOM,NO,W/GROUND TERM, MANUAL INSERTION,100 GRAMS,SILVER,SEALED	34361	B3F1152
	366-0616-00			*ATTACHED PARTS* PUSH BUTTON:0.585 X 0.3 X 0.150	7X318	ORDER BY DESC
A2S510	260-2300-00			*END ATTACHED PARTS* SWITCH,SIG:SPST;PUSH,MOM,NO,W/GROUND TERM, MANUAL INSERTION,100 GRAMS,SILVER,SEALED	34361	B3F1152
	366-0616-00			*ATTACHED PARTS* PUSH BUTTON:0.585 X 0.3 X 0.150	7X318	ORDER BY DESC
A2S519	260-2300-00			*END ATTACHED PARTS* SWITCH,SIG:SPST;PUSH,MOM,NO,W/GROUND TERM, MANUAL INSERTION,100 GRAMS,SILVER,SEALED	34361	B3F1152
	366-0616-00			*ATTACHED PARTS* PUSH BUTTON:0.585 X 0.3 X 0.150	7X318	ORDER BY DESC
A2S520	260-2300-00			*END ATTACHED PARTS* SWITCH,SIG:SPST;PUSH,MOM,NO,W/GROUND TERM, MANUAL INSERTION,100 GRAMS,SILVER,SEALED	34361	B3F1152
				*ATTACHED PARTS*		

Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
	366-0616-00			PUSH BUTTON:0.585 X 0.3 X 0.150 *END ATTACHED PARTS*	7X318	ORDER BY DESC
A2S530	260-2300-00			SWITCH,SIG:SPST;PUSH,MOM,NO,W/GROUND TERM, MANUAL INSERTION,100 GRAMS,SILVER,SEALED *ATTACHED PARTS*	34361	B3F1152
	366-0616-00			PUSH BUTTON:0.585 X 0.3 X 0.150 *END ATTACHED PARTS*	7X318	ORDER BY DESC
A2DS107	150-1163-00			DIODE,OPTO:LED;GRN,565NM,24MCD AT 20MA,45 DEGREE VIEW ANGLE,NON-DIFFUSED	50434	HLMP-1540 OPT 0
A2DS108	150-1163-00			DIODE,OPTO:LED;GRN,565NM,24MCD AT 20MA,45 DEGREE VIEW ANGLE,NON-DIFFUSED	50434	HLMP-1540 OPT 0
A2DS109	150-1163-00			DIODE,OPTO:LED;GRN,565NM,24MCD AT 20MA,45 DEGREE VIEW ANGLE,NON-DIFFUSED	50434	HLMP-1540 OPT 0
A2DS123	150-1163-00			DIODE,OPTO:LED;GRN,565NM,24MCD AT 20MA,45 DEGREE VIEW ANGLE,NON-DIFFUSED	50434	HLMP-1540 OPT 0
A2DS124	150-1163-00			DIODE,OPTO:LED;GRN,565NM,24MCD AT 20MA,45 DEGREE VIEW ANGLE,NON-DIFFUSED	50434	HLMP-1540 OPT 0
A2DS125	150-1163-00			DIODE,OPTO:LED;GRN,565NM,24MCD AT 20MA,45 DEGREE VIEW ANGLE,NON-DIFFUSED	50434	HLMP-1540 OPT 0
A2DS142	150-1163-00			DIODE,OPTO:LED;GRN,565NM,24MCD AT 20MA,45 DEGREE VIEW ANGLE,NON-DIFFUSED	50434	HLMP-1540 OPT 0
A2DS143	150-1163-00			DIODE,OPTO:LED;GRN,565NM,24MCD AT 20MA,45 DEGREE VIEW ANGLE,NON-DIFFUSED	50434	HLMP-1540 OPT 0
A2DS208	150-1163-00			DIODE,OPTO:LED;GRN,565NM,24MCD AT 20MA,45 DEGREE VIEW ANGLE,NON-DIFFUSED	50434	HLMP-1540 OPT 0
A2DS209	150-1163-00			DIODE,OPTO:LED;GRN,565NM,24MCD AT 20MA,45 DEGREE VIEW ANGLE,NON-DIFFUSED	50434	HLMP-1540 OPT 0
A2DS220	150-1163-00			DIODE,OPTO:LED;GRN,565NM,24MCD AT 20MA,45 DEGREE VIEW ANGLE,NON-DIFFUSED	50434	HLMP-1540 OPT 0
A2DS242	150-1163-00			DIODE,OPTO:LED;GRN,565NM,24MCD AT 20MA,45 DEGREE VIEW ANGLE,NON-DIFFUSED	50434	HLMP-1540 OPT 0
A2DS243	150-1163-00			DIODE,OPTO:LED;GRN,565NM,24MCD AT 20MA,45 DEGREE VIEW ANGLE,NON-DIFFUSED	50434	HLMP-1540 OPT 0
A2DS307	150-1163-00			DIODE,OPTO:LED;GRN,565NM,24MCD AT 20MA,45 DEGREE VIEW ANGLE,NON-DIFFUSED	50434	HLMP-1540 OPT 0
A2DS308	150-1163-00			DIODE,OPTO:LED;GRN,565NM,24MCD AT 20MA,45 DEGREE VIEW ANGLE,NON-DIFFUSED	50434	HLMP-1540 OPT 0
A2DS309	150-1163-00			DIODE,OPTO:LED;GRN,565NM,24MCD AT 20MA,45 DEGREE VIEW ANGLE,NON-DIFFUSED	50434	HLMP-1540 OPT 0
A2DS320	150-1163-00			DIODE,OPTO:LED;GRN,565NM,24MCD AT 20MA,45 DEGREE VIEW ANGLE,NON-DIFFUSED	50434	HLMP-1540 OPT 0
A2DS341	150-1163-00			DIODE,OPTO:LED;GRN,565NM,24MCD AT 20MA,45 DEGREE VIEW ANGLE,NON-DIFFUSED	50434	HLMP-1540 OPT 0
A2DS342	150-1163-00			DIODE,OPTO:LED;GRN,565NM,24MCD AT 20MA,45 DEGREE VIEW ANGLE,NON-DIFFUSED	50434	HLMP-1540 OPT 0
A2DS420	150-1238-00			DIODE,OPTO:LED;HIGH EFFIC RED,626NM,24MCD AT 20MA,45 DEG VIEW ANGLE,HLMP-1340,T-1	50434	HLMP1340
A2DS421	150-1238-00			DIODE,OPTO:LED;HIGH EFFIC RED,626NM,24MCD AT 20MA,45 DEG VIEW ANGLE,HLMP-1340,T-1	50434	HLMP1340
A3	672-0278-09	B020000	B024644	CIRCUIT BD ASSY:MAIN	80009	672027809
A3	672-0278-10	B024645	B024748	CIRCUIT BD ASSY:MAIN	80009	672027810
A3	672-0278-11	B024749	B024877	CIRCUIT BD ASSY:MAIN	80009	672027811
A3	672-0278-12	B024878		CIRCUIT BD ASSY:MAIN *ATTACHED PARTS*	80009	672027812
	131-3717-00			BUS,CONDUCTOR:PCB;MALE,STR,2 X 42,0.3 X0.1 LAYER,INSULATED,6 AMP (QUANTITY 3)	65033	SM2098
	337-0896-00			PLATE,ELEC SHLD:B SWEEP CKT BD	TK1935	337-0896-00
	337-1197-02			SHIELD,ELEC:CIRCUIT BD;2.300 X .400 IN	TK1947	337-1197-02

## Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
	337-3761-00			SHIELD,ELEC:PLATE,B SWEEP CIRCUIT BOARD *END ATTACHED PARTS*	TK1947	337-3761-00
A3C114	281-0812-00			CAP,FXD,CERAMIC:MLC:1000PF,10%,100V,0.100 X	04222	SA101C102KAA
A3C119	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C156	290-0974-03			CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A3C187	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C193	281-0799-00			CAP,FXD,CER DI:62PF,2%,100V	04222	SA102A620GAA
A3C197	290-0848-00			CAP,FXD,ALUM:47UF,+100%-20%,16V,NONPOLAR, 0.681X0.414	0H1N5	CEBPM1E470M
A3C215	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C218	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C242	290-0974-03			CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A3C243	290-0974-03			CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A3C246	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C255	281-0757-00			CAP,FXD,CERAMIC:MLC:10PF,10%,200V,NPO,0.100	04222	SA102A100KAA
A3C258	281-0759-00			CAP,FXD,CERAMIC:MLC:22PF,10%,100V,0.100 X 0.170	04222	SA102A220KAA
A3C290	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C297	290-0848-00			CAP,FXD,ALUM:47UF,+100%-20%,16V,NONPOLAR, 0.681X0.414	0H1N5	CEBPM1E470M
A3C310	290-0747-00			CAP,FXD,ELCTLT:100UF,+50-20%,25WVDC	0H1N5	CE02W1E101F
A3C336	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C338	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C342	290-0974-03			CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A3C343	290-0974-03			CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A3C348	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C350	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C353	281-0757-00			CAP,FXD,CERAMIC:MLC:10PF,10%,200V,NPO,0.100	04222	SA102A100KAA
A3C354	281-0773-00			CAP,FXD,CERAMIC:MLC:0.01UF,10%,100V	TK1743	CGB103KEX
A3C355	281-0812-00			CAP,FXD,CERAMIC:MLC:1000PF,10%,100V,0.100 X	04222	SA101C102KAA
A3C370	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C379	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C391	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C395	281-0819-00			CAP,FXD,CERAMIC:MLC:33 PF,5%,50V,0.100 X 0.170	04222	SA102A330JAA
A3C399	281-0812-00			CAP,FXD,CERAMIC:MLC:1000PF,10%,100V,0.100 X	04222	SA101C102KAA
A3C424	285-1067-00			CAP,FXD,PLSTC:0.5UF,1%,200V	14752	230B1C504F
A3C436	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C438	281-0767-00			CAP,FXD,CERAMIC:MLC:330PF,20%,100V,0.100 X0.170	04222	SA102C331MAA
A3C446	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C448	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C455	281-0773-00			CAP,FXD,CERAMIC:MLC:0.01UF,10%,100V	TK1743	CGB103KEX
A3C460	281-0182-00			CAP,VAR,PLSTC:1.8-10PF,300V	19701	2805D1R810BH03F
A3C461	281-0756-00			CAP,FXD,CERAMIC:MLC:2.2PF,+/-0.5PF,200V,NPO,0.100 X 0.170	04222	SA102A2R2DAA
A3C462	281-0810-00			CAP,FXD,CERAMIC:MLC:5.6PF,+/-0.5PF,100V,0.100 X 0.170	04222	SA102A5R6DAA
A3C466	281-0767-00			CAP,FXD,CERAMIC:MLC:330PF,20%,100V,0.100 X0.170	04222	SA102C331MAA
A3C469	281-0537-00			CAP,FXD,CERAMIC:MLC:0.68PF,20%,500V,0.170 X	TK2058	DA12COG2HR68M
A3C470	281-0537-00			CAP,FXD,CERAMIC:MLC:0.68PF,20%,500V,0.170 X	TK2058	DA12COG2HR68M
A3C479	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C482	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C486	281-0763-00			CAP,FXD,CERAMIC:MLC:47PF,10%,100V,0.100 X 0.170	04222	SA102A470KAA
A3C487	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C497	290-0848-00			CAP,FXD,ALUM:47UF,+100%-20%,16V,NONPOLAR, 0.681X0.414	0H1N5	CEBPM1E470M
A3C498	281-0773-00			CAP,FXD,CERAMIC:MLC:0.01UF,10%,100V	TK1743	CGB103KEX
A3C516	285-1224-00			CAP,FXD,PLSTC:0.0033UF,1%,200V	84411	TEK 329
A3C521	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C538	281-0767-00			CAP,FXD,CERAMIC:MLC:330PF,20%,100V,0.100 X0.170	04222	SA102C331MAA
A3C547	283-0524-00			CAP,FXD,MICA DI:750PF,5%,500V	TK0891	RDM19FD751J03



Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A3C554	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C568	283-0633-01			CAP,FXD,MICA DI:77PF,1%,500V,RADIAL	09023	CDA15ED770F03
A3C573	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C581	281-0756-00			CAP,FXD,CERAMIC:MLC;2.2PF,+/-0.5PF,200V,NPO,0.100 X 0.170	04222	SA102A2R2DAA
A3C582	290-0782-02			CAP,FXD,ELCTL:4.7UF,+75-10%,35VDC	55680	UVX1V4R7MAA1TD
A3C584	281-0765-00			CAP,FXD,CER DI:100PF,5%,100V	04222	SA102A101JAA
A3C589	290-0974-03			CAP,FXD,ELCTL:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A3C591	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C594	281-0819-00			CAP,FXD,CERAMIC:MLC;33 PF,5%,50V,0.100 X 0.170	04222	SA102A330JAA
A3C616	281-0791-00			CAP,FXD,CERAMIC:MLC;270PF,10%,100V,0.100 X0.170	04222	SA102C271KAA
A3C622	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C624	290-0920-00			CAP,FXD,ALUM:33UF,20%,50V,6 X 11MM,0.1SP	55680	UVX1H330MEA
A3C635	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C636	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C644	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C645	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C646	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C647	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C649	281-0797-00			CAP,FXD,CERAMIC:MLC;15PF,10%,100V	04222	SA102A150KAA
A3C652	281-0205-00			CAP,VAR,PLSTC:5.5-65 PF,100V	TK1727	2222-808-32659
A3C672	281-0810-00			CAP,FXD,CERAMIC:MLC;5.6PF,+/-0.5PF,100V,0.100 X 0.170	04222	SA102A5R6DAA
A3C675	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C684	290-0974-03			CAP,FXD,ELCTL:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A3C685	290-0974-03			CAP,FXD,ELCTL:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A3C686	290-0974-03			CAP,FXD,ELCTL:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A3C690	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C692	281-0763-00			CAP,FXD,CERAMIC:MLC;47PF,10%,100V,0.100 X 0.170	04222	SA102A470KAA
A3C693	281-0812-00			CAP,FXD,CERAMIC:MLC;1000PF,10%,100V,0.100 X	04222	SA101C102KAA
A3C694	281-0773-00			CAP,FXD,CERAMIC:MLC;0.01UF,10%,100V	TK1743	CGB103KEX
A3C720	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C734	283-0934-00			CAP,FXD,PLSTC:0.0022UF,5%,100WVDC	TK1913	FKP2 2200/100/5
A3C757	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C763	290-0974-03			CAP,FXD,ELCTL:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A3C769	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C772	283-0625-01			CAP,FXD,MICA DI:220PF,1%,500V	09023	CDA10FD221F03
A3C790	281-0763-00			CAP,FXD,CERAMIC:MLC;47PF,10%,100V,0.100 X 0.170	04222	SA102A470KAA
A3C791	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C794	290-0974-03			CAP,FXD,ELCTL:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A3C796	281-0773-00			CAP,FXD,CERAMIC:MLC;0.01UF,10%,100V	TK1743	CGB103KEX
A3C797	281-0812-00			CAP,FXD,CERAMIC:MLC;1000PF,10%,100V,0.100 X	04222	SA101C102KAA
A3C820	281-0756-00			CAP,FXD,CERAMIC:MLC;2.2PF,+/-0.5PF,200V,NPO,0.100 X 0.170	04222	SA102A2R2DAA
A3C828	283-0934-00			CAP,FXD,PLSTC:0.0022UF,5%,100WVDC	TK1913	FKP2 2200/100/5
A3C834	283-0934-00			CAP,FXD,PLSTC:0.0022UF,5%,100WVDC	TK1913	FKP2 2200/100/5
A3C840	281-0168-00			CAP,VAR,AIR DI:1.3-5.4PF,150V	74970	187-0103-005
A3C851	281-0810-00			CAP,FXD,CERAMIC:MLC;5.6PF,+/-0.5PF,100V,0.100 X 0.170	04222	SA102A5R6DAA
A3C852	281-0184-00			CAP,VAR,PLSTC:2-18PF,500VDC	TK1727	2222-809-05003
A3C855	281-0756-00			CAP,FXD,CERAMIC:MLC;2.2PF,+/-0.5PF,200V,NPO,0.100 X 0.170	04222	SA102A2R2DAA
A3C856	281-0302-00			CAP,VAR,PLSTC:1.2-4PF,100V	52769	GXL4R000
A3C857	281-0797-00			CAP,FXD,CERAMIC:MLC;15PF,10%,100V	04222	SA102A150KAA
A3C860	281-0537-00			CAP,FXD,CERAMIC:MLC;0.68PF,20%,500V,0.170 X	TK2058	DA12COG2HR68M
A3C861	281-0898-00			CAP,FXD,CER DI:7.5PF,+/-0.5PF,500VTUBULAR,MI	04222	MA107A7R5DAA
A3C862	281-0302-00			CAP,VAR,PLSTC:1.2-4PF,100V	52769	GXL4R000
A3C863	281-0756-00			CAP,FXD,CERAMIC:MLC;2.2PF,+/-0.5PF,200V,NPO,0.100 X 0.170	04222	SA102A2R2DAA
A3C864	281-0184-00			CAP,VAR,PLSTC:2-18PF,500VDC	TK1727	2222-809-05003

## Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A3C869	283-0625-01			CAP,FXD,MICA DI:220PF,1%,500V	09023	CDA10FD221F03
A3C870	281-0765-00			CAP,FXD,CER DI:100PF,5%,100V	04222	SA102A101JAA
A3C873	281-0819-00			CAP,FXD,CERAMIC:MLC:33 PF,5%,50V,0.100 X 0.170	04222	SA102A330JAA
A3C875	281-0763-00			CAP,FXD,CERAMIC:MLC:47PF,10%,100V,0.100 X 0.170	04222	SA102A470KAA
A3C876	281-0783-00			CAP,FXD,CERAMIC:MLC:0.1 UF 20%,100V,0.150 X	04222	SA301C104MAA
A3C926	281-0756-00			CAP,FXD,CERAMIC:MLC:2.2PF,+/-0.5PF,200V,NPO,0.100 X 0.170	04222	SA102A2R2DAA
A3C928	290-0974-03			CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A3C929	283-0934-00			CAP,FXD,PLSTC:0.0022UF,5%,100WVDC	TK1913	FKP2 2200/100/5
A3C937	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C946	290-0974-03			CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A3C959	290-0974-03			CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A3C963	283-0600-01			CAP,FXD,MICA DI:43PF,5%,500V	09023	CDA10ED430J03
A3C989	290-0974-03			CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A3C992	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A3C994	281-0819-00			CAP,FXD,CERAMIC:MLC:33 PF,5%,50V,0.100 X 0.170	04222	SA102A330JAA
A3C997	290-0848-00			CAP,FXD,ALUM:47UF,+100%-20%,16V,NONPOLAR,0.681X0.414	0H1N5	CEBPM1E470M
A3J131	131-2951-00			CONN,DIN:PCB:FEMALE,STR,2 X 16,0.1 CTR,0.456 H X 0.110 TAIL,1/2C,BD RETENTION	00779	536460-4
				*MOUNTING PARTS*		
	210-0001-00			WASHER,LOCK:#2 INTL,0.013 THK,STL (QUANTITY 2)	78189	1202-00-00-0541
	210-0405-00			NUT,PLAIN,HEX:2-56 X 0.188,BRS CD PL (QUANTITY 2)	73743	12157-50
	211-0001-00			SCREW,MACHINE:2-56 X 0.25,PNH,STL (QUANTITY 2)	TK0435	ORDER BY DESC
				*END MOUNTING PARTS*		
A3J154	175-9797-00			CA ASSY,SP:FLAT FLEX:FLX,10,27 AWG,2.5 L,1X10,BOX X STR,SLDR TAB,CONN NON PLZ	TK2469	175-9797-00
A3J158	131-4794-00			CONN,HDR:PCB:MALE,STR,1 X 2,0.1 CTR,0.235 MLG X 0.112 TAIL,30GOLD,0.035 DIA PCB	53387	2402-6112 UB
A3J161	131-2951-00			CONN,DIN:PCB:FEMALE,STR,2 X 16,0.1 CTR,0.456 H X 0.110 TAIL,1/2C,BD RETENTION	00779	536460-4
				*MOUNTING PARTS*		
	210-0001-00			WASHER,LOCK:#2 INTL,0.013 THK,STL (QUANTITY 2)	78189	1202-00-00-0541
	210-0405-00			NUT,PLAIN,HEX:2-56 X 0.188,BRS CD PL (QUANTITY 2)	73743	12157-50
	211-0001-00			SCREW,MACHINE:2-56 X 0.25,PNH,STL (QUANTITY 2)	TK0435	ORDER BY DESC
				*END MOUNTING PARTS*		
A3J216	131-3766-00			CONN,HDR:PCB:MALE,RTANG,1 X 2,0.1 CTR,0.235 MLG X 0.110 TAIL,30 GOLD,0.025 SQ	00779	87232-2
A3J453	131-4794-00			CONN,HDR:PCB:MALE,STR,1 X 2,0.1 CTR,0.235MLG X 0.112 TAIL,30GOLD,0.035 DIA PCB	53387	2402-6112 UB
A3J843	131-4794-00			CONN,HDR:PCB:MALE,STR,1 X 2,0.1 CTR,0.235MLG X 0.112 TAIL,30GOLD,0.035 DIA PCB	53387	2402-6112 UB
A3J897	131-4794-00			CONN,HDR:PCB:MALE,STR,1 X 2,0.1 CTR,0.235MLG X 0.112 TAIL,30GOLD,0.035 DIA PCB	53387	2402-6112 UB
A3J978	131-4750-00			CONN,HDR:PCB:MALE,STR,1 X 6,0.100 CTR,0.230 MLG X 0.110 TAIL,30 GOLD	53387	2406-6112TB
A3L210	108-1263-00			INDUCTOR,FXD:POWER:10UH,10%,I<2.1A,RDC<0.043 OHM,Q>20,SRF>19MHZ,BOBBIN	TK2058	TSL0707-100K1R9
A3L776	108-1212-00			INDUCTOR,FXD:CUSTOM,SIGNAL:9UH,2%,IDC<300 MA,RDC<1.6 OHM,Q>60@4MHZ,SRF>50 MHZ	0JR03	108-1212-00
A3L876	108-1212-00			INDUCTOR,FXD:CUSTOM,SIGNAL:9UH,2%,IDC<300 MA,RDC<1.6 OHM,Q>60@4MHZ,SRF>50 MHZ	0JR03	108-1212-00
A3P158	131-3199-00			CONN,SHUNT:SHUNT:FEMALE,STR,1 X 2,0.1 CTR,0.2 H,LOW PROFILE,JUMPER	22526	68786-202

Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A3P179	131-4752-00			CONN,HDR::PCB;MALE,45 DEG,1 X 2,0.1CTR,0.240 MLG X 0.110 TAIL,30 GOLD	58050	082-0243-AS10
A3P180	131-4865-00			CONN,HDR::PCB;MALE,STR,2 X 7,0.1 CTR,0.350D	53387	925320-01-14-30
A3P453	131-3199-00			CONN,SHUNT;SHUNT;FEMALE,STR,1 X 2,0.1 CTR, 0.2 H,LOW PROFILE,JUMPER	22526	68786-202
A3P843	131-3199-00			CONN,SHUNT;SHUNT;FEMALE,STR,1 X 2,0.1 CTR, 0.2 H,LOW PROFILE,JUMPER	22526	68786-202
A3P897	131-3199-00			CONN,SHUNT;SHUNT;FEMALE,STR,1 X 2,0.1 CTR, 0.2 H,LOW PROFILE,JUMPER	22526	68786-202
A3Q121	151-0190-00	672-0278-12		TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ,AMPL	04713	2N3904
A3Q167	151-0207-01			TRANSISTOR,SIG:BIPOLAR,NPN;45V,300MA,250MHZ,AMPL	27014	PN100A/D75Z
A3Q191	151-0221-08			TRANSISTOR,SIG:BIPOLAR,PNP;12V,80MA,SWITCHING	27014	PN4258/D75Z
A3Q214	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ,AMPL	04713	2N3906
A3Q221	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ,AMPL	04713	2N3906
A3Q222	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ,AMPL	04713	2N3904
A3Q256	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ,AMPL	04713	2N3906
A3Q263	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ,AMPL	04713	2N3904
A3Q350	151-0207-01			TRANSISTOR,SIG:BIPOLAR,NPN;45V,300MA,250MHZ,AMPL	27014	PN100A/D75Z
A3Q351	151-1005-03			TRANSISTOR,SIG:JFET,N-CH;5V,6MA,2MS,500 OHM	66182	SNJ1641
A3Q352	151-1005-03			TRANSISTOR,SIG:JFET,N-CH;5V,6MA,2MS,500 OHM	66182	SNJ1641
A3Q355	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ,AMPL	04713	2N3906
A3Q358	151-1005-03			TRANSISTOR,SIG:JFET,N-CH;5V,6MA,2MS,500 OHM	66182	SNJ1641
A3Q393	151-0221-08			TRANSISTOR,SIG:BIPOLAR,PNP;12V,80MA,SWITCHING	27014	PN4258/D75Z
A3Q397	151-1059-01			TRANSISTOR,SIG:JFET,N-CH;10V,30MA(MIN),30OHM	04713	MPF4391RLRP
A3Q415	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ,AMPL	04713	2N3904
A3Q432	151-0207-01			TRANSISTOR,SIG:BIPOLAR,NPN;45V,300MA,250MHZ,AMPL	27014	PN100A/D75Z
A3Q433	151-0207-01			TRANSISTOR,SIG:BIPOLAR,NPN;45V,300MA,250MHZ,AMPL	27014	PN100A/D75Z
A3Q434	151-0207-01			TRANSISTOR,SIG:BIPOLAR,NPN;45V,300MA,250MHZ,AMPL	27014	PN100A/D75Z
A3Q445	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ,AMPL	04713	2N3906
A3Q463	151-0192-02			TRANSISTOR,SIG:BIPOLAR,NPN;25V,100MA,200MHZ,AMPL	04713	SPS8801RLRP
A3Q464	151-0192-02			TRANSISTOR,SIG:BIPOLAR,NPN;25V,100MA,200MHZ,AMPL	04713	SPS8801RLRP
A3Q465	151-0221-08			TRANSISTOR,SIG:BIPOLAR,PNP;12V,80MA,SWITCHING	27014	PN4258/D75Z
A3Q466	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ,AMPL	04713	2N3906
A3Q470	151-0221-08			TRANSISTOR,SIG:BIPOLAR,PNP;12V,80MA,SWITCHING	27014	PN4258/D75Z
A3Q471	151-0221-08			TRANSISTOR,SIG:BIPOLAR,PNP;12V,80MA,SWITCHING	27014	PN4258/D75Z
A3Q483	151-0619-00			TRANSISTOR,SIG:BIPOLAR,NPN;35V,20MA,SUPER-MATCHED DUAL	24355	MATO2EH
A3Q490	151-1005-03			TRANSISTOR,SIG:JFET,N-CH;5V,6MA,2MS,500 OHM	66182	SNJ1641
A3Q513	151-0207-01			TRANSISTOR,SIG:BIPOLAR,NPN;45V,300MA,250MHZ,AMPL	27014	PN100A/D75Z
A3Q518	151-0207-01			TRANSISTOR,SIG:BIPOLAR,NPN;45V,300MA,250MHZ,AMPL	27014	PN100A/D75Z
A3Q525	151-0619-00			TRANSISTOR,SIG:BIPOLAR,NPN;35V,20MA,SUPER-MATCHED DUAL	24355	MATO2EH
A3Q553	151-0192-02			TRANSISTOR,SIG:BIPOLAR,NPN;25V,100MA,200MHZ,AMPL	04713	SPS8801RLRP
A3Q555	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ,AMPL	04713	2N3906
A3Q562	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ,AMPL	04713	2N3904
A3Q563	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ,AMPL	04713	2N3904
A3Q568	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ,AMPL	04713	2N3904
A3Q570	151-0198-04			TRANSISTOR,SIG:BIPOLAR,NPN;15V,50MA,600 MHZ,AMPL	04713	MPS918RLRP
A3Q579	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ,AMPL	04713	2N3904
A3Q581	151-0223-00			TRANSISTOR,SIG:BIPOLAR,NPN;15V,500MA,SWITCHING	04713	MPS2369A
A3Q593	151-0221-08			TRANSISTOR,SIG:BIPOLAR,PNP;12V,80MA,SWITCHING	27014	PN4258/D75Z
A3Q597	151-1059-01			TRANSISTOR,SIG:JFET,N-CH;10V,30MA(MIN),30OHM	04713	MPF4391RLRP
A3Q632	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ,AMPL	04713	2N3906
A3Q663	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ,AMPL	04713	2N3906
A3Q673	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ,AMPL	04713	2N3906
A3Q689	151-1005-03			TRANSISTOR,SIG:JFET,N-CH;5V,6MA,2MS,500 OHM	66182	SNJ1641
A3Q737	151-0619-00			TRANSISTOR,SIG:BIPOLAR,NPN;35V,20MA,SUPER-MATCHED DUAL	24355	MATO2EH
A3Q747	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ,AMPL	04713	2N3906

## Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A3Q751	151-0347-02			XSTR,SIG:BIPOLAR,NPN;160V,600MA,100MHZ,AMPL	04713	2N5551RLRP
A3Q753	151-0261-00			XSTR,SIG:BIPOLAR,PNP;60V,50MA,100MHZ,AMPL,DUAL	80009	151026100
A3Q755	151-0347-02			XSTR,SIG:BIPOLAR,NPN;160V,600MA,100MHZ,AMPL	04713	2N5551RLRP
A3Q764	151-0198-04			TRANSISTOR,SIG:BIPOLAR,NPN;15V,50MA,600 MHZ,AMPL	04713	MPS918RLRP
A3Q771	151-0220-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,400MHZ,AMPL	27014	S036228.22
A3Q772	151-0198-04			TRANSISTOR,SIG:BIPOLAR,NPN;15V,50MA,600 MHZ,AMPL	04713	MPS918RLRP
A3Q773	151-0211-00			TRANSISTOR,SIG:BIPOLAR,NPN;30V VCEO,55V VCBO,400MA,500MHZ,AMPL	04713	2N3866
A3Q773	342-0324-00			INSULATOR,DISK:TRANSISTOR,NYLON	13103	7717-5N
A3Q790	151-1005-03			TRANSISTOR,SIG:JFET,N-CH;5V,6MA,2MS,500 OHM	66182	SNJ1641
A3Q840	151-0198-04			TRANSISTOR,SIG:BIPOLAR,NPN;15V,50MA,600 MHZ,AMPL	04713	MPS918RLRP
A3Q842	151-0221-08			TRANSISTOR,SIG:BIPOLAR,PNP;12V,80MA,SWITCHING	27014	PN4258/D75Z
A3Q846	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ,AMPL	04713	2N3904
A3Q851	151-0916-00			TRANSISTOR,PWR:BIPOLAR,PN;300V,100MA,60MHZ,AMPL	0LUA3	BF472
A3Q857	151-0916-00			TRANSISTOR,PWR:BIPOLAR,PN;300V,100MA,60MHZ,AMPL	0LUA3	BF472
A3Q859	151-0198-04			TRANSISTOR,SIG:BIPOLAR,NPN;15V,50MA,600 MHZ,AMPL	04713	MPS918RLRP
A3Q860	151-0198-04			TRANSISTOR,SIG:BIPOLAR,NPN;15V,50MA,600 MHZ,AMPL	04713	MPS918RLRP
A3Q878	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ,AMPL	04713	2N3904
A3Q897	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ,AMPL	04713	2N3906
A3Q898	151-1059-01			TRANSISTOR,SIG:JFET,N-CH;10V,30MA(MIN),30OHM	04713	MPF4391RLRP
A3Q961	151-0220-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,400MHZ,AMPL	27014	S036228.22
A3Q971	151-0198-04			TRANSISTOR,SIG:BIPOLAR,NPN;15V,50MA,600 MHZ,AMPL	04713	MPS918RLRP
A3Q972	151-0220-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,400MHZ,AMPL	27014	S036228.22
A3Q973	151-0211-00			TRANSISTOR,SIG:BIPOLAR,NPN;30V VCEO,55V VCBO,400MA,500MHZ,AMPL	04713	2N3866
				*ATTACHED PARTS*		
	342-0324-00			INSULATOR,DISK:TRANSISTOR,NYLON	13103	7717-5N
				*END ATTACHED PARTS*		
A3Q993	151-0221-08			TRANSISTOR,SIG:BIPOLAR,PNP;12V,80MA,SWITCHING	27014	PN4258/D75Z
A3R109	322-3289-00			RES,FXD:METAL FILM;10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A3R110	322-3385-00			RES,FXD:METAL FILM;100K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10002F
A3R111	322-3322-00			RES,FXD:METAL FILM;22.1K OHM,1%,0.2W,TC=100	91637	CCF50G22101F
A3R113	322-3385-00			RES,FXD:METAL FILM;100K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10002F
A3R115	322-3354-00			RES,FXD:METAL FILM;47.5K OHM,1%,0.2W,TC=100	91637	CCF50G47501F
A3R117	322-3193-00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10000F
A3R118	322-3261-00			RES,FXD,FILM;5.11K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF50G5111FT
A3R120	322-3326-00	672-0278-09	672-0278-11	RES,FXD,FILM;24.3K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF50-2F24301F
A3R121	322-3294-00	672-0278-12		RES,FXD,FILM;11.3K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF50G1132FT
A3R142	311-2230-00			RES,VAR,TRMR: CERMET;500 OHM,20%,0.5W,0.197SQ, TOP ADJUST	TK2073	GF06UT2 501 M L
A3R159	322-3193-00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10000F
A3R167	322-3339-00			RES,FXD:METAL FILM;33.2K OHM,1%,0.2W,TC=100	91637	CCF50-2-G3322FT
A3R168	322-3437-00			RES,FXD,FILM;348K OHM,1%,0.2W,TC=TOMI,SMALL	91637	CCF50G34802F
A3R186	322-3250-00			RES,FXD:METAL FILM;3.92K OHM,1%,0.2W,TC=100	91637	CCF50-2F39200F
A3R187	322-3281-00			RES,FXD:METAL FILM;8.25K OHM,1%,0.2W,TC=100	91637	CCF50G82500F
A3R188	322-3239-00			RES,FXD,FILM;3.01K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF50G30100F
A3R189	322-3126-00			RES,FXD,FILM;200 OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF50G200ROF
A3R190	322-3273-00			RES,FXD:METAL FILM;6.81K OHM,1%,0.2W,TC=100	91637	CCF50-2-G68100F
A3R192	322-3193-00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10000F
A3R193	322-3250-00			RES,FXD:METAL FILM;3.92K OHM,1%,0.2W,TC=100	91637	CCF50-2F39200F
A3R194	322-3306-00			RES,FXD:METAL FILM;15K OHM,1%,0.2W,TC=100 PPM	91637	CCF50-2-G1502F
A3R195	322-3193-00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10000F
A3R196	322-3210-00			RES,FXD:METAL FILM;1.5K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G15000F
A3R214	322-3314-00			RES,FXD:METAL FILM;18.2K OHM,1%,0.2W,TC=100	91637	CCF50G18201F
A3R217	322-3097-00			RES,FXD:METAL FILM;100 OHM,1%,0.2W,TC=100 PPM	91637	CCF50G100R0F
A3R218	322-3097-00			RES,FXD:METAL FILM;100 OHM,1%,0.2W,TC=100 PPM	91637	CCF50G100R0F
A3R219	301-0181-00			RES,FXD,FILM;180 OHM,5%,0.5W	TK1727	SFR30 2322-182-
A3R222	307-0023-00			RES,FXD,CMPSN;4.7 OHM,10%,0.5W	50139	EB47G1

Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A3R225	322-3239-00			RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G30100F
A3R239	322-3172-00			RES,FXD,FILM:604 OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G604ROF
A3R242	322-3258-00			RES,FXD:METAL FILM:4.75K OHM,1%,0.2W,TC=100	56845	CCF50-2-G4751FT
A3R243	322-3258-00			RES,FXD:METAL FILM:4.75K OHM,1%,0.2W,TC=100	56845	CCF50-2-G4751FT
A3R253	322-3222-00			RES,FXD:METAL FILM:2K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20000F
A3R254	322-3258-00			RES,FXD:METAL FILM:4.75K OHM,1%,0.2W,TC=100	56845	CCF50-2-G4751FT
A3R255	315-0106-00			RES,FXD,FILM:10M OHM,5%,0.25W	TK1727	SFR25 2322-181-
A3R257	322-3289-00			RES,FXD:METAL FILM:10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A3R258	322-3318-00			RES,FXD:METAL FILM:20K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G20001F
A3R262	322-3289-00			RES,FXD:METAL FILM:10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A3R263	322-3289-00			RES,FXD:METAL FILM:10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A3R264	322-3385-00			RES,FXD:METAL FILM:100K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10002F
A3R267	322-3001-00			RES,FXD:METAL FILM:10 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10R00F
A3R273	322-3001-00			RES,FXD:METAL FILM:10 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10R00F
A3R274	322-3001-00			RES,FXD:METAL FILM:10 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10R00F
A3R288	311-2232-00			RES,VAR,TRMR:CERMET:2K OHM,20%,0.5W,0.197 SQ, TOP ADJUST	TK2073	GF06UT2 202 M L
A3R289	322-3239-00			RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G30100F
A3R292	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A3R293	322-3123-00			RES,FXD:METAL FILM:187 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G187R0F
A3R295	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A3R297	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A3R314	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A3R315	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A3R316	322-3235-00			RES,FXD:METAL FILM:2.74K OHM,1%,0.2W,TC=100	91637	CCF501G27400F
A3R317	322-3235-00			RES,FXD:METAL FILM:2.74K OHM,1%,0.2W,TC=100	91637	CCF501G27400F
A3R318	322-3330-00			RES,FXD,FILM:26.7K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G26701F
A3R319	322-3330-00			RES,FXD,FILM:26.7K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G26701F
A3R329	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A3R333	322-3047-00			RES,FXD,FILM:30.1 OHM,1%,0.2W,TC=T0,SMALL BODY	57668	CRB20FXE30E1
A3R334	322-3047-00			RES,FXD,FILM:30.1 OHM,1%,0.2W,TC=T0,SMALL BODY	57668	CRB20FXE30E1
A3R343	322-3226-00	672-0278-09	672-0278-11	RES,FXD:METAL FILM:2.21K OHM,1%,0.2W,TC=100	91637	CCF501G22100F
A3R343	322-3266-00	672-0278-12		RES,FXD,FILM:5.76K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G57600F
A3R346	322-3172-00			RES,FXD,FILM:604 OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G604ROF
A3R353	315-0106-00			RES,FXD,FILM:10M OHM,5%,0.25W	TK1727	SFR25 2322-181-
A3R354	322-3289-00			RES,FXD:METAL FILM:10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A3R355	322-3289-00			RES,FXD:METAL FILM:10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A3R357	322-3297-00			RES,FXD:METAL FILM:12.1K OHM,1%,0.2W,TC=100	91637	CCF501G12101F
A3R358	322-3222-00			RES,FXD:METAL FILM:2K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20000F
A3R359	322-3289-00			RES,FXD:METAL FILM:10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A3R359	337-0896-00			PLATE,ELEC SHLD:B SWEEP CKT BD	TK1935	337-0896-00
A3R360	322-3318-00			RES,FXD:METAL FILM:20K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20001F
A3R361	322-3346-00			RES,FXD:METAL FILM:39.2K OHM,1%,0.2W,TC=100	91637	CCF50-2-G39201F
A3R362	322-3385-00			RES,FXD:METAL FILM:100K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10002F
A3R363	322-3385-00			RES,FXD:METAL FILM:100K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10002F
A3R364	322-3346-00			RES,FXD:METAL FILM:39.2K OHM,1%,0.2W,TC=100	91637	CCF50-2-G39201F
A3R365	311-2235-00			RES,VAR,TRMR:CERMET,10K OHM,20%,0.5W,0.197 SQ, TOP ADJUST	TK2073	GF06UT2 103 M L
A3R366	322-3269-02			RES,FXD,FILM:6.19K OHM,0.2W,5%TAPED & REELED	91637	CCF501D61900D
A3R370	322-3259-00			RES,FXD,FILM:4.87K OHM,1%,0.2W,TC=T0MI,SMALL BODY	80009	322325900
A3R373	322-3250-00			RES,FXD:METAL FILM:3.92K OHM,1%,0.2W,TC=100	91637	CCF50-2F39200F
A3R374	322-3273-00			RES,FXD:METAL FILM:6.81K OHM,1%,0.2W,TC=100	91637	CCF50-2-G68100F
A3R379	322-3293-00			RES,FXD:METAL FILM:11K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G11001F
A3R382	322-3381-00			RES,FXD,FILM:90.9K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50-2-G9092FT
A3R383	322-3335-00			RES,FXD,FILM:30.1K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G30101F
A3R387	322-3281-00			RES,FXD:METAL FILM:8.25K OHM,1%,0.2W,TC=100	91637	CCF501G82500F
A3R388	322-3239-00			RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G30100F
A3R389	315-0106-00			RES,FXD,FILM:10M OHM,5%,0.25W	TK1727	SFR25 2322-181-

## Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A3R391	322-3273-00			RES,FXD:METAL FILM:6.81K OHM,1%,0.2W,TC=100	91637	CCF50-2-G68100F
A3R392	322-3210-00			RES,FXD:METAL FILM:1.5K OHM,1%,0.2W,TC=100PPM	91637	CCF501G15000F
A3R395	322-3250-00			RES,FXD:METAL FILM:3.92K OHM,1%,0.2W,TC=100	91637	CCF50-2F39200F
A3R396	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A3R397	315-0106-00			RES,FXD,FILM:10M OHM,5%,0.25W	TK1727	SFR25 2322-181-
A3R398	322-3306-00			RES,FXD:METAL FILM:15K OHM,1%,0.2W,TC=100 PPM	91637	CCF50-2-G1502F
A3R399	322-3306-00			RES,FXD:METAL FILM:15K OHM,1%,0.2W,TC=100 PPM	91637	CCF50-2-G1502F
A3R414	322-3030-00			RES,FXD:METAL FILM:20 OHM,1%,0.2W,TC=100 PPM	91637	CCF50G20R00F
A3R415	322-3275-00			RES,FXD,FILM:7.15K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G71500F
A3R416	322-3299-00			RES,FXD,FILM:12.7K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G12701F
A3R425	322-3273-00			RES,FXD:METAL FILM:6.81K OHM,1%,0.2W,TC=100	91637	CCF50-2-G68100F
A3R428	311-2348-00			RES,VAR,NONWW:P/NL,25K OHM,10%,0.5WLINEAR	12697	CM45227
A3R428	366-0649-00			KNOB:GY,0.127 ID X 0.392 OD X 0.5 H	80009	366064900
A3R428	376-0051-01			CPLG,SHAFT,FLEX:0.127 ID X 0.375 OD,DELTRIN	TK2562	376-0051-01
A3R428	384-1065-00			EXTENSION SHAFT:3.485 L X 0.125 OD,AL	80009	384106500
A3R429	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A3R430	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A3R435	311-2226-00			RES,VAR,TRMR:CERMET;50 OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 500 M L
A3R436	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A3R439	322-3066-00			RES,FXD:METAL FILM:47.5 OHM,1%,0.2W,TC=100 PPM	09969	CCF502G47R50F
A3R444	322-3165-00			RES,FXD,FILM:511 OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G511R0F
A3R445	322-3254-00			RES,FXD,FILM:4.32K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF502G4321FT
A3R446	322-3269-02			RES,FXD,FILM:6.19K OHM,0.2W,5%TAPED & REELED	91637	CCF501D61900D
A3R447	322-3260-00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=TO	91637	CCF501G49900F
A3R448	322-3354-00			RES,FXD:METAL FILM:47.5K OHM,1%,0.2W,TC=100	91637	CCF501G47501F
A3R452	322-3393-00			RES,FXD:METAL FILM:121K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G12102F
A3R453	322-3385-00			RES,FXD:METAL FILM:100K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10002F
A3R454	322-3339-00			RES,FXD:METAL FILM:33.2K OHM,1%,0.2W,TC=100	91637	CCF50-2-G3322FT
A3R455	322-3250-00			RES,FXD:METAL FILM:3.92K OHM,1%,0.2W,TC=100	91637	CCF50-2F39200F
A3R457	311-2232-00			RES,VAR,TRMR:CERMET;2K OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 202 M L
A3R458	322-3273-00			RES,FXD:METAL FILM:6.81K OHM,1%,0.2W,TC=100	91637	CCF50-2-G68100F
A3R459	322-3315-00			RES,FXD,FILM:18.7K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G18701F
A3R460	322-3258-00			RES,FXD:METAL FILM:4.75K OHM,1%,0.2W,TC=100	56845	CCF50-2-G4751FT
A3R461	322-3318-00			RES,FXD:METAL FILM:20K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20001F
A3R462	322-3260-00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=TOTAPED &	91637	CCF501G49900F
A3R463	322-3243-00			RES,FXD:METAL FILM:3.32K OHM,1%,0.2W,TC=100	91637	CCF50-1-G33200F
A3R464	322-3354-00			RES,FXD:METAL FILM:47.5K OHM,1%,0.2W,TC=100	91637	CCF501G47501F
A3R465	322-3258-00			RES,FXD:METAL FILM:4.75K OHM,1%,0.2W,TC=100	56845	CCF50-2-G4751FT
A3R466	322-3123-00			RES,FXD:METAL FILM:187 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G187R0F
A3R467	322-3258-00			RES,FXD:METAL FILM:4.75K OHM,1%,0.2W,TC=100	56845	CCF50-2-G4751FT
A3R468	322-3461-00			RES,FXD,FILM:619K OHM,1%,0.2W,TC=TOMI,SMALL	91637	CCF50-2-G6193FT
A3R469	322-3371-00			RES,FXD,FILM:71.5K OHM,1%,0.2W,TC=TO	91637	CCF50G71501F
A3R470	322-3274-00			RES,FXD,FILM:6.98K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF50-2-G-69800
A3R471	322-3235-00			RES,FXD:METAL FILM:2.74K OHM,1%,0.2W,TC=100	91637	CCF501G27400F
A3R472	322-3222-00			RES,FXD:METAL FILM:2K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20000F
A3R473	322-3273-00			RES,FXD:METAL FILM:6.81K OHM,1%,0.2W,TC=100	91637	CCF50-2-G68100F
A3R474	322-3030-00			RES,FXD:METAL FILM:20 OHM,1%,0.2W,TC=100 PPM	91637	CCF50G20R00F
A3R476	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A3R477	322-3066-00			RES,FXD:METAL FILM:47.5 OHM,1%,0.2W,TC=100 PPM	09969	CCF502G47R50F
A3R478	322-3344-00	672-0278-09	672-0278-10	RES,FXD,FILM:37.4K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G37401F
A3R478	322-3343-00	672-0278-11		RES,FXD,FILM:36.5K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G36501FT
A3R479	311-2235-00			RES,VAR,TRMR:CERMET;10K OHM,20%,0.5W,0.197SQ,TOP ADJUST	TK2073	GF06UT2 103 M L
A3R482	322-3001-00			RES,FXD:METAL FILM:10 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10R00F
A3R483	322-3385-00			RES,FXD:METAL FILM:100K OHM,1%,0.2W,TC=100PPM	91637	CCF501G10002F
A3R484	322-3275-00			RES,FXD,FILM:7.15K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G71500F

Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A3R485	322-3189-00			RES,FXD,FILM:909 OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G909FOR
A3R487	322-3239-00			RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G30100F
A3R488	322-3281-00			RES,FXD:METAL FILM:8.25K OHM,1%,0.2W,TC=100	91637	CCF501G82500F
A3R489	322-3239-00			RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G30100F
A3R490	311-2232-00			RES,VAR,TRMR:CERMET;2K OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 202 M L
A3R491	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A3R492	322-3306-00			RES,FXD:METAL FILM:15K OHM,1%,0.2W,TC=100 PPM	91637	CCF50-2-G1502F
A3R493	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A3R495	322-3457-00			RES,FXD,FILM:562K OHM,1%,0.2W,TC=T0MI,SMALL	91637	CCF50-2F56202F
A3R496	311-2238-00			RES,VAR,TRMR:CERMET;50K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST	TK2073	GF06UT2 503 M L
A3R497	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A3R498	315-0305-00			RES,FXD,FILM:3M OHM,5%,0.25W	TK1727	SFR25 2322-181-
A3R500	311-2269-00			RES,VAR,NONWW:TRMR,20K OHM,20%,0.5WLINEAR,MI	TK2073	GF06VT2 203 M L
A3R506	322-3130-00			RES,FXD:METAL FILM:221 OHM,1%,0.2W,TC=100 PPM	57668	RB20FX221E
A3R507	322-3306-00			RES,FXD:METAL FILM:15K OHM,1%,0.2W,TC=100 PPM	91637	CCF50-2-G1502F
A3R508	322-3268-00			RES,FXD,FILM:6.04K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G60400F
A3R513	322-3306-00			RES,FXD:METAL FILM:15K OHM,1%,0.2W,TC=100 PPM	91637	CCF50-2-G1502F
A3R514	322-3227-00			RES,FXD,FILM:2.26K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF502G2261FT
A3R515	322-3240-00			RES,FXD,FILM:3.09K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50-2G30900F
A3R516	315-0155-00			RES,FXD,FILM:1.5M OHM,5%,0.25W	TK1727	SFR25 2322-181-
A3R517	322-3443-00			RES,FXD,FILM:402K OHM,1%,0.2W,TC=T0MI,SMALL	91637	CCF501G40202F
A3R518	322-3294-00			RES,FXD,FILM:11.3K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50G1132FT
A3R519	322-3377-00			RES,FXD:METAL FILM:82.5K OHM,1%,0.2W,TC=100	91637	CCF50-2F82501F
A3R520	322-3377-00			RES,FXD:METAL FILM:82.5K OHM,1%,0.2W,TC=100	91637	CCF50-2F82501F
A3R521	322-3306-00			RES,FXD:METAL FILM:15K OHM,1%,0.2W,TC=100 PPM	91637	CCF50-2-G1502F
A3R522	322-3202-00			RES,FXD,FILM:1.24K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50-1G12400F
A3R523	322-3231-00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50-1G24900F
A3R524	322-3202-00			RES,FXD,FILM:1.24K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50-1G12400F
A3R525	322-3218-00			RES,FXD:METAL FILM:1.82K OHM,1%,0.2W,TC=100	91637	CCF501G18200F
A3R526	322-3200-00			RES,FXD,FILM:1.18K OHM,1%,0.2W,TC=T0MI,SMALL BODY	57668	CRB20 FXE 1K18
A3R527	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A3R528	322-3265-00			RES,FXD:METAL FILM:5.62K OHM,1%,0.2W,TC=100	91637	CCF501G56200F
A3R529	322-3306-00			RES,FXD:METAL FILM:15K OHM,1%,0.2W,TC=100 PPM	91637	CCF50-2-G1502F
A3R532	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A3R533	322-3200-00			RES,FXD,FILM:1.18K OHM,1%,0.2W,TC=T0MI,SMALL BODY	57668	CRB20 FXE 1K18
A3R534	311-2232-00			RES,VAR,TRMR:CERMET;2K OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 202 M L
A3R535	322-3297-00			RES,FXD:METAL FILM:12.1K OHM,1%,0.2W,TC=100	91637	CCF501G12101F
A3R540	322-3237-00			RES,FXD,FILM:2.87K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G28700F
A3R541	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A3R544	322-3285-00			RES,FXD,FILM:9.09K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G90900F
A3R547	322-3258-00			RES,FXD:METAL FILM:4.75K OHM,1%,0.2W,TC=100	56845	CCF50-2-G4751FT
A3R548	315-0226-00			RES,FXD,FILM:22M OHM,5%,0.25W	50139	CB2265
A3R549	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A3R551	311-2237-00			RES,VAR,TRMR:CERMET;25K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST	TK2073	GF06UT2 253 M L
A3R552	322-3339-00			RES,FXD:METAL FILM:33.2K OHM,1%,0.2W,TC=100	91637	CCF50-2-G3322FT
A3R553	322-3414-00			RES,FXD:METAL FILM:200K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20002F
A3R554	322-3210-00			RES,FXD:METAL FILM:1.5K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G15000F
A3R555	322-3181-00			RES,FXD,FILM:750 OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G750ROF
A3R556	322-3261-00			RES,FXD,FILM:5.11K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50G5111FT
A3R557	322-3261-00			RES,FXD,FILM:5.11K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50G5111FT
A3R558	322-3210-00			RES,FXD:METAL FILM:1.5K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G15000F
A3R560	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A3R561	322-3261-00			RES,FXD,FILM:5.11K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50G5111FT

## Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A3R562	322-3261-00			RES,FXD,FILM:5.11K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF50G5111FT
A3R564	322-3289-00			RES,FXD:METAL FILM:10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A3R565	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A3R566	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A3R567	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A3R568	322-3289-00			RES,FXD:METAL FILM:10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A3R569	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A3R570	322-3170-00			RES,FXD,FILM:576 OHM,1%,0.2W,TC=T0,SMALL BODY	91637	CCF50G576R0F
A3R571	322-3218-00			RES,FXD:METAL FILM:1.82K OHM,1%,0.2W,TC=100	91637	CCF501G18200F
A3R572	322-3066-00			RES,FXD:METAL FILM:47.5 OHM,1%,0.2W,TC=100 PPM	09969	CCF502G47R50F
A3R573	322-3314-00			RES,FXD:METAL FILM:18.2K OHM,1%,0.2W,TC=100	91637	CCF501G18201F
A3R574	322-3030-00			RES,FXD:METAL FILM:20 OHM,1%,0.2W,TC=100 PPM	91637	CCF50G20R00F
A3R575	322-3030-00			RES,FXD:METAL FILM:20 OHM,1%,0.2W,TC=100 PPM	91637	CCF50G20R00F
A3R576	322-3030-00			RES,FXD:METAL FILM:20 OHM,1%,0.2W,TC=100 PPM	91637	CCF50G20R00F
A3R577	322-3385-00			RES,FXD:METAL FILM:100K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10002F
A3R578	322-3289-00			RES,FXD:METAL FILM:10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A3R579	322-3185-00			RES,FXD:METAL FILM:825 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G825ROF
A3R580	311-2232-00			RES,VAR,TRMR:CERMET;2K OHM,20%,0.5W,0.197 SQ, TOP ADJUST	TK2073	GF06UT2 202 M L
A3R581	322-3066-00			RES,FXD:METAL FILM:47.5 OHM,1%,0.2W,TC=100 PPM	09969	CCF502G47R50F
A3R582	322-3205-00			RES,FXD,FILM:1.33K OHM,1%,0.2W,TC=T0	91637	CCF501G13300F
A3R583	322-3222-00			RES,FXD:METAL FILM:2K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20000F
A3R584	311-2228-00			RES,VAR,TRMR:CERMET;200 OHM,20%,0.5W,0.197 SQ, TOP ADJUST	TK2073	GF06UT2 201 M L
A3R585	322-3311-00			RES,FXD,FILM:16.9K OHM,1%,0.2W,TC=TOMI,SMALL BODY	56845	CCF-50-2-1692F
A3R586	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A3R590	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A3R591	322-3273-00			RES,FXD:METAL FILM:6.81K OHM,1%,0.2W,TC=100	91637	CCF50-2-G68100F
A3R593	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A3R594	322-3250-00			RES,FXD:METAL FILM:3.92K OHM,1%,0.2W,TC=100	91637	CCF50-2F39200F
A3R595	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A3R596	322-3210-00			RES,FXD:METAL FILM:1.5K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G15000F
A3R597	322-3306-00			RES,FXD:METAL FILM:15K OHM,1%,0.2W,TC=100 PPM	91637	CCF50-2-G1502F
A3R598	315-0106-00			RES,FXD,FILM:10M OHM,5%,0.25W	TK1727	SFR25 2322-181-
A3R621	322-3367-00			RES,FXD,FILM:64.9K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF50-2-G64901F
A3R622	322-3367-00			RES,FXD,FILM:64.9K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF50-2-G64901F
A3R628	311-2348-00			RES,VAR,NONWWW:PNL,25K OHM,10%,0.5WLINEAR	12697	CM45227
A3R628	366-0649-00			KNOB:GY,0.127 ID X 0.392 OD X 0.5 H	80009	366064900
A3R628	376-0051-01			CPLG,SHAFT,FLEX:0.127 ID X 0.375 OD,DELTRIN	TK2562	376-0051-01
A3R628	384-1065-00			EXTENSION SHAFT:3.485 L X 0.125 OD,AL	80009	384106500
A3R632	322-3222-00			RES,FXD:METAL FILM:2K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20000F
A3R634	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A3R635	322-3306-00			RES,FXD:METAL FILM:15K OHM,1%,0.2W,TC=100 PPM	91637	CCF50-2-G1502F
A3R636	322-3030-00			RES,FXD:METAL FILM:20 OHM,1%,0.2W,TC=100 PPM	91637	CCF50G20R00F
A3R637	322-3066-00			RES,FXD:METAL FILM:47.5 OHM,1%,0.2W,TC=100 PPM	09969	CCF502G47R50F
A3R638	322-3266-00			RES,FXD,FILM:5.76K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G57600F
A3R639	322-3250-00			RES,FXD:METAL FILM:3.92K OHM,1%,0.2W,TC=100	91637	CCF50-2F39200F
A3R640	322-3237-00			RES,FXD,FILM:2.87K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G28700F
A3R641	322-3266-00			RES,FXD,FILM:5.76K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G57600F
A3R642	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A3R643	322-3250-00			RES,FXD:METAL FILM:3.92K OHM,1%,0.2W,TC=100	91637	CCF50-2F39200F
A3R644	322-3126-00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=TOMI,SMALLBODY	91637	CCF501G200ROF
A3R645	322-3246-00			RES,FXD,FILM:3.57K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G35700F
A3R646	322-3281-00			RES,FXD:METAL FILM:8.25K OHM,1%,0.2W,TC=100	91637	CCF501G82500F
A3R647	322-3185-00			RES,FXD:METAL FILM:825 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G825ROF
A3R648	322-3250-00			RES,FXD:METAL FILM:3.92K OHM,1%,0.2W,TC=100	91637	CCF50-2F39200F
A3R649	322-3189-00			RES,FXD,FILM:909 OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G909FOR
A3R650	322-3268-00			RES,FXD,FILM:6.04K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G60400F



Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A3R652	322-3289-00			RES,FXD:METAL FILM;10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A3R654	311-2231-00			RES,VAR,TRMR:CERMET;1K OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 102 M L
A3R655	311-2232-00			RES,VAR,TRMR:CERMET;2K OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 202 M L
A3R666	322-3193-00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A3R667	322-3193-00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A3R672	322-3243-00			RES,FXD:METAL FILM;3.32K OHM,1%,0.2W,TC=100	91637	CCF50-1-G33200F
A3R673	322-3243-00			RES,FXD:METAL FILM;3.32K OHM,1%,0.2W,TC=100	91637	CCF50-1-G33200F
A3R675	322-3097-00			RES,FXD:METAL FILM;100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A3R680	322-3346-00			RES,FXD:METAL FILM;39.2K OHM,1%,0.2W,TC=100	91637	CCF50-2-G39201F
A3R683	322-3264-00			RES,FXD,FILM:5.49K OHM,1%,0.2W,TC=T0	91637	CCF501G54900F
A3R684	322-3231-00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50-1G24900F
A3R689	311-2238-00			RES,VAR,TRMR:CERMET;50K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST	TK2073	GF06UT2 503 M L
A3R690	322-3193-00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A3R691	322-3306-00			RES,FXD:METAL FILM;15K OHM,1%,0.2W,TC=100 PPM	91637	CCF50-2-G1502F
A3R692	315-0106-00			RES,FXD,FILM:10M OHM,5%,0.25W	TK1727	SFR25 2322-181-
A3R693	315-0305-00			RES,FXD,FILM:3M OHM,5%,0.25W	TK1727	SFR25 2322-181-
A3R694	322-3457-00			RES,FXD,FILM:562K OHM,1%,0.2W,TC=T0MI,SMALL	91637	CCF50-2F56202F
A3R696	322-3306-00			RES,FXD:METAL FILM;15K OHM,1%,0.2W,TC=100 PPM	91637	CCF50-2-G1502F
A3R697	322-3154-00			RES,FXD:METAL FILM;392 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G392R0F
A3R698	322-3193-00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A3R699	322-3457-00			RES,FXD,FILM:562K OHM,1%,0.2W,TC=T0MI,SMALL	91637	CCF50-2F56202F
A3R704	322-3290-00			RES,FXD,FILM:10.2K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G10201F
A3R705	322-3402-00			RES,FXD:METAL FILM;150K OHM,1%,0.2W,TC=100PPM	91637	CCF50G15002F
A3R719	322-3288-00			RES,FXD,FILM:9.76K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G97600F
A3R720	322-3228-00			RES,FXD,FILM:2.32K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50-1G2320F
A3R728	311-2348-00			RES,VAR,NONWWW:P/NL,25K OHM,10%,0.5WLINEAR	12697	CM45227
				*ATTACHED PARTS*		
	366-0649-00			KNOB:GY,0.127 ID X 0.392 OD X 0.5 H	80009	366064900
	376-0051-01			CPLG,SHAFT,FLEX:0.127 ID X 0.375 OD,DELTRIN	TK2562	376-0051-01
	384-1065-00			EXTENSION SHAFT:3.485 L X 0.125 OD,AL	80009	384106500
				*END ATTACHED PARTS*		
A3R729	322-3222-00			RES,FXD:METAL FILM;2K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20000F
A3R730	322-3258-00			RES,FXD:METAL FILM;4.75K OHM,1%,0.2W,TC=100	56845	CCF50-2-G4751FT
A3R733	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225L	24546	OMA0207
A3R734	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225L	24546	OMA0207
A3R735	311-2235-00			RES,VAR,TRMR:CERMET;10K OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 103 M L
A3R736	322-3306-00			RES,FXD:METAL FILM;15K OHM,1%,0.2W,TC=100 PPM	91637	CCF50-2-G1502F
A3R737	322-3210-00			RES,FXD:METAL FILM;1.5K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G15000F
A3R738	322-3066-00			RES,FXD:METAL FILM;47.5 OHM,1%,0.2W,TC=100 PPM	09969	CCF502G47R50F
A3R740	322-3191-00			RES,FXD,FILM:953 OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G953R0F
A3R741	322-3294-00			RES,FXD,FILM:11.3K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50G1132FT
A3R743	322-3097-00			RES,FXD:METAL FILM;100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A3R745	322-3258-00			RES,FXD:METAL FILM;4.75K OHM,1%,0.2W,TC=100	56845	CCF50-2-G4751FT
A3R746	322-3193-00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A3R750	322-3143-00			RES,FXD,FILM:301 OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G301R0F
A3R751	322-3267-00			RES,FXD,FILM:5.9K OHM,1%,0.2W,TC=T0MI,SMALL	56845	CCF50-2-G5901FT
A3R752	322-3262-00			RES,FXD,FILM:5.23K OHM,1%,0.2W,TC=T0	91637	CCF50G52300F
A3R753	322-3260-00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	91637	CCF501G49900F
A3R754	322-3151-00			RES,FXD,FILM:365 OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G365R0F
A3R755	322-3143-00			RES,FXD,FILM:301 OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G301R0F
A3R756	322-3267-00			RES,FXD,FILM:5.9K OHM,1%,0.2W,TC=T0MI,SMALL	56845	CCF50-2-G5901FT
A3R757	322-3030-00			RES,FXD:METAL FILM;20 OHM,1%,0.2W,TC=100 PPM	91637	CCF50G20R00F
A3R758	322-3193-00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A3R759	322-3210-00			RES,FXD:METAL FILM;1.5K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G15000F

## Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A3R760	322-3216-00			RES,FXD,FILM:1.74K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G17400F
A3R761	322-3227-00			RES,FXD,FILM:2.26K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF502G2261FT
A3R762	322-3277-00			RES,FXD,FILM:7.5K OHM,1%,0.2W,TC=T0,SMALL BODY	91637	CCF501G75000F
A3R764	322-3226-00			RES,FXD:METAL FILM:2.21K OHM,1%,0.2W,TC=100	91637	CCF501G22100F
A3R765	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A3R766	322-3289-00			RES,FXD:METAL FILM:10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A3R767	322-3277-00			RES,FXD,FILM:7.5K OHM,1%,0.2W,TC=T0,SMALL BODY	91637	CCF501G75000F
A3R768	322-3314-00			RES,FXD:METAL FILM:18.2K OHM,1%,0.2W,TC=100	91637	CCF501G18201F
A3R769	322-3153-00			RES,FXD,FILM:383 OHM,1%,0.2W,TC=TOMI,SMALL BODY	57668	CRB20 FXE383
A3R770	322-3153-00			RES,FXD,FILM:383 OHM,1%,0.2W,TC=TOMI,SMALL BODY	57668	CRB20 FXE383
A3R771	322-3273-00			RES,FXD:METAL FILM:6.81K OHM,1%,0.2W,TC=100	91637	CCF50-2-G68100F
A3R772	322-3248-00			RES,FXD,FILM:3.74K OHM,1%,0.2W,TC=T0	91637	CCF50G37400F
A3R774	322-3373-00			RES,FXD,FILM:75K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G75001F
A3R775	307-1033-00			RES,FXD,FILM:1.2K OHM,1%,3W	91637	CPF-3-1201FT-2
A3R776	322-3126-00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G200ROF
A3R790	315-0106-00			RES,FXD,FILM:10M OHM,5%,0.25W	TK1727	SFR25 2322-181-
A3R791	322-3306-00			RES,FXD:METAL FILM:15K OHM,1%,0.2W,TC=100 PPM	91637	CCF50-2-G1502F
A3R792	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A3R793	322-3210-00			RES,FXD:METAL FILM:1.5K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G15000F
A3R794	322-3306-00			RES,FXD:METAL FILM:15K OHM,1%,0.2W,TC=100 PPM	91637	CCF50-2-G1502F
A3R795	322-3322-00			RES,FXD:METAL FILM:22.1K OHM,1%,0.2W,TC=100	91637	CCF501G22101F
A3R796	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A3R797	315-0305-00			RES,FXD,FILM:3M OHM,5%,0.25W	TK1727	SFR25 2322-181-
A3R798	315-0106-00			RES,FXD,FILM:10M OHM,5%,0.25W	TK1727	SFR25 2322-181-
A3R799	322-3354-00			RES,FXD:METAL FILM:47.5K OHM,1%,0.2W,TC=100	91637	CCF501G47501F
A3R800	311-2269-00			RES,VAR,NONWWW:TRMR,20K OHM,20%,0.5W,LINEAR,MI	TK2073	GF06VT2 203 M L
A3R820	322-3289-00			RES,FXD:METAL FILM:10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A3R821	322-3289-00			RES,FXD:METAL FILM:10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A3R822	322-3289-00			RES,FXD:METAL FILM:10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A3R823	322-3289-00			RES,FXD:METAL FILM:10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A3R824	322-3289-00			RES,FXD:METAL FILM:10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A3R828	322-3309-00			RES,FXD,FILM:16.2K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF50-2-G16201F
A3R829	322-3309-00			RES,FXD,FILM:16.2K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF50-2-G16201F
A3R830	311-2234-00			RES,VAR,TRMR:CERMET;5K OHM,20%,0.5W,0.197 SQ, TOP ADJUST	TK2073	GF06UT2 502 M L
A3R834	311-2237-00			RES,VAR,TRMR:CERMET;25K OHM,20%,0.5W,0.197 SQ, SIDE ADJUST	TK2073	GF06UT2 253 M L
A3R835	322-3284-00			RES,FXD,FILM:8.87K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G88700F
A3R836	322-3418-00			RES,FXD:METAL FILM:221K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G22102F
A3R837	322-3231-00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF50-1G24900F
A3R838	322-3210-00			RES,FXD:METAL FILM:1.5K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G15000F
A3R839	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A3R840	322-3173-00			RES,FXD,FILM:619 OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF50-2F619R0F
A3R841	322-3222-00			RES,FXD:METAL FILM:2K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20000F
A3R842	322-3318-00			RES,FXD:METAL FILM:20K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20001F
A3R843	322-3302-00			RES,FXD,FILM:13.7K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF502G13701F
A3R844	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A3R845	322-3289-00			RES,FXD:METAL FILM:10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A3R847	322-3030-00			RES,FXD:METAL FILM:20 OHM,1%,0.2W,TC=100 PPM	91637	CCF50G20R00F
A3R849	322-3143-00			RES,FXD,FILM:301 OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G301R0F
A3R850	322-3356-00			RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G49901F
A3R851	322-3356-00			RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G49901F
A3R852	322-3126-00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G200ROF
A3R853	322-3126-00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G200ROF
A3R854	322-3356-00			RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G49901F
A3R855	322-3356-00			RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G49901F
A3R856	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A3R857	322-3261-00			RES,FXD,FILM:5.11K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF50G5111FT

Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A3R858	322-3281-00			RES,FXD:METAL FILM:8.25K OHM,1%,0.2W,TC=100	91637	CCF501G82500F
A3R859	322-3206-00			RES,FXD,FILM:1.37K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G13700F
A3R860	322-3481-00			RES,FXD,FILM:1M OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G10003F
A3R861	322-3295-00			RES,FXD:METAL FILM:11.5K OHM,1%,0.2W,TC=100	91637	CCF50G11501F
A3R862	311-2236-00			RES,VAR,TRMR:CERMET:20K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST	TK2073	GF06UT2 203 M L
A3R863	322-3481-00			RES,FXD,FILM:1M OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G10003F
A3R864	322-3206-00			RES,FXD,FILM:1.37K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G13700F
A3R865	322-3215-00			RES,FXD,FILM:1.69K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50-2F16900F
A3R866	322-3215-00			RES,FXD,FILM:1.69K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50-2F16900F
A3R867	322-3277-00			RES,FXD,FILM:7.5K OHM,1%,0.2W,TC=T0,SMALL BODY	91637	CCF501G75000F
A3R868	322-3030-00			RES,FXD:METAL FILM:20 OHM,1%,0.2W,TC=100 PPM	91637	CCF50G20R00F
A3R869	322-3281-00			RES,FXD:METAL FILM:8.25K OHM,1%,0.2W,TC=100	91637	CCF501G82500F
A3R870	322-3077-00			RES,FXD,FILM:61.9 OHM,1%,0.2W,TC=T0MI,SMALL	91637	CCF501G61R90F
A3R871	322-3066-00			RES,FXD:METAL FILM:47.5 OHM,1%,0.2W,TC=100 PPM	09969	CCF502G47R50F
A3R872	311-2230-00			RES,VAR,TRMR:CERMET:500 OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 501 M L
A3R873	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A3R875	307-1033-00			RES,FXD,FILM:1.2K OHM,1%,3W	91637	CPF-3-1201FT-2
A3R876	322-3001-00			RES,FXD:METAL FILM:10 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10R00F
A3R878	322-3306-00			RES,FXD:METAL FILM:15K OHM,1%,0.2W,TC=100 PPM	91637	CCF50-2-G1502F
A3R879	322-3289-00			RES,FXD:METAL FILM:10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A3R890	311-2232-00			RES,VAR,TRMR:CERMET:2K OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 202 M L
A3R891	322-3239-00			RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G30100F
A3R892	322-3281-00			RES,FXD:METAL FILM:8.25K OHM,1%,0.2W,TC=100	91637	CCF501G82500F
A3R893	322-3239-00			RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G30100F
A3R895	322-3289-00			RES,FXD:METAL FILM:10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A3R896	322-3330-00			RES,FXD,FILM:26.7K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G26701F
A3R897	322-3222-00			RES,FXD:METAL FILM:2K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20000F
A3R898	322-3306-00			RES,FXD:METAL FILM:15K OHM,1%,0.2W,TC=100 PPM	91637	CCF50-2-G1502F
A3R924	322-3289-00			RES,FXD:METAL FILM:10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A3R925	322-3289-00			RES,FXD:METAL FILM:10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A3R926	322-3289-00			RES,FXD:METAL FILM:10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A3R930	311-2234-00			RES,VAR,TRMR:CERMET:5K OHM,20%,0.5W,0.197 SQ,TOP ADJUST	TK2073	GF06UT2 502 M L
A3R936	322-3248-00			RES,FXD,FILM:3.74K OHM,1%,0.2W,TC=T0	91637	CCF50G37400F
A3R937	322-3302-00			RES,FXD,FILM:13.7K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF502G13701F
A3R940	322-3066-00			RES,FXD:METAL FILM:47.5 OHM,1%,0.2W,TC=100 PPM	09969	CCF502G47R50F
A3R941	322-3269-02			RES,FXD,FILM:6.19K OHM,0.2W,5%,TAPED & REELED	91637	CCF501D61900D
A3R942	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A3R944	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A3R947	322-3143-00			RES,FXD,FILM:301 OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G301ROF
A3R948	322-3151-00			RES,FXD,FILM:365 OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G365ROF
A3R953	322-3175-00			RES,FXD,FILM:649 OHM,1%,0.2W,TC=T0,SMALL BODY	91637	CCF50G649ROF
A3R955	322-3175-00			RES,FXD,FILM:649 OHM,1%,0.2W,TC=T0,SMALL BODY	91637	CCF50G649ROF
A3R956	322-3330-00			RES,FXD,FILM:26.7K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G26701F
A3R958	322-3243-00			RES,FXD:METAL FILM:3.32K OHM,1%,0.2W,TC=100	91637	CCF50-1-G33200F
A3R959	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A3R960	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100ROF
A3R963	322-3277-00			RES,FXD,FILM:7.5K OHM,1%,0.2W,TC=T0,SMALL BODY	91637	CCF501G75000F
A3R964	322-3272-00			RES,FXD,FILM:6.65K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50-2-G66500F
A3R965	322-3030-00			RES,FXD:METAL FILM:20 OHM,1%,0.2W,TC=100 PPM	91637	CCF50G20R00F
A3R966	322-3281-00			RES,FXD:METAL FILM:8.25K OHM,1%,0.2W,TC=100	91637	CCF501G82500F
A3R967	322-3215-00			RES,FXD,FILM:1.69K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50-2F16900F
A3R968	322-3207-00			RES,FXD,FILM:1.4K OHM,1%,0.2W,TC=T0MI,SMALL	91637	CCF501G14000F
A3R969	322-3260-00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	91637	CCF501G49900F
A3R970	322-3318-00			RES,FXD:METAL FILM:20K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20001F

## Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A3R972	322-3066-00			RES,FXD:METAL FILM;47.5 OHM,1%,0.2W,TC=100 PPM	09969	CCF502G47R50F
A3R976	322-3126-00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G200ROF
A3R991	322-3097-00			RES,FXD:METAL FILM;100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A3R992	322-3273-00			RES,FXD:METAL FILM;6.81K OHM,1%,0.2W,TC=100	91637	CCF50-2-G68100F
A3R993	322-3097-00			RES,FXD:METAL FILM;100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A3R994	322-3250-00			RES,FXD:METAL FILM;3.92K OHM,1%,0.2W,TC=100	91637	CCF50-2F39200F
A3R996	322-3097-00			RES,FXD:METAL FILM;100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A3R997	322-3097-00			RES,FXD:METAL FILM;100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A3U115	156-1225-00			IC,LINEAR:BIPOLAR,COMPARATOR;DUAL,OPEN COLLECTOR,300NS	01295	LM393P
A3U121	156-1955-00	672-0278-09	672-0278-11	IC,LINEAR:BIPOLAR,CURRENT MIRROR;1:1RATIO	80009	156195500
A3U139	156-1451-00			IC,LINEAR:BIPOLAR,VR;NEG,ADJUST,1.5A,4%	01295	LM337KC
A3U146	156-1161-00			IC,LINEAR:BIPOLAR,VR;POS,ADJUST,1.5A,4%	04713	LM317T
A3U174	156-3170-00			IC,MISC:CMOS,ANALOG SWITCH;QUAD SPST,75 OHM, T-SWITCH,RF/VIDEO	1ES66	IH5352CPE
A3U176	156-3170-00			IC,MISC:CMOS,ANALOG SWITCH;QUAD SPST,75 OHM, T-SWITCH,RF/VIDEO	1ES66	IH5352CPE
A3U191	156-0048-00			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY;(5),NPN, (1)DIFF PAIR,(3)IND,15V,50MA,300MHZ,AMPL	34371	CA3046
A3U264	156-3170-00			IC,MISC:CMOS,ANALOG SWITCH;QUAD SPST,75 OHM ,T-SWITCH,RF/VIDEO	1ES66	IH5352CPE
A3U293	156-0048-00			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY;(5),NPN, (1)DIFF PAIR,(3)IND,15V,50MA,300MHZ,AMPL	34371	CA3046
A3U419	156-1191-00			IC,LINEAR:BIFET,OP-AMP;DUAL	01295	TL072CP
A3U443	156-2460-00			IC,MISC:BIPOLAR,MOD/DEMODO;BALANCED	04713	MC1496P
A3U452	156-1191-00			IC,LINEAR:BIFET,OP-AMP;DUAL	01295	TL072CP
A3U458	156-1850-00			IC,MISC:CMOS,ANALOG SWITCH;QUAD	17856	DG211CJ
A3U479	156-2460-00			IC,MISC:BIPOLAR,MOD/DEMODO;BALANCED	04713	MC1496P
A3U485	156-1191-00			IC,LINEAR:BIFET,OP-AMP;DUAL	01295	TL072CP
A3U493	156-0048-00			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY;(5),NPN, (1)DIFF PAIR,(3)IND,15V,50MA,300MHZ,AMPL	34371	CA3046
A3U495	156-1191-00			IC,LINEAR:BIFET,OP-AMP;DUAL	01295	TL072CP
A3U535	156-1225-00			IC,LINEAR:BIPOLAR,COMPARATOR;DUAL,OPEN COLLECTOR,300NS	01295	LM393P
A3U544	156-0259-00			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY;(5)NPN, INDEPENDENT,15V,100MA,300MHZ,AMPL	34371	CA3083
A3U574	156-0048-00			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY;(5),NPN, (1)DIFF PAIR,(3)IND,15V,50MA,300MHZ,AMPL	34371	CA3046
A3U588	156-1850-00			IC,MISC:CMOS,ANALOG SWITCH;QUAD	17856	DG211CJ
A3U615	156-0509-00			IC,CONVERTER:BIPOLAR,D/A;8 BIT,400NS, MULTIPLYING, CURRENT OUTPUT	1CH66	MC1408-8N
A3U619	156-1191-00			IC,LINEAR:BIFET,OP-AMP;DUAL	01295	TL072CP
A3U658	156-2910-00			IC,MISC:CMOS,ANALOG MUX;DUAL SPDT,DIELECTRIC ISOLATED	34371	HI3-0303-5
A3U733	156-1312-00			IC,MISC:BIPOLAR,SAMPLE/HOLD;LOW DROOP RATE	24355	SMP11-004Y(STD)
A3U742	156-2460-00			IC,MISC:BIPOLAR,MOD/DEMODO;BALANCED	04713	MC1496P
A3U781	156-1850-00			IC,MISC:CMOS,ANALOG SWITCH;QUAD	17856	DG211CJ
A3U794	156-1191-00			IC,LINEAR:BIFET,OP-AMP;DUAL	01295	TL072CP
A3U826	156-1200-00			IC,LINEAR:BIFET,OP-AMP;QUAD	01295	TL074CN
A3U833	156-1312-00			IC,MISC:BIPOLAR,SAMPLE/HOLD;LOW DROOP RATE	24355	SMP11-004Y(STD)
A3U883	156-2614-00			IC,LINEAR:BIFET,OP-AMP;QUAD,DECOMPENSATED	04713	MC34085P
A3U893	156-0048-00			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY;(5),NPN, (1)DIFF PAIR,(3)IND,15V,50MA,300MHZ,AMPL	34371	CA3046
A3U981	156-1850-00			IC,MISC:CMOS,ANALOG SWITCH;QUAD	17856	DG211CJ
A3W438	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225L	24546	OMA0207
A3CR159	152-0141-02			DIODE,SIG:ULTRA FAST;40V,150MA,4NS,2PF	27014	FDH9427
A3CR190	152-0141-02			DIODE,SIG:ULTRA FAST;40V,150MA,4NS,2PF	27014	FDH9427
A3CR215	152-0400-00			DIODE,RECT:FAST RCVRY;400V,1A,200NS	0LUA3	1N4936
A3CR238	152-0066-00			DIODE,RECT:400V,1A,IFSM=30A,1.2VF,2US	0LUA3	1N5060

Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A3CR338	152-0066-00			DIODE,RECT:400V,1A,IFSM=30A,1.2VF,2US	0LUA3	1N5060
A3CR345	152-0066-00			DIODE,RECT:400V,1A,IFSM=30A,1.2VF,2US	0LUA3	1N5060
A3CR347	152-0066-00			DIODE,RECT:400V,1A,IFSM=30A,1.2VF,2US	0LUA3	1N5060
A3CR391	152-0141-02			DIODE,SIG:ULTRA FAST:40V,150MA,4NS,2PF	27014	FDH9427
A3CR414	152-0141-02			DIODE,SIG:ULTRA FAST:40V,150MA,4NS,2PF	27014	FDH9427
A3CR473	152-0141-02			DIODE,SIG:ULTRA FAST:40V,150MA,4NS,2PF	27014	FDH9427
A3CR533	152-0141-02			DIODE,SIG:ULTRA FAST:40V,150MA,4NS,2PF	27014	FDH9427
A3CR590	152-0141-02			DIODE,SIG:ULTRA FAST:40V,150MA,4NS,2PF	27014	FDH9427
A3CR634	152-0141-02			DIODE,SIG:ULTRA FAST:40V,150MA,4NS,2PF	27014	FDH9427
A3CR726	152-0141-02			DIODE,SIG:ULTRA FAST:40V,150MA,4NS,2PF	27014	FDH9427
A3CR727	152-0141-02			DIODE,SIG:ULTRA FAST:40V,150MA,4NS,2PF	27014	FDH9427
A3CR862	152-0141-02			DIODE,SIG:ULTRA FAST:40V,150MA,4NS,2PF	27014	FDH9427
A3CR865	152-0501-01			DIODE,SIG:FAST RCVRY:70V,200MA,100NS,COM-ANODE	04713	MSD6150RLRP
A3CR953	152-0141-02			DIODE,SIG:ULTRA FAST:40V,150MA,4NS,2PF	27014	FDH9427
A3CR965	152-0307-00			DIODE,SIG:ULTRA FAST:100V,4.0NS,1.5PF,DUAL	04713	MSD6100
A3CR991	152-0141-02			DIODE,SIG:ULTRA FAST:40V,150MA,4NS,2PF	27014	FDH9427
A3DS505	150-1185-00	672-0278-09	672-0278-09	LT EMITTING DIO:GREEN	95263	L613DG
A3DS505	150-1278-00	672-0278-10		DIODE,OPTO:LED:GRN,569NM,2MCD AT 5V,60 DEGHT AGL	50434	HLMP-1640-010
A3DS700	150-1184-00	672-0278-09	672-0278-09	LT EMITTING DIO:RED	95263	L613DR
A3DS700	150-1201-00	672-0278-10		DIO,OPTO:LED:HIG EFFIC. RED,635NM,INTEGRAL RES	50434	HLMP-1600-010
A3VR190	152-0166-00			DIODE,ZENER:6.2V,5%,0.4W	04713	1N5995BRL
A3VR366	152-0166-00			DIODE,ZENER:6.2V,5%,0.4W	04713	1N5995BRL
A3VR391	152-0166-00			DIODE,ZENER:6.2V,5%,0.4W	04713	1N5995BRL
A3VR591	152-0166-00			DIODE,ZENER:6.2V,5%,0.4W	04713	1N5995BRL
A3VR675	152-0166-00			DIODE,ZENER:6.2V,5%,0.4W	04713	1N5995BRL
A3VR675	152-0195-00			DIODE,ZENER:5.1V,5%,0.4W	14552	CD332125
A3VR840	152-0667-00			DIODE,ZENER:3V,2%,0.4W	04713	SZG30025RSL
A3VR948	152-0461-00			DIODE,SIG:6.2V,5%,0.4W	04713	1N821
A3VR992	152-0166-00			DIODE,ZENER:6.2V,5%,0.4W	04713	1N5995BRL
A3A1	671-1365-00			CIRCUIT BD ASSY:TRANSCODER STD (STANDARD ONLY)	80009	671136500
A3A1	671-1358-00			CIRCUIT BD ASSY:TRANSCODER OPT 10 (OPTION 10 ONLY)	80009	671135800
A3A1P180	-----			CONN,PLUG,ELEC:		
A3A1R782	321-1718-07	671-1358-00		RES,FXD,FILM:1.111K OHM,0.1%,0.125W,TC=T9	19701	5033RE1K111B
A3A1R782	321-0955-03	671-1365-00		RES,FXD,FILM:823 OHM,0.25%,0.125W,TC=T2 MI	07716	CEA 823OHM 0.25
A3A1R783	321-0257-00	671-1358-00		RES,FXD,FILM:4.64K OHM,1%,0.125W,TC=T0MI	19701	5043ED4K640F
A3A1R783	321-1704-03	671-1365-00		RES,FXD,FILM:2.386K OHM,0.25%,0.125W,TC=T2	91637	CMF55116D23860C
A3A1R784	321-1616-02	671-1358-00		RES,FXD,FILM:2.25K OHM,0.5%,0.125W,TC=T2	19701	5033RC2K250D
A3A1R784	321-0199-06	671-1365-00		RES,FXD,FILM:1.15K OHM,0.25%,0.125W,TC=T9	19701	5033RE1K150C
A3A1R785	315-0102-00	671-1358-00		RES,FXD,FILM:1K OHM,5%,0.25W	TK1727	SFR25 2322-181-
A3A1R785	315-0821-00	671-1365-00		RES,FXD,FILM:820 OHM,5%,0.25W	TK1727	SFR25 2322-181-
A3A1R786	321-0199-06	671-1358-00		RES,FXD,FILM:1.15K OHM,0.25%,0.125W,TC=T9	19701	5033RE1K150C
A3A1R786	322-0173-07	671-1365-00		RES,FXD,FILM:619 OHM,0.1%,0.125W	91637	CCF502C619R0B
A3A1R787	321-0210-07	671-1358-00		RES,FXD,METAL FILM:1.5K OHM,0.1%,0.125W,TC=25 PPM	91637	CMF55116C15000B
A3A1R787	321-1739-07	671-1365-00		RES,FXD,FILM:585.8 OHM,0.1%,0.125W	91637	CMF-55 116C585R
A3A1R788	322-3193-07	671-1358-00		RES,FXD,FILM:1K OHM,0.1%,0.2W,TC=T9	91637	CCF501C10000B
A3A1R788	321-1718-07	671-1365-00		RES,FXD,FILM:1.111K OHM,0.1%,0.125W,TC=T9	19701	5033RE1K111B
A3A1R882	321-0955-03	671-1358-00		RES,FXD,FILM:823 OHM,0.25%,0.125W,TC=T2 MI	07716	CEA 823OHM 0.25
A3A1R882	321-1173-03	671-1365-00		RES,FXD,FILM:626 OHM,5%,0.25W,TC=T2 MI	19701	5033RC626R0C
A3A1R884	315-0911-00	671-1358-00		RES,FXD,FILM:910 OHM,5%,0.25W	TK1727	SFR25 2322-181-
A3A1R884	315-0182-00	671-1365-00		RES,FXD,FILM:1.8K OHM,5%,0.25W	TK1727	SFR25 2322-181-
A3A1R885	322-3193-07	671-1358-00		RES,FXD,FILM:1K OHM,0.1%,0.2W,TC=T9	91637	CCF501C10000B
A3A1R885	321-1718-07	671-1365-00		RES,FXD,FILM:1.111K OHM,0.1%,0.125W,TC=T9	19701	5033RE1K111B
A3A1R886	321-1709-01	671-1358-00		RES,FXD,FILM:800 OHM,0.5%,0.125W,TC=T0MI	19701	5033RD800R0D
A3A1R886	321-1173-03	671-1365-00		RES,FXD,FILM:626 OHM,0.25%,0.125W,TC=T2 MI	19701	5033RC626R0C
A3A1R983	321-0698-00	671-1358-00		RES,FXD,FILM:1.89K OHM,0.25%,0.125W,TC=T9	19701	5033RE1K890C

## Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A3A1R983	321-0955-03	671-1365-00		RES,FXD,FILM:823 OHM,0.25%,0.125W,TC=T2 MI	07716	CEA 823OHM 0.25
A3A1R985	322-3193-07	671-1358-00		RES,FXD,FILM:1K OHM,0.1%,0.2W,TC=T9	91637	CCF501C10000B
A3A1R985	321-0955-03	671-1365-00		RES,FXD,FILM:823 OHM,0.25%,0.125W,TC=T2 MI	07716	CEA 823OHM 0.25
A3A1R986	321-0619-00	671-1358-00		RES,FXD,FILM:1.012K OHM,0.25%,0.125W,TC=T2	91637	CMF55116C10120C
A3A1R986	321-1739-07	671-1365-00		RES,FXD,FILM:585.8 OHM,0.1%,0.125W	91637	CMF-55 116C585R
A3A1R987	315-0102-00	671-1358-00		RES,FXD,FILM:1K OHM,5%,0.25W	TK1727	SFR25 2322-181-
A3A1R987	315-0132-00	671-1365-00		RES,FXD,FILM:1.3K OHM,5%,0.25W	TK1727	SFR25 2322-181-
A3A1R988	322-3222-07	671-1358-00		RES,FXD,FILM:2K OHM,0.1%,0.2W TC=T9,SMALL BODY	91637	CCF501C20000B
A3A1R988	321-1739-07	671-1365-00		RES,FXD,FILM:585.8 OHM,0.1%,0.125W	91637	CMF-55 116C585R
A3A2	671-1796-00			CIRCUIT BD ASSY:GRATICULE LIGHT	80009	671179600
A3A2J100	131-4530-00			CONN,HDR:PCB;MALE,STR,1 X 3,0.1 CTR,0.230 MLG X 0.120 TAIL,30GOLD,BD RETENTION	00779	104344-1
A3A2P100	131-3199-00			CONN,SHUNT:SHUNT;FEMALE,STR,1 X 2,0.1 CTR, 0.2 H,LOW PROFILE,JUMPER	22526	68786-202
A3A2P200	131-2790-00			CONN,HDR:PCB;MALE,RTANG,1 X 2,0.15CTR,0.230 MLG X 0.120 TAIL,30 GOLD	22526	65595-102
A3A2P800	131-2790-00			CONN,HDR:PCB;MALE,RTANG,1 X 2,0.15CTR,0.230 MLG X 0.120 TAIL,30 GOLD	22526	65595-102
A3A2DS100	150-0168-00			LAMP,INCAND:14V,0.08A,WEDGE BASE,T1.75FOR SKT MT *MOUNTING PARTS*	55335	73W
	136-1119-00			SOCKET,LPHLDR:PCB,LAMPHOLDER;FEMALE,STR, SINGLE,0.404 H X 0.218 TAIL,TIN,T-1.75 WEDGE BASE *END MOUNTING PARTS*	65654	CIC 7500 A-VALO
A3A2DS200	150-0168-00			LAMP,INCAND:14V,0.08A,WEDGE BASE,T1.75FOR SKT MT *MOUNTING PARTS*	55335	73W
	136-1119-00			SOCKET,LPHLDR:PCB,LAMPHOLDER;FEMALE,STR, SINGLE,0.404 H X 0.218 TAIL,TIN,T-1.75 WEDGE BASE *END MOUNTING PARTS*	65654	CIC 7500 A-VALO
A3A2DS300	150-0168-00			LAMP,INCAND:14V,0.08A,WEDGE BASE,T1.75FOR SKT MT *MOUNTING PARTS*	55335	73W
	136-1119-00			SOCKET,LPHLDR:PCB,LAMPHOLDER;FEMALE,STR, SINGLE,0.404 H X 0.218 TAIL,TIN,T-1.75 WEDGE BASE *END MOUNTING PARTS*	65654	CIC 7500 A-VALO
A4	671-1357-02	B020000	B024324	CIRCUIT BD ASSY:CONTROL	80009	671135702
A4	671-1357-03	B024325	B024877	CIRCUIT BD ASSY:CONTROL	80009	671135703
A4	671-1357-04	B024878		CIRCUIT BD ASSY:CONTROL	80009	671135704
A4C133	290-0974-03			CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A4C135	290-0973-00			CAP,FXD,ELCTLT:100UF,20%,25VDC	0H1N5	CEUSM1E101
A4C148	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A4C172	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A4C173	281-0759-00			CAP,FXD,CERAMIC:MLC:22PF,10%,100V,0.100 X 0.170	04222	SA102A220KAA
A4C178	281-0759-00			CAP,FXD,CERAMIC:MLC:22PF,10%,100V,0.100 X 0.170	04222	SA102A220KAA
A4C192	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A4C197	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A4C198	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A4C200	283-0059-00			CAP,FXD,CER DI:1UF,+80-20%,50V	04222	SR305C105MAA
A4C206	283-0059-00			CAP,FXD,CER DI:1UF,+80-20%,50V	04222	SR305C105MAA
A4C216	283-0790-00			CAP,FXD,MICA DI:850PF,1%,500V	TK0891	RDM19FD851F03
A4C220	283-0790-00			CAP,FXD,MICA DI:850PF,1%,500V	TK0891	RDM19FD851F03
A4C222	283-0790-00			CAP,FXD,MICA DI:850PF,1%,500V	TK0891	RDM19FD851F03
A4C223	283-0790-00			CAP,FXD,MICA DI:850PF,1%,500V	TK0891	RDM19FD851F03
A4C226	283-0790-00			CAP,FXD,MICA DI:850PF,1%,500V	TK0891	RDM19FD851F03
A4C227	283-0630-00			CAP,FXD,MICA DI:110PF,1%,100V	TK0891	RDM15FD111F03
A4C228	283-0645-00			CAP,FXD,MICA DI:790PF,1%,300V	TK0891	RDM15FC791F03
A4C232	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A4C238	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A4C258	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA

Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A4C273	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A4C297	290-0973-00			CAP,FXD,ELCTLT:100UF,20%,25VDC	0H1N5	CEUSM1E101
A4C309	281-0763-00			CAP,FXD,CERAMIC:MLC;47PF,10%,100V,0.100 X 0.170	04222	SA102A470KAA
A4C321	283-0790-00			CAP,FXD,MICA DI:850PF,1%,500V	TK0891	RDM19FD851F03
A4C322	283-0790-00			CAP,FXD,MICA DI:850PF,1%,500V	TK0891	RDM19FD851F03
A4C330	281-0774-00			CAP,FXD,CER DI:0.022MFD,20%,100V	04222	SA101E223MAA
A4C337	290-0974-03			CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A4C338	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A4C368	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A4C375	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A4C404	283-0790-00			CAP,FXD,MICA DI:850PF,1%,500V	TK0891	RDM19FD851F03
A4C406	283-0634-00			CAP,FXD,MICA DI:65PF,1%,100V	TK0891	RDM15ED650F03
A4C410	281-0786-00			CAP,FXD,CERAMIC:MLC;150PF,10%,100V,0.100 X0.170	04222	SA101A151KAA
A4C412	281-0763-00			CAP,FXD,CERAMIC:MLC;47PF,10%,100V,0.100 X 0.170	04222	SA102A470KAA
A4C422	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A4C424	281-0898-00			CAP,FXD,CER DI:7.5PF,+/-0.5PF,500VTUBULAR,MI	04222	MA107A7R5DAA
A4C437	281-0819-00			CAP,FXD,CERAMIC:MLC;33 PF,5%,50V,0.100 X 0.170	04222	SA102A330JAA
A4C438	281-0819-00			CAP,FXD,CERAMIC:MLC;33 PF,5%,50V,0.100 X 0.170	04222	SA102A330JAA
A4C452	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A4C488	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A4C497	290-0848-00			CAP,FXD,ALUM:47UF,+100%-20%,16V,NONPOLAR,0.681X0.414	0H1N5	CEBPM1E470M
A4C498	290-0974-03			CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A4C506	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A4C507	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A4C508	281-0762-00			CAP,FXD,CERAMIC:MCL;27PF,10%,100V,NPO,0.100	04222	SA102A270KAA
A4C514	281-0773-00			CAP,FXD,CERAMIC:MLC;0.01UF,10%,100V,,	TK1743	CGB103KEX
A4C515	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A4C518	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A4C520	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A4C521	283-0194-00			CAP,FXD,CER DI:4.7UF,20%,50V	04222	SR505E475MAA
A4C527	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A4C538	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A4C555	281-0775-01			CAP,FXD,CERAMIC:MCL;0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A4J131	131-2949-00			CONN,DIN:PCB;MALE,RTANG,2 X 16,0.1 CTR,0.210 MLG X 0.118 TAIL,1/2C,BD RETENTION	58050	078-32C14-290
A4J161	131-2949-00			CONN,DIN:PCB;MALE,RTANG,2 X 16,0.1 CTR,0.210 MLG X 0.118 TAIL,1/2C,BD RETENTION	58050	078-32C14-290
A4J295	131-3364-00			CONN,HDR:PCB;MALE,STR,2 X 17,0.1 CTR,0.365D	53387	2534-6002UB
A4J303	131-3718-00			CONN,HDR:PCB;MALE,STR,2 X 5,0.1 CTR,0.385H X 0.120 TAIL,SHRD/4 SIDES,CTR PLZ,30 GOLD,0.150 END DIM	TK1462	FAP-10-08-4-OAS
A4J352	131-3152-00			CONN,HDR:PCB;MALE,STR,2 X 8,0.1 CTR,0.365 H X 0.112 TAIL,SHRD/4 SIDES,CTR PLZ,30 GOLD	53387	2516-6002UB
A4J419	131-4794-00			CONN,HDR:PCB;MALE,STR,1 X 2,0.1 CTR,0.235 MLG X 0.112 TAIL,30GOLD,0.035 DIA PCB	53387	2402-6112 UB
A4J498	131-4794-00			CONN,HDR:PCB;MALE,STR,1 X 2,0.1 CTR,0.235 MLG X 0.112 TAIL,30GOLD,0.035 DIA PCB	53387	2402-6112 UB
A4P350	131-3199-00			CONN,SHUNT:SHUNT;FEMALE,STR,1 X 2,0.1 CTR,0.2 H,LOW PROFILE,JUMPER	22526	68786-202
A4P351	131-3199-00			CONN,SHUNT:SHUNT;FEMALE,STR,1 X 2,0.1 CTR,0.2 H,LOW PROFILE,JUMPER	22526	68786-202
A4Q210	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ,AMPL	04713	2N3906
A4Q211	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ,AMPL	04713	2N3906
A4Q297	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ,AMPL	04713	2N3904
A4Q298	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ,AMPL	04713	2N3904
A4Q411	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ,AMPL	04713	2N3904
A4Q423	151-0190-00	671-1357-04		TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ,AMPL	04713	2N3904
A4Q426	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ,AMPL	04713	2N3904
A4Q428	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ,AMPL	04713	2N3904

## Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A4Q437	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ,AMPL	04713	2N3904
A4Q509	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ,AMPL	04713	2N3904
A4Q525	151-0190-00	671-1357-04		TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ,AMPL	04713	2N3904
A4Q526	151-0190-00	671-1357-04		TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ,AMPL	04713	2N3904
A4Q572	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ,AMPL	04713	2N3906
A4R126	322-3402-00			RES,FXD:METAL FILM;150K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G15002F
A4R130	322-3412-00			RES,FXD,FILM:191K OHM,1%,0.2W,TC=T0MI,SMALL	91637	CCF501G19102F
A4R131	322-3412-00			RES,FXD,FILM:191K OHM,1%,0.2W,TC=T0MI,SMALL	91637	CCF501G19102F
A4R197	322-3126-00	671-1357-02	671-1357-03	RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G200ROF
A4R197	322-3322-00	671-1357-04		RES,FXD:METAL FILM;22.1K OHM,1%,0.2W,TC=100	91637	CCF501G22101F
A4R198	322-3126-00	671-1357-02	671-1357-03	RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G200ROF
A4R198	322-3322-00	671-1357-04		RES,FXD:METAL FILM;22.1K OHM,1%,0.2W,TC=100	91637	CCF501G22101F
A4R199	322-3322-00	671-1357-04		RES,FXD:METAL FILM;22.1K OHM,1%,0.2W,TC=100	91637	CCF501G22101F
A4R200	322-3168-00			RES,FXD,FILM:549 OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50-2F549ROF
A4R201	322-3168-00			RES,FXD,FILM:549 OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50-2F549ROF
A4R202	322-3481-00			RES,FXD,FILM:1M OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G10003F
A4R203	322-3269-02			RES,FXD,FILM:6.19K OHM,0.2W,5%TAPED & REELED	91637	CCF501D61900D
A4R204	322-3357-00			RES,FXD,FILM:51.1K OHM,1%,0.2W,TC=TO	91637	CCF501G51101F
A4R205	322-3373-00			RES,FXD,FILM:75K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G75001F
A4R206	311-2273-00			RES,VAR,TRMR:CERMET;2K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST	TK2073	GF06VT2 202 M L
A4R207	311-2273-00			RES,VAR,TRMR:CERMET;2K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST	TK2073	GF06VT2 202 M L
A4R208	322-3193-00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A4R209	322-3114-00			RES,FXD:METAL FILM;150 OHM,1%,0.2W,TC=100 PPM	91637	CCF50-2-G1500F
A4R210	322-3437-00			RES,FXD,FILM:348K OHM,1%,0.2W,TC=T0MI,SMALL	91637	CCF501G34802F
A4R211	322-3193-00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A4R212	322-3222-00			RES,FXD:METAL FILM;2K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20000F
A4R213	322-3289-00			RES,FXD:METAL FILM;10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A4R214	322-3322-00	671-1357-04		RES,FXD:METAL FILM;22.1K OHM,1%,0.2W,TC=100	91637	CCF501G22101F
A4R215	322-3481-00			RES,FXD,FILM:1M OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G10003F
A4R216	322-3226-00			RES,FXD:METAL FILM;2.21K OHM,1%,0.2W,TC=100	91637	CCF501G22100F
A4R217	322-3289-00	671-1357-04		RES,FXD:METAL FILM;10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A4R218	311-2269-00			RES,VAR,MONWW:TRMR,20K OHM,20%,0.5WLINEAR,MI	TK2073	GF06VT2 203 M L
A4R219	322-3297-00			RES,FXD:METAL FILM;12.1K OHM,1%,0.2W,TC=100	91637	CCF501G12101F
A4R221	322-3289-00	671-1357-04		RES,FXD:METAL FILM;10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A4R222	322-3326-00			RES,FXD,FILM:24.3K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50-2F24301F
A4R224	322-3236-00			RES,FXD,FILM:2.8K OHM,1%,0.2W,TC=T0MI,SMALL	91637	CCF501G28000F
A4R227	322-3236-00			RES,FXD,FILM:2.8K OHM,1%,0.2W,TC=T0MI,SMALL	91637	CCF501G28000F
A4R232	322-3254-00			RES,FXD,FILM:4.32K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF502G4321FT
A4R233	322-3251-00			RES,FXD,FILM:4.02K OHM,1%,0.2W,TC=TO	91637	CCF501G40200F
A4R234	322-3402-00			RES,FXD:METAL FILM;150K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G15002F
A4R235	322-3402-00			RES,FXD:METAL FILM;150K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G15002F
A4R236	322-3326-00			RES,FXD,FILM:24.3K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50-2F24301F
A4R246	307-0446-00			RES NTWK,FXD,FI:10K OHM,20%,(9)RES	11236	750-101-R10K
A4R252	307-0446-00			RES NTWK,FXD,FI:10K OHM,20%,(9)RES	11236	750-101-R10K
A4R297	322-3001-00			RES,FXD:METAL FILM;10 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10R00F
A4R300	322-3481-00			RES,FXD,FILM:1M OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G10003F
A4R301	322-3258-00			RES,FXD:METAL FILM;4.75K OHM,1%,0.2W,TC=100	56845	CCF50-2-G4751FT
A4R309	322-3273-00			RES,FXD:METAL FILM;6.81K OHM,1%,0.2W,TC=100	91637	CCF50-2-G68100F
A4R313	322-3300-02			RES,FXD,FILM:13K OHM,0.5%,0.2W,TC=T2	91637	CCF501D13001D
A4R314	322-3273-00			RES,FXD:METAL FILM;6.81K OHM,1%,0.2W,TC=100	91637	CCF50-2-G68100F
A4R315	322-3226-00			RES,FXD:METAL FILM;2.21K OHM,1%,0.2W,TC=100	91637	CCF501G22100F
A4R321	322-3297-00			RES,FXD:METAL FILM;12.1K OHM,1%,0.2W,TC=100	91637	CCF501G12101F
A4R322	322-3287-00			RES,FXD,FILM:9.53K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50G95300F
A4R330	322-3385-00			RES,FXD:METAL FILM;100K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10002F
A4R337	322-3289-00			RES,FXD:METAL FILM;10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A4R348	322-3193-00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F



Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A4R352	322-3289-00			RES,FXD:METAL FILM;10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A4R360	307-0446-00			RES NTWK,FXD,FI:10K OHM,20%,(9)RES	11236	750-101-R10K
A4R361	322-3289-00			RES,FXD:METAL FILM;10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A4R382	322-3193-00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A4R383	322-3193-00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A4R384	322-3193-00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A4R385	322-3193-00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A4R386	322-3097-00			RES,FXD:METAL FILM;100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A4R387	322-3097-00			RES,FXD:METAL FILM;100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A4R388	322-3097-00			RES,FXD:METAL FILM;100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A4R389	322-3097-00			RES,FXD:METAL FILM;100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A4R390	322-3097-00			RES,FXD:METAL FILM;100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A4R397	322-3306-00			RES,FXD:METAL FILM;15K OHM,1%,0.2W,TC=100 PPM	91637	CCF50-2-G1502F
A4R404	322-3264-00			RES,FXD,FILM:5.49K OHM,1%,0.2W,TC=T0	91637	CCF501G54900F
A4R405	322-3097-00			RES,FXD:METAL FILM;100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A4R406	322-3289-00			RES,FXD:METAL FILM;10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A4R408	322-3318-00			RES,FXD:METAL FILM;20K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20001F
A4R409	322-3289-00			RES,FXD:METAL FILM;10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A4R410	322-3258-00			RES,FXD:METAL FILM:4.75K OHM,1%,0.2W,TC=100	56845	CCF50-2-G4751FT
A4R411	322-3281-00			RES,FXD:METAL FILM;8.25K OHM,1%,0.2W,TC=100	91637	CCF501G82500F
A4R412	322-3281-00			RES,FXD:METAL FILM;8.25K OHM,1%,0.2W,TC=100	91637	CCF501G82500F
A4R413	322-3354-00			RES,FXD:METAL FILM;47.5K OHM,1%,0.2W,TC=100	91637	CCF501G47501F
A4R414	322-3250-00			RES,FXD:METAL FILM;3.92K OHM,1%,0.2W,TC=100	91637	CCF50-2F39200F
A4R415	322-3336-00			RES,FXD,FILM:30.9K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50-2F30901F
A4R416	322-3369-00			RES,FXD:METAL FILM;68.1K OHM,1%,0.2W,TC=100	57668	CRB20 FXE 68R1
A4R417	322-3289-00			RES,FXD:METAL FILM;10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A4R418	322-3336-00			RES,FXD,FILM:30.9K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50-2F30901F
A4R421	322-3294-00	671-1357-04		RES,FXD,FILM:11.3K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50G1132FT
A4R422	322-3318-00			RES,FXD:METAL FILM;20K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20001F
A4R423	322-3318-00	671-1357-02	671-1357-03	RES,FXD:METAL FILM;20K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20001F
A4R424	322-3193-00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A4R425	322-3193-00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A4R426	322-3097-00			RES,FXD:METAL FILM;100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A4R427	322-3126-00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G200R0F
A4R436	322-3193-00			RES,FXD:METAL FILM;1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A4R488	322-3097-00			RES,FXD:METAL FILM;100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A4R489	322-3097-00			RES,FXD:METAL FILM;100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A4R506	322-3369-00			RES,FXD:METAL FILM;68.1K OHM,1%,0.2W,TC=100	57668	CRB20 FXE 68R1
A4R507	322-3354-00			RES,FXD:METAL FILM;47.5K OHM,1%,0.2W,TC=100	91637	CCF501G47501F
A4R508	322-3354-00			RES,FXD:METAL FILM;47.5K OHM,1%,0.2W,TC=100	91637	CCF501G47501F
A4R514	322-3261-00			RES,FXD,FILM:5.11K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50G5111FT
A4R517	322-3473-00			RES,FXD,FILM:825K OHM,1%,0.2W,TC=100PPM,MI,SMALL	91637	CCF50-2F82502FT
A4R519	322-3318-00			RES,FXD:METAL FILM;20K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20001F
A4R520	322-3147-00			RES,FXD:METAL FILM;332 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G332R0F
A4R521	322-3282-00	671-1357-04		RES,FXD,FILM:8.45K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G84500F
A4R523	322-3286-00	671-1357-04		RES,FXD,FILM:9.31K OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G93100F
A4R525	322-3314-00	671-1357-02	671-1357-03	RES,FXD:METAL FILM;18.2K OHM,1%,0.2W,TC=100	91637	CCF501G18201F
A4R526	322-3097-00			RES,FXD:METAL FILM;100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A4R527	322-3226-00			RES,FXD:METAL FILM;2.21K OHM,1%,0.2W,TC=100	91637	CCF501G22100F
A4R528	322-3318-00			RES,FXD:METAL FILM;20K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20001F
A4R529	322-3126-00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G200R0F
A4R532	322-3097-00			RES,FXD:METAL FILM;100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A4R533	322-3126-00			RES,FXD,FILM:200 OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G200R0F
A4R538	322-3265-00			RES,FXD:METAL FILM;5.62K OHM,1%,0.2W,TC=100	91637	CCF501G56200F
A4R566	322-3289-00			RES,FXD:METAL FILM;10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A4R567	322-3289-00			RES,FXD:METAL FILM;10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A4R568	322-3322-00			RES,FXD:METAL FILM;22.1K OHM,1%,0.2W,TC=100	91637	CCF501G22101F
A4R569	322-3369-00			RES,FXD:METAL FILM;68.1K OHM,1%,0.2W,TC=100	57668	CRB20 FXE 68R1

## Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A4R571	311-2267-00			RES,VAR,NONWW:TRMR,50K OHM,20%,0.5WLINEAR	TK2073	GF06VT2 503 M L
A4U100	160-6608-02	671-1357-02	671-1357-02	IC,DIGITAL:CMOS,EPROM;32K X 8,27C256	80009	160660802
A4U100	160-6608-03	671-1357-03		IC,DIGITAL:CMOS,EPROM;32K X 8,27C256,DIP28.6	80009	160660803
	136-0755-00			*MOUNTING PARTS*		
				SKT,DIP:PCB;FEM,STR,2 X 14,28 POS,0.1 X 0.6 CTR,0.175 H X0.130 TAIL,BECU,TIN,ACCOM 0.008-0.0015 X 0.014-0.022	09922	DILB28P-108
				*END MOUNTING PARTS*		
A4U137	156-0991-00			IC,LINEAR:BIPOLAR,VR;POS,5.0V,100MA,5%	01295	UA78L05ACLP
A4U152	160-4193-00			IC,DIGITAL:CMOS,PLD:EEPLD,16V8,25NS,45MA	80009	160-4193-00
	136-0752-00			*MOUNTING PARTS*		
				SKT,PL-IN ELEK:MICROCIRCUIT,20 DIP	09922	DILB20P-108
				*END MOUNTING PARTS*		
A4U160	160-4194-00			IC,DIGITAL:CMOS,PLD:EEPLD,16V8,25NS,45MA	80009	160-4194-00
	136-0752-00			*MOUNTING PARTS*		
				SKT,PL-IN ELEK:MICROCIRCUIT,20 DIP	09922	DILB20P-108
				*END MOUNTING PARTS*		
A4U202	156-1335-00			IC,DIGITAL:LSTTL,MULTIVIBRATOR;DUAL RETRIG MONOSTABLE	27014	DM96LS02N
A4U213	156-0383-02			IC,DIGITAL:LSTTL,GATES	01295	SN74LS02N
A4U218	156-1335-00			IC,DIGITAL:LSTTL,MULTIVIBRATOR;DUAL RETRIG MONOSTABLE	27014	DM96LS02N
A4U223	156-1335-00			IC,DIGITAL:LSTTL,MULTIVIBRATOR;DUAL RETRIG MONOSTABLE	27014	DM96LS02N
A4U226	156-1335-00			IC,DIGITAL:LSTTL,MULTIVIBRATOR;DUAL RETRIG MONOSTABLE	27014	DM96LS02N
A4U230	156-0704-00			IC,MISC:CMOS,PLL;LOW SPEED	04713	MC14046BCP
A4U238	156-1126-00			IC,LINEAR:BIPOLAR,COMPARATOR;OPEN COLLECTOR, 200NS	01295	LM311P
A4U252	156-2369-00			IC,DIGITAL:HCTCMOS,BUFFER;OCTAL BUFFER/DRIVER, 3-STATE	01295	SN74HCT541N
	136-0752-00			*MOUNTING PARTS*		
				SKT,PL-IN ELEK:MICROCIRCUIT,20 DIP	09922	DILB20P-108
				*END MOUNTING PARTS*		
A4U255	156-0784-00			IC,DIGITAL:LSTTL,COUNTER;SYNCH 4-BIT BINARY	01295	SN74LS163AN
A4U260	156-0784-00			IC,DIGITAL:LSTTL,COUNTER;SYNCH 4-BIT BINARY	01295	SN74LS163AN
A4U268	160-6607-01			MICROCKT,DGTL:CMOS,EPROM,32K X 8 PRGM; 27C256,DIP28.6	80009	160660701
	136-0755-00			*MOUNTING PARTS*		
				SKT,DIP:PCB;FEM,STR,2 X 14,28 POS,0.1 X 0.6 CTR,0.175 H X0.130 TAIL,BECU,TIN,ACCOM 0.008-0.0015 X 0.014-0.022	09922	DILB28P-108
				*END MOUNTING PARTS*		
A4U275	156-2459-00			IC,CONVERTER:BIPOLAR,D/A;12 BIT,VOLTAGEOUT, MPU COMPATIBLE,REFERENCE	24355	AD667JN
A4U283	156-2459-00			IC,CONVERTER:BIPOLAR,D/A;12 BIT,VOLTAGEOUT, MPU COMPATIBLE,REFERENCE	24355	AD667JN
A4U288	156-1430-00			IC,DIGITAL:CMOS,MISC;4-DIGIT LED DSPY CONTROLLER	27014	MM74C911N
A4U300	156-2707-00			IC,DIGITAL:HCNOS,BUFFER;QUAD BUFFER, /OE, 3-STATE	01295	SN74HC125N
A4U309	156-1450-00			IC,DIODE:DIODE ARRAY	34371	CA3141E
A4U313	156-1226-00			IC,LINEAR:BIPOLAR,COMPARATOR;DUAL,OPEN COLLECTOR,80NS	1CH66	LM319N
A4U317	156-1335-00			IC,DIGITAL:LSTTL,MULTIVIBRATOR;DUAL RETRIG MONOSTABLE	27014	DM96LS02N
A4U334	156-2029-00			IC,MEMORY:NMOS,NVRAM;16 X 16, SERIALDATA	60395	X2444P
	136-0727-00			*MOUNTING PARTS*		
				SKT,PL-IN ELEK:MICROCKT,8 CONTACT	09922	DILB8P-108
				*END MOUNTING PARTS*		
A4U338	156-2029-00			IC,MEMORY:NMOS,NVRAM;16 X 16, SERIALDATA	60395	X2444P
	136-0727-00			*MOUNTING PARTS*		
				SKT,PL-IN ELEK:MICROCKT,8 CONTACT	09922	DILB8P-108

Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A4U343	156-5526-00			*END MOUNTING PARTS* IC,PROCESSOR:CMOS,MICROCOMPUTER;8-BIT,12MHZ, ROMLESS,128X8 RAM,(7)8-BIT I/O PORTS,SERIAL I/O,80C51 FAMILY	1CH66	SC80C451CCA68
	136-0871-00			*MOUNTING PARTS* SOCKET,PLCC:PCB;68 POS,0.05 CTR,0.360H X0.125 TAIL,TIN,0.1 CTRPCB,0.060 SHOULDER HEIGHT	00779	3-821574-1
A4U352	156-2626-00			*END MOUNTING PARTS* IC,DIGITAL:ALSTTL,GATE;QUAD 2-INPUT NAND, OC	01295	SN74ALS03BN
A4U360	156-2356-00			IC,DIGITAL:HCTCMOS,LATCH;OCTAL D-TYPE,3-STATE	01295	SN74HCT573N
A4U368	156-2026-00			IC,DIGITAL:HCMOS,GATE;QUAD 2-INPUT NOR	04713	MC74HC02AN
A4U375	156-2256-00			IC,DIGITAL:HCMOS,GATE;QUAD 2-INPUT NAND	01295	SN74HC00N
A4U417	156-1126-00			IC,LINEAR:BIPOLAR,COMPARATOR;OPEN COLLECTOR, 200NS	01295	LM311P
A4U422	156-0382-00			IC,DIGITAL:LSTTL,GATE;QUAD 2-INPUT NAND	01295	SN74LS00N
A4U423	156-1955-00	671-1357-02	671-1357-03	IC,LINEAR:BIPOLAR,CURRENT MIRROR;1:1RATIO	80009	156195500
A4U425	156-3852-00			IC,LINEAR:CMOS,OP-AMP;W/2-INPUT MUX	1ES66	MAX453CPA
A4U428	156-0388-00			IC,DIGITAL:LSTTL,FLIP FLOP;DUAL D W/SET & CLR	01295	SN74LS74AN
A4U434	156-2906-00			IC,DIGITAL:HCMOS,COUNTER;DUAL 4-BIT BINARY RIPPLE	1CH66	74HC393N
A4U451	156-2357-00			IC,DIGITAL:HCTCMOS,FLIP FLOP;OCTAL D-TYPE, NONINV, 3-STATE	01295	SN74HCT574N
A4U463	156-2905-00			IC,PROCESSOR:CMOS,PERIPHERAL;PROGRAMMABLE PERIPHERAL INTERFACE	0JR04	TMP82C55AP-2
A4U485	156-0259-00			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY;(5)NPN, INDEPENDENT,15V,100MA,300MHZ,AMPL	34371	CA3083
A4U493	156-1850-00			IC,MISC:CMOS,ANALOG SWITCH;QUAD	17856	DG211CJ
A4U502	156-2256-00			IC,DIGITAL:HCMOS,GATE;QUAD 2-INPUT NAND	01295	SN74HC00N
A4U510	156-0742-00			IC,LINEAR:BIPOLAR,OP-AMP;HIGH SLEW RATE	01295	LM318P
A4U514	165-2028-00			MICROCKT,LINEAR:SYNC SEPARATOR	TK2601	165202800
A4U523	156-0048-00			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY;(5),NPN, (1)DIFF PAIR,(3)IND,15V,50MA,300MHZ,AMPL	34371	CA3046
A4U525	156-1955-00	671-1357-02	671-1357-03	IC,LINEAR:BIPOLAR,CURRENT MIRROR;1:1RATIO	80009	156195500
A4U526	156-1955-00	671-1357-02	671-1357-03	IC,LINEAR:BIPOLAR,CURRENT MIRROR;1:1RATIO	80009	156195500
A4U533	156-0382-00			IC,DIGITAL:LSTTL,GATE;QUAD 2-INPUT NAND	01295	SN74LS00N
A4U560	156-2357-00			IC,DIGITAL:HCTCMOS,FLIP FLOP;OCTAL D-TYPE, NONINV, 3-STATE	01295	SN74HCT574N
A4U565	156-1126-00			IC,LINEAR:BIPOLAR,COMPARATOR;OPEN COLLECTOR, 200NS	01295	LM311P
A4U595	160-4195-00			IC,DIGITAL:CMOS,PLD;EEPLD,16V8,25NS,45MA	80009	160-4195-00
	136-0752-00			*MOUNTING PARTS* SKT,PL-IN ELEK:MICROCIRCUIT,20 DIP	09922	DILB20P-108
A4Y440	158-0300-00			*END MOUNTING PARTS* XTAL UNIT,QTZ:12.0 MHZ,50 PPM,SERIES	61429	FOX120X
A4CR238	152-0400-00			DIODE,RECT:FAST RCVRY;400V,1A,200NS	0LUA3	1N4936
A4CR437	152-0141-02			DIODE,SIG:ULTRA FAST;40V,150MA,4NS,2PF	27014	FDH9427
A4CR488	152-0141-02			DIODE,SIG:ULTRA FAST;40V,150MA,4NS,2PF	27014	FDH9427
A4CR489	152-0141-02			DIODE,SIG:ULTRA FAST;40V,150MA,4NS,2PF	27014	FDH9427
A4CR498	152-0141-02			DIODE,SIG:ULTRA FAST;40V,150MA,4NS,2PF	27014	FDH9427
A4CR514	152-0141-02			DIODE,SIG:ULTRA FAST;40V,150MA,4NS,2PF	27014	FDH9427
A4CR525	152-0141-02			DIODE,SIG:ULTRA FAST;40V,150MA,4NS,2PF	27014	FDH9427
A4CR536	152-0141-02			DIODE,SIG:ULTRA FAST;40V,150MA,4NS,2PF	27014	FDH9427
A4CR537	152-0141-02			DIODE,SIG:ULTRA FAST;40V,150MA,4NS,2PF	27014	FDH9427
A4CR598	152-0141-02			DIODE,SIG:ULTRA FAST;40V,150MA,4NS,2PF	27014	FDH9427
A4VR518	152-0195-00			DIODE,ZENER:5.1V,5%,0.4W	14552	CD332125
A5	671-1356-04			CIRCUIT BD ASSY:GBR	80009	671135604
A5C200	290-0782-02			CAP,FXD,ELCTLT:4.7UF,+75-10%,35VDC	55680	UVX1V4R7MAA1TD
A5C203	281-0898-00			CAP,FXD,CER DI:7.5PF,+/-0.5PF,500VTUBULAR,MI	04222	MA107A7R5DAA
A5C210	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA

## Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A5C211	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A5C212	281-0773-00			CAP,FXD,CERAMIC:MLC:0.01UF,10%,100V,,	TK1743	CGB103KEX
A5C213	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A5C220	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A5C311	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A5C312	281-0773-00			CAP,FXD,CERAMIC:MLC:0.01UF,10%,100V	TK1743	CGB103KEX
A5C313	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A5C315	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A5C411	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A5C412	281-0773-00			CAP,FXD,CERAMIC:MLC:0.01UF,10%,100V	TK1743	CGB103KEX
A5C413	281-0775-01			CAP,FXD,CERAMIC:MCL:0.1UF,20%,50V,Z5U,0.170	04222	SA105E104MAA
A5C500	283-0177-05			CAP,FXD,CER DI:1UF,+80-20%,25V	04222	SR303E105ZAAAP1
A5C510	283-0177-00			CAP,FXD,CER DI:1UF,+80-20%,25V	04222	SR303E105ZAA
A5C515	290-0943-00			CAP,FXD,ALUM:47UF,+50-20%,25V,6 X 11MM	0H1N5	CEUSM1E470-Q
A5C516	290-0943-00			CAP,FXD,ALUM:47UF,+50-20%,25V,6 X 11MM	0H1N5	CEUSM1E470-Q
A5C600	281-0198-00			CAP,VAR,AIR DI:1.7-11PF,250V	74970	187-0306-105
A5J115	174-1168-00			CA ASSY,SP:RIBBON;IDC,10,28AWG,4.25L,2X10,0.1,PCB,X 2X10,0.1,CTRPLZ,RCPT	TK1386	174-1168-00
A5J200	131-3192-00			CONN,RF JACK:BNC;50 OHM,FEMALE,STR,PCB/REAR PNL,1.375 MLG X 0.125TAIL,W/O FLANGE,W/MTG POST,METAL BODY,GOLD/NICKEL	00779	227673-1
A5J205	131-3192-00			CONN,RF JACK:BNC;50 OHM,FEMALE,STR,PCB/REAR PNL,1.375 MLG X 0.125TAIL,W/O FLANGE,W/MTG POST,METAL BODY,GOLD/NICKEL	00779	227673-1
A5J300	131-3192-00			CONN,RF JACK:BNC;50 OHM,FEMALE,STR,PCB/REAR PNL,1.375 MLG X 0.125TAIL,W/O FLANGE,W/MTG POST,METAL BODY,GOLD/NICKEL	00779	227673-1
A5J305	131-3192-00			CONN,RF JACK:BNC;50 OHM,FEMALE,STR,PCB/REAR PNL,1.375 MLG X 0.125TAIL,W/O FLANGE,W/MTG POST,METAL BODY,GOLD/NICKEL	00779	227673-1
A5J400	131-3192-00			CONN,RF JACK:BNC;50 OHM,FEMALE,STR,PCB/REAR PNL,1.375 MLG X 0.125TAIL,W/O FLANGE,W/MTG POST,METAL BODY,GOLD/NICKEL	00779	227673-1
A5J405	131-3192-00			CONN,RF JACK:BNC;50 OHM,FEMALE,STR,PCB/REAR PNL,1.375 MLG X 0.125TAIL,W/O FLANGE,W/MTG POST,METAL BODY,GOLD/NICKEL	00779	227673-1
A5J501	131-4750-00			CONN,HDR:PCB;MALE,STR,1 X 6,0.100 CTR,0.230 MLG X 0.110 TAIL,30 GOLD	53387	2406-6112TB
A5P600	131-4752-00			CONN,HDR::PCB;MALE,45 DEG,1 X 2,0.1CTR,0.240 MLG X 0.110 TAIL,30 GOLD	58050	082-0243-AS10
A5P610	131-4752-00			CONN,HDR::PCB;MALE,45 DEG,1 X 2,0.1CTR,0.240 MLG X 0.110 TAIL,30 GOLD	58050	082-0243-AS10
A5Q200	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP:40V,200MA,250MHZ,AMPL	04713	2N3906
A5Q300	151-0216-04			TRANSISTOR,SIG:BIPOLAR,PNP:25V,100MA,170MHZ,AMPL	04713	MPS6523RLRP
A5Q310	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN:40V,200MA,300MHZ,AMPL	04713	2N3904
A5R202	322-3147-00			RES,FXD:METAL FILM:332 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G332R0F
A5R203	322-3148-00			RES,FXD:FILM:340 OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF50-2F340R0F
A5R204	322-3085-00			RES,FXD:METAL FILM:75 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G75R00F
A5R206	322-3385-00			RES,FXD:METAL FILM:100K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10002F
A5R208	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A5R209	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A5R210	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A5R211	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A5R212	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A5R213	322-3354-00			RES,FXD:METAL FILM:47.5K OHM,1%,0.2W,TC=100	91637	CCF501G47501F
A5R300	322-3222-00			RES,FXD:METAL FILM:2K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G20000F
A5R305	322-3085-00			RES,FXD:METAL FILM:75 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G75R00F
A5R306	322-3139-00			RES,FXD:METAL FILM:274 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G274R0F
A5R309	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A5R310	322-3237-00			RES,FXD:FILM:2.87K OHM,1%,0.2W,TC=TOMI,SMALL BODY	91637	CCF501G28700F

Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A5R311	322-3189-00			RES,FXD,FILM:909 OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G909FOR
A5R312	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A5R313	322-3354-00			RES,FXD:METAL FILM:47.5K OHM,1%,0.2W,TC=100	91637	CCF501G47501F
A5R315	322-3066-00			RES,FXD:METAL FILM:47.5 OHM,1%,0.2W,TC=100 PPM	09969	CCF502G47R50F
A5R320	311-2271-00			RES,VAR,TRMR:CERMET;5K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST	TK2073	GF06VT2 502 M L
A5R330	322-3128-00			RES,FXD,FILM:210 OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF50-2-G210R0F
A5R405	322-3085-00			RES,FXD:METAL FILM:75 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G75R00F
A5R406	322-3139-00			RES,FXD:METAL FILM:274 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G274R0F
A5R408	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A5R409	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A5R410	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A5R411	322-3189-00			RES,FXD,FILM:909 OHM,1%,0.2W,TC=T0MI,SMALLBODY	91637	CCF501G909FOR
A5R412	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A5R413	322-3354-00			RES,FXD:METAL FILM:47.5K OHM,1%,0.2W,TC=100	91637	CCF501G47501F
A5R420	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A5R505	322-3085-00			RES,FXD:METAL FILM:75 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G75R00F
A5R506	322-3139-00			RES,FXD:METAL FILM:274 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G274R0F
A5R509	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A5R510	322-3097-00			RES,FXD:METAL FILM:100 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G100R0F
A5R511	322-3001-00			RES,FXD:METAL FILM:10 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10R00F
A5R512	322-3001-00			RES,FXD:METAL FILM:10 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10R00F
A5R513	322-3189-00			RES,FXD,FILM:909 OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G909FOR
A5R550	322-3135-00			RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G249R0F
A5R560	322-3193-00			RES,FXD:METAL FILM:1K OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10000F
A5R570	322-3001-00			RES,FXD:METAL FILM:10 OHM,1%,0.2W,TC=100 PPM	91637	CCF501G10R00F
A5R600	322-3289-00			RES,FXD:METAL FILM:10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A5R601	322-3289-00			RES,FXD:METAL FILM:10K OHM,1%,0.2W,TC=100 PPM	91637	CCF50G10001F
A5R603	311-2258-00			RES,VAR,TRMR:CERMET;1K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST	TK2073	GF06VT2 102 M L
A5R604	322-3164-00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0MI,SMALL BODY	91637	CCF501G499ROF
A5R606	311-2271-00			RES,VAR,TRMR:CERMET;5K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST	TK2073	GF06VT2 502 M L
A5U200	156-3599-00			IC,LINEAR:BIPOLAR,OP-AMP:CUR FEEDBACK,50MHZ	64762	EL2020CN
A5U213	156-2880-00			IC,LINEAR:BIFET,OP-AMP:DUAL,DECOMPENSATED	04713	MC34083P
A5U413	156-2880-00			IC,LINEAR:BIFET,OP-AMP:DUAL,DECOMPENSATED	04713	MC34083P
A5U418	156-1850-00			IC,MISC:CMOS,ANALOG SWITCH;QUAD	17856	DG211CJ
A5U513	156-2880-00			IC,LINEAR:BIFET,OP-AMP:DUAL,DECOMPENSATED	04713	MC34083P
A5U600	156-3599-00			IC,LINEAR:BIPOLAR,OP-AMP:CUR FEEDBACK,50MHZ	64762	EL2020CN
A5CR305	152-0141-02			DIODE,SIG:ULTRA FAST;40V,150MA,4NS,2PF	27014	FDH9427
A5CR405	152-0141-02			DIODE,SIG:ULTRA FAST;40V,150MA,4NS,2PF	27014	FDH9427
A5CR505	152-0141-02			DIODE,SIG:ULTRA FAST;40V,150MA,4NS,2PF	27014	FDH9427
E100	276-0569-00			CORE,EM:TOROID;FERRITE,UO=125,FREQ<5MHZ (QUANTITY 2)	TK1263	M1019
E120	276-0569-00			CORE,EM:TOROID;FERRITE,UO=125,FREQ<5MHZ (QUANTITY 2)	TK1263	M1019
E200	276-0569-00			CORE,EM:TOROID;FERRITE,UO=125,FREQ<5MHZ	TK1263	M1019
E220	276-0569-00			CORE,EM:TOROID;FERRITE,UO=125,FREQ<5MHZ	TK1263	M1019
E300	276-0569-00			CORE,EM:TOROID;FERRITE,UO=125,FREQ<5MHZ	TK1263	M1019
E320	276-0569-00			CORE,EM:TOROID;FERRITE,UO=125,FREQ<5MHZ	TK1263	M1019
E400	276-0569-00			CORE,EM:TOROID;FERRITE,UO=125,FREQ<5MHZ	TK1263	M1019
E420	276-0569-00			CORE,EM:TOROID;FERRITE,UO=125,FREQ<5MHZ	TK1263	M1019
J100	131-0106-02			CONN,RF JACK:BNC;50 OHM,FEM,STR,SLDR CUP/FRT PNL,0.520 MLG X0.403 TAIL,0.04 L SLDR CUP,0.380,D/1 FLT	24931	28JR178-1
J120	131-0106-02			CONN,RF JACK:BNC;50 OHM,FEM,STR,SLDR CUP/FRT PNL,0.520 MLG X0.403 TAIL,0.04 L SLDR CUP,0.380,D/1 FLT	24931	28JR178-1
J120	210-0255-00			TERMINAL,LUG:0.391 ID,LOCKING,BRS CD PL	TK1572	ORDER BY DESC

## Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
J200	131-0106-02			CONN,RF JACK:BNC;50 OHM,FEM,STR,SLDR CUP/FRT PNL,0.520 MLG X0.403 TAIL,0.04 L SLDR CUP,0.380,D/1 FLT	24931	28JR178-1
J220	131-0106-02			CONN,RF JACK:BNC;50 OHM,FEM,STR,SLDR CUP/FRT PNL,0.520 MLG X0.403 TAIL,0.04 L SLDR CUP,0.380,D/1 FLT	24931	28JR178-1
J220	210-0255-00			TERMINAL,LUG:0.391 ID,LOCKING,BRS CD PL	TK1572	ORDER BY DESC
J300	131-0106-02			CONN,RF JACK:BNC;50 OHM,FEM,STR,SLDR CUP/FRT PNL,0.520 MLG X0.403 TAIL,0.04 L SLDR CUP,0.380,D/1 FLT	24931	28JR178-1
J320	131-0106-02			CONN,RF JACK:BNC;50 OHM,FEM,STR,SLDR CUP/FRT PNL,0.520 MLG X0.403 TAIL,0.04 L SLDR CUP,0.380,D/1 FLT	24931	28JR178-1
J320	210-0255-00			TERMINAL,LUG:0.391 ID,LOCKING,BRS CD PL	TK1572	ORDER BY DESC
J400	131-0106-02			CONN,RF JACK:BNC;50 OHM,FEM,STR,SLDR CUP/FRT PNL,0.520 MLG X0.403 TAIL,0.04 L SLDR CUP,0.380,D/1 FLT	24931	28JR178-1
J420	131-0106-02			CONN,RF JACK:BNC;50 OHM,FEM,STR,SLDR CUP/FRT PNL,0.520 MLG X0.403 TAIL,0.04 L SLDR CUP,0.380,D/1 FLT	24931	28JR178-1
J420	210-0255-00			TERMINAL,LUG:0.391 ID,LOCKING,BRS CD PL	TK1572	ORDER BY DESC
S1	260-2465-00			SWITCH,PUSH:0.4A,125VAC,W/SOLDER LUG,BUTTON	31918	(602844)
	174-2648-00			*ATTACHED PARTS* CA ASSY,SP:RIBBON,POWER SWITCH:MIXED/CRIMP, 2,26 AWG,3.5 L,0.1 CTR 2 POS RCPT X 0.2 INC H CUT/STRIP *END ATTACHED PARTS*	TK2469	174-2648-00
V1	154-0909-16			ELECTRON TUBE:CRT,T1710-4-3.41, (STANDARD ONLY, OPTION 05 ONLY)	80009	154090916
V1	154-0937-16			ELECTRON TUBE:CRT,T1710-4-3.42 (OPTION 10,14 ONLY)	80009	154093716
W179	174-1446-00			CABLE ASSY;:COAX:RFD,50 OHM,13.0L,1X2,0.1 CTR,RCPT,BOTH ENDS (CONNECTED @ A3P179 & A5P610)	TK2469	ORDER BY DESC
W190	196-3146-00			CA ASSY,SP:FLAT FLEX:FLX,27 AWG,1.0 L,PCB, TERM,STR BOTH ENDS	TK0196	FSN-1A,P OR K
W191	196-3146-00			CA ASSY,SP:FLAT FLEX:FLX,27 AWG,1.0 L,PCB, TERM,STR BOTH ENDS	TK0196	FSN-1A,P OR K
W290	196-3146-00			CA ASSY,SP:FLAT FLEX:FLX,27 AWG,1.0 L,PCB, TERM,STR BOTH ENDS	TK0196	FSN-1A,P OR K
W291	196-3146-00			CA ASSY,SP:FLAT FLEX:FLX,27 AWG,1.0 L,PCB, TERM,STR BOTH ENDS	TK0196	FSN-1A,P OR K
W352	174-1849-00			CA ASSY,SP:RBN;.IDC,16,28AWG,8.0L,2X8,0.1 CTR PLZ,RCPT X DSUB,15 POS,FEM,W/STRAIN RELIEF & 4-40THD INSERT (CONNECTED @ A4J352 TO "REMOTE" REAR PANEL) *MOUNTING PARTS*	53387	ORDER BY DESC
	214-3903-01			SCREW,JACK:4-40 X 0.312 EXT THD,4-40 INT THD,0.188 HEX,STEEL,CADPLATE (QUANTITY 2) *END MOUNTING PARTS*	0KB01	214-3903-01
W419	174-1445-00			CABLE ASSY;:COAX:RFD,50 OHM,8.0L,1X2,0.1 CTR,RCPT,BOTH ENDS (CONNECTED @ A4J419 & A5P600)	TK2469	ORDER BY DESC
W590	196-3146-00			CA ASSY,SP:FLAT FLEX:FLX,27 AWG,1.0 L,PCB, TERM,STR BOTH ENDS	TK0196	FSN-1A,P OR K
W591	196-3146-00			CA ASSY,SP:FLAT FLEX:FLX,27 AWG,1.0 L,PCB, TERM,STR BOTH ENDS	TK0196	FSN-1A,P OR K
W890	196-3146-00			CA ASSY,SP:FLAT FLEX:FLX,27 AWG,1.0 L,PCB, TERM,STR BOTH ENDS	TK0196	FSN-1A,P OR K
W891	196-3146-00			CA ASSY,SP:FLAT FLEX:FLX,27 AWG,1.0 L,PCB, TERM,STR BOTH ENDS	TK0196	FSN-1A,P OR K
W978	174-0417-00			CA ASSY,SP:RIBBON;IDC,6,28AWG,6.0L,1X6,0.1 CTR,RCPT BOTH ENDS (CONNECTED @ A3J978 & A5J501)	55322	IDSS-6-D-6
CS100	119-2425-00			COLOR SHUTTER:5 INCH DIAGONAL,BLUE/WHITE	80009	119242500

# Section 9 Diagrams/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.

Overline, parenthesis, or leading slash indicate a low asserting state.

