Instruction Manual

Tektronix

1730–Series
Waveform Monitor (SN B030000 and Up)

070-7948-00

Please check for change information at the rear of this manual.

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Subsidiaries and distributors worldwide.

Certificate of the Manufacturer/Importer

We hereby certify that the 1730–Series Waveform Monitor complies with the RF Interference Suppression requirements of Amtsbl.-Vfg 1046/1984.

The German Postal Service was notified that the equipment is being marketed.

The German Postal Service has the right to re-test the series and to verify that it complies.

TEKTRONIX

Bescheinigung des Herstellers/Importeurs

Hiermit wird bescheinigt, daß der/die/das 1730–Series Waveform Monitor in Übereinstimmung mit den Bestimmungen der Amtsblatt-Verfügung 1046/1984 funkentstört ist.

Der Deutschen Bundespost wurde das Inverkehrbringen dieses Gerätes angezeigt und die Berechtigung zur Überprufüng der Serie auf Einhalten der Bestimmungen eingeräumt.

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NOTICE to the user/operator:

The German Postal Service requires that this equipment, when used in a test setup, may only be operated if the requirements of Postal Regulation, Vfg. 1046/1984, Par. 2, Sect 1 7.1 are complied with.

HINWEIS für den Benutzer/Betreiber:

Dies Gerät darf in Meßaufbauten nur betrieben werden, wenn die Voraussetzungen des Par. 2, Ziff. 1.7.1 der Vfg. 1046/1984 eingehalten werden.

NOTICE to the user/operator:

The German Postal Service requires that Systems assembled by the operator/user of this instrument must also comply with Postal Regulation, Vfg. 1046/1984, Par. 2, Sect. 1.

HINWEIS für den Benutzer/Betreiber:

Die vom Betreiber zusammengestellte Anlage, innerhalb derer dies Gerät eingesetzt wird, muß ebenfalls den Voraussetzungen nach Par. 2, Ziff. 1 der Vfg. 1046/1984 genugen.

PREFACE

This manual documents the TEKTRONIX 1730–Series Waveform Monitor (B030000 and Up). Information that applies to all instruments in the series refers to the 1730–Series. Information that applies to only specific instruments within the series refers to the model numbers of those instruments (i.e., 1730, 1731, etc.).

The information in this manual is intended for instrument operators and service technicians. Operators are assumed to be familiar with basic television terms and measurements. Qualified service technicians are also assumed to be familiar with television terms and measurements, and have moderate experience with analog and logic circuits.

The manual is divided into two parts: Operator's Information and Service Information. The Operator's Information is useful to both operators and service technicians. The Service Information is intended only for qualified service technicians.

OPERATOR'S PART

The Operator's part includes Sections 1 and 2.

Section 1, Introduction, includes a general description of the instrument followed by the Specifications. The Specifications include references to the corresponding Performance check steps.

Section 2, Operating Instructions, familiarizes the user with the front- and rear-panel controls, connectors, and indicators; includes an operator's checkout procedure; and includes other operator familiarization information.

SERVICE PART

The Service part contains information required by service technicians to install, calibrate, maintain, and troubleshoot the instrument. This is included in the remaining sections of the manual.

Section 3, Installation, includes electrical and mechanical installation information. The electrical installation information includes power mains conversion, adjustments, and operational changes available with the instrument. The mechanical installation information includes rackmounting, custom installation, and portable use.

Section 4, Theory of Operation, provides an overall block diagram description and detailed circuit descriptions. Read the block diagram description for an overview of the instrument. The detailed circuit descriptions should be used with the block diagram and schematic diagrams in the foldout pages for specific information about individual circuits.

Section 5, Checks and Adjustments, includes the Performance Check Procedure and the Adjustment Procedure. The Performance Check Procedure is used to verify that the instrument's performance is within its specifications, and the Adjustment Procedure is used to adjust the instrument to meet its specifications. The procedures are preceded by a list of recommended test equipment. Each procedure has a short form listing of the individual steps.

Section 6, Maintenance, include preventive, troubleshooting, and corrective information.

Section 7, Options, documents instrument options. The information in this section summarizes the options. Additional details are included in appropriate places throughout the manual.

Section 8, Replaceable Electrical Parts, includes order information and part numbers for all replaceable electrical parts.

Section 9, Diagrams, contains servicing illustrations. These include adjustment locations, circuit board part locations, a block diagram, schematic diagrams, and waveforms. Parts locating tables are included that cross-reference the circuit board illustrations and the schematic diagrams.

Section 10, Replaceable Mechanical Parts, includes ordering information and part numbers for all replaceable mechanical parts. This parts list is referenced to an exploded view mechanical drawing. Also included are lists of accessories and optional accessories.

OPERATOR'S SAFETY SUMMARY

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

TERMS

In This Manual

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

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

As Marked on Equipment

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

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

SYMBOLS

In This Manual


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

As Marked on Equipment


DANGER — High voltage.


Protective ground (earth) terminal.


ATTENTION — refer to manual.

Power Source

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

Ground the Product

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

Danger Arising From Loss of Ground

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

Use the Proper Fuse

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

Refer fuse replacement to qualified service personnel.

Do Not Operate in Explosive Atmospheres

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

Do Not Operate Without Covers

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

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1730–Series Waveform Monitor

PART I
OPERATOR INFORMATION
SECTION 1
INTRODUCTION

The TEKTRONIX 1730–Series is an 8-1/2-inch wide by 5-1/4-inch high waveform monitor, weighing approximately 8 pounds. The 1730 (System M, NTSC) and the 1731 (System I, B, etc., PAL, PAL-M), and the 1735 (dual-standard) versions can be powered from an ac source or, with the addition of a field upgrade kit (1700F10), 12 Vdc. The crt occupies approximately two-thirds of the front-panel area, with the control panel taking up the remainder of the space. Operation is controlled by a microprocessor that polls the front-panel switches and remote ground closures. Front-panel switches are of the momentary touch type with lighted functional indicators. Most of the switches are also used to select special functions, which are accessed by holding the switches in until the microprocessor recognizes the request.

The signal is displayed on a bright crt capable of displaying one line per frame. It is of the mesh type, for better geometry, and uses an internal graticule to reduce parallax. Variable graticule scale illumination provides even lighting to improve measurement accuracy and the quality of waveform pictures. Option 74 provides a P4 (white) phosphor tube.

Composite video signals for the Channel A and B Inputs and the External Reference Signal Input are high impedance bridging loop-throughs, in order to protect the integrity of the signal paths. The input switching allows for the display of either Channel A or Channel B Input or both inputs. Synchronization can be either internal or external, with the further choices of using remote sync or 90 or 100 Hz synchronization, from a VTR, where the application warrants.

The 1730–Series offers a choice of three basic sweep rates: 2 Field, 2 Line, and 1 Line, each of which can be magnified to provide three additional sweep rates: 1 μs (2 Line), 0.2 μs (1 Line), and X25 (2 Field) which provides for viewing the complete vertical interval. In addition, there is full frame line selection that can be displayed as 1 line, 2 lines, or 15 lines. A bright-up pulse, for picture monitors, that corresponds to the intensified region on the crt display, is available through a rear-panel bnc connector.

The vertical signal processing provides a choice of dc restoration, fast or slow, or an unclamped display. The input signal can be unfiltered (Flat) or either Low Pass or Chrominance filtered. When Low Pass filtering is selected and either a 2 Line or 2 Field sweep rate is employed, the display consists of one line or field low pass filtered while the second is unfiltered. Vertical amplitudes can be displayed in a calibrated gain mode, which corresponds directly with the graticule vertical scales, magnified 5 times or can be set to a specific amplitude by using the Variable.

An RGB or YRGB Parade display, for camera setup, is accommodated with a shortened sweep. The input of the camera signal and an enable are through the rear-panel REMOTE jack. The choice of 3-step (RGB) or 4-step (YRGB) is made by changing the position of an internal plug-jumper.

The 1730–Series has a unique Store and Recall function built in that allows for the storing of up to four front-panel setups that can be recalled by pressing the appropriate recall button, or a ground closure through the rear-panel REMOTE connector. In addition, four factory-programmed measurement setups can be accessed, by external ground closures input through the REMOTE connector.

An auxiliary output, to control a companion 1720–Series Vectorscope, is provided through a rear-panel connector. The auxiliary output contains a bus for two-way communications between the waveform monitor and vectorscope microprocessors and a strobe to provide line select unblanking for the Vectorscope.

TYPICAL CONFIGURATIONS

The 1730–Series Waveform Monitor is designed for operation either alone or with a 1720–Series Vectorscope. Line select and measurement recall for this waveform monitor are also used by the vectorscope. Because of these capabilities, and the available 90 or 100 Hz triggering, the 1730–Series Waveform Monitor is ideally suited to operate in a VCR bridge. With its factory-preset measurement routines, that can be accessed through the rear-panel REMOTE connector and the Store/Recall functions, it is possible to have one-button measurements of key parameters, including various vectorscope measurements.

In addition to the VCR bridge and the typical Master Control monitoring applications, this monitor can be used in camera chains. It has a choice of RGB or YRGB Parade display that can easily be selected by changing one internal plug-jumper setting. The Parade signal and enable are input through the rear-panel REMOTE connector.

A number of operating conditions can be altered by changing internal plug-jumpers, using some of the factory-preset combinations, or setting up and saving the front panel with the Store/Recall function. Using these methods most of the current 528A operational mods can be accommodated. There is a difference in how the remote control operates — the 1730–Series uses ground closures, not positive voltage as the 528A did.

OPTIONS

CRT Options

The standard instrument is shipped with a P31 (green) phosphor crt installed. Option 74 instruments are shipped with a P4 (white) phosphor crt installed.

Power Cord Options

Any of the power cord options described in Section 7 can be ordered for the 1730–Series. If no power cord option is ordered, instruments are shipped with a North American 125 V power cord and one replacement fuse.

ACCESSORIES

Standard Accessories

The following accessories are shipped with the 1730–Series. See the Accessories illustration, at the rear of the manual, for part numbers.

1 1730–Series Instruction Manual
1 Power Cord, with selected power plug option
1 Replacement Cartridge Fuse (correct rating for the power plug option)
2 Replacement Scale Illumination Bulbs

1730–SN B038557 & Up, 1731–B032967 & Up, 1735–B030485 & Up:
3 Replacement Scale Illumination Bulbs (Tektronix Part No. 150-0168-00 or ANSI #73)

Optional Accessories

There are a number of accessories that can be used with a 1730–Series Waveform Monitor. The following is a list of the most common accessory items for this series of waveform monitors. 1700F items are Field Upgrade Kits that are installed by the customer; instructions are included in all Field Upgrade Kits.

Cameras, C9 (Option 20)
Viewing Hood (016-0475-00)
Front Panel Cover (200-3897-01)
1700F00, Plain Cabinet
(painted silver-grey)
1700F02, Portable Cabinet
(painted silver-grey)
1700F05, Side-by-Side Rack Adapter
1700F06, Blank Half-Rack Width Panel
1700F10, DC Power Converter

SAFETY INFORMATION

The 1730–Series is intended to operate from an ac power source that will not apply more than 250 V rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor is essential for safe operation (except for those instruments that are operated from a battery supply).

The 1730–Series was tested for compliance in a cabinet. To ensure continued compliance, the instrument will need to be enclosed in a cabinet that is equivalent to the Factory Upgrade Kits that are listed as Optional Accessories for the 1730–Series. A drawing of the 1700F00 plain cabinet is contained in the Installation Instructions (Section 3).

The 1730–Series is designed and tested in accordance with the following industry safety standards:

UL1244–1980 — "Standard for Electrical and Electronic Measuring and Testing Equipment."

FM. 3820 — "Approval Standard for Electrical Utilization Equipment, Class Number 3820."

ANSI C39.5 — "Safety Requirements for Electrical and Electronic Measuring and Controlling Instrumentation, 1974."

CSA — Electrical Bulletin No. 556B.

IEC 348, Second Edition — "Safety Standard for Electronic Measuring Apparatus."

VDE 0871.5 (Class B) — "Radio Frequency Interference Suppression of Electrical Equipment and Systems."

ELECTRICAL SPECIFICATION

Table 1-1
Vertical Deflection System

Characteristic	Performance Requirements	Supplemental Information	Check Step
Frequency Response 1 V Full Scale or in X5 Gain FLAT	50 kHz to 6 MHz within 2% of response at 50 kHz.	Specifications apply for full screen height video input signal, with variable GAIN off.	13
FLAT (X5)	50 kHz to 6 MHz within 5% of response at 50 kHz.		13
LOW PASS	At least 30 dB attenuation at 3.58 MHz-1730 (4.00 MHz-1735, 4.43 MHz-1731).	Response at 15 kHz does not vary between FLAT and LPASS by more than 1%.	17
CHROMA NTSC and PAL-M	Nominal Bandwidth 1 MHz. Attenuation at 7.2 MHz 20 dB or greater. Response at 3.58 MHz does not vary between FLAT and CHROMA by more than 1%.	Upper and lower -3 dB points are approximately ±350 kHz from 3.579545 MHz. 15 to 35° C operating temperature.	18 18
PAL	Nominal Bandwidth 1 MHz. Attenuation at 8.9 MHz 20 dB or greater. Response at 4.43 MHz does not vary between FLAT and CHROMA by more than 1%.	Upper and lower -3 dB points are approximately ±350 kHz from 4.433619 MHz. 15 to 35° C operating temperature.	18 18
Transient Response 1 V Full Scale or X5 Gain FLAT (using 2T pulse and 2T bar) Preshoot	1% or less.	Specifications apply for full screen height video input signal, with variable GAIN off.	15 & 16
Pulse-to-Bar Ratio	X1: 0.99:1 to 1.01:1. X5: 0.98:1 to 1.02:1.		15 16
Overshoot	X1: 2% or less. X5: 4% or less.		15 16

Table 1-1 (cont.)

Characteristic	Performance Requirements	Supplemental Information	Check Step
Ringing	X1: 2% or less. X5: 4% or less.		15 16
Tilt Field Rate Square Wave or Vertical Window	1% or less.		15
25 μs Bar	1% or less.		15
Overscan	Less than 2% variation in baseline of 100 IRE (700 mV) 12.5T (20T) modulated pulse as it is positioned over the middle 80% of the screen.		15
Differential Gain	Displayed differential gain is 1% or less with 10% to 90% APL changes.	Chroma filter must be selected. Baseline at 50 IRE and displayed subcarrier adjusted to 100 IRE with VAR gain.	
Deflection Factor 1 V Full Scale	140 IRE (1.0 V) within 1% with 1 V input.	20-30° C, Flat response selected. Vertical Gain temperature coefficient is -0.3% / 10° C.	9
X5 Gain Accuracy	Gain Accuracy ±5%.	1 V input signal.	9
X5 Gain Registration	≥1 major div. of vertical shift from baseline.	Unmagnified to magnified display.	9
Variable Gain Range	Input signals between 0.8 V and 2 V can be adjusted to 140 IRE (1.0 V) display. 160 mV and 400 mV for X5 Gain.		9
Position Range	1 V signal can be positioned so that peak white and sync tip can be placed at blanking level, with the DC RESTORER on, regardless of gain setting.	Applies to calibrated gain positions only.	9
Maximum Absolute Input Level	±5 Vdc + peak ac.	Displays in excess of 200 IRE (1.428 V) may cause frequency response aberrations.	

Table 1-1 (cont.)

Characteristic	Performance Requirements	Supplemental Information	Check Step
DC Input Impedance (Unterminated)	Greater than 15 kΩ.		
Return Loss (75Ω) Video Inputs (CH-A, CH-B)	At least 40 dB from 50 kHz to 6 MHz.	A and B channels, loop-through terminated in 75Ω. Input in use or not in use, instrument power on or off, all deflection factor settings.	19
Crosstalk between Channels		Greater than 50 dB of isolation between channels. Measured at F_{SC} between Channel A, Channel B, and EXT REF.	
Loop-Through Isolation		Greater than 80 dB of isolation between loop-throughs. Measured at F_{SC} between Channel A, Channel B, and EXT REF.	
PIX MON Frequency Response	50 kHz to 6 MHz, within 3% of response at 50 kHz.	Terminated in 75Ω.	14
Differential Gain (50% APL)	Within 1% with a 140 IRE (1.0 V) unit display.		
Differential Phase (50% APL)	Within 1° with a 140 IRE (1.0 V) unit display.		
Dc Level on Output	0.5 V or less into 75Ω load.	No input signal.	11
Intensification (Bright-up)		During line select only. Active video of selected lines has a dc offset of approximately 180 mV.	
Output Impedance		75Ω (Nominal).	
Return Loss (75Ω)	At least 30 dB, 50 kHz to 6 MHz.	With instrument turned on.	19
Input to PIX MON Output Gain Ratio	1:1 ±5% at 15 kHz.		11

Table 1-2
DC Restoration

Characteristic	Performance Requirements	Supplemental Information	Check Step
DC Restorer Clamp Time		Backporch.	
Frequency Response at 60 Hz	SLOW — 20% or less. FAST — 90% or greater.	Attenuation of 60 Hz on input signal.	12
Blanking Level Shift with 10% to 90% APL Change	APL changes from 50% to either 10% or 90% will cause blanking level shift of 1 IRE unit (7.14 mV) or less.		12
Blanking Level Shift Due to Presence or Absence of Burst	1 IRE unit (7.14 mV) or less shift from no color burst to presence of color burst.		12

Table 1-3
Calibrator

Characteristic	Performance Requirements	Supplemental Information	Check Step
Calibrator Signal Frequency	100 kHz, ±100 Hz. Synchronizes in 2H and 1H sweep.	Crystal controlled. Timing accuracy is 10 μs, ±0.01 μs. Can be used as 10 μs and 1 μs timing calibrator.	3
Amplitude	140 IRE (1 V) within 1%.		10
Position		Top of waveform must be between 80 IRE (0.86 V) and 120 IRE (1.14 V) on graticule when backporch is positioned to 0 IRE (0.300 V) line, with DC RESTORER on.	