Example:  $\overline{\text{ID CONTROL}}$ , (ID CONTROL), or /ID CONTROL.

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:

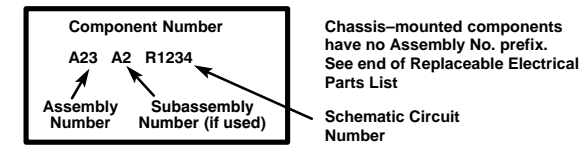
- Capacitors: Values one or greater are in picofarads (pF).  
Values less than one are in microfarads ( $\mu\text{F}$ ).
- Resistors = Ohms ( $\Omega$ ).

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

## Assembly Numbers

Each assembly in the instrument is assigned an assembly number (e.g., A20). The assembly number appears on the diagram (in circuit board outline), circuit board illustration title, and lookup table for the schematic diagram.

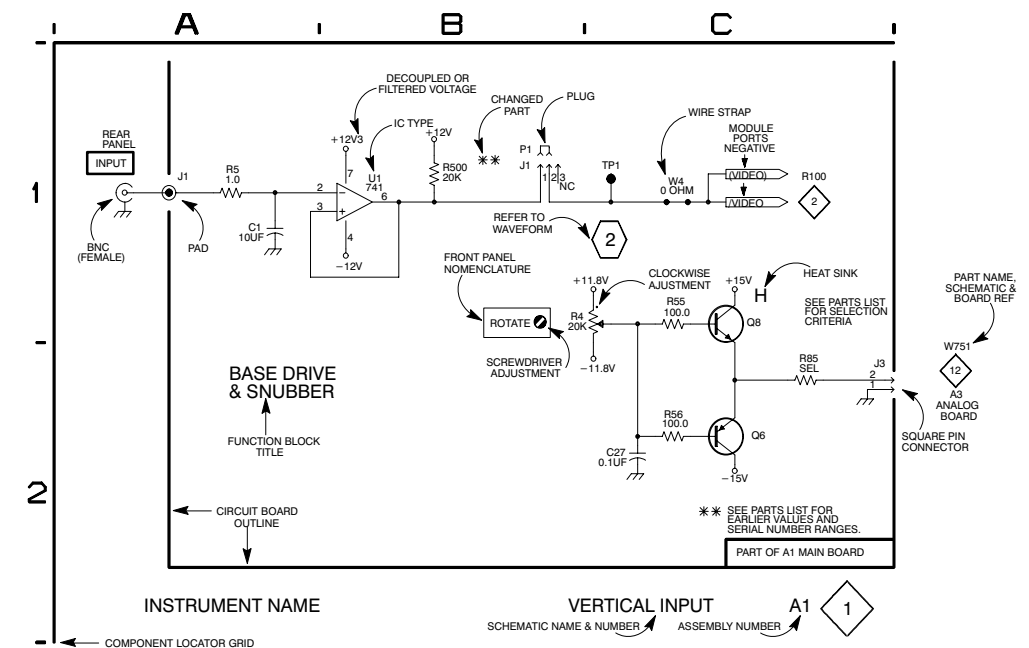
The Replaceable Electrical Parts List is arranged by assembly number in numerical sequence; the components are listed by component number. Example:

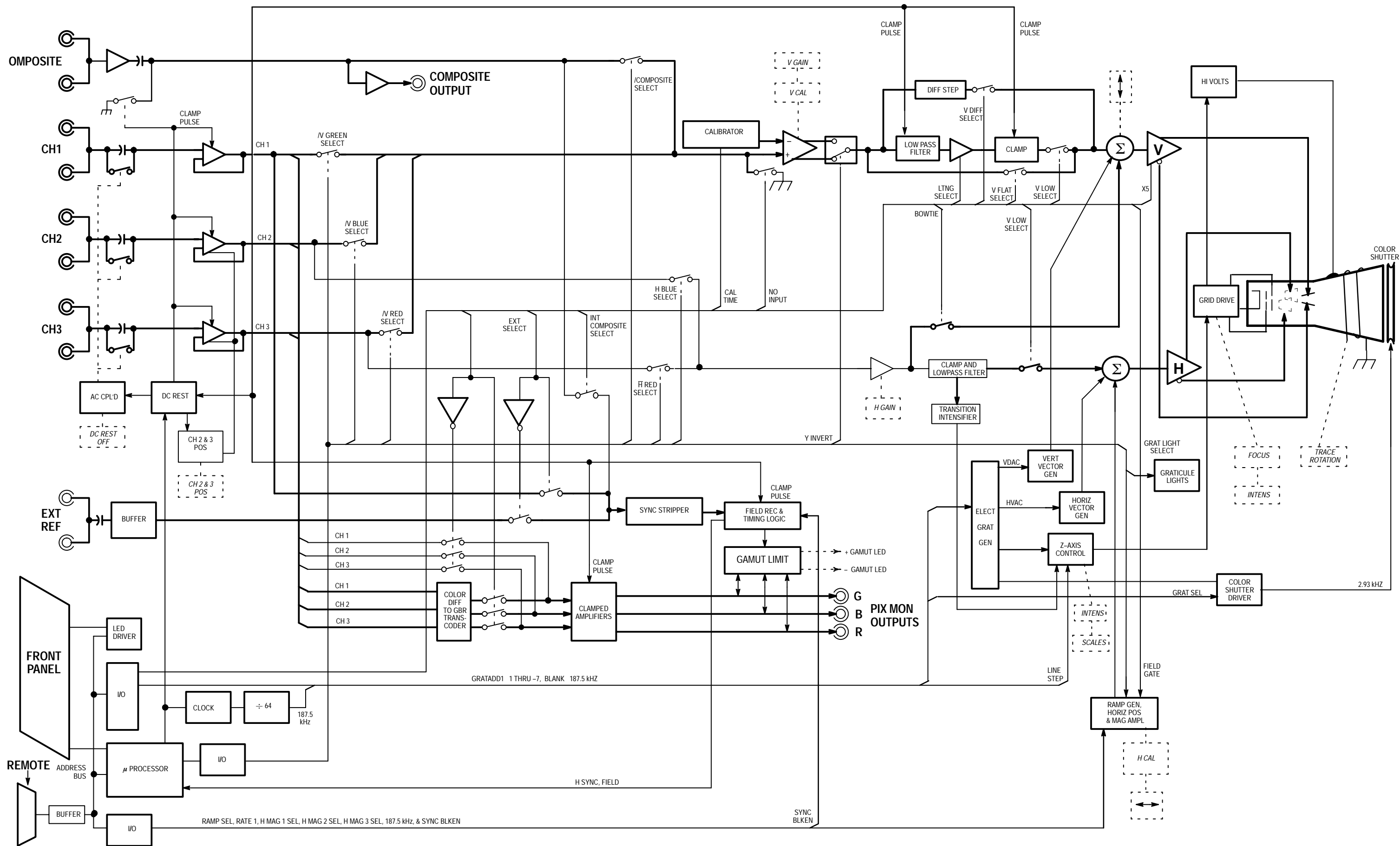


## Grid Coordinates

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 will only appear opposite the first diagram; the lookup table will list the diagram number of other diagrams that the other circuitry appears on.





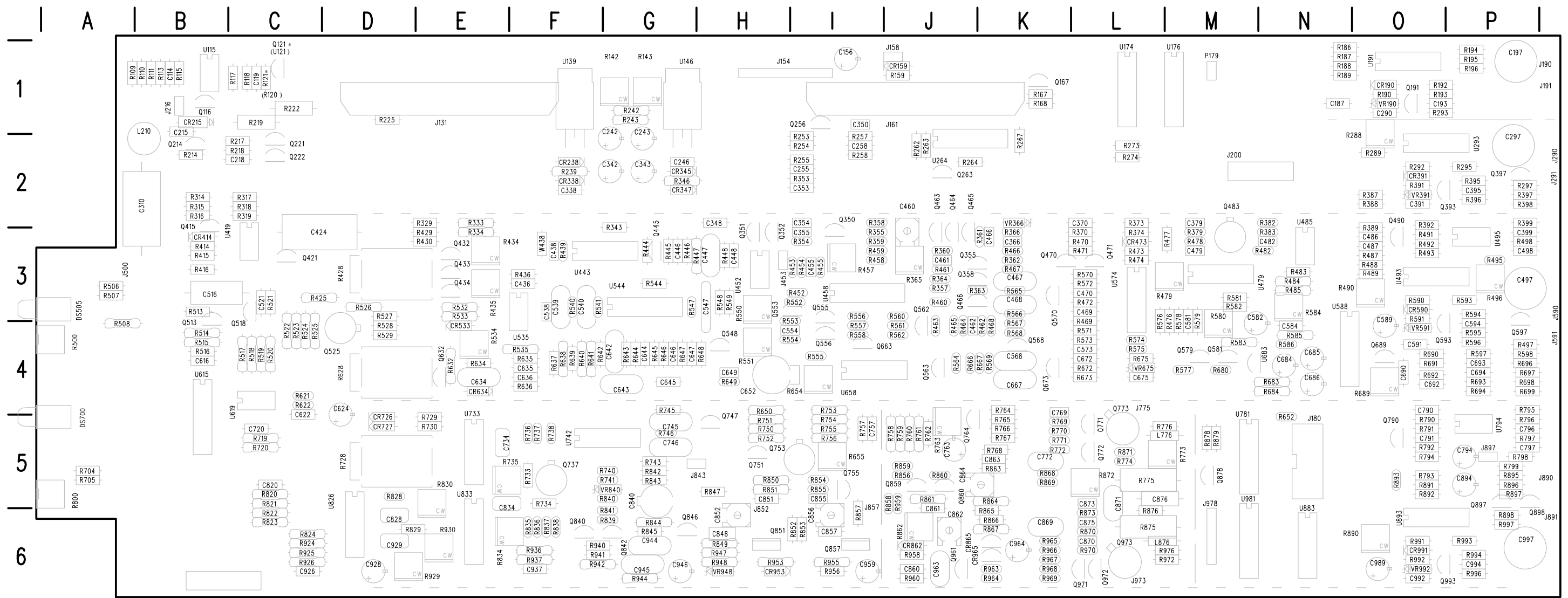
WFM 300A

BLOCK DIAGRAM



**A3 MAIN BOARD Component Locator** (with cross-references to schematic diagrams 1, 2, 3, 4, and 5).

Comp No	Diag No	Diag Loc	Bd Loc	Comp No	Diag No	Diag Loc	Bd Loc	Comp No	Diag No	Diag Loc	Bd Loc	Comp No	Diag No	Diag Loc	Bd Loc	Comp No	Diag No	Diag Loc	Bd Loc	Comp No	Diag No	Diag Loc	Bd Loc	Comp No	Diag No	Diag Loc	Bd Loc	Comp No	Diag No	Diag Loc	Bd Loc	Comp No	Diag No	Diag Loc	Bd Loc				
C114	5	B2	B1	C649	4	E2	H4	CR865	3	F2	J6	Q563	3	B2	J4	R267	1	G1	K2	R466	3	D3	K3	R570	2	F1	L3	R737	4	B2	F5	R860	3	E2	J5	U264D	1	G1	J2
C119	5	B2	C1	C652	4	D1	H4	CR953	4	G3	H6	Q568	3	C3	K4	R273	1	G5	L2	R467	3	D3	K3	R571	2	G1	L4	R738	4	B2	F5	R861	3	F2	J5	U293A	1	E1	P2
C156	3	H5	I1					CR965	3	F2	K6	Q570	2	G1	K4	R274	1	G3	L2					R572	2	G1	L3					R862	3	E2	J6	U293B	1	F1	P2
C187	2	B3	N1	C667	3	C3	K4	CR991	1	D4	O6					R288	1	D2	N2	R468	3	D4	K4	R573	2	G1	L4	R740	4	C2	G5	R863	3	F2	K5	U293C	1	D2	P2
C193	2	C4	O1	C672	3	C4	L4					Q579	2	F5	M4	R289	1	D2	O2	R469	2	H1	L4	R574	2	G2	L4	R741	4	C2	G5	R864	3	F3	K6	U293D	1	D1	P2
				C675	2	G2	L4					Q581	2	F5	M4					R470	2	G1	L3					R743	4	B2	G5					U419A	4	C1	C3
C197	2	B4	P1	C684	2	F5	N4	DS505	1	B4	A4	Q593	1	E2	O4	R292	1	D1	O2	R471	2	G1	L3	R575	2	G2	L4	R745	4	E2	G5	R865	3	F3	K6	U419B	4	C4	C3
C215	5	C1	B2	C685	3	G5	N4	DS700	2	E4	A5	Q597	1	B3	P4	R293	2	B4	O1	R472	2	G1	L3	R576	2	G3	M4	R746	4	D2	G5	R866	3	F3	K6	U419C	4	C4	C3
C218	5	C3	C2									Q632	4	E3	E4	R295	1	E1	P2	R297	1	B1	P2	R577	2	F5	M4					R867	3	F2	K6	U443	4	G1	F3
C242	5	C5	G2	C686	3	H5	N4	J131	4	A3	E1					R314	4	B4	B2	R473	2	G2	L3	R578	2	F5	M4	R750	4	G4	H5	R868	3	H2	K5	U452A	4	D2	H3
C243	5	B5	G2	C690	1	F4	O4	J154	5	A3	H1	Q663	3	B1	I4	R315	4	B3	B2	R474	2	F2	L3	R579	2	G4	M4	R751	4	G4	H5	R869	3	H2	K5	U452B	3	D5	H3
				C692	1	F4	O4	J158	1	B5	J1	Q673	3	B4	K4	R316	4	C3	B2	R475	2	G3	M4					R752	4	F4	H5					U458A	3	A1	I3
C246	5	A5	G2	C693	1	E3	P4	J161	3	A3	J1	Q689	1	F3	O4	R317	4	B4	C2	R476	2	G3	M4	R580	2	G4	M4	R753	4	F4	I5	R870	3	G3	L6	U458B	3	B1	I3
C255	4	E2	I2	C694	1	E3	P4					Q737	4	B2	F5	R318	4	C4	C2	R477	2	F4	M3	R581	2	G4	M3	R754	4	H4	I5	R871	3	H2	L5	U458C	3	E4	I3
C258	3	B5	I2					J180	2	B2	N5	Q747	4	D2	H5	R319	4	C3	C2	R478	2	F4	M3	R582	2	G4	M3					R872	3	H2	L5				
C290	2	C3	O1	C720	4	D5	C5	J190	2	A4	Q1					R318	4	C4	C2	R479	2	F3	L3	R583	2	F5	M4	R755	4	H4	I5	R873	3	G3	L6	U458D	3	E4	I3
C297	1	B1	P2	C734	3	D3	F5	J191	2	A4	Q1	Q751	4	G4	H5	R319	4	C3	C2	R482	2	G3	N3	R584	2	G5	N3	R756	4	G4	I5	R875	3	G1	L6	U479	2	G4	N3
				C745	4	D2	G5	J200	2	A1	M2	Q753	4	G4	H5					R483	2	G5	N3					R757	4	H5	I5					U485A	2	F3	N3
C310	5	C1	B2	C746	4	D2	G5	J216	5	D3	B1	Q755	4	H4	I5	R329	4	E4	E3	R484	2	F3	N3	R585	2	F5	N4	R758	3	C2	J5	R876	3	G1	L6	U493A	1	E3	O3
C338	5	C5	F2	C757	4	G5	I5					Q764	3	F3	J5	R333	4	E4	E3	R485	2	G5	N3	R586	2	F4	N4	R759	3	E3	J5	R877	2	D3	M5	U493B	1	F3	O
C342	5	C5	G2					J290	1	A2	Q2	Q771	3	G2	L5	R334	4	D4	E3					R590	1	D3	O3					R878	2	D3	M5				
C343	5	B5	G2	C763	3	C3	J5	J291	1	A1	Q2					R343	4	G1	G3	R487	1	D3	O3	R591	1	D2	O4	R760	3	C2	J5	R879	2	D3	M5	U493C	1	D3	O3
C348	4	E2	H3	C769	3	G3	K5	J453	3	D5	I3	Q772	3	H2	L5	R346	5	B5	G2	R488	1	D3	O3	R593	1	E3	P3	R761	3	E2	J5	R891	1	D5	O5	U493D	1	D3	O3
				C772	3	H2	K5	J500	5	C1	A3	Q773	3	G2	L5					R489	1	D4	O3					R762	3	C3	J5					U495A	1	H1	P3
C350	3	C4	I1	C790	1	F5	O5	J590	1	A3	Q4	Q790	1	F5	O5	R353	3	E5	I2	R490	1	D3	N3	R594	1	E3	P4	R763	3	C2	J5	R892	1	D5	O5	U495B	1	E2	P3
C353	3	E5	I2	C791	1	F5	O5					Q840	4	D1	F6	R354	3	D5	I3	R491	1	F2	O3	R595	1	D3	P4	R764	3	E3	K	R893	1	D5	O5	U495B	1	E2	P3
C354	3	E5	I3					J591	1	A3	Q4	Q842	4	D1	G6	R355	3	C5	I3					R596	1	E3	P4					R895	1	B5	P5	U535A	4	F4	F4
C355	3	E5	I3	C794	3	G4	P5	J775	3	H1	L5					R357	3	C4	J3	R492	1	E2	O3	R597	1	D3	P4	R765	3	E3	K5	R896	1	B5	P5				
C366	3	E3	K3	C796	1	E5	P5	J843	4	D3	G5	Q846	4	D2	G6	R358	3	E5	I3	R493	1	E2	O3	R598	1	C3	P4	R766	3	F3	K5	R897	1	B5	P5	U535B	4	F3	F4
				C797	1	E5	P5	J852	4	H4	H6	Q851	4	G3	H6					R495	1	E2	P3					R767	3	B3	K5					U544A	3	B1	G3
C370	2	G1	L3	C820	3	C2	C5	J857	4	H3	I6	Q854	4	H3	I6	R359	3	D5	I3	R496	1	E2	P3	R621	4	C5	C4	R768	3	F1	K5	R898	1	C5	P6	U544B	3	C1	G3
C379	2	F4	M3	C828	3	D2	D6					Q859	3	E2	J5	R360	3	C4	J3	R497	1	B3	P4	R622	4	C5	C4	R769	3	G3	K5	R924	4	E5	C6	U544C	3	D1	G3
C391	1	E1	O2					J890	1	A4	Q5	Q860	3	F2	J6	R361	3	C4	K3					R628	4	B1	D4					R925	4	D5	C6	U544D	3	D1	G3
C395	1	E1	P2	C834	4	F5	E6	J891	1	A4	Q6					R362	3	C4	K3	R498	1	E2	P3	R632	4	E4	E4	R770	3	H3	K5	R926	4	E5	C6				
C399	1	E2	P3	C840	4	C1	G6	J897	1	C5	P5	Q878	2	D3	M5	R363	3	C4	J3	R500	2	G4	A4	R634	4	E3	E4	R771	3	H3	K5	R929	3	E2	E6	U544E	3	D1	G3
				C848	4	H3	H6	J973	3	H1	L6	Q897	1	B5	P6					R506	1	B3	A3	R507	1	B3	A3	R772	3	H2	K5					U574A	2	G2	L3
C424	4	C4	C3	C851	4	H4	H5	J978	2	E1	M6	Q898	1	B4	P6	R364	3	D5	J3	R508	4	B3	A4	R635	4	D3	F4	R773	3	H3	M5	R930	4	F5	E6	U574B	2	G2	L3
C436	4	F3	F3	C852	4	G4	H6					Q961	3	F1	J6	R365	3	E5	J3					R636	4	E3	F4	R774	3	H3	L5	R936	4	B1	F6	U574C	2	H2	L3
C438	4	G2	F3					L210	5	C1	B2	Q971	3	G2	L6	R366	3	D3	K3	R513	4	C4	B3	R637	4	F2	F4					R937	4	B1	F6	U574D	2	F2	L3
C446	3	F4	G3	C855	4	G3	I5	L776	3	G1	L5					R370	2	G1	L3	R514	4	C3	B4	R638	3	B1	F4	R775	3	G1	L5	R940	4	D1	F6				
C447	3	D2	H3	C856	4	G3	I6	L876	3	G1	L6	Q972	3	G2	L6	R373	2	F2	L3	R515	4	C4	B4	R639	3	C1	F4	R776	3	H1	L5	R941	4	D1	F6	U588A	1	C2	N3
				C857	4	G3	I6					Q973	3	G2	L6					R516	4	C4	B4					R777	1	F5	O5					U588B	1	C5	N3
C448	4	D3	H3	C860	3	F2	J6	P158	1	B5		Q993	1	E4	P6	R374	2	F2	L3	R517	4	C5	C4	R640	3	C1	F4	R778	1	F5	O5	R942	4	C1	F6	U588C	1	C3	N3
C455	3	D5	I3	C861	3	E3	J6	P179	1	G4						R379	2	F4	M3					R641	3	C1	F4	R779	1	F5	O5	R944	4	D2	G6	U588D	1	C3	N3
C460	3	D4	J2					P453	3	D5		R109	5	B2	B1					R382	2	F3	N3	R642	3	C1	G4					R947	4	H3	H6	U615	4	B3	B4
C461	3	E4	J3	C862	3	F2	J6	P843	4	D2		R110	5	B2	B1					R383	2	F3	N3	R643	3	C2	G4	R793	1	E4	O5	R948	4	G3	H6	U619A	4	D5	C5
C462	3	D3	K4	C863	3	F2	K5	P897	1	C5		R111	5	B3	B1					R387	1	D2	O2	R644	3	C1	G4	R794	1	D5	O5	R953	4	G3	H6				
				C864	3	F3	J5					R113	5	B2	B1					R388	1	D1	O2	R520	4	C5	C4	R795											



Board lookup table on front of this page.

Static Sensitive Devices  
See Maintenance Section

### A3 Main Board

#### Assembly A3.

#### Schematic Diagram <1> Component Locator Chart

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

**Assembly A3.** Partial Assembly A3 also shown on Diagrams 2, 3, 4, and 5.

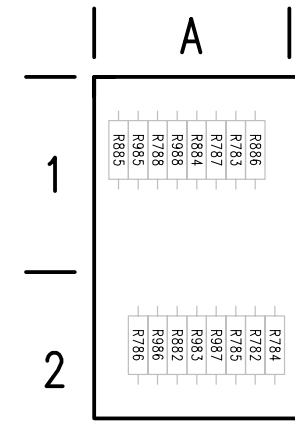
Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc			
C297	B1	P2	C992	E4	O6	P179	G4	M1	R274	G3	L2	R487	D3	O3	R595	D3	P4	R792	F5	O5	R992	D4	O6	U493D	D3	O3
C391	E1	O2	C994	E4	P6	P897	C5	K1	R288	D2	N2	R488	D3	O3	R596	E3	P4	R793	E4	O5	R993	E4	P6	U495A	H1	P3
C395	E1	P2	C997	E4	P6	Q167	C5	K1	R289	D2	O2	R489	D4	O3	R597	D3	P4	R794	D5	O5	R994	E4	P6	U495B	E2	P3
C399	E2	P3				Q393	E1	P2	R292	D1	O2	R295	E1	P2	R598	C3	P4	R795	C3	P5	R996	D4	P6			
C486	F2	O3	CR159	B5	J1	Q397	B1	P2	R295	E1	P2	R490	D3	N3	R598	C3	P4	R796	E5	P5	R997	B4	P6	U588A	C2	N3
			CR391	D1	O2	Q490	F2	O3	R297	B1	P2	R491	F2	O3	R689	E3	O4				U588C	C5	N3			
C487	F2	O3	CR590	D3	O3	Q593	E2	O4	R297	B1	P2	R492	E2	O3	R690	F3	O4	R797	E5	P5	U174C	G5	L1	U588D	C3	N3
C497	B3	P3	CR991	D4	O6				R387	D2	O2	R493	E2	O3				R798	C4	P5	U174D	G3	L1	U794A	E5	P5
C498	E2	P3				Q597	B3	P4	R388	D1	O2	R495	E2	P3	R691	E3	O4	R799	C4	P5	U176A	G4	M1	U794B	E3	P5
C591	E2	O4	DS505	B4	A4	Q689	F3	O4	R389	F2	O3	R391	D1	O2	R692	F3	O4	R890	D5	N6	U264C	G2	J2			
C594	E3	P4				Q790	F5	O5	R391	D1	O2	R496	E2	P3	R693	E4	P4	R891	D5	O5	U264D	G1	J2	U893A	E4	O6
			J158	B5	J1	Q897	B5	P6	R392	E1	O3	R497	B3	P4	R694	E3	P4				U893B	F4	O6			
C690	F4	O4	J290	A2	Q2	Q898	B4	P6	R395	E1	P2	R498	E2	P3	R696	C3	P4	R892	D5	O5	U293A	E1	P2	U893C	D5	O6
C692	F4	O4	J291	A1	Q2	Q993	E4	P6	R395	E1	P2	R506	B3	A3				R893	D5	O5	U293B	F1	P2	U893D	D4	O6
C693	E3	P4	J590	A3	Q4				R396	D1	P2	R507	B3	A3	R697	C3	P4	R895	B5	P5	U293C	D2	P2			
C694	E3	P4	J591	A3	Q4	R159	B5	J1	R397	B1	P2	R397	B1	P2	R698	E4	P4	R896	B5	P5	U293D	D1	P2	VR391	E1	O2
C790	F5	O5	J890	A4	Q5	R167	B5	K1	R398	C1	P2	R398	C1	P2	R699	E5	P4	R897	B5	P5	U493A	E3	O3	VR591	E2	O4
			J891	A4	Q6	R168	B5	K1				R399	D2	P3	R790	F5	O5				U493B	F3	O3	VR992	E4	O6
C791	F5	O5	J897	C5	P5	R267	G1	K2	R267	G1	K2	R399	D2	P3	R791	E5	O5	R898	C5	P6	U493C	D3	O3			
C796	E5	P5				R273	G5	L2	R273	G5	L2	R428	B3	D3				R991	D4	O6						
C797	E5	P5	P158	B5																						



### Schematic Diagram <2> Component Locator Chart

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

**Assembly A3 and A3A1.** Partial Assembly A3 also shown on diagrams 1, 3, 4 and 5.



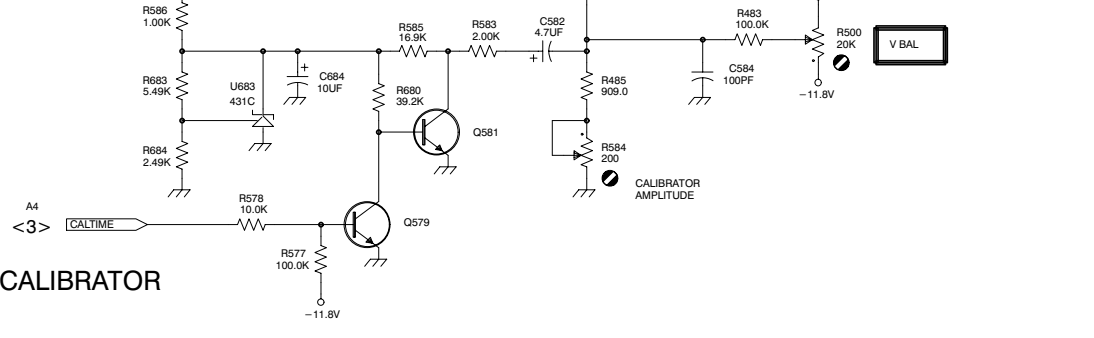
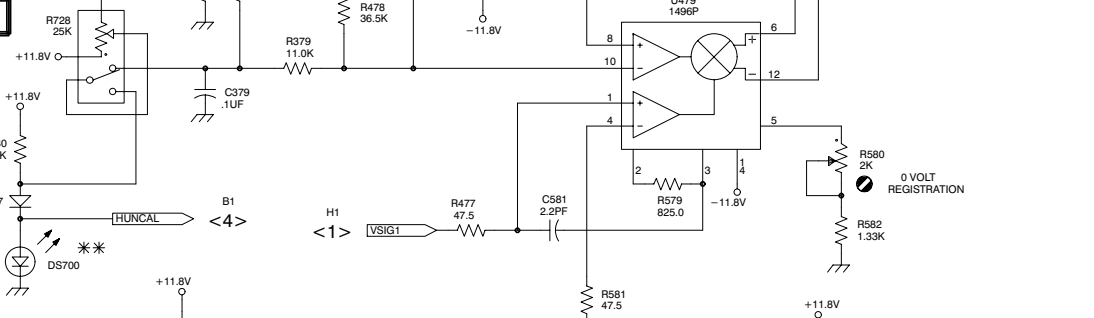
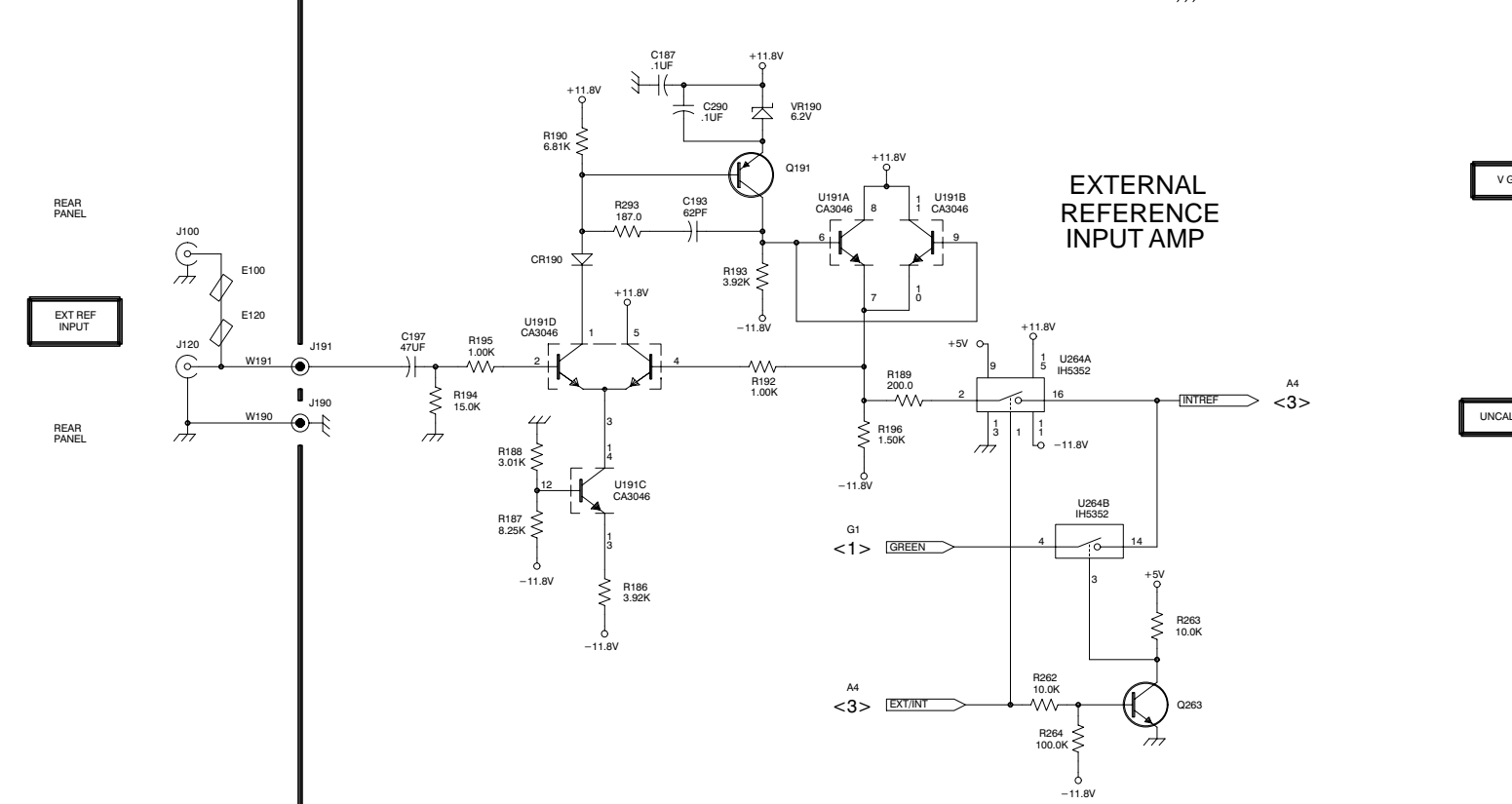
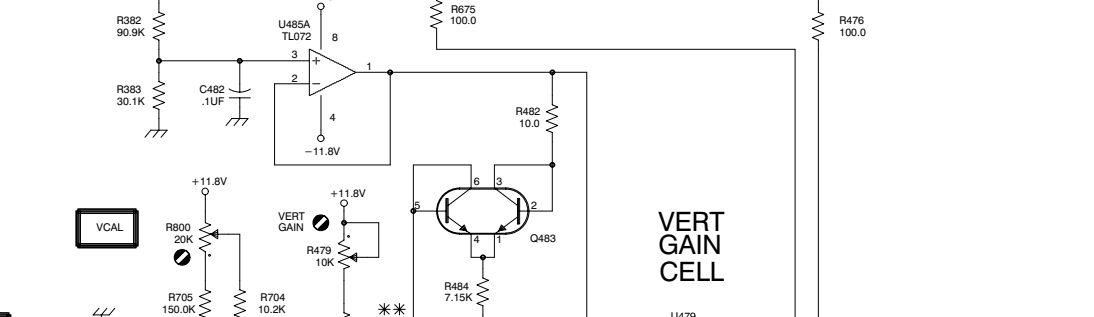
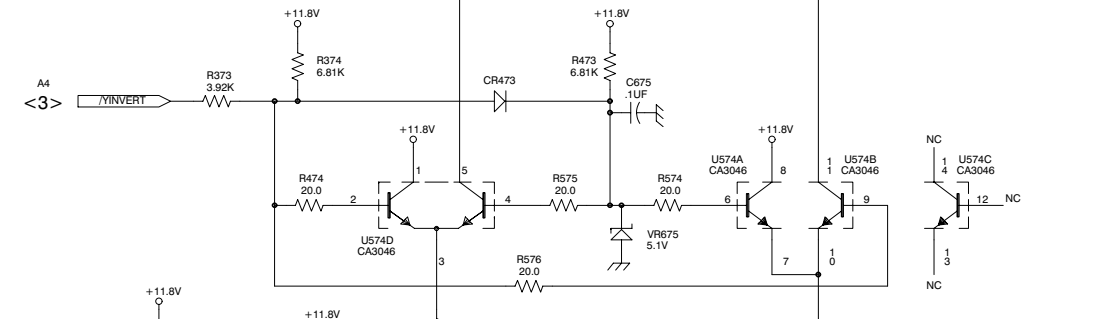
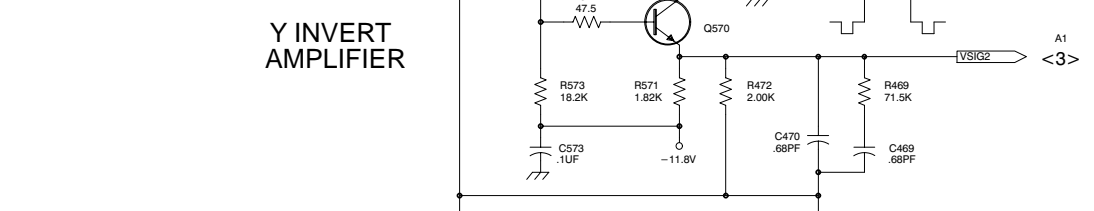
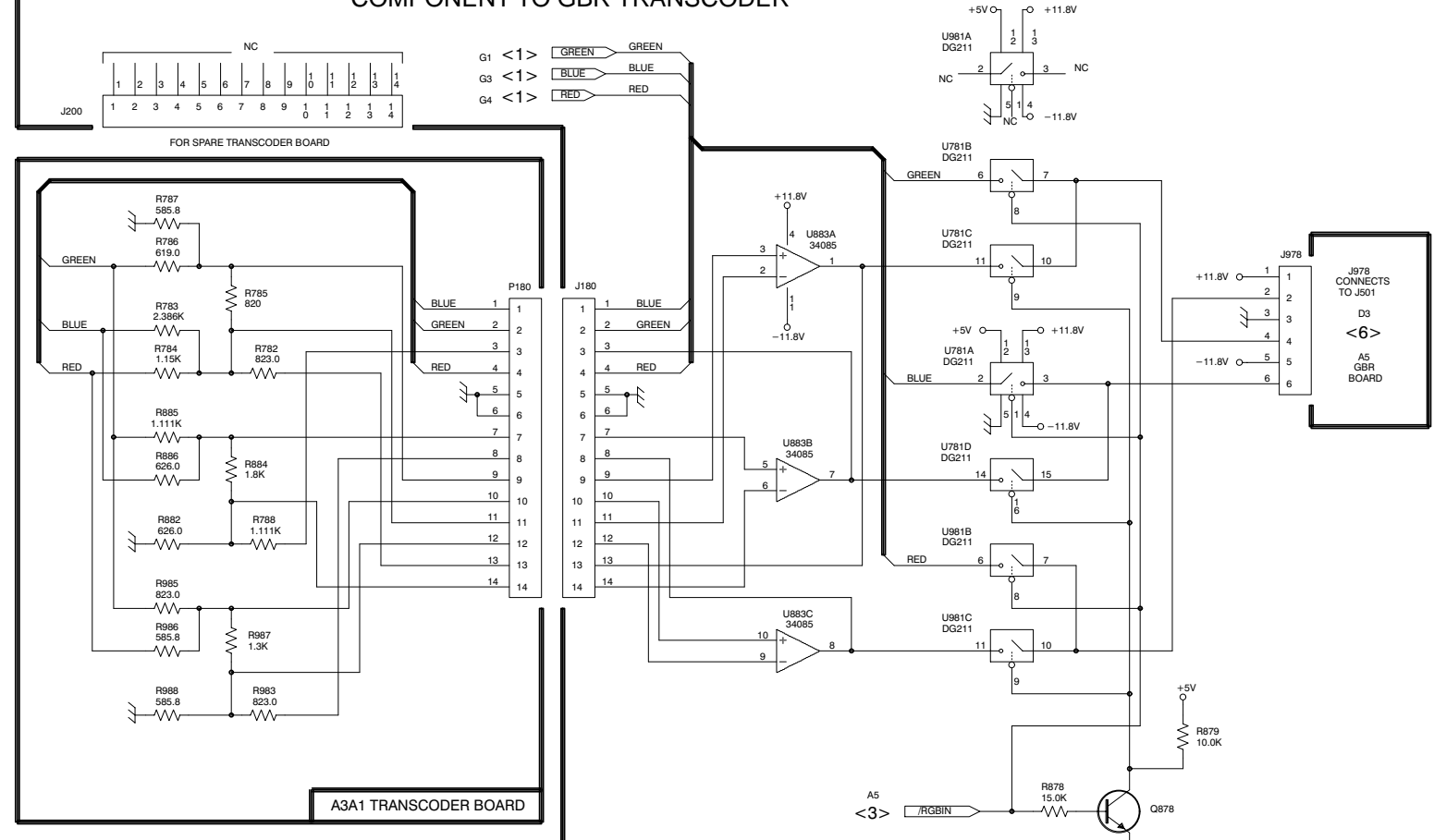
**A3A1 Transcoder Board**