Table 1-4
Horizontal Deflection System

Characteristic	Performance Requirements	Supplemental Information	Check Step
Sweep	Sweep will occur in all Horizontal mode settings with or without synchronization.		5
2FLD Sweep Repetition Rate	Equal to frame rate of applied video or external sync.		
2FLD Sweep Magnification		Approximately X25.	
1LINE Sweep Repetition Rate	Equal to line rate of applied video or external sync.		
2LINE Sweep Repetition Rate	Equal to half line rate of applied video or external sync.		
Sweep Length		2LINE and 2FLD sweep length is nominally 12.5 divisions.	
Timing Accuracy		All timing and linearity specifications exclude the first and last major divisions of the unmagnified display. Timing can be adjusted ±5% with front-panel H CAL.	
10 μs/div. (2 LINE)	Within 2%.		6
5 μs/div. (1 LINE)	Within 2%.		6
1 μs/div. (2LINE + MAG)	Within 2%.		6
0.2 μs/div. (1LINE + MAG)	Within 3%.		6
Integral Linearity	Within 1%.	Measured between the 10 μs and 110 μs points on the 10 μs/ division sweep. Calibrator transitions fall exactly on graticule marks.	6
Sweep Magnifier Registration		Magnification occurs about the center of the screen.	

Table 1-4 (cont.)

Characteristic	Performance Requirements	Supplemental Information	Check Step
HORIZONTAL Position	Any portion of a synchronized video sweep can be positioned on screen in all sweep modes.		
LINE SELECT		Displays the selected line in 1LINE. Displays the selected line first in 2LINE. Intensifies selected line in 2FLD. In 15LINE, displays overlayed lines in 1 or 2LINE, intensifies the selected 15 lines in 2FLD. A small 15 is added to the bottom of the crt readout in 15LINE mode.	
Read Out NTSC Field 1 Field 2 All		 Lines 1 to 263. Lines 1 to 262. Lines 1 to 262.	
PAL Field 1 Field 2 All		 Lines 1 to 313. Lines 314 to 625. Lines 1 to 312.	
PAL-M Field 1 Field 2 All		 Lines 1 to 263 Lines 264 to 525. Lines 1 to 262.	

Table 1-5
Synchronization

Characteristic	Performance Requirements	Supplemental Information	Check Step
Input Requirements Internal Reference NTSC and PAL-M	Composite video or black burst with sync amplitudes 40 IRE ±6 dB.		4
PAL	Composite video or black burst with sync amplitudes 300 mV ±6 dB.		4
EXTernal REFerence	Sync amplitude between 143 mV and 4 V will synchronize sweeps.		4
EXT REF Input Dc Input Impedance (Unterminated)	Greater than 15 kΩ.		
Return Loss (75Ω)	At least 40 dB from 50 kHz to 6 MHz.	Loop-through terminated in 75Ω, instrument power on or off.	19
Absolute Maximum Input Voltage		±12 Vdc plus peak ac.	
Remote Sync Amplitude	2.0 to 5.0 V square wave, or 4.0 V comp sync.	Input and enabled through rear-panel REMOTE connector. Input Impedance 1 MΩ. 30/60 Hz (25/50 Hz) square wave will sync 2FLD Sweep. Remote sync bypasses the sync stripper and field ID circuits.	
Sweep Trigger Polarity		Internal jumper selects polarity. Normal: Negative-going edge line sync, positive edge of field sync. Inverted: Positive-going edge line sync, negative edge of field sync.	
90 / 100 Hz Triggering Amplitude	2.0 to 5.0 V square wave.		
Trigger Frequency NTSC PAL	 90 Hz ±15%. 100 Hz ±15%.		 9 9

Table 1-6
RGB/YRGB Mode

Characteristic	Performance Requirements	Supplemental Information	Check Step
RGB/YRGB	Will display either a 3-step or 4-step RGB / YRGB Parade or Overlay display.	Internal jumper is used to change from 3-step to 4-step capability. Factory set to 3-step.	7
Staircase Amplitude — RGB or YRGB	A 10 V input will result in a horizontal display of 9 divisions ±1.4 major divisions.	12 V p–p ac component. Signal voltage not to exceed ±12 Vdc plus peak ac. Internal adjustment offsets any incoming signal dc component between ±12 V. Input Impedance 1 MΩ shunted by approx. 3 pF.	7
Sweep Repetition Rate	Field or line rate of displayed video or external sync signal as selected by front-panel HORIZONTAL controls.	Field or line rate, if enabled from the REMOTE connector.	7
Control		RGB/YRGB mode and Parade/Overlay selected by applying ground (TTL low) at the RGB Enable pin on the rear-panel REMOTE connector. RGB components may be overlayed with normal sweep length by not activating RGB Enable.	
MAGnifier		Approx. X25 for 2FLD, and X10 in 1 or 2LINE.	
Sweep Length	3-step: 3.4 — 4.1 divs. 4-step: 2.5 — 3.1 divs.	Field or line rate sweeps. A 1FLD sweep is selected by grounding the 1FLD/1LINE pin of the rear-panel REMOTE connector.	7

Table 1-7
CRT Display

Characteristic	Performance Requirements	Supplemental Information	Check Step
CRT Viewing Area		80 X 100 mm. Horizontal = 12.5 div. Vertical = 170 IRE units (1.19 V).	
Accelerating Potential		Nominally 13.75 kV.	
Trace Rotation Range	Greater than ±1° from horizontal.	Total adjustment range is typically 8°.	
Graticule		Internal, variable illumination.	

Table 1-8
Power Source

Characteristic	Performance Requirements	Supplemental Information	Check Step
Mains Voltage Ranges 120 V 220 V	 90–132 V. 180–250 V.		2
Mains Frequency Range	48 Hz to 66 Hz.		
Power Consumption		35 Watts maximum.	
Optional Battery Operation		1700F10 Field Upgrade Kit can be installed for dc operation.	

Table 1-9
Environmental Characteristics

Characteristic	Supplemental Information
Temperature Non-Operating Operating	 –55° C to +75° C. 0° C to +50° C.
Altitude Non-Operating Operating	 To 50,000 feet. 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.

Table 1-10
Certification

Characteristic	Supplemental Information
Safety/EMI	Designed to meet or exceed: UL - 1244 Factory Mutual - 3820 CSA Bulletin 556B IEC 348 FCC EMI Compatibility (FCC Rules Part 15 Subpart J, Class A) VDE 0871.5 (Class B)

Table 1-11
Physical Characteristics

Characteristic	Supplemental Information
Dimensions 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 8.5 lbs (approximately 3.8 kg).

SECTION 2
OPERATING INSTRUCTIONS

These instructions provide information about the front-panel controls, rear-panel connectors, graticules, and an Operator's Familiarization / Checkout Procedure, along with measurement discussions.

FRONT-PANEL CONTROLS AND INDICATORS

The front-panel controls and indicators consist of momentary contact push-button switches, variable controls, and backlit switch selections. See Fig. 2-1 for control and indicator locations. When Line Select is being used, the field and line numbers are displayed on the crt for field rate sweeps; a strobe pulse is applied to displays of 2 field rate sweep to identify the selected line.

There are eight push-button switches that have functions that are accessed by holding the switch down for approximately one second. These functions are identified by a blue box surrounding the front-panel label. The DC Restorer switch toggles between FAST and SLOW when pushed and held. When exiting a held mode the selection reverts to the top of the list at the touch of the push button, with the exception of the REF switch, which returns to its previous setting.

INPUT

FILTER 1

Toggles through three positions, FLAT, LPASS, and CHROMA. In 2LINE or 2FLD SWEEP a combination filtering routine, consisting of Low Pass and Flat for alternate lines or fields, can be accessed by holding the FILTER push button in. In the dual filter mode the low-pass filtered line or field will always be on the left in 2LINE or 2FLD SWEEPs. Lines are overlapped in 1LINE SWEEP. The dual filter can not be accessed when 1730–Series is in AB switching or Line Select mode. Filtering always returns to FLAT when coming out of the combination filtering routine. If AB switching or LINE SELECT is selected after the dual filter mode, filtering will be Low Pass.

REF 2

Toggles between internal and external reference. Calibrator is accessed by holding in the REF switch. Instrument status is retained in memory when CAL is selected and the original status restored when the push button is again pushed. All front-panel lights, except SWEEP and MAG, go out and GAIN goes to X1, but X5 and VAR are usable with the CAL position. CAL cannot be Stored or Recalled. (Note that MAG and SWEEP are switchable in the Calibrator mode but revert to their previous setting when the mode is exited.)

CH–A–CH–B 3

Switch that toggles between Channel A and Channel B input. When held, the 1730–Series goes into an AB (BOTH) alternate mode, with the A input on the left and the B input on the right in 2 Line or 2 Field (overlapped in 1 Line). When in the AB switching mode the REF is forced to EXT, the FILTER is forced to LPASS (if it was in the LPASS-FLAT switching mode; if not the FILTER remains in the previous position), and the DC REST goes to SLOW; all three functions go back to their previous setting when input is switched out of AB. The DC Restorer can be changed after entering the AB mode. When leaving (BOTH), the input always returns to CH-A.

VERTICAL

GAIN (Switch) 4

Toggles between VAR, X5, and off. A BOTH mode consisting of VAR and X5 is accessed by holding the push button until both LED indicators are lit.

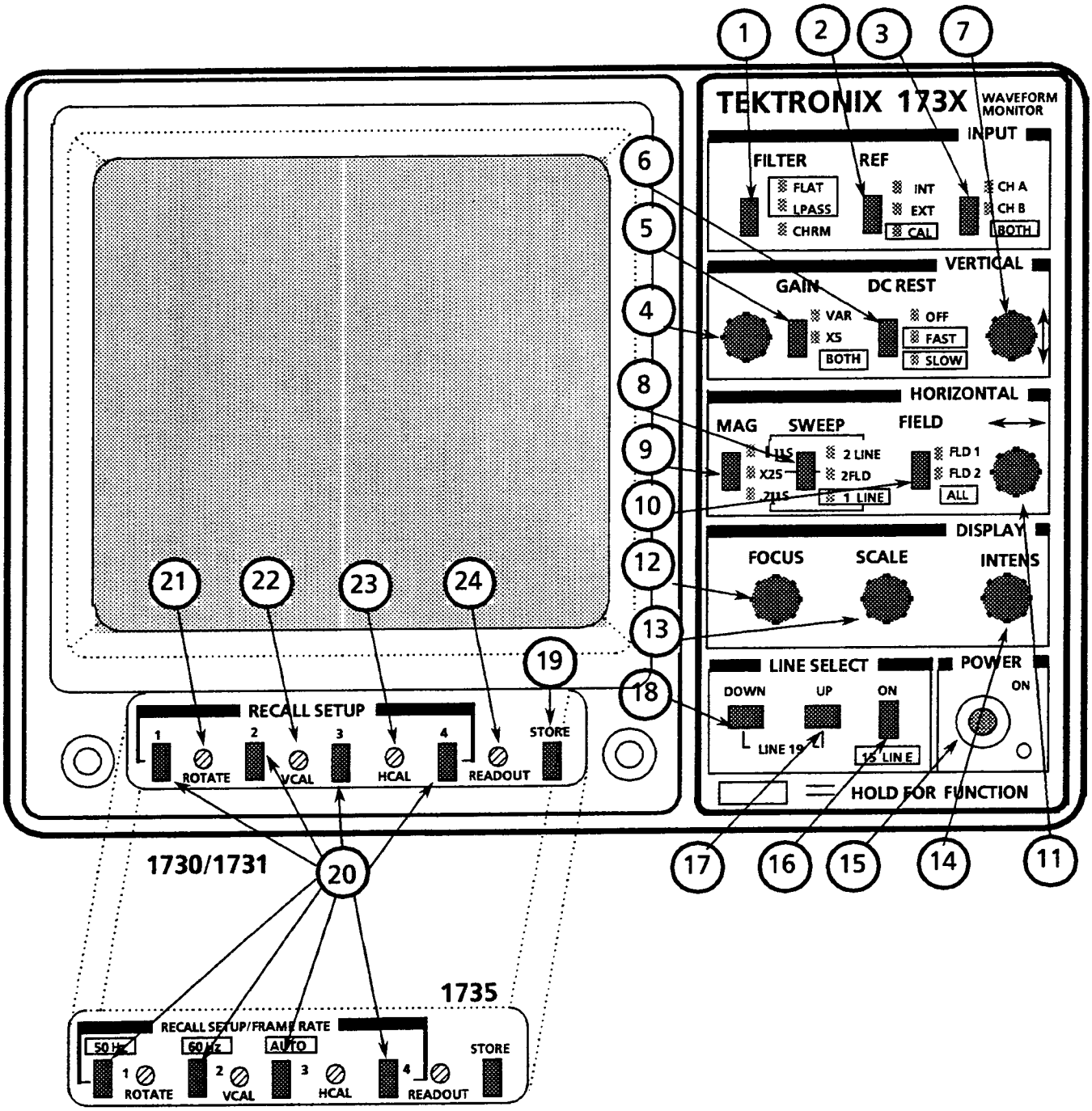


Fig. 2-1. 1730-Series front-panel control locations. Front panel control nomenclature is identical for both the 1730 and 1731, inserted crt panel indicates the different switch functions for the 1735.

GAIN (control) 5
Enabled when the GAIN switch is in VAR. Adjusts amplifier input gain rate to make any input waveform signal, between 0.8 and 2.0 V peak-to-peak a full-scale display. Control has no detent.

DC REST 6
Toggles the DC Restorer on and off. When turned on the restorer comes up as previously selected, in either the SLOW or FAST position. Pushing and holding the switch in toggles the restorer between FAST and SLOW. Once the restorer speed has been selected, pushing the DC REST button turns the DC Restorer on, at the selected speed, or off.

POSITION 7
Variable control that positions the waveform display vertically.

HORIZONTAL

SWEEP 8
Toggles between 2LINE and 2FLD Sweep. 1LINE Sweep is accessed by holding the SWEEP push button in until recognition occurs. The MAG is automatically turned off if SWEEP is changed. Sweep rates are as follows:
2LINE unmagnified = 10 μs/div
1LINE unmagnified = 5 μs/div

MAG 9
Toggles between on and off. Operates in conjunction with the SWEEP mode to provide usable sweep rates as follows:
2LINE + MAG = 1 μs/div
2FLD + MAG = 1 full vertical interval
1LINE + MAG = 0.2 μs/div

The vertical interval displayed in 2FLD MAG is the one following the selected field trigger; for example, if FLD 1 is selected as the trigger, the vertical interval displayed is the one between field 1 and field 2 (field 2 interval).

FIELD 10
Toggles between FLD 1 and FLD 2. The ALL mode is accessed, in the LINE SELECT mode, by holding the FIELD push button in until the word ALL appears on the CRT readout for 2LINE or 1LINE Sweep or a bright-up strobe appears in both fields for 2FLD Sweep.

This switch determines which field triggers the 2FLD Sweep. The selected field trigger is the first (left) field displayed. For example, selecting Field 2 trigger places field 2 on the left, followed by field 1.

In LINE SELECT, the indicator lights go off but triggering of the 2FLD Sweep continues on the selected field. A line strobe identifies the selected line. In 1LINE or 2LINE, the FIELD button determines the field from which the selected line is displayed (field 1, field 2, or ALL fields). When exiting ALL fields, switching defaults to FLD 1.

POSITION 11
Variable control that positions the waveform display horizontally.

DISPLAY

FOCUS 12
Adjusts CRT beam for optimum definition.

SCALE 13
Controls the level of graticule illumination.

INTENSITY 14
Controls display brightness.

POWER

ON – OFF 15
Turns on and off external power to the 1730–Series. A mechanical indicator in the center of the switch shows the status of the POWER switch.

LINE SELECT

ON 16
Toggles between ON and OFF. Line and field number are displayed on the CRT in 1LINE or 2LINE Sweep rates with a colon as a delimiter, for example: F1:19 (field 1, line 19). In LINE SELECT mode, the selected line is displayed in 1LINE Sweep rate, the selected line is displayed first in the 2LINE Sweep rate, and a bright-up is provided to mark the selected line in 2FLD Sweep rate. The field from which the line will be displayed can be selected with the FIELD switch. For line numbering sequences, see Table 2-1 (1730 and 1731) or Table 2-2 (1735).

Table 2-1
Line and Field Select Sequence

Color Standard	Field 1 Lines	Field 2 Lines	All Lines
NTSC	1-263	1-262	1-262
PAL	1-313	314-625	1-312
PAL-M	1-263	264-525	1-263

15 LINE display is accessed by holding the LINE SELECT ON button until there is recognition. In 2FLD, the 15 lines are intensified in the display. In 1 or 2LINE, the 15 lines are overlayed and the CRT readout is active, giving the field and line of the first displayed line plus a small 15 immediately below the colon in the readout.