**Static Sensitive Devices**  
See Maintenance Section

Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc
<b>A3</b>			R477	F4	M3
C187	B3	N1	R478	F4	M3
C193	C4	O1	R479	F3	L3
C197	B4	P1	R482	G3	N3
C290	C3	O1	R483	G5	N3
C370	G1	L3	R484	F3	N3
			R485	G5	N3
			R500	G4	A4
C379	F4	M3			
C469	H2	L3	R570	F1	L3
C470	G2	L3	R571	G1	L4
C482	F3	N3	R572	G1	L3
C573	G2	L4	R573	G1	L4
			R574	G2	L4
C581	G4	M4			
C582	G5	M4	R575	G2	L4
C584	G5	N4	R576	G3	M4
C675	G2	L4	R577	F5	M4
C684	F5	N4	R578	F5	M4
			R579	G4	M4
CR190	B4	O1	R580	G4	M4
CR473	G2	L3	R581	G4	M3
CR727	E4	D5	R582	G4	M3
			R583	F5	M4
DS700	E4	A5	R584	G5	N3
J180	B2	N5	R585	F5	N4
J190	A4	Q1	R586	F4	N4
J191	A4	Q1	R675	F3	L4
J200	A1	M2	R680	F5	M4
J978	E1	M6	R683	F5	N4
Q191	C4	O1	R684	F5	N4
Q263	D5	J2	R704	F3	A5
Q470	G1	K3	R705	F3	A5
Q471	G1	L3	R728	E4	D5
Q483	F3	M2	R730	E4	E5
Q570	G1	K4	R800	F3	A6
Q579	F5	M4	R878	D3	M5
Q581	F5	M4	R879	D3	M5
Q878	D3	M5			
			U191A	C4	O1
R186	B5	N1	U191B	C4	O1
R187	B5	N1	U191C	B4	O1
R188	B4	N1	U191D	B4	O1
R189	C4	N1	U264A	C4	J2
R190	B3	O1			
			U264B	D5	J2
R192	C4	O1	U479	G4	N3
R193	C4	O1	U485A	F3	N3
R194	B4	P1	U574A	G2	L3
R195	B4	P1	U574B	G2	L3
R196	C4	P1			
			U574C	H2	L3
R262	D5	J2	U574D	F2	L3
R263	D5	J2	U683	F5	N4
R264	D5	J2	U781A	D2	M5
R293	B4	O1	U781B	D1	M5
R370	G1	L3			
			U781C	D1	M5
R373	F2	L3	U781D	D2	M5
R374	F2	L3	U883A	C1	N6
R379	F4	M3	U883B	C2	N6
R382	F3	N3	U883C	C2	N6
R383	F3	N3			
			U981A	D1	M5
R469	H1	L4	U981B	D2	M5
R470	G1	L3	U981C	D2	M5
R471	G1	L3			
R472	G1	L3	VR190	C3	O1
R473	G2	L3	VR675	G2	L4
R474	F2	L3			
R476	G3	M4			

Comp No	Diag Loc	Bd Loc
<b>A3A1</b>		
P180	B2	A1
R782	A2	A2
R783	A2	A1
R784	A2	A2
R785	A1	A2
R786	A1	A2
R787	A1	A1
R788	A2	A1
R882	A2	A2
R884	A2	A1
R885	A2	A1
R886	A2	A1
R983	A3	A2
R985	A2	A1
R986	A3	A2
R987	A2	A2
R988	A3	A1

COMPONENT TO GBR TRANSCODER



NOTE: \* SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES.

PART OF A3 MAIN BOARD

### Schematic Diagram <3> Component Locator Chart

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

**Assembly A3.** Partial Assembly A3 also shown on diagrams 1, 2, 4, and 5.

Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc
C156	H5	I1	C875	G2	L6	Q973	G2	L6	R562	B1	J4	R856	E2	J5
C258	B5	I2	C876	H1	L5	R253	C5	I2	R564	B2	J4	R858	E2	J6
C350	C4	I1	C894	G5	P5	R254	C5	I2	R565	C4	K3	R859	E3	J5
C353	E5	I2	C928	G4	D6	R257	B5	I2	R566	C4	K4	R8603	E2	J5
C354	E5	I3	C946	H4	G6	R258	C5	I2	R567	C4	K4	R861	F2	J5
C355	E5	I3	C959	H4	I6	R353	E5	I2	R568	C4	K4	R862	E2	J6
C366	E3	K3	C963	F1	J6	R354	D5	I3	R569	C3	K4	R863	F2	K5
C446	F4	G3	C964	H5	K6	R355	C5	I3				R864	F3	K6
C447	D2	H3	C989	H4	O6	R357	C4	J3	R638	B1	F4	R865	F3	K6
C455	D5	I3	CR862	F1	J6	R358	E5	I3	R639	C1	F4	R866	F3	K6
C460	D4	J2	CR865	F2	J6				R640	C1	F4	R867	F2	K6
C461	E4	J3	CR965	F2	K6	R359	D5	I3	R641	C1	F4	R868	H2	K5
C462	D3	K4				R360	C4	J3	R642	C1	G4	R869	H2	K5
C466	D3	K3	J161	A3	J1	R361	C4	K3	R643	C2	G4	R870	G3	L6
C467	C3	K3	J453	D5	I3	R362	C4	K3	R644	C1	G4	R871	H2	L5
C468	C4	K3	J775	H1	L5	R363	C4	J3				R872	H2	L5
C479	G5	M3	J973	H1	L6	R364	D5	J3	R645	B2	G4	R873	G3	L6
C539	B1	F3	L776	G1	L5	R365	E5	J3	R646	B2	G4	R875	G1	L6
C540	B1	F3	L876	G1	L6	R366	D3	K3	R647	E1	G4	R876	G1	L6
C547	D1	H3				R446	D2	G3	R648	E2	H4	R929	E2	E6
C554	C1	H4	P453	D5		R447	D2	H3	R666	B3	K4			
C568	C3	K4	Q256	C5	I1	R452	D4	I3				R958	E2	J6
C589	G4	O4	Q350	C5	I2	R453	E5	I3	R667	B3	K4	R959	F2	J6
C642	C2	G4	Q352	E5	H3	R454	E5	I3	R672	C4	L4	R960	F2	J6
C643	C1	G4	Q355	C4	J3	R455	E5	I3	R673	C4	L4	R963	F2	K6
C644	B2	G4	Q358	D4	J3	R457	D4	I3				R964	F2	K6
C645	F5	G4				R458	D4	I3	R758	C2	J5	R965	G2	K6
C646	B2	G4	Q463	D3	J2	R459	D4	I3	R759	E3	J5	R966	G2	K6
C647	E1	H4	Q464	D3	J2	R460	E4	J3	R760	C2	J5	R967	G2	K6
C667	C3	K4	Q465	E3	K2	R461	E4	J3	R761	E2	J5			
C672	C4	L4	Q466	D4	J3	R462	D3	K4	R762	C3	J5	R968	F2	K6
C685	G5	N4	Q548	B2	H4				R763	C2	J5	R969	G2	K6
C686	H5	N4	Q553	D4	H4	R463	E4	J4	R764	E3	K5	R970	G3	L6
C734	D3	F5	Q555	C1	I3	R464	E4	J4	R765	E3	K5	R972	G2	M6
C763	C3	J5	Q562	E1	I4	R465	E4	J4	R766	F3	K5	R976	H1	M6
C769	G3	K5	Q563	E4	J3	R466	D3	K3	R767	B3	K5	U452B	D5	H3
C772	H2	K5	Q568	B2	J4	R467	D3	K3	R768	F1	K5	U458A	A1	I3
C794	G4	P5	Q663	B1	I4	R468	D4	K4	R769	G3	K5	U458B	B1	I3
C820	C2	C5	Q673	B4	K4							U458C	E4	I3
C828	D2	D6	Q764	F3	J5	R540	B1	F3	R770	H3	K5			
C860	F2	J6	Q771	G2	L5	R541	B1	G3	R771	H3	K5	U458D	E4	I3
C861	E3	J6	Q772	H2	L5	R544	D1	G3	R772	H2	K5	U544A	B1	G3
C862	F2	J6	Q773	G2	L5	R547	D1	H3	R773	H3	M5	U544B	C1	G3
C863	F2	K5	Q859	E2	J5	R550	D5	H4	R774	H3	L5	U544C	D1	G3
C864	F3	J5	Q860	F2	J6	R552	D4	I3	R775	G1	L5	U544D	D1	G3
C869	G2	K6							R776	H1	L5			
C870	G3	L6	Q961	F1	J6	R553	D5	H4				U544E	D1	G3
C871	G2	L6	Q971	G2	L6	R554	C1	H4	R820	C3	C5	U733	D2	E5
C873	G3	L6	Q972	G2	L6	R556	C1	I4	R821	C3	C6	U826A	C2	D6
						R557	E1	I4	R822	E2	C6	U826D	D2	D6
						R558	B2	I4	R823	C2	C6			
						R560	E3	J4	R828	D2	D5	VR366	E3	K3
						R561	B2	J4	R830	D3	E5			



### Schematic Diagram <4> Component Locator Chart

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

**Assembly A3.** Partial Assembly A3 also shown on diagrams 1, 2, 3, and 5.

Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc
C255	E2	I2	Q351	E2	H3	R439	G2	F3	R655	F4	I5			
C348	E2	H3	Q415	C3	B3	R444	F1	G3	R719	D5	C5	R853	G3	I6
C424	C4	C3	Q421	C4	C3	R445	F2	G3				R854	G4	I5
C436	F3	F3	Q432	D4	E3	R448	D3	H3	R720	D5	C5	R855	G4	I5
C438	G2	F3	Q433	E4	E3				R729	B1	E5	R857	H3	I6
C448	D3	H3				R508	B3	A4	R733	B2	F5	R924	E5	C6
C516	C3	B3	Q434	E4	E3	R513	C4	B3	R734	C2	F6			
C521	C5	C3	Q445	F2	G3	R514	C3	B4	R735	F5	E5	R925	D5	C6
C538	F2	F4	Q513	C4	B4	R515	C4	B4				R926	E5	C6
C616	C4	B4	Q518	C5	C4	R516	C4	B4	R736	B2	F5	R930	F5	E6
C622	C5	C5	Q525	D3	D4				R737	B2	F5	R936	B1	F6
C624	E5	D5				R517	C5	C4	R738	B2	F5	R937	B1	F6
C634	E3	E4	Q632	E3	E4	R518	C5	C4	R740	C2	G5			
C635	D3	F4	Q737	B2	F5	R519	C5	C4	R741	C2	G5	R940	D1	F6
C636	E3	F4	Q747	D2	H5	R520	C5	C4				R941	D1	F6
C649	E2	H4	Q751	G4	H5	R521	B5	C3	R743	B2	G5	R942	C1	F6
C652	D1	H4	Q753	G4	H5				R745	E2	G5	R944	D2	G6
C720	D5	C5				R522	C4	C4	R746	D2	G5	R947	H3	H6
			Q755	H4	I5	R523	C3	C4	R750	G4	H5			
C745	D2	G5	Q840	D1	F6	R524	C4	C4	R751	G4	H5	R948	G3	H6
C746	D2	G5	Q842	D1	G6	R525	D4	D4				R953	G3	H6
C757	G5	I5	Q846	D2	G6	R526	D4	D3	R752	F4	H5	R955	H3	I6
C834	F5	E6	Q851	G3	H6				R753	F4	I5	R956	H3	I6
C840	C1	G6	Q857	H3	I6	R527	D3	D4	R754	H4	I5			
						R528	D3	D4	R755	H4	I5	U174A	B2	L1
C848	H3	H6	R225	E5	D1	R529	D3	D4	R756	G4	I5	U174B	B2	L1
C851	H4	H5	R255	E2	I2	R532	E4	E3				U419A	C3	C3
C852	G4	H6	R314	B4	B2	R533	E4	E4	R757	H5	I5	U419B	C4	C3
C855	G3	I5	R315	B3	B2				R824	E5	C6	U443	G1	F3
C856	G3	I6	R316	C3	B2	R534	E4	E4	R829	F5	D6			
						R535	F4	F4	R834	B1	E6	U452A	D2	H3
C857	G3	I6	R317	B4	C2	R548	D3	H3	R835	C1	F6	U535A	F4	F4
C926	E5	C6	R318	C4	C2	R549	E2	H3				U535B	F3	F4
C929	F5	D6	R319	C3	C2	R551	D3	H4	R836	C1	F6	U615	B3	B4
C937	C1	F6	R329	E4	E3				R837	B1	F6	U619A	D5	C5
C944	C2	G6	R333	E4	E3	R555	D1	I4	R838	D1	F6			
C945	D2	G6				R621	C5	C4	R839	D1	G6	U619B	C5	C5
			R334	D4	E3	R622	C5	C4	R840	C1	G5	U658A	F2	I4
CR414	C3	B3	R343	G1	G3	R628	B1	D4				U658B	E1	I4
CR533	E3	E4	R414	C3	B3	R632	E4	E4	R841	C1	G6	U742	C2	F5
CR634	E3	E4	R415	C3	B3				R842	B2	G5	U826B	E5	D6
CR726	B1	D5	R416	C4	B3	R634	E3	E4	R843	C2	G5			
CR953	G3	H6				R635	D3	F4	R844	D2	G6	U826C	F5	D6
			R425	D3	C3	R636	E3	F4	R845	D2	G6	U833	E5	E5
J131	A3	E1	R429	D4	E3	R637	F2	F4				U981D	E2	M5
J843	D3	G5	R430	D4	E3	R649	E2	H4	R847	G2	H5			
J852	H4	H6	R434	E4	E3				R849	G3	H6	VR840	D1	G5
J857	H3	I6	R435	D4	E3	R650	F4	H5	R850	G4	H5	VR948	G3	H6
						R652	F2	N5	R851	G4	H5			
P843	D2		R436	F3	F3	R654	D1	I4	R852	H3	I6			



A B C D E F G H

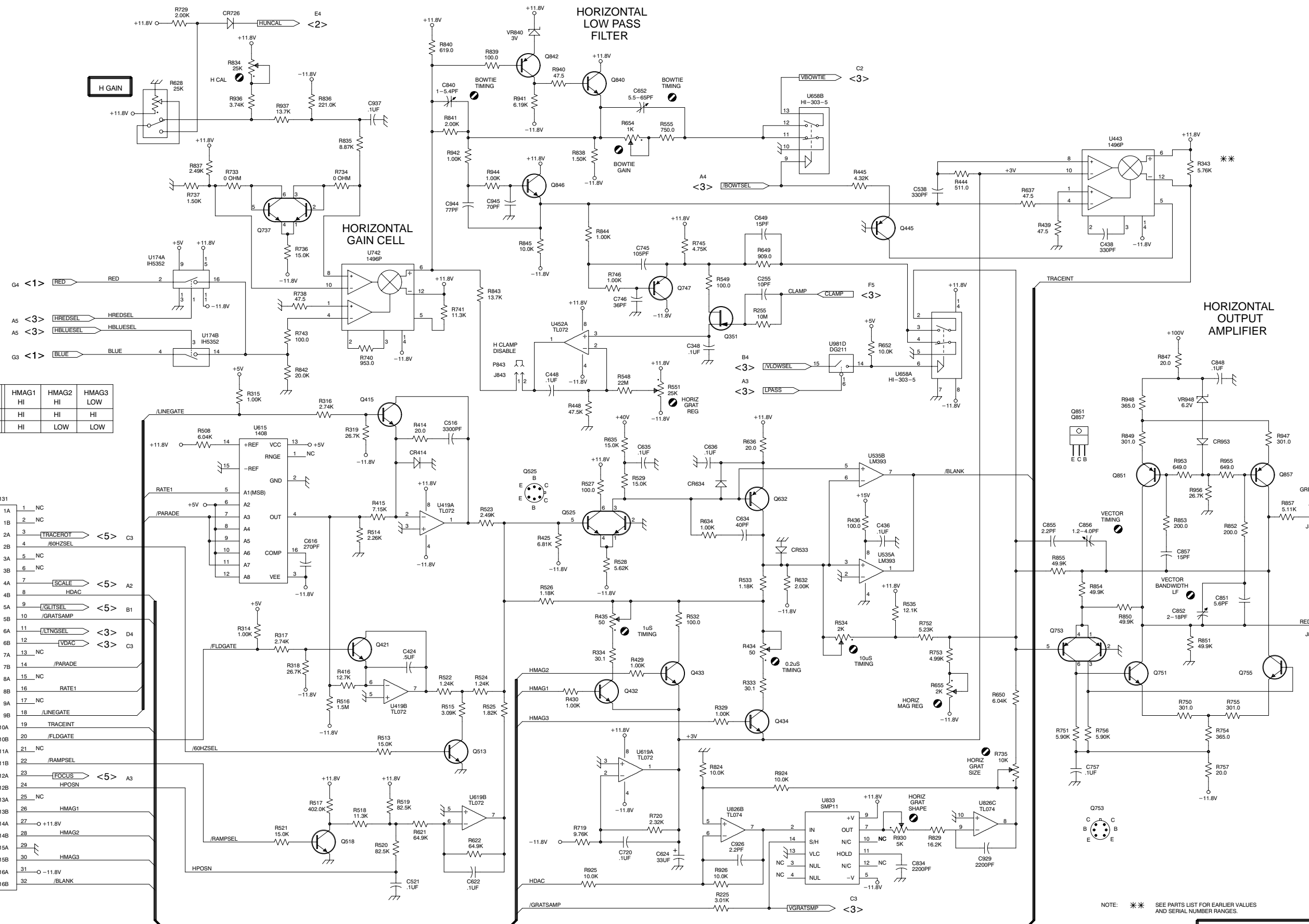
1

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2FIELD	HMAG1	HMAG2	HMAG3
1LINE	HI	HI	LOW
2LINE	HI	LOW	LOW

J131	1	NC
1A	2	NC
2A	3	TRACEROY <5> C3
2B	4	NC
3A	5	NC
3B	6	NC
4A	7	SCALE <5> A2
4B	8	HDAC
5A	9	GLTSEL <5> B1
5B	10	GRATSAMP
6A	11	LTNGSEL <3> D4
6B	12	VDAC <3> C3
7A	13	NC
7B	14	PARADE
8A	15	NC
8B	16	RATE1
9A	17	NC
9B	18	LINEGATE
10A	19	TRACEINT
10B	20	FLDGATE
11A	21	NC
11B	22	RAMPSEL
12A	23	FOCUS <5> A3
12B	24	HPOSN
13A	25	NC
14A	27	+11.8V
14B	28	HMAG2
15A	29	HMAG3
15B	30	HMAG1
16A	31	-11.8V
16B	32	BLANK

J131 CONNECTS TO J131  
H3 <9>  
A4 CONTROL BOARD

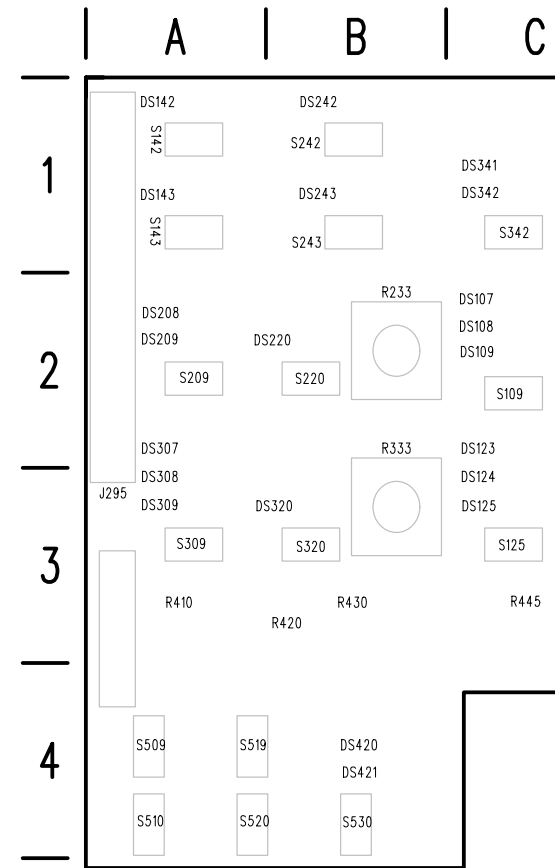
NOTE: \*\* SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES.

PART OF A3 MAIN BOARD

**Schematic Diagram <5> Component Locator Chart**

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

**Assembly A3 and A2.** Partial Assembly A3 also shown on diagrams 1, 2, 3, and 4.

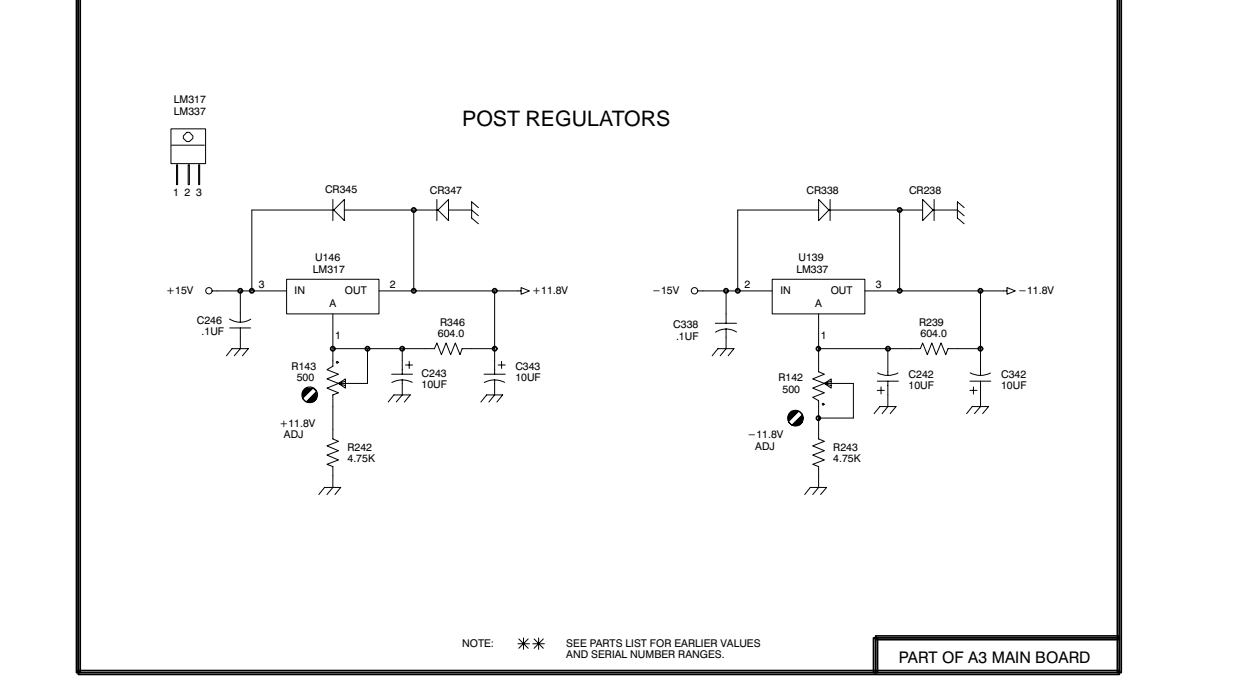
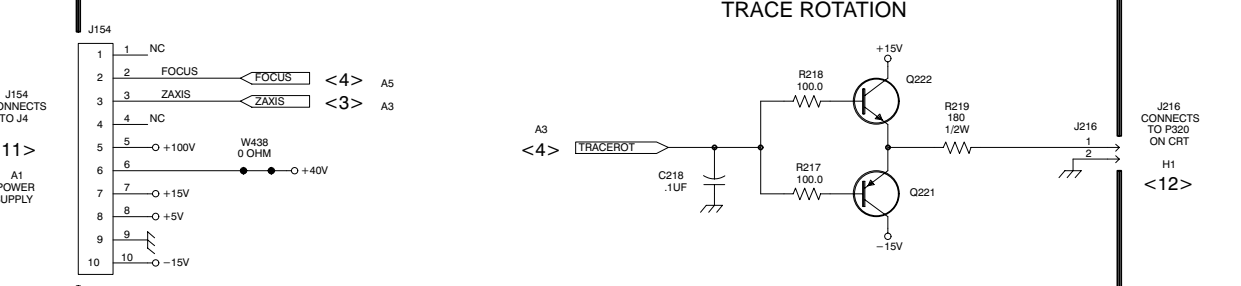
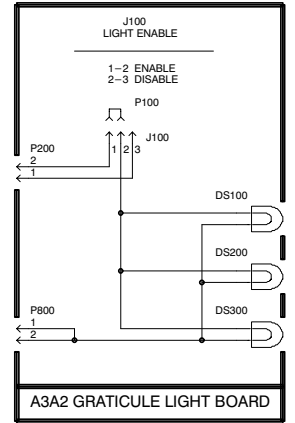
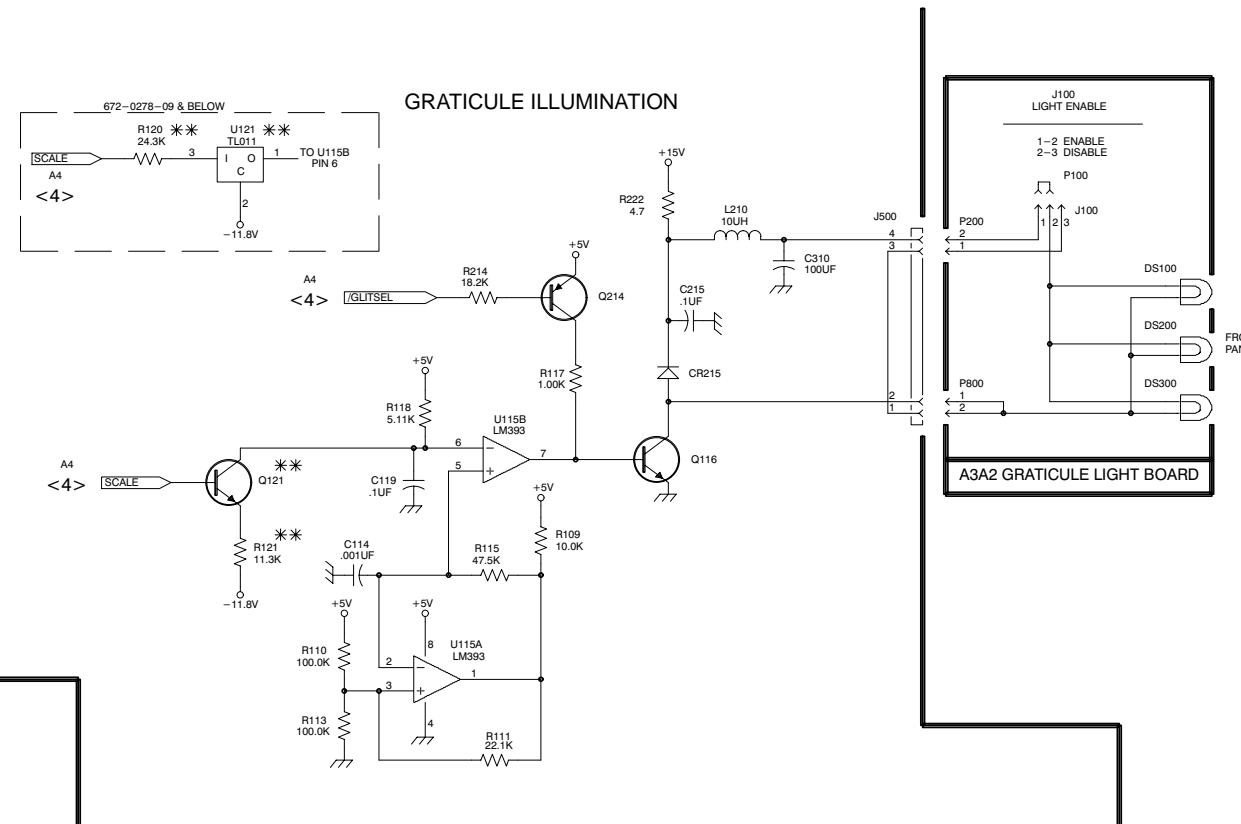