Lines displayed in the LINE SELECT mode have their active video intensified on the PIX MON OUT signal.

UP 17

Increments the line count (when enabled). Holding the UP push button in increments faster.

DOWN 18

Decrements the line count (when enabled). Holding the DOWN push button in decrements faster.

Holding either button down until the count passes the beginning or end of field causes the count to shift to the other field.

(When LINE SELECT is enabled, holding in both the UP and DOWN push buttons returns the line count to Field 1, Line 19.)

Table 2-2
1735 NTSC/PAL Translations for Dual-Standard Switching

Color Standard Switched From:	Field 1 Lines	Field 2 Lines	All Field Lines	Color Standard Translated To:	Field 1 Lines	Field 2 Lines	All Field Lines
NTSC	1-263			PAL	1-263		
NTSC		1-50		PAL	264-314		
NTSC		51-262		PAL		315-525	
NTSC			1-262	PAL			1-262
PAL	1-263			NTSC	1-263		
PAL	264-313			NTSC		1-50	
PAL		314-525		NTSC		51-262	
PAL			1-262	NTSC			1-262
PAL			262-312	NTSC			19*
PAL		526-625		NTSC	19*		

*Where there is no corresponding line number associated with a standard change, line count is reset to line 19 (the reference position in the vertical interval).

RECALL SETUP

STORE 19

Enables the storage of front-panel settings, including line number, in four different memory locations. To Store a front-panel setup, the STORE switch is pushed and then one of the four RECALL SETUP switches is pushed. When STORE is pushed, all front-panel lights cycle off and on (approximately 15 times) to indicate that the front-panel, as it is currently set up, can be Stored. If the current selection is not the desired setup, pushing any front-panel button, except a RECALL SETUP, will cancel the STORE mode. If one of the RECALL SETUP switches is pushed while STORE is active, the current front-panel setup will be stored in the selected RECALL position. CAL cannot be Stored.

When a Store operation is performed on the 1735, the selected standard (50 Hz, 60 Hz, or AUTO) is stored.

RECALL SETUP (1-2-3-4) 20

Recalls from memory, or causes the storage in memory of a (1-2-3-4) front-panel setting. Each of the four switches operates with a memory location and the STORE push-button switch.

A special feature in the 1735 allows the operator to use the Store and Recall function in the normal manner, or to select from three operating modes by holding the RECALL switches. The 50 Hz (PAL) standard of operation is selected by holding the Recall Setup 1 key and 60 Hz is selected with the Recall Setup 2 key. AUTO, which provides automatic switching between the two standards, is selected with the Recall Setup 3 key. In non-line select modes of operation, holding the Recall Setup 4 key will display the status of the current standard.

If 50 Hz or 60 Hz operation has been Stored as a setup, it will be recalled by pushing a RECALL switch. If the AUTO mode of operation is Recalled, and a change in input signal standard has occurred, the 1735 will recall the correct standard (after the slight delay associated with automatic determination of the reference standard).

MISCELLANEOUS

ROTATE 21

A 270° screwdriver adjustment that aligns the display with the graticule.

V CAL 22

A 270° screwdriver adjustment that sets the vertical amplifier gain. Is normally used with the CAL position of the REF switch.

H CAL 23

A 270° screwdriver adjustment that sets the timebase. Can be used accurately with the CAL position of the REF switch in the 2H Sweep.

READOUT 24

A 270° screwdriver adjustment used to change the brightness of the readout portion of the CRT display, relative to the waveform intensity.

REAR-PANEL CONNECTORS

Signal input, power input, RGB input, Remote Sync Input, Picture Monitor Out, Auxiliary Control Output, and Remote Control are all located on the 1730–Series rear panel. Because of the similarity of the 1730– and 1720–Series rear panels, WAVEFORM MONITOR is printed on the 1730–Series rear panel. See Fig. 2-2 for the locations of the rear-panel connectors.

BNC CONNECTORS

CH-A 1

Bridging loop-through composite video input, compensated for 75Ω. This input is selected for display by the front-panel INPUT switch.

CH-B 2

Bridging loop-through composite video input, compensated for 75Ω. This input is selected for display by the front-panel INPUT switch.

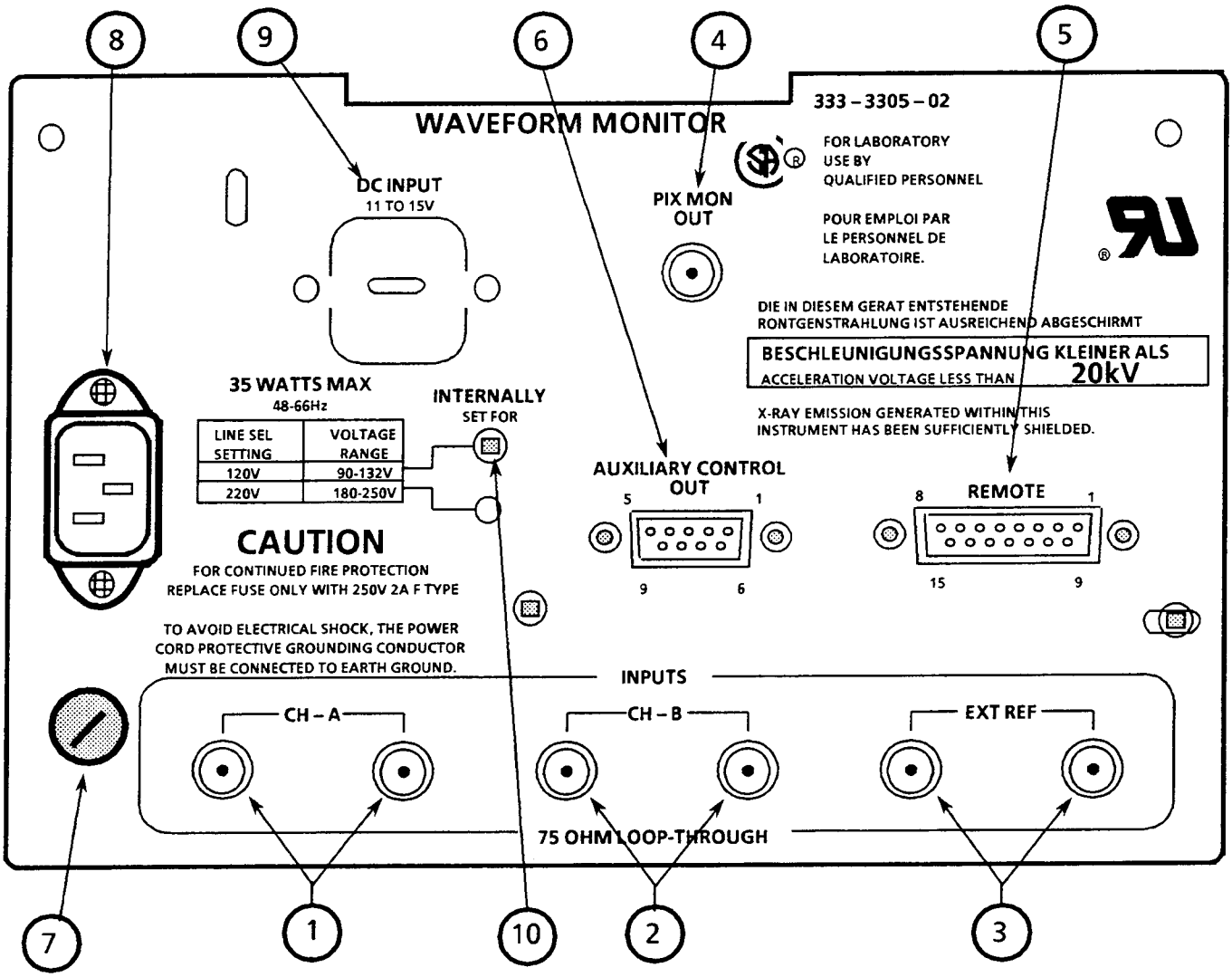


Fig. 2-2. 1730–Series rear panel.

EXT REF 3

Bridging loop-through synchronization input (compensated for 75Ω), selected as the synchronizing source by the front-panel REF switch. The input signal may be composite sync, black burst, or composite video.

PIX MON 4

A 75Ω output signal that corresponds to the front-panel selected display. This signal has bright-up, in the LINE SELECT mode, and is used to drive a picture monitor.

MULTI-PIN CONNECTORS

REMOTE 5

15-pin, D-type, female connector that provides limited remote control functions, such as four factory-preset front-panel setups, store disable, and the input connector and enable for the RGB/YRGB staircase.

Remote functions are activated by polled ground closure; only changes in remote input are responded to, allowing the front panel to be fully operational.

AUXILIARY 6

A 9-pin, D-type, female connector to interface with the 1720–Series. Auxiliary control consists of a signal line and an interface bus. The bus provides the 1730–Series with control of the status of the 1720–Series.

POWER INPUT

AC FUSE 7

Holder for the instrument's mains fuse.

AC POWER 8

A standard ac plug receptacle for 120 or 240 Vac power mains. Plug is compatible with any of the three power cord options available for the 1730–Series Waveform Monitor.

DC INPUT 9

A knockout for installation of a 1700F10 Field Upgrade Kit dc power plug.

LINE VOLTAGE SETTING 10

A screw mounted to denote the placement of an internal, soldered-in strap.

OPERATOR'S CHECKOUT PROCEDURE

The following procedure is provided as an aid in obtaining a display on the 1730-Series Waveform Monitor (operator familiarization), and as a quick check of basic instrument operation. Only instrument functions, not measurement quantities or specifications, are checked in this procedure. Therefore, a minimum amount of test equipment is required. All checks are made with the cabinet on and all internal jumpers in the factory-set position. Display photographs shown in this procedure were taken with the 1730-Series.

If performing the Operator's Checkout Procedure reveals improper operation or instrument malfunction, first check the operation of associated equipment. If associated equipment is performing normally, refer the 1730-Series Waveform Monitor to qualified service personnel for repair or adjustment.

When a complete check of the instrument performance, to its specification, is desired, refer to the Performance Check (which should only be performed by qualified service personnel) in Section 5 of this manual.

This procedure requires a source of composite video. The TEKTRONIX 1410-Series Television Test Signal Generator (1410 for NTSC, 1411 for PAL, or 1412 for PAL-M) with Sync, Color Bar, and Linearity modules was used in preparing this procedure.

Procedure

This procedure requires only one hook-up to perform. Fig. 2-3 shows the required connections. Once the signals are connected continue on to step 1 of the procedure.

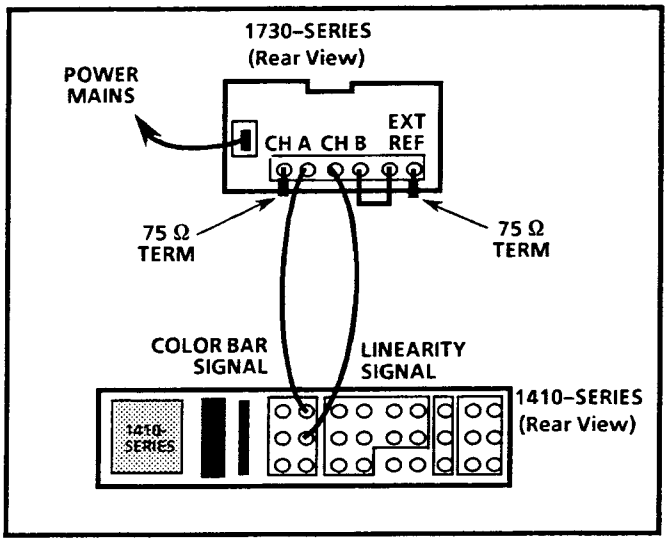


Fig. 2-3. Equipment connections for the 1730-Series Operator's Checkout Procedure.

1. Initial Generator Setup

Video Signal Generator

Test Signals
Full Field Color Bars
75% Ampl. 7.5% Setup - NTSC and PAL-M
75% Ampl. 0% Setup - PAL

Modulated Staircase
(Flat Field, 5 Step)

2. Apply Power

Connect the instrument to a suitable ac power source and push the POWER button. A center dot should appear in the eye of the POWER switch to indicate that it is on.

NOTE

Do not set any of the front-panel screwdriver controls until after the instrument warms up (20 minutes minimum).

3. Initial Front-Panel Setup

1730–Series Monitor	
FILTER	FLAT
REF	INT
INPUT	A
GAIN	Off (no indicators on)
VERTICAL POSITION	as is
DC REST	OFF
SWEEP	2LINE
MAG	Off (no indicators on)
FIELD	as is
HORIZONTAL POSITION	as is
FOCUS	as is
SCALE	as is
INTENS	as is
DOWN	as is
UP	as is
LINE SELECT	off (no line number readout on CRT)
RECALL SETUP	as is
ROTATE	as is
V CAL	as is
H CAL	as is
READOUT	as is
POWER	ON

4. Obtain Display

Adjust the INTENS and FOCUS controls for the desired brightness and a well-defined display. Adjust the multi-turn VERTICAL Position control to place the display blanking level on the graticule 0 IRE (NTSC and PAL-M) or 300 mV (PAL) line. Center the display with the HORIZONTAL Position. See Fig. 2-4.

Adjust the SCALE illumination control for the desired graticule scale brightness.

5. Check the Rotation of the Display

Variations in the earth's magnetic field may make adjustment of the ROTATE control necessary at installation time or whenever the instrument is moved.

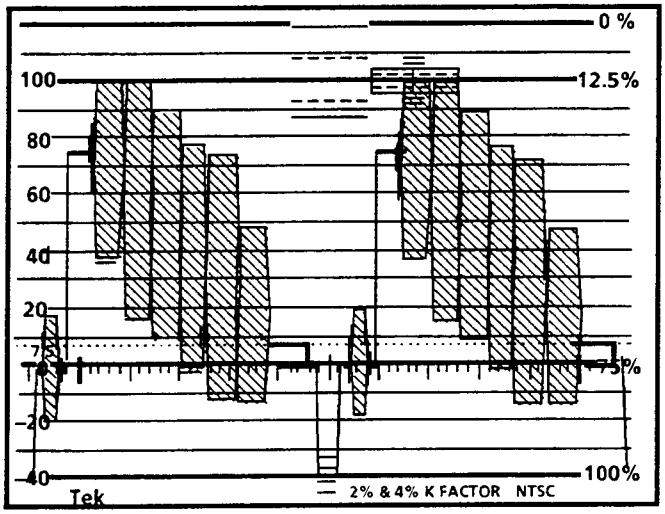


Fig. 2-4. 2 Line color bar display in FLAT filter mode.

Check that the display blanking level is parallel to the horizontal axis. If not, adjust the ROTATE screwdriver adjustment until the sweep is parallel to the horizontal axis.

6. Calibrate Display

The CAL mode on the REF switch enables the waveform monitor calibrator signal. Press and hold the REF button until the CAL indicator LED is lit. Adjust the VERTICAL and HORIZONTAL Position controls to obtain a display similar to that shown in Fig. 2-5.

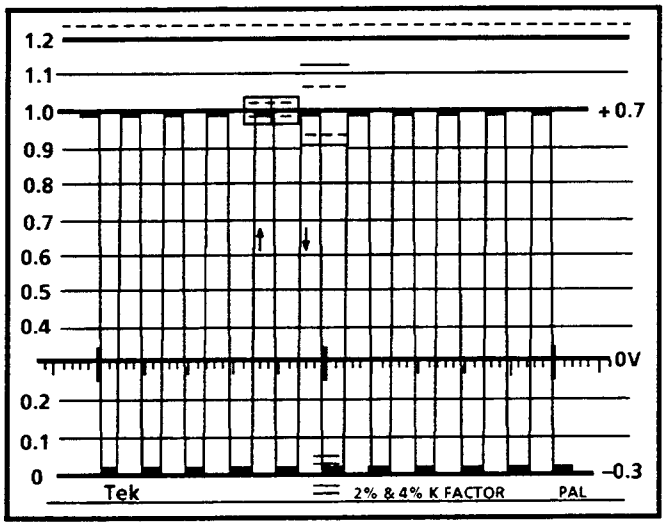


Fig. 2-5. Checking Vertical Gain Calibration with the 1730–Series internal CAL Reference.

If necessary, adjust the V CAL screwdriver control for 1 V amplitude (140 IRE). Switch REF to INT mode.

7. Select Input

The AB switch selects the rear-panel Channel A or Channel B inputs. Position the color bar waveform so that the blanking level is at the -40 IRE (0 V) graticule line and the sync pulses are at each end of the graticule.

Select the Channel B input. Note that the linearity waveform is displayed.

Push and hold the INPUT button until both the color bar and linearity waveforms are displayed. See Fig. 2-6. Check that both the CH-A and CH-B front-panel indicators are on.

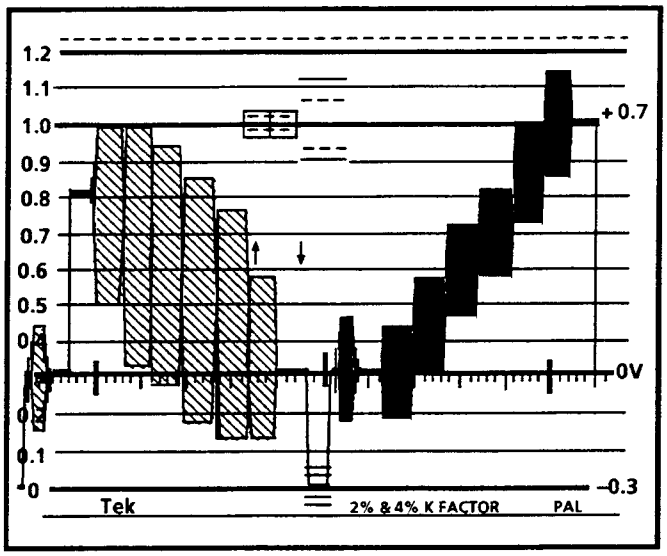


Fig. 2-6. Dual channel, 2 Line display of color bar and linearity signals.