**A2 Front Panel Board**

 **Static Sensitive Devices**  
See Maintenance Section

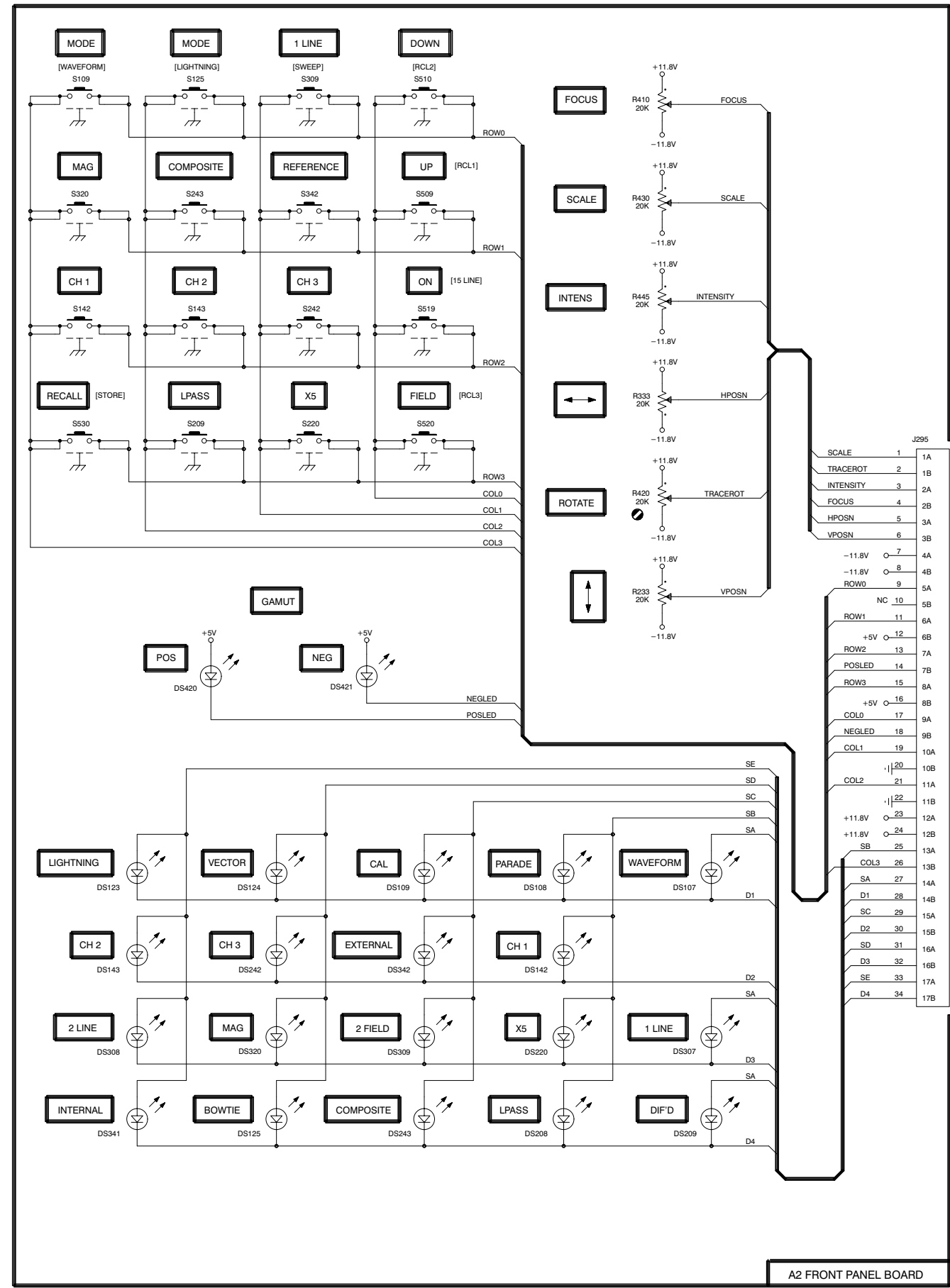
Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc
<b>A3</b>			<b>A2</b>		
C114	B2	B1	DS107	G4	C2
C119	B2	C1	DS108	G4	C2
C215	C1	B2	DS109	F4	C2
C218	C3	C2	DS123	E4	C2
C242	C5	G2	DS124	E4	C3
C243	B5	G2	DS125	E5	C3
C246	A5	G2	DS142	G4	A1
C310	C1	B2	DS143	E4	A1
C338	C5	F2	DS208	G5	A2
C342	C5	G2	DS209	G5	A2
C343	B5	G2	DS220	G4	A2
CR215	C2	B1	DS242	E4	B1
CR238	C4	F2	DS243	F5	B1
CR338	C4	F2	DS307	G4	A2
CR345	B4	G2	DS308	E4	A3
CR347	B4	G2	DS309	F4	A3
J154	A3	H1	DS320	E4	A3
J216	D3	B1	DS341	E5	C1
J500	C1	A3	DS342	F4	C1
L210	C1	B2	DS420	E3	B4
			DS421	F3	B4
Q116	B2	B1	J295	H2	A3
Q121 *	A2	C1	R233	G3	B2
Q214	B1	B2	R333	G2	B2
Q221	C3	C2	R410	G1	A3
Q222	C3	C2	R420	G2	B3
R109	B2	B1	R430	G1	B3
R110	B2	B1	R445	G2	C3
R111	B3	B1	S109	E1	C2
R113	B2	B1	S125	E1	C3
R115	B2	B1	S142	E2	A1
R117	B2	C1	S143	E2	A1
R118	B2	C1	S209	E2	A2
R120 *	A2	C1	S220	E2	A2
R121 *	A2	C1	S242	E2	B1
R142	C5	G1	S243	E1	B1
R143	B5	G1	S309	E1	A3
R214	B1	B2	S320	E1	A3
R217	C3	C2	S342	E1	C1
R218	C3	C2	S509	F1	A4
R219	C3	C1	S510	F1	A4
R222	C1	C1	S519	F2	B4
R239	C5	F2	S520	F2	B4
R242	B5	G1	S530	E2	B4
R243	C5	G1			
R346	B5	G2			
U115A	B2	B1			
U115B	B2	B1			
U121 *	A2	C1			
U139	C4	F1			
U146	A4	G1			
W438	A3	F3			

1  
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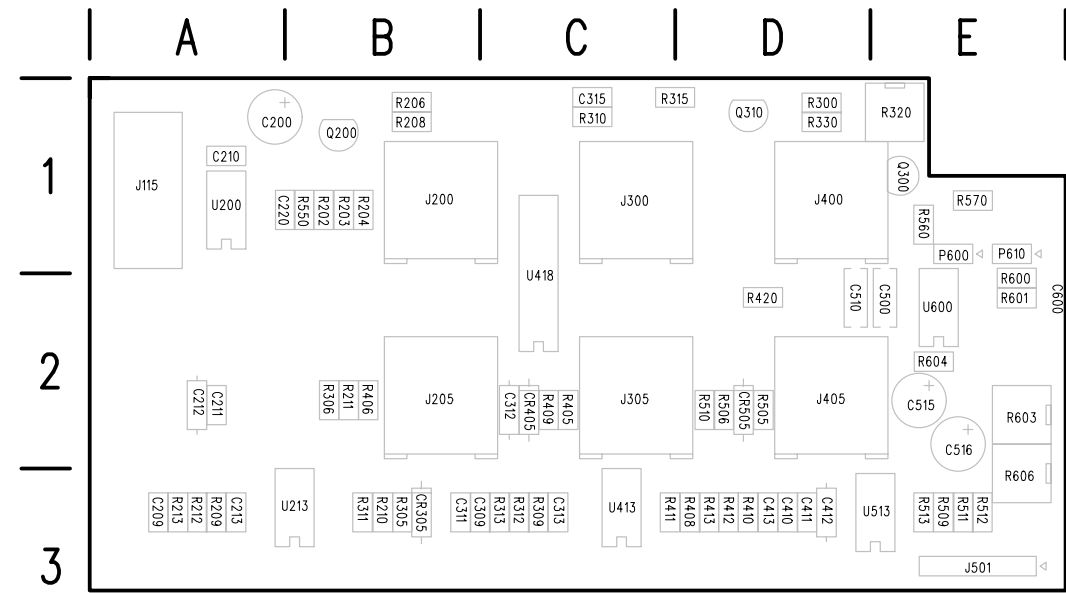


NOTE: \*\* SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES.

PART OF A3 MAIN BOARD



A2 FRONT PANEL BOARD



**A5 GBR Board**

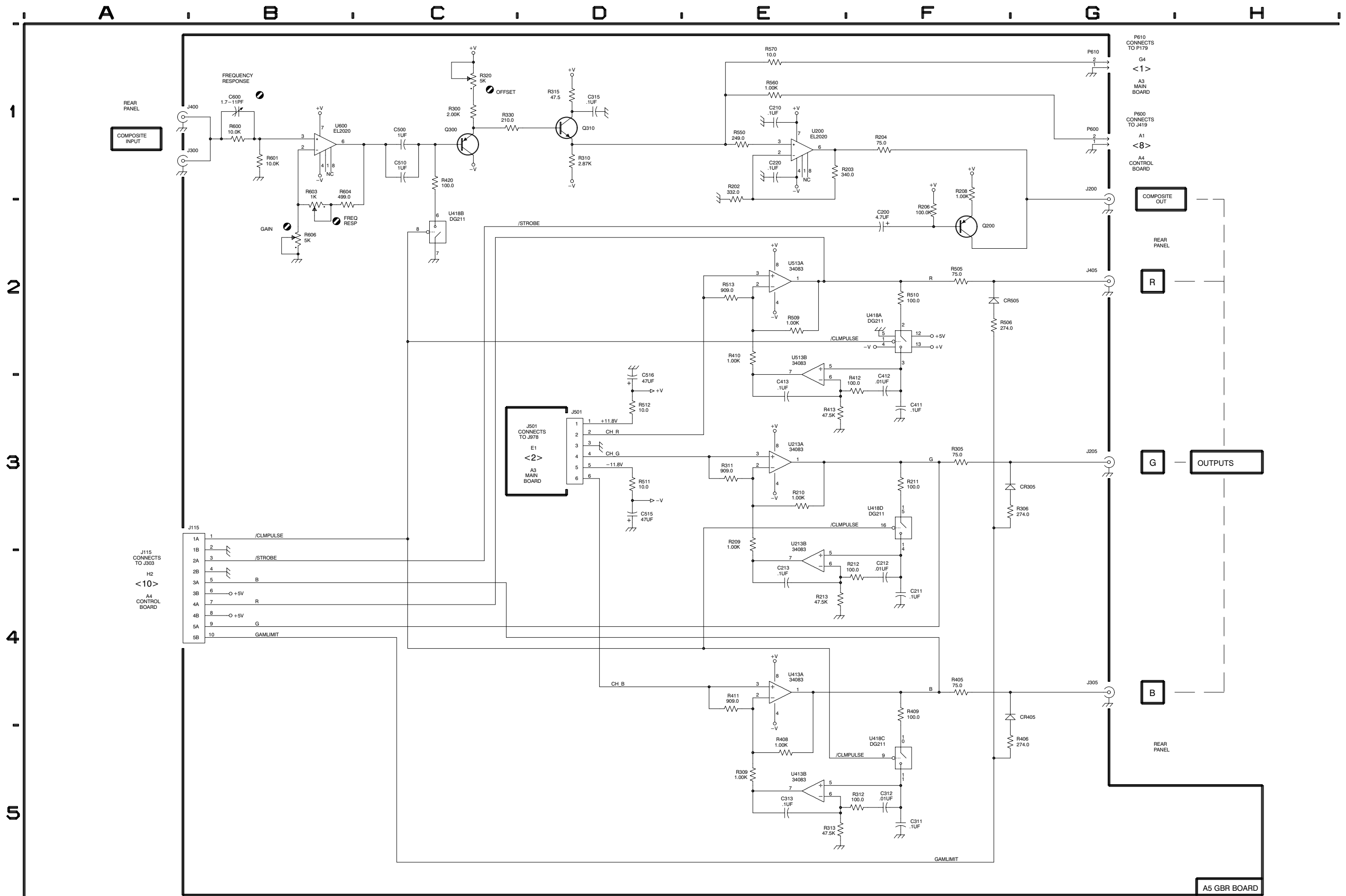
 **Static Sensitive Devices**  
See Maintenance Section

**Schematic Diagram <6> Component Locator Chart**

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

**Assembly A5.**

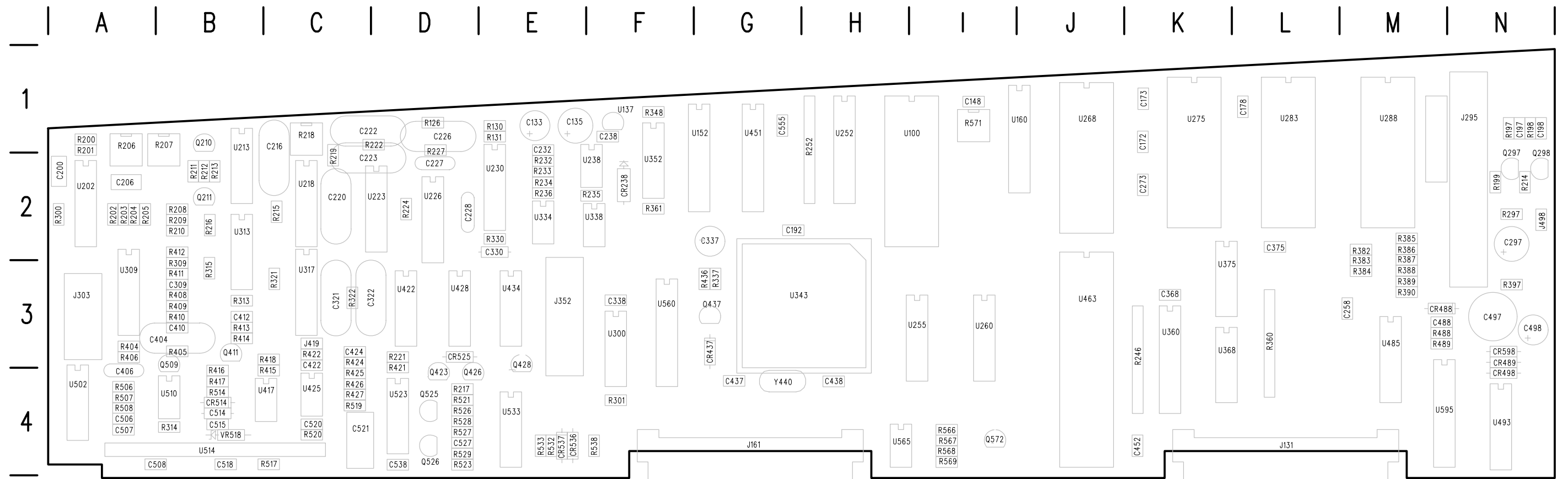
Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc
C200	F2	A1	J300	A1	C2	R306	F3	B2	R512	D3	E3
C210	E1	A1	J305	G4	C2	R309	E5	C3	R513	E2	E3
C211	F4	A2				R310	D1	C1	R550	E1	B1
C212	F4	A2	J400	A1	D2				R560	E1	E1
C213	E4	A3	J405	G2	D2	R311	E3	B3	R570	E1	E1
			J501	D3	E3	R312	E5	C3			
C220	E1	A1				R313	E5	C3	R600	B1	E2
C311	F5	B3	P600	G1	E1	R315	D1	C1	R601	B1	E2
C312	F5	C2	P610	G1	E1	R320	C1	D1	R603	B2	E2
C313	E5	C3							R604	B2	E2
C315	D1	C1	Q200	F2	B1	R330	C1	D1	R606	B2	E2
			Q300	C1	E1	R405	F4	C2			
C411	F3	D3	Q310	D1	D1	R406	F5	B2	U200	E1	A1
C412	F3	D3				R408	E5	D3	U213A	E3	A3
C413	E3	D3	R202	E1	B1	R409	F4	C2	U213B	E4	A3
C500	C1	E2	R203	E1	B1				U413A	E4	C3
C510	C1	D2	R204	F1	B1	R410	E2	D3	U413B	E5	C3
			R206	F2	B1	R411	E4	C3			
C515	D3	E2	R208	F1	B1	R412	E3	D3	U418A	F2	C2
C516	D3	E2				R413	E3	D3	U418B	C2	C2
C600	B1	E2	R209	E3	A3	R420	C1	D2	U418C	F5	C2
			R210	E3	B3				U418D	F3	C2
CR305	F3	B3	R211	F3	B2	R505	F2	D2	U513A	E2	D3
CR405	F4	C2	R212	E4	A3	R506	F2	D2			
CR505	F2	D2	R213	E4	A3	R509	E2	E3	U513B	E2	D3
						R510	F2	D2	U600	B1	E2
J115	A3	A1	R300	C1	D1	R511	D3	E3			
J200	G1	B2	R305	F3	B3						
J205	G3	B2									



WFM 300A COMPONENT/COMPOSITE WAVEFORM MONITOR

GBR & COMPOSITE OUT <6>

A5 GBR BOARD



Static Sensitive Devices  
See Maintenance Section

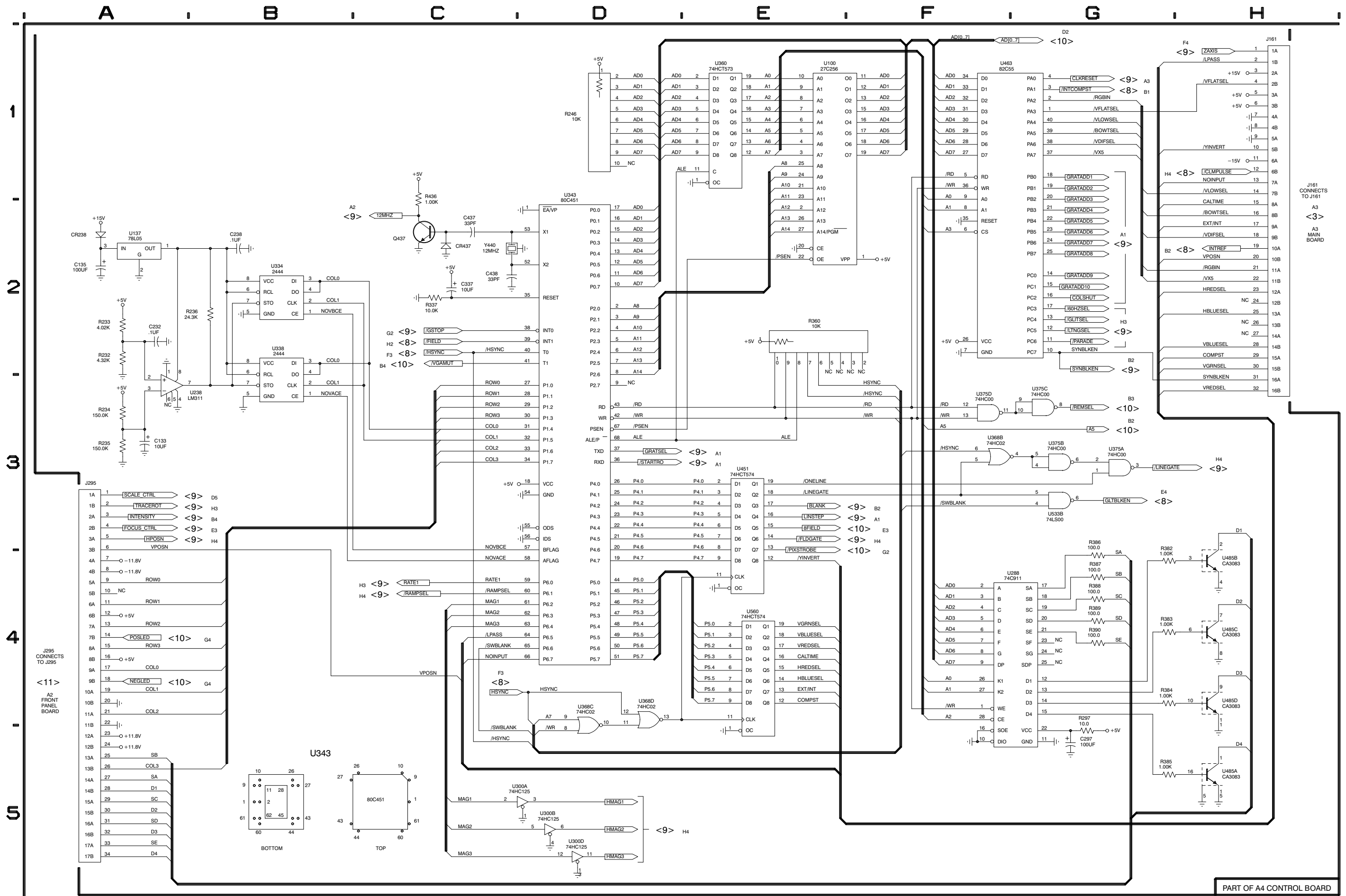
**A4 Control Board**

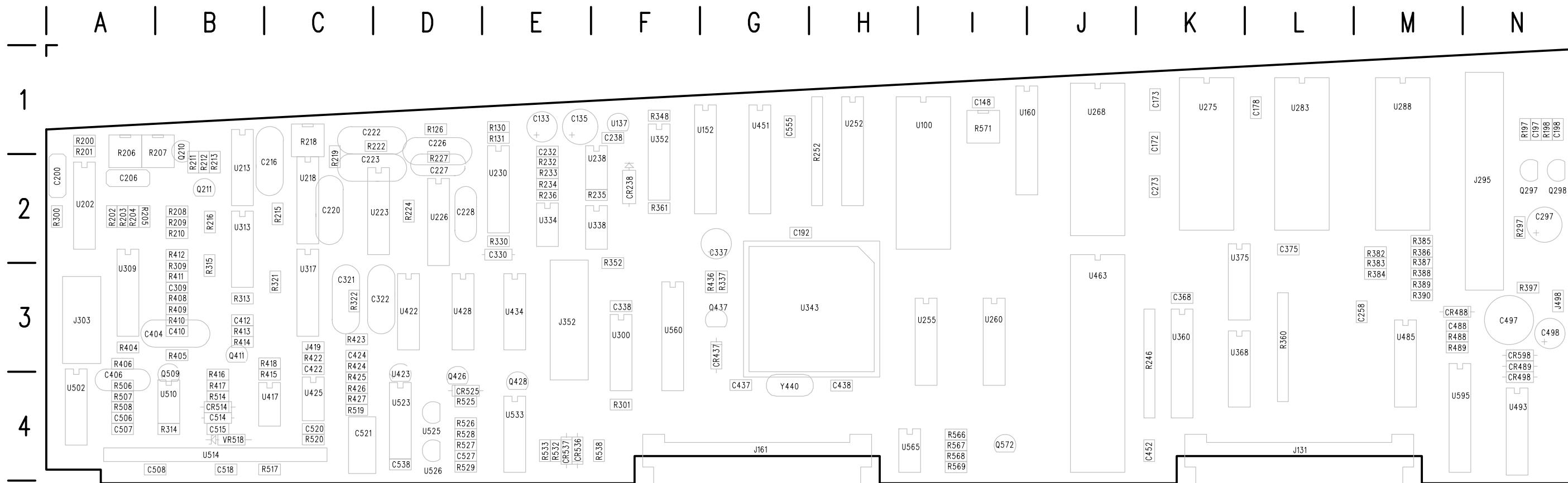
**671-1357-04**

**A4 Control Board Component Locator** (with cross-references to schematic diagrams 7, 8, 9, and 10)

Comp No	Diag No	Diag Loc	Bd Loc	Comp No	Diag No	Diag Loc	Bd Loc	Comp No	Diag No	Diag Loc	Bd Loc	Comp No	Diag No	Diag Loc	Bd Loc	Comp No	Diag No	Diag Loc	Bd Loc	Comp No	Diag No	Diag Loc	Bd Loc	Comp No	Diag No	Diag Loc	Bd Loc	Comp No	Diag No	Diag Loc	Bd Loc								
C133	7	A3	E1	C368	10	A5	K3	CR489	9	G1	N3	R126	8	B3	D1	R227	8	E3	D2	R388	7	G4	M3	R506	8	E1	A4	U213A	10	F3	B1	U485A	7	H5	M4				
C135	7	A2	E1	C375	10	A5	L2	CR498	9	G1	N4	R130	8	C3	E1	R232	7	A2	E2	R389	7	G4	M3	R507	8	E1	A4	U213B	10	E3	B1	U485B	7	H4	M4				
C148	10	A5	I1	C404	8	D4	B3	CR514	8	E1	B4	R131	8	C3	E1	R233	7	A2	E2	R390	7	G4	M3	R508	8	E2	A4	U213C	10	E4	B1	U485C	7	H4	M4				
C172	10	A5	K1	C406	8	E1	A4	CR525	9	D4	D4	R197	9	D5	N1	R234	7	A3	E2	R397	9	H1	N3	R514	8	F1	B4	U213D	10	F3	B1	U352A	9	F2	F2				
C173	9	G3	K1	C410	8	G4	B3	CR536	9	D3	E4	R198	9	C3	N1	R235	7	A3	E2	R404	8	D4	A3	R517	8	C1	B4	U352B	9	B2	F2	U485D	7	H4	M4				
C178	9	G5	L1	C412	10	D4	B3	CR537	9	D3	E4	R199*	9	D5	N2	R236	7	B2	E2	R405	8	G4	B3	R519	8	C1	C4	U218A	8	C4	C2	U352C	9	B3	F2	U493A	9	H1	N4
C192	10	A5	G2	C422	8	B1	C3	CR598	9	G1	N3	R200	10	F4	A1	R246	7	D1	K3	R406	8	F1	A3	R520	8	A2	C4	U218B	8	C5	C2	U493B	9	H2	N4				
C197	9	D5	N1	C424	8	C1	C3	CS100	9	H1		R201	10	F4	A1	R252	10	B2	H2	R408	10	D5	B3	R521*	9	E4	D4	U218C	8	D5	C2	U493C	9	G1	N4				
C198	9	C4	N1	C437	7	C2	G4	J131	9	H2	L4	R202	10	F4	A2	R297	7	G5	N2	R409	8	D4	B3	R522*	9	D4	D4	U226A	8	E3	D3	U368B	7	F3	K4	U502C	8	D1	A4
C200	10	F3	A2	C438	7	C2	H4	J161	7	H1	G4	R203	10	C3	A2	R300	10	F3	A2	R410	8	D4	B3	R525*	9	C4	D4	U226B	8	B3	D3	U368C	7	D4	K4	U502D	8	G2	A4
C206	10	F4	A2	C452	10	A5	K4	J295	7	A3	N3	R204	10	C3	A2	R301	10	H2	F4	R411	10	D4	B3	R526	9	D4	D4	U230	8	C3	D2	U368D	7	D4	K4	U510	8	E1	B4
C216	8	C4	C2	C488	10	B5	M3	J303	10	H2	A3	R205	10	C4	A2	R309	10	E4	B3	R412	10	D3	B2	R527	9	C4	D4	U238	7	A3	E2	U375A	7	G3	K3	U514	8	C1	B4
C220	8	C5	C2	C497	9	G1	N3	J352	10	B1	E4	R206	10	C3	A1	R313	10	C3	B3	R413	10	C4	B3	R528	9	C4	D4	U252	10	C2	H2	U375B	7	G3	K3	U523A	9	D4	D4
C222	8	F2	C1	C498	9	A4	N3	J419	8	A1	C3	R207	10	C4	B1	R314	10	E5	B4	R414	10	C5	B3	R529	9	D4	D4	U255	9	C2	I4	U375C	7	G3	K3	U523B	9	D4	D4
C223	8	D5	C2	C506	10	A5	A4	J498	9	H1	N3	R208	10	F3	B2	R315	10	D4	B3	R415	8	F1	B4	R532	9	C3	E4	U260	9	C1	I4	U375D	7	F3	K3	U523C	9	E4	D4
C226	8	B3	D1	C507	10	B5	A4	Q210	10	G3	B2	R209	10	F2	B2	R321	8	F3	C3	R416	8	F1	B4	R533	9	C3	E4	U268	9	E1	J2	U417	8	F1	B4	U525*	9	C4	D4
C227	8	E3	D2	C508	8	C1	A4	Q211	10	F3	B2	R210	10	D3	B2	R322	8	G3	C3	R417	8	F1	B4	R534	9	D3	F4	U275	9	F2	K2	U422A	8	D3	D3	U526*	9	D4	D4
C232	7	A2	E1	C514	8	E1	B4	Q211	10	F3	B2	R211	10	F3	B2	R330	8	D3	E2	R418	8	F1	B3	R566	9	E2	I4	U283	9	F4	L2	U422B	8	E4	D3	U533A	9	C4	E4
C238	7	B2	F1	C515	10	A5	B4	Q297	9	D5	N2	R212	10	F3	B2	R337	7	C2	G3	R421*	9	E5	D4	R567	9	E3	I4	U288	7	F4	M2	U422C	8	F4	D3	U533B	7	G3	E4
C258	10	B5	M3	C518	10	A5	B4	Q298	9	C3	N2	R213	10	F3	B2	R348	9	C2	F1	R422	8	A1	C3	R568	9	F2	I4	U300A	7	C5	F4	U422D	10	B4	D3	U533C	9	D2	E4
C273	10	B5	K2	C520	8	B2	C4	Q411	10	C4	B3	R214*	9	C3	N2	R423*	9	E5	C3	R423*	9	E5	C3	R569	9	E3	I4	U300B	7	D5	F4	U423*	9	E5	D3	U533D	9	C3	E4
C297	7	G5	N2	C521	8	C1	C4	Q423*	9	E5	D3	R215	8	C4	C2	R360	7	E2	L3	R424	8	B1	C3	R571	9	F2	I2	U300C	10	G2	F4	U423*	9	E5	D3	U560	7	E4	F4
C309	10	D4	B3	C527	9	C4	D4	Q428	9	D3	D3	R216	10	D3	B2	R361	9	G2	F2	R425	8	B2	C4	R571	9	F2	I2	U300D	7	D5	F4	U425	8	B1	C4	U565	9	D2	H4
C321	8	F3	C3	C538	9	D3	D4	Q428	9	D3	D3	R217*	9	C4	D4	R382	7	G4	M2	R426	9	E3	C4	R571	9	F2	I2	U309	10	D4	A2	U428A	8	G2	D3	U595	9	F1	M4
C322	8	G3	D3	C555	10	B5	G1	Q437	7	C2	G3	R218	8	C5	C1	R383	7	G4	M2	R427	9	E4	C4	R571	9	F2	I2	U313A	10	D3	B2	U428B	8	F4	D3	VR518	8	B2	B4
C330	8	D3	E2	CR238	7	A2	F2	Q509	8	D4	B3	R219	8	C5	C2	R384	7	G4	M3	R428	9	E4	C4	R571	9	F2	I2	U313B	10	D4	B2	U434A	9	A2	E3				
C337	7	C2	G2	CR437	7	C2	G3	Q525*	9	C4	D3	R221*	9	D5	D3	R385	7	G5	M2	R429	9	E4	C4	R571	9	F2	I2	U317A	8	F3	A2	U434B	9	A2	E3				
C338	10	B5	F3	CR488	9	G2	M3	Q526*	9	C4	D4	R222	8	D5	C1	R386	7	G4	M2	R436	9	E3	C4	R571	9	F2	I2	U317B	8	G3	C2	U451	7	E3	G2				
				CR488	9	G2	M3	Q572	9	E2	I4	R224	8	F2	D2	R387	7	G4	M2	R437	9	A4	M3	R571	9	F2	I2	U334	7	B2	E2	U463	7	F1	J4	Y440	7	C2	G4

\* See parts list for serial number ranges.





**Static Sensitive Devices**  
See Maintenance Section

Board lookup table on previous page.

**A4 Control Board**

**671-1357-00 - 03**

**Schematic Diagram <8> Component Locator Chart**

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

**Assembly A4.**

Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc
C216	C4	C2	J419	A1	C3	R409	D4	B3	U226A	E3	D3
C220	C5	C2				R410	D4	B3			
C222	F2	C1				R415	F1	B4	U226B	B3	D3
C223	D5	C2	Q509	D4	B3	R416	F1	B4	U230	C3	D2
C226	B3	D1				R417	F1	B4	U317A	F3	C2
			R126	B3	D1				U317B	G3	C2
C227	E3	D2	R130	C3	E1	R418	F1	B3	U417	F1	B4
C228	C3	D2	R131	C3	E1	R422	A1	C3			
C321	F3	C3	R215	C4	C2	R424	B1	C3	U422A	D3	D3
C322	G3	D3	R218	C5	C1	R425	B2	C4	U422B	E4	D3
C330	D3	E2				R506	E1	A4	U422C	F4	D3
			R219	C5	C2				U425	B1	C4
C404	D4	B3	R222	D5	C1	R507	E1	A4	U428A	G2	D3
C406	E1	A4	R224	F2	D2	R508	E2	A4			
C410	G4	B3	R227	E3	D2	R514	F1	B4	U428B	F4	D3
C422	B1	C3	R321	F3	C3	R517	C1	B4	U502C	D1	A4
C424	C1	C3				R519	C1	C4	U502D	G2	A4
			R322	G3	C3	R520	A2	C4	U510	E1	B4
C508	C1	A4	R330	D3	E2				U514	C1	B4
C514	E1	B4	R404	D4	A3	U218A	C4	C2			
C520	B2	C4	R405	G4	B3	U218B	C5	C2	VR518	B2	B4
C521	C1	C4	R406	F1	A3	U223A	D5	C2			
						U223B	F3	C2			
CR514	E1	B4									





### Schematic Diagram <9> Component Locator Chart

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

**Assembly A4.** Partial Assembly A4 also shown on diagrams 7, 8, and 10.

Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc
C173	G3	K1	R523 *	C5	D4
C178	G5	L1	R525 *	C4	D4
C197	D5	N1	R526	D4	D4
C198	C4	N1	R527	C4	D4
C497	G1	N3			
			R528	C4	D4
C498	A4	N3	R529	D4	D4
C527	C4	D4	R532	D3	E4
C538	D3	D4	R533	C3	E4
			R538	D3	F4
CR488	G2	M3			
CR489	G1	N3	R566	E2	I4
CR498	G1	N4	R567	E3	I4
CR525	D4	D4	R568	F2	I4
CR536	D3	E4	R569	E3	I4
CR537	D3	E4	R571	F2	I2
CR598	G1	N3			
			U152	B1	F2
CS100	H1		U160	D1	I2
			U255	C2	I4
J131	H2	L4	U260	C1	I4
J498	H1	N3	U268	E1	J2
Q297	D5	N2	U275	F2	K2
Q298	C3	N2	U283	F4	L2
Q423 *	E5	D4	U352A	F2	F2
Q426	D3	D3	U352B	B2	F2
Q428	C3	E3	U352C	B3	F2
Q525 *	C4	D4	U352D	B2	F2
Q526 *	C4	D4	U423 *	E5	D3
Q572	E2	I4	U434A	A2	E3
			U434B	A2	E3
R197	D5	N1	U493A	H1	N4
R198	C3	N1			
R199 *	D5	N2	U493B	H2	N4
R214 *	C4	N2	U493C	G1	N4
R217 *	C4	D4	U493D	G1	N4
			U523A	D4	D4
R221 *	D5	D3	U523B	D4	D4
R348	C2	F1			
R361	G2	F2	U523D	E4	D4
R397	H1	N3	U525 *	C4	D4
R421 *	E5	D4	U526 *	D4	D4
			U533A	C4	E4
R423 *	E5	C3	U533C	D2	E4
R426	E3	C4			
R427	E4	C4	U533D	C3	E4
R488	A4	M3	U565	D2	H4
R489	A4	M3	U595	F1	M4
R521 *	C4	D4			

\* See parts list for serial number ranges.



### Schematic Diagram <10> Component Locator Chart

The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.

**Assembly A4.** Partial Assembly A4 also shown on diagrams 7, 8, and 9.

Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc
C148	A5	I1	R209	F2	B2
C172	A5	K1			
C192	A5	G2	R210	D3	B2
C200	F3	A2	R211	F3	B2
C206	F4	A2	R212	F3	B2
C258	B5	3	R213	F3	B2
C273	B5	K2	R216	D3	B2
C309	D4	B3			
C338	B5	F3	R252	B2	H2
C368	A5	K3	R300	F3	A2
			R301	H2	F4
C375	A5	L2	R309	E4	B3
C412	D4	B3	R313	C3	B3
C452	A5	K4			
C488	B5	M3	R314	E5	B4
C506	A5	A4	R315	D4	B3
			R408	D5	B3
C507	B5	A4	R411	D4	B3
C515	A5	B4	R412	D3	B2
C518	A5	B4			
C555	B5	G1	R413	C4	B3
			R414	C5	B3
J303	H2	A3			
J352	B1	E4	U202A	F3	A2
			U202B	F4	A2
Q210	G3	B2	U213A	F3	B1
Q211	F3	B2	U213B	E3	B1
			U213C	E4	B1
Q411	C4	B3			
			U213D	F3	B1
R200	F4	A1	U252	C2	H2
R201	F4	A1	U300C	G2	F4
R202	F4	A2	U309	D4	A2
R203	C3	A2	U313A	D3	B2
R204	C3	A2			
			U313B	D4	B2
R205	C4	A2	U422D	B4	D3
R206	C3	A1			
R207	C4	B1			
R208	F3	B2			

A B C D E F G H

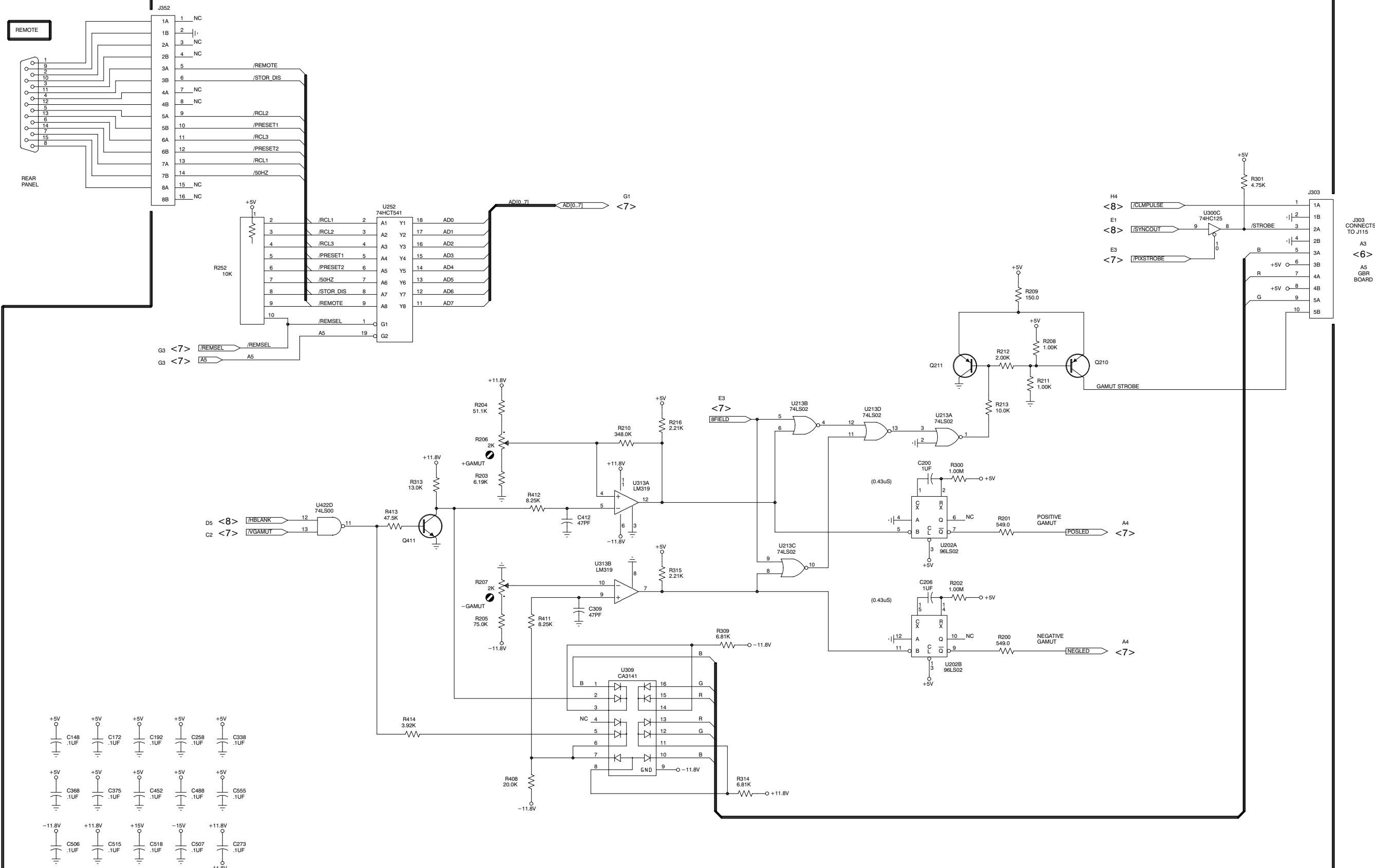
1

2

3

4

5



PART OF A4 CONTROL BOARD



A B C D E F G H

1

2

3

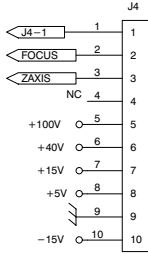
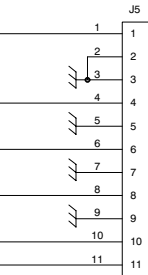
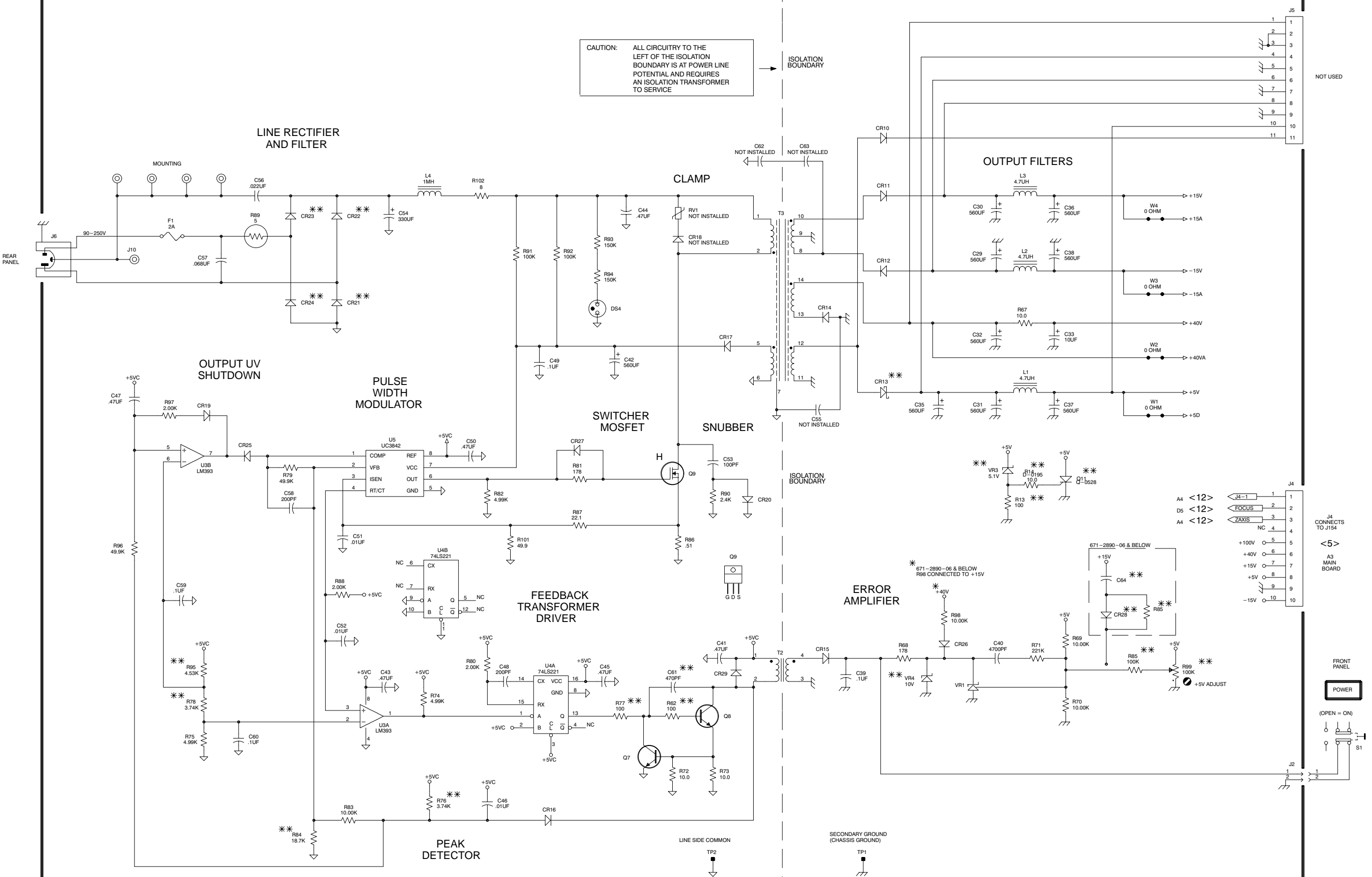
4

5

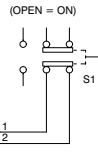
CAUTION: ALL CIRCUITRY TO THE LEFT OF THE ISOLATION BOUNDARY IS AT POWER LINE POTENTIAL AND REQUIRES AN ISOLATION TRANSFORMER TO SERVICE

ISOLATION BOUNDARY

NOT USED



J4 CONNECTS TO J154  
<5>  
A3 MAIN BOARD



NOTE: \*\* SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES.

PART OF A1 POWER SUPPLY

**Schematic Diagram <12> Component Locator Chart**

*The schematic diagram has an alphanumeric grid to assist in locating parts within that diagram.*

**Assembly A1.** Partial Assembly A1 also shown on diagram 11.

Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc	Comp No	Diag Loc	Bd Loc
C1	C4	A4				R35	D4	B3
C2	D3	D1	DS1	E2	B2			
C3	D3	A2	DS2	E2	B2	R36	D4	B3
C4	D3	A2	DS3	E3	B2	R37	C5	B4
C5	D4	B3				R38	E2	B1
			FIL1	C3	C1	R39	E2	B1
C6	C4	B4	FIL2	C3	C1	R40	D2	B2
C7	F3	B1						
C8	D3	B2	J1	F3	B1	R41	D4	B3
C9	E2	B2	J3	F2	D1	R42	E3	C1
C10	C5	B4	J11	F4	A2	R43	E2	B3
						R44	D2	B3
C11	E2	B1	Q1	E5	B3	R45	F2	C4
C12	D2	C4	Q2	E5	A3			
C13	D2	C4	Q3	D4	B4	R46	E3	C1
C14	D2	C4	Q4	D4	B4	R47	D2	C3
C15	F2	C4	Q5	C4	B4	R48	C2	C4
			Q6	B2	E1	R49	F2	C4
C16	C2	C3	Q10	A2	E2	R50	F2	E1
C17	F2	D4						
C18	F3	E1	R1	E3	A1	R51	F3	E1
C19	C1	D4	R2	E4	A2	R52	F2	E1
C20	C2	D4	R3	E4	A2	R53	F2	E1
			R4	E4	A3	R54	F2	E1
C21	C1	D4	R5	E5	A3	R55	D2	D4
C22	B2	E2						
C23	B2	E3	R7	B4	A4	R56	F3	E1
C24	D1	E4	R8	B4	A4	R57	B2	E1
C25	A3	E2	R11	F4	A2	R58	D2	E4
			R12	D3	C1	R59	B1	E2
C27	B1	E3	R20	C4	A4	R60	C1	E3
C28	B1	E3						
C34	D1	F4	R21	C5	A4	R61	D1	E4
C65	B2	F4	R22	D5	A4	R63	A2	E2
C66	A2	E2	R23	B4	A4	R64	C2	E2
			R24	D5	A4	R65	B1	E3
CR1	E2	B1	R25	B4	A4	R66	B1	E3
CR2	D4	B3				R103	A2	E2
CR3	E2	B1	R26	E5	A3			
CR4	C2	B2	R27	E5	A4	T1	B2	C4
CR5	D2	C3	R28	E5	A4			
			R29	D2	B1	U1	D1	C1
CR6	E2	C3	R30	D2	A2	U2	B1	F4
CR7	C2	D4						
CR8	C2	D4	R31	D4	B3	VR2	A2	E2
CR9	C1	E4	R32	E5	B3			
CR30	A2	E2	R33	C4	B4			
CR31	A2	E2	R34	C4	B4			







# Section 10

## Replaceable Mechanical Parts

This section contains a list of the components that are replaceable for the WFM 300A. Use this list to identify and order replacement parts. There is a separate Replaceable Mechanical Parts list for each instrument.

### 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. Therefore, when ordering parts, it is important to include the following information in your order.

- Part number
- Instrument type or model number
- Instrument serial number
- Instrument 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.

### Using the Replaceable Mechanical Parts List

The tabular information in the Replaceable Mechanical Parts list is arranged for quick retrieval. Understanding the structure and features of the list will help you find all of the information you need for ordering replaceable parts.

#### **Cross Index–Mfr. Code Number to Manufacturer**

The Mfg. Code Number to Manufacturer Cross Index for the mechanical parts list is located immediately after this page. The cross index provides codes, names, and addresses of manufacturers of components listed in the mechanical parts list.

#### **Abbreviations**

Abbreviations conform to American National Standards Institute (ANSI) standard Y1.1.

#### **Chassis Parts**

Chassis-mounted parts and cable assemblies are located at the end of the Replaceable Electrical Parts list.

## Column Descriptions

<b>Figure &amp; Index No. (Column 1)</b>	Items in this section are referenced by figure and index numbers to the illustrations.																																																												
<b>Tektronix Part No. (Column 2)</b>	Indicates part number to be used when ordering replacement part from Tektronix.																																																												
<b>Serial No. (Column 3 and 4)</b>	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.																																																												
<b>Qty (Column 5)</b>	This indicates the quantity of mechanical parts used.																																																												
<b>Name and Description (Column 6)</b>	<p>An item name is separated from the description by a colon (:). Because of space limitations, an item name may sometimes appear as incomplete. Use the U.S. Federal Catalog handbook H6-1 for further item name identification.</p> <p>Following is an example of the indentation system used to indicate relationship.</p> <table border="0" style="margin-left: 20px;"> <tr> <td style="padding-right: 5px;"><b>1</b></td> <td style="padding-right: 5px;"><b>2</b></td> <td style="padding-right: 5px;"><b>3</b></td> <td style="padding-right: 5px;"><b>4</b></td> <td style="padding-right: 5px;"><b>5</b></td> <td><b>Name &amp; Description</b></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Assembly and/or Component</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Mounting parts for Assembly and/or Component</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td><b>*MOUNTING PARTS*/*END MOUNTING PARTS*</b></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Detail Part of Assembly and/or Component</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Mounting parts for Detail Part</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td><b>*MOUNTING PARTS*/*END MOUNTING PARTS*</b></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Parts of Detail Part</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Mounting parts for Parts of Detail Part</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td><b>*MOUNTING PARTS*/*END MOUNTING PARTS*</b></td> </tr> </table> <p>Mounting 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. <b>Mounting parts must be purchased separately, unless otherwise specified.</b></p>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>Name &amp; Description</b>						Assembly and/or Component						Mounting parts for Assembly and/or Component						<b>*MOUNTING PARTS*/*END MOUNTING PARTS*</b>						Detail Part of Assembly and/or Component						Mounting parts for Detail Part						<b>*MOUNTING PARTS*/*END MOUNTING PARTS*</b>						Parts of Detail Part						Mounting parts for Parts of Detail Part						<b>*MOUNTING PARTS*/*END MOUNTING PARTS*</b>
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					<b>*MOUNTING PARTS*/*END MOUNTING PARTS*</b>																																																								
<b>Mfr. Code (Column 7)</b>	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.)																																																												
<b>Mfr. Part Number (Column 8)</b>	Indicates actual manufacturer's part number.																																																												

## Cross Index – Mfr. Code Number To Manufacturer

Mfr. Code	Manufacturer	Address	City, State, Zip Code
S3109	FELLER	72 Veronica Ave Unit 4	Summerset NJ 08873
TK0435	LEWIS SCREW CO	4300 S RACINE AVE	CHICAGO IL 60609-3320
TK1151	QUALITY PLASTIC INC	2101 CRESTVIEW DR PO BOX 740	NEWBERG OR 97132-9518
TK1155	QUALITY PLASTIC INJECTION MOLDING	3910 INDUSTRIAL AVE	COEUR D'ALENE ID 83814
TK1617	CRAFT FACTORY PLASTICS	17145 SW ALEXANDER	ALOHA OR 97007
TK1935	ACCRA-FAB INC	11007 NE 37TH CIRCLE	VANCOUVER WA 98682
TK2364	ARROW/KIERULFF ELECTRONICS	1800 NW 167TH PLACE SUITE 145	BEAVERTON OR 97006
TK2548	XEROX BUSINESS SERVICES DIV OF XEROX CORPORATION	14181 SW MILLIKAN WAY	BEAVERTON OR 97077
OJR05	TRIQUEST CORP	3000 LEWIS AND CLARK HWY	VANCOUVER WA 98661-2999
OJ9P9	GEROME MFG CO INC	PO BOX 737 403 NORTH MAIN	NEWBERG OR 97132
0KBZ5	MORELLIS Q & D PLASTICS	1812 16TH AVE	FOREST GROVE OR 97116
0KB01	STAUFFER SUPPLY	810 SE SHERMAN	PORTLAND OR 97214
06383	PANDUIT CORP	17301 RIDGELAND	TINLEY PARK IL 60477-3048
06915	RICHCO PLASTIC CO	5825 N TRIPP AVE	CHICAGO IL 60646-6013
07416	NELSON NAME PLATE CO	3191 CASITAS	LOS ANGELES CA 90039-2410
2K262	BOYD CORP	6136 NE 87th AVE PO BOX 20038	PORTLAND OR 97220
22670	G M NAMEPLATE INC	2040 15TH AVE WEST	SEATTLE WA 98119-2728
31918	ITT SCHADOW INC	8081 WALLACE RD	EDEN PRAIRIE MN 55344-2224
52152	MINNESOTA MINING AND MFG CO INDUSTRIAL TAPE DIV	3M CENTER	ST PAUL MN 55144-0001
55335	JKL COMPONENTS CORP	13343 PAXTON STREET	PACOIMA CA 91331
71400	BUSSMANN DIV OF COOPER INDUSTRIES INC	114 OLD STATE RD PO BOX 14460	ST LOUIS MO 63178
73743	FISCHER SPECIAL MFG CO	111 INDUSTRIAL RD	COLD SPRING KY 41076-9749
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON OR 97077-0001
80126	PACIFIC ELECTRICORD CO	747 W REDONDO BEACH PO BOX 10	GARDENA CA 90247-4203
85471	BOYD CORP	13885 RAMOMA AVE	CHINO CA 91710
86928	SEASTROM MFG CO INC	701 SONORA AVE	GL ENDALE CA 91201-2431
9M860	ELECTRONIC SUB ASSEMBLY MFG CORP (ESAM)	930 SE M STREET PO BOX 376	GRANTS PASS OR 97526-3248
93907	TEXTRON INC CAMCAR DIV	600 18TH AVE	ROCKFORD IL 61108-5181

## Replaceable Mechanical Parts

Fig. & Index No.	Tektronix Part No.	Serial Number		Qty	12345	Name & Description	Mfr. Code	Mfr. Part No.
		Effective	Dscont					
1-1	426-2174-00			1		FRAME,CRT:BEZEL *MOUNTING PARTS*	TK1151	ORDER BY DESC
-2	211-0690-02			2		SCREW,MACHINE:6-32 X 0.875,PNH,SST *END MOUNTING PARTS*	93907	B20-70430
-3	333-3397-00			1		PANEL,FRONT:WFM300	22670	ORDER BY DESC
-4	378-0298-00			1		FILTER,CRT:CLEAR,4.736 X 3.882,PLEXIGLASS	0JR05	378-0298-00
-5	354-0670-00			1		RING,RETAINING:COLOR SHUTTER	TK1151	ORDER BY DESC
-6	348-0660-00			4		CUSHION,CRT:POLYURETHANE	80009	348066000
-7	333-3761-01			1		PANEL,FRONT:WFM300A *MOUNTING PARTS*	80009	333376101
-8	211-0721-00			2		SCREW,MACH:6-32 X 0.375,PNH,STL,CDPL,T-15 TORX DR *END MOUNTING PARTS*	0KB01	ORDER BY DESC
-9	-----			1		CIRCUIT BD ASSY:FRONT PANEL (SEE A2 REPL) *MOUNTING PARTS*		
-10	211-0721-00			3		SCREW,MACH:6-32 X 0.375,PNH,STL,CDPL,T-15 TORX DR *END MOUNTING PARTS*	0KB01	ORDER BY DESC
-11	-----			1		SWITCH,PUSH:0.4A,125VAC,W/SOLDER LUG,BUTTON W/YELLOW INDICATOR (SEE S1 REPL) *MOUNTING PARTS*		
-12	210-0405-00			2		NUT,PLAIN,HEX:2-56 X 0.188,BRS CD PL	73743	12157-50
-13	211-0100-00			2		SCREW,MACHINE:2-56 X 0.750,PNH,STL *END MOUNTING PARTS*	TK0435	ORDER BY DESC
-14	426-2101-01			1		FRAME SECT,CAB.:FRONT *MOUNTING PARTS*	TK1151	ORDER BY DESC
-15	211-0721-00			3		SCREW,MACH:6-32 X 0.375,PNH,STL,CDPL,T-15 TORX DR *END MOUNTING PARTS*	0KB01	ORDER BY DESC
-16	-----			1		CIRCUIT BD ASSY:MAIN (SEE A3 REPL) *MOUNTING PARTS*		
-17	211-0721-00			8		SCREW,MACH:6-32 X 0.375,PNH,STL,CDPL,T-15 TORX DR *END MOUNTING PARTS*	0KB01	ORDER BY DESC
-18	-----			1		CIRCUIT BD ASSY:TRANSCODER STD (SEE A3A1 REPL)		
-19	-----			1		CIRCUIT BD ASSY:GRATICULE LIGHT (SEE A3A2 REPL)		
-20	337-3375-01			1		SHIELD,ELEC:CIRCUIT BD,POLYCARBONATE	85471	337-3375-01
-21	-----			1		CIRCUIT BD ASSY:POWER SUPPLY (SEE A1 REPL) *MOUNTING PARTS*		
-22	211-0721-00			7		SCREW,MACH:6-32 X 0.375,PNH,STL,CDPL,T-15 TORX DR	0KB01	ORDER BY DESC
-23	210-0586-00			2		NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	TK0435	ORDER BY DESC
-24	211-0016-00			2		SCREW,MACHINE:4-40 X 0.625,PNH,STL *END MOUNTING PARTS*	TK0435	ORDER BY DESC
-25	131-3573-00			1		CONN,PLUG,ELEC:MALE,W/LOCKING ADAPTER	80126	B-0779
-26	337-3257-00			2		SHIELD,CKT BD:LV PWR SUPPLY	2K262	ORDER BY DESC
-27	337-3931-00			1		SHIELD,ELEC:ALUMINUM	80009	337393100
-28	175-9872-01			1		CA ASSY,SP,ELEC:2,18 AWG,2.5 L,0-N	TK2364	175-9872-01
-29	333-3769-01			1		PANEL,REAR:WFM300A *MOUNTING PARTS*	80009	333376901
-30	211-0721-00			2		SCREW,MACH:6-32 X 0.375,PNH,STL,CDPL,T-15 TORX DR *END MOUNTING PARTS*	0KB01	ORDER BY DESC
-31	-----			1		CIRCUIT BD ASSY:GBR (SEE A5 REPL) *MOUNTING PARTS*		
-32	220-0497-00			12		NUT,PLAIN,HEX:0.5-28 X 0.562 HEX,BRS CD PL	73743	ORDER BY DESC

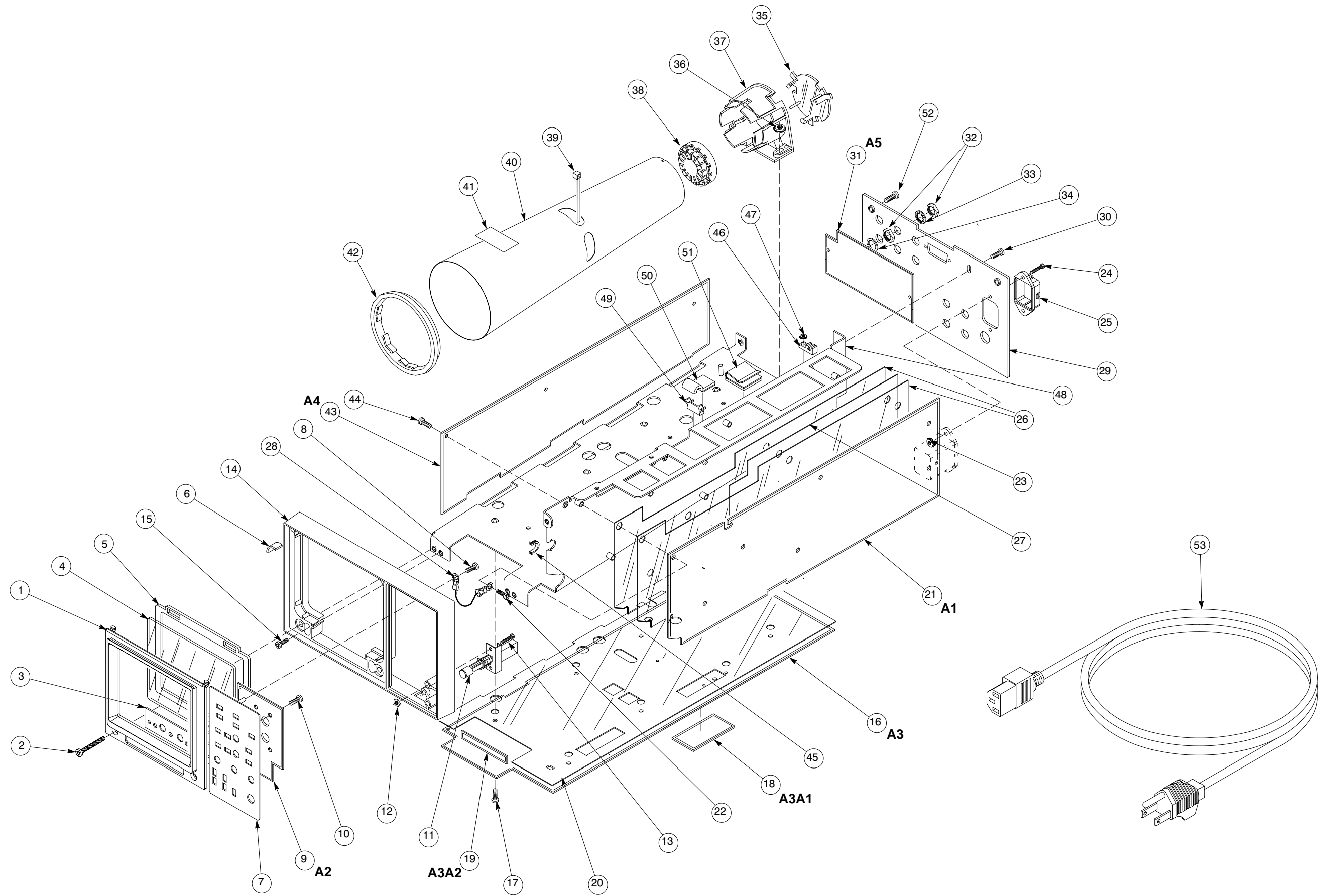
Replaceable Mechanical Parts

Fig. & Index No.	Tektronix Part No.	Serial Number		Qty	12345	Name & Description	Mfr. Code	Mfr. Part No.
		Effective	Dscont					
-33	210-1039-00			8		WASHER,LOCK:0.521 ID,INT,0.025 THK,SST	0KB01	1224-02-00-0541
-34	210-0986-00			8		WASHER,FLAT:0.5 ID X 0.672 OD X 0.035,STL	86928	A371-176-35
-35	200-2519-00			1		CAP,CRT SOCKET:NATURAL LEXAN	80009	200251900
-36	426-2096-00			1		MOUNT,RESILIENT:CRT REAR *MOUNTING PARTS*	TK1155	426-2096-00
-37	210-0457-00			2		NUT,PL,ASSEM WA:6-32 X 0.312,STL CD PL *END MOUNTING PARTS*	TK0435	ORDER BY DESC
-38	136-1167-00			1		SKT,CRT ASSY:HARNESS;14 POS 136-0202-04X 13,24-26 AWG,300V,UL1430WIRE W/ULTRA-HI CRIMP TERMINALS	9M860	136-1167-00
-39	346-0120-00			3		STRAP,TIEDOWN,E:5.5 L MIN,PLASTIC,WHITE	06383	SST1.5M
-40	337-3487-00			1		SHIELD,ELEC:CRT,STL	OJ9P9	337-3487-00
-41	334-1379-00			1		MARKER,IDENT:MKD HI VACUUM	07416	ORDER BY DESC
-42	386-4443-00			1		SUPPORT,SHIELD:CRT,FRONT,PLASTIC	80009	386444300
-43	-----			1		CIRCUIT BD ASSY:CONTROL (SEE A4 REPL) *MOUNTING PARTS*		
-44	211-0721-00			3		SCREW,MACH:6-32 X 0.375,PNH,STL,CDPL,T-15 TORX DR *END MOUNTING PARTS*	0KB01	ORDER BY DESC
-45	348-0171-00			1		GROMMET,PLASTIC:BLACK,U-SHAPED,0.276 ID	0KBZ5	NA
-46	351-0728-00			1		GUIDE,CKT BOARD:POLYCARBONATE,0.69 L *MOUNTING PARTS*	80009	351072800
-47	210-0586-00			1		NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL *END MOUNTING PARTS*	TK0435	ORDER BY DESC
-48	426-2173-02			1		FRAME,CHASSIS:ALUMINUM	TK1935	426-2173-02
-49	344-0111-00			2		INSUL,SPREADER:DEFL LEADS,POLYPROPYLENE	TK1617	NA
-50	343-0298-00			2		STRAP,RETAINING:0.25 DIA CABLE	06915	HUC-4
-51	343-0775-00			1		CABLE,CLAMP:RIBBON;1.0 X 1.0,GRAY,POLYVINYL,W/URETHANE FOAM TAPEBACKING,RETAINS 6 RIBBON CABLES,UL94V-0	52152	80610029243/348
-52	211-0720-01			2		SCREW,MACH:6-32 X 0.50,PNH,STL,TORX T-15WITH SLOT	0KB01	211-0720-01
						STANDARD ACCESSORIES		
	070-7636-04			1		MANUAL,TECH:INSTR,WFM300A	80009	070763604
	150-0168-00			3		LAMP,INCAND:14V,0.08A,WEDGE BASE,T1.75FOR SKT MT	55335	73W
	159-0021-00			1		FUSE,CARTRIDGE:3AG,2A,250V,FAST BLOW	71400	AGC-2
-53	161-0216-00			1		CABLE ASSY,PWR,:3,18 AWG,2.5M L,BLACK (STANDARD ONLY)	80126	C7120-25M-BL
						OPTIONAL ACCESSORIES		
	161-0215-00			1		CABLE ASSY,PWR,:3,0.75MU,2.5MM L,GREY (EUROPEAN OPTION A1 ONLY)	80126	0-5335-008-GY
	161-0066-10			1		CA ASSY,PWR:3,0.1MM SQ,250V/10A,2.5 METER,STR,IEC320,RCPT X 13A,FUSED UK PLUG(13A FUSE),UNITED KINGDOM,SAFTEY CONTROLLED (UNITED KINGDOM OPTION A2 ONLY)	S3109	BS/13-H05VVF3G0
	161-0066-11			1		CA ASSY,PWR:3,1.0MM SQ,250V/10A,2.5 METER,STR,IEC320,RCPT,AUSTRALIA,SAFTEY CONTROLLED (AUSTRALIAN OPTION A3 ONLY)	S3109	198-000
	016-0475-00			1		VIEWING HOOD:1740	80009	016047500
	200-3897-01			1		COVER,FRONT:1700F02,HOT STAMPED	80009	200389701
	670-7981-00			1		CIRCUIT BD ASSY:EXTENDER	80009	670798100
	-----			1		PLAIN CASE:1700F00		
	-----			1		PTD CASE ASSY:1700F02		
	-----			1		RACK ADAPTER,SIDE-BY-SIDE:1700F05		
	-----			1		FILLER PANEL:1700F06		
	-----			1		DRAWER,UTILITY:1700F07		





FIG. 1 EXPLODED VIEW



WFM 300A