Push the switch to return to the Channel A (color bar) display.

8. Select Timing Reference

Be sure that SWEEP is still 2LINE. Hold the REF button until the CAL signal appears. Position it so the top of the display is on the 70 IRE (NTSC and PAL-M) or 0.7 V (PAL). Horizontally position the display so the first transition is on the left side timing mark (the mark that goes completely through the blanking line. There are three on the graticule.) See Fig. 2-7a. Check that the falling transition of the 10th square wave passes directly through the right side timing mark. The H CAL can be adjusted if timing is off. Push the MAG button and check for one cycle of square wave over the 10 divisions of timing area. See Fig. 2-7b.

Hold the SWEEP button until the 1LINE front-panel indicator lights. Check for five full cycles over the 10-division timing area. See Fig. 2-7c.

Push the waveform monitor REF switch and return to INT.

9. Gain Control

The normal GAIN setting (with the GAIN switch off) is 1 V full scale with neither the X5 nor the VAR indicator lit. The GAIN (VAR) control changes the amplifier gain so that signals greater or lesser in amplitude to the calibrated 1 volt full scale can be displayed as full scale.

Push the GAIN switch and note that the VAR indicator is lit. Also note the range of amplitude (signal amplitude greater than the scale at one extreme and considerably smaller at the other) that is obtained with the control.

Push the button and check that the X5 indicator lights. Check for a large increase in gain. (It can be determined that this is a X5 gain increase by setting the signal base line on the graticule 0 IRE (NTSC and PAL-M) or 300 mV (PAL) and checking that the maximum excursion of color burst is at approximately the 100 IRE or 1 V graticule line.)

Push the button in and hold it until both the VAR and X5 indicators are lit. Rotate the GAIN control and look for a greater than 5X amplitude display at one extreme and a nearly normal amplitude display at the other extreme.

Push the GAIN button once and notice that the display amplitude returns to 1 V Full Scale.

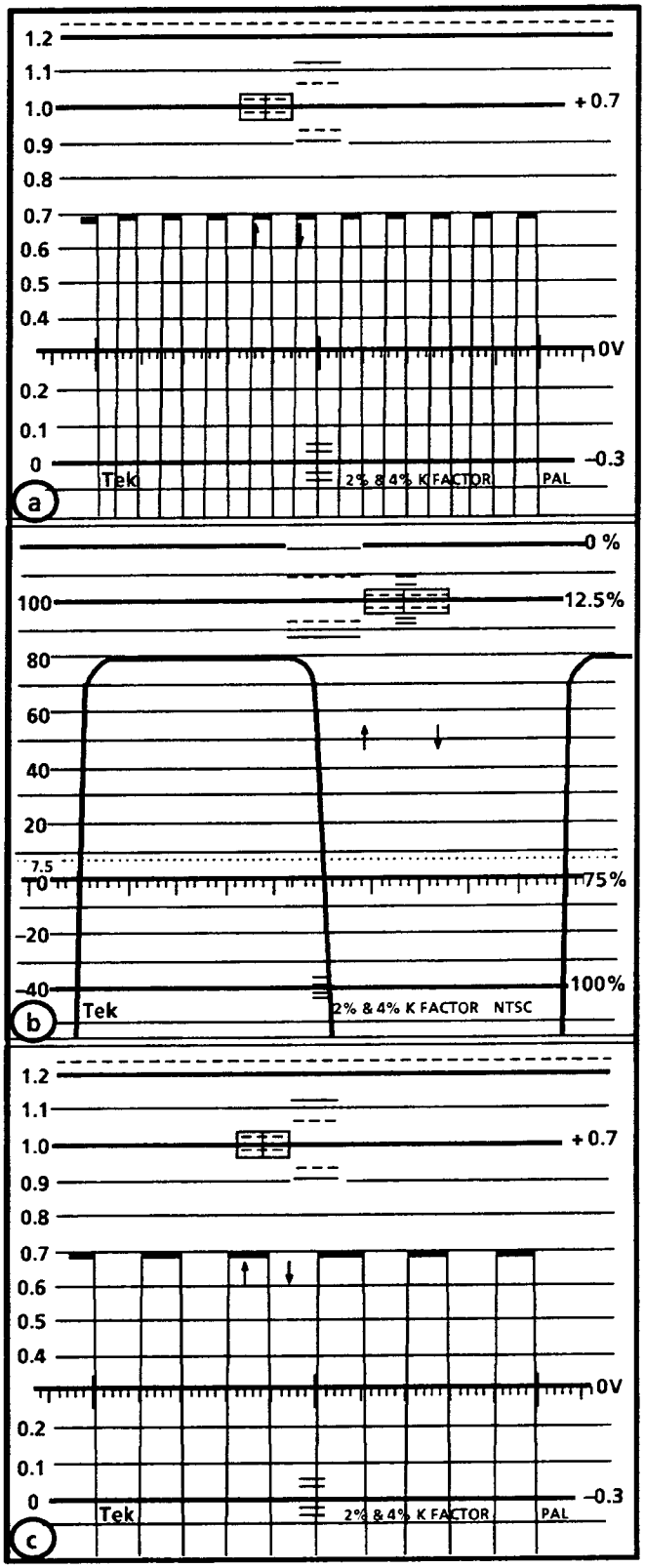


Fig. 2-7. Checking timing with the internal calibrator signal (a) 2 Line display, (b) 2 Line display magnified, (c) 1 Line display.

10. Filter Selection

The FILTER button selects the frequency response characteristic for the displayed signal. The FLAT response is used for normal applications. Fig. 2-4 shows the color bar signal with the FLAT response.

Press and hold the FILTER button to get the front-panel LPASS indicator to light. This provides the low-pass frequency response; the chrominance component of the signal has been removed. See Fig. 2-8.

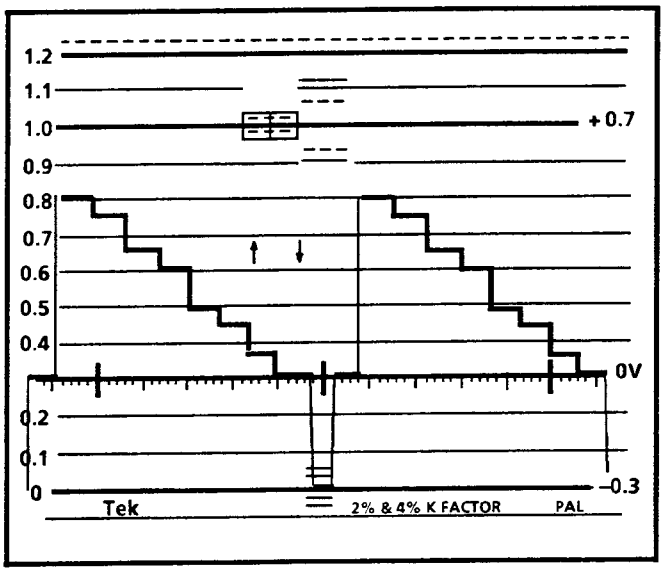


Fig. 2-8. 2 Line display of color bar signal with Low-Pass filter on.

Press the FILTER button once more and look to see that the CHROMA indicator is lit. The signal is now displayed as chrominance only; the luminance component is removed. See Fig. 2-9.

Hold the FILTER button in until both the FLAT and LPASS front-panel indicators are lit. The display now consists of two lines, the first of which has the chrominance removed and the second is unfiltered. See Fig. 2-10.

Push the FILTER switch and return to FLAT.

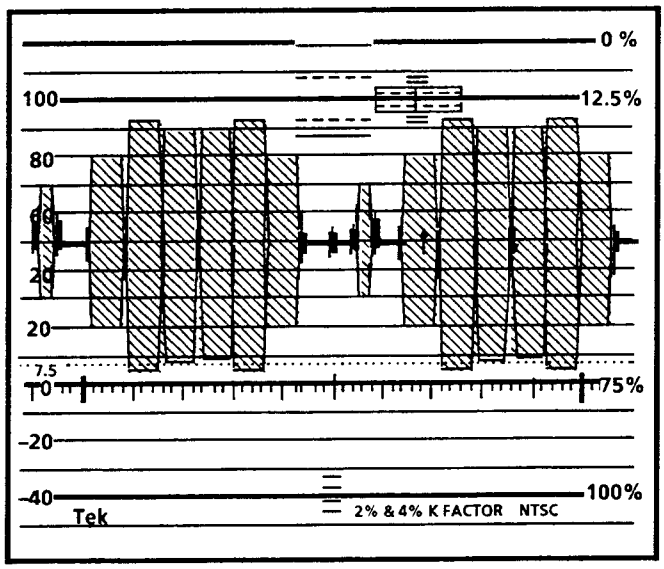


Fig. 2-9. 2 Line display of color bar signal with Chroma filter on.

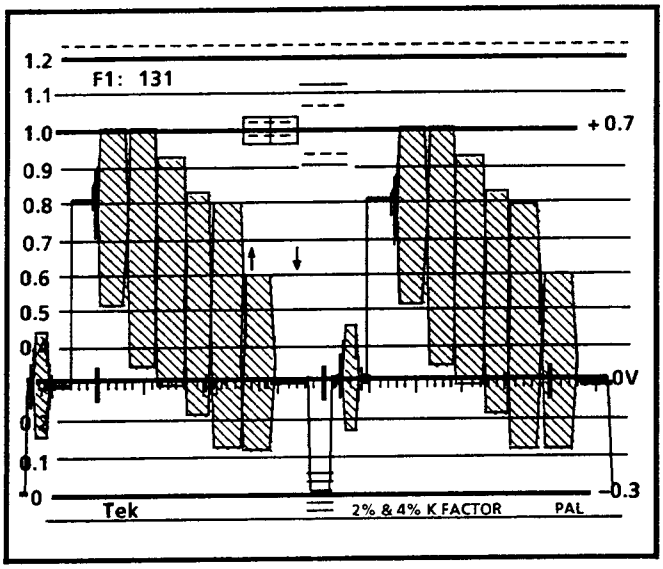


Fig. 2-11. 2 Line display with LINE SELECT on. Note readout in upper left corner of graticule.

11. Sweep Speeds and Line Select

Turn on LINE SELECT and push and hold both the UP and DOWN buttons until the readout indicates that line 19 of field 1 is being displayed. Use the LINE SELECT UP button or DOWN to display line 131. Holding in the UP or DOWN button causes the counter to move faster. See Fig. 2-11.

Push the sweep button and observe the 2FLD Sweep with an intensified line at the mid point of one of the fields. See Fig. 2-12. Push and hold the LINE SELECT button until the intensified portion of the display increases in width; this is the 15 Line mode of LINE SELECT. See Fig. 2-13.

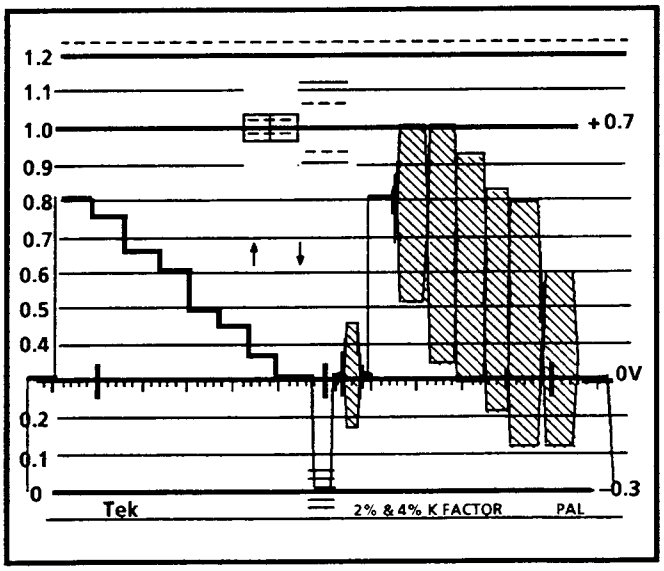


Fig. 2-10. 2 Line display with dual filter selected (Low-Pass and Flat).

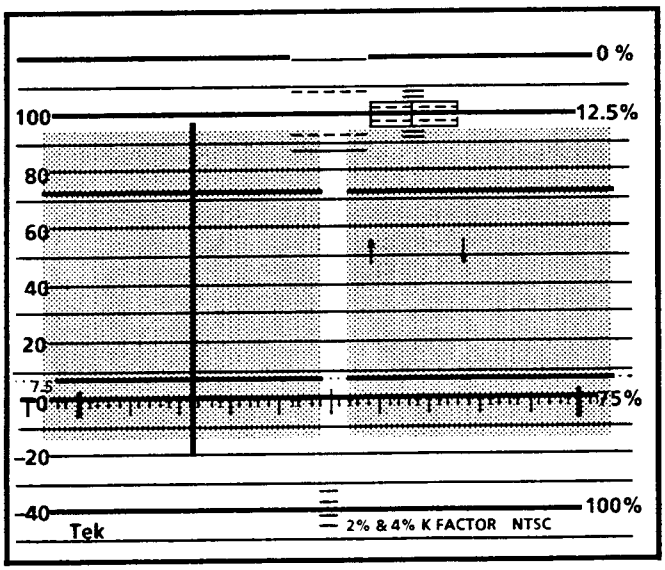


Fig. 2-12. 2 Field display with intensified line in the first displayed field.

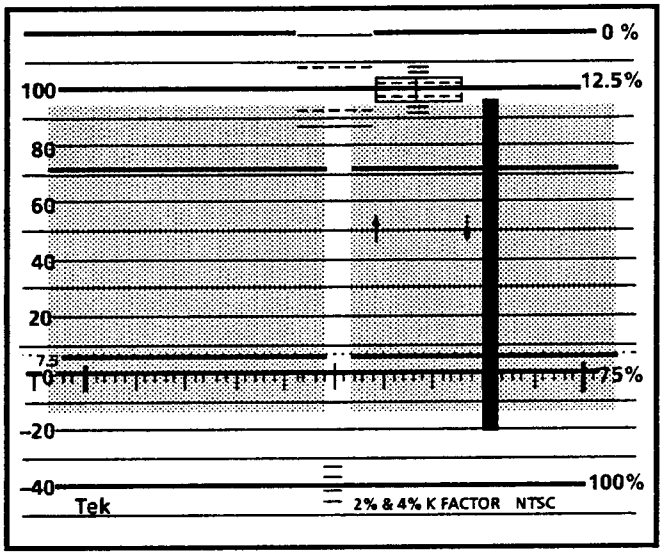


Fig. 2-13. 2 Field display with 15 Line mode of LINE SELECT on.

Push and hold the SWEEP button until the front-panel 1 LINE indicator lights. Look for a display of one line, with a line F1 or F2:131 over 15 readout. This is 15 continuous in field 1 or field 2 (as indicated by the readout). Change the field by pushing the FIELD button. See Fig. 2-14. Turn off the LINE SELECT.

12. Horizontal Magnifier

Select the 2LINE SWEEP and center the horizontal sync on the screen. Press the MAG button and note the magnification of the horizontal sync details. Push SWEEP for 2FLD and MAG for X25 and note that the vertical interval is displayed. See Fig. 2-15. Note that the MAG button works with any SWEEP selection. Push the MAG button to turn off the MAG.

13. Recall Setup

Set the 1730–Series for both CH-A and CH-B input, SWEEP to 1LINE, MAG on, and VERTICAL GAIN to X5. Note front-panel indicators. Push the RECALL SETUP 1 button and note that the front-panel setup changes.

NOTE

The Store function could also be checked; however, operating settings may be stored in the memory location, and they would be overwritten with the new front-panel information. For more information on how to use the Store function, see CONTROLS and CONNECTORS in this section of the manual.

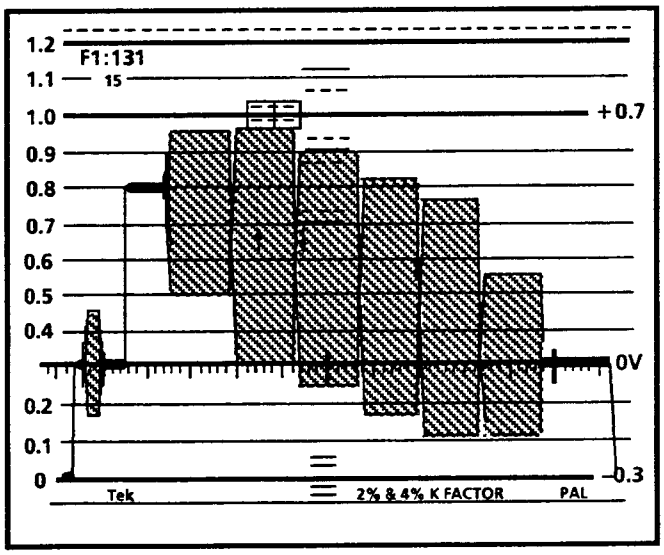


Fig. 2-14. A 1 Line Sweep rate with 15 continuous lines (from mid field) displayed using LINE SELECT.

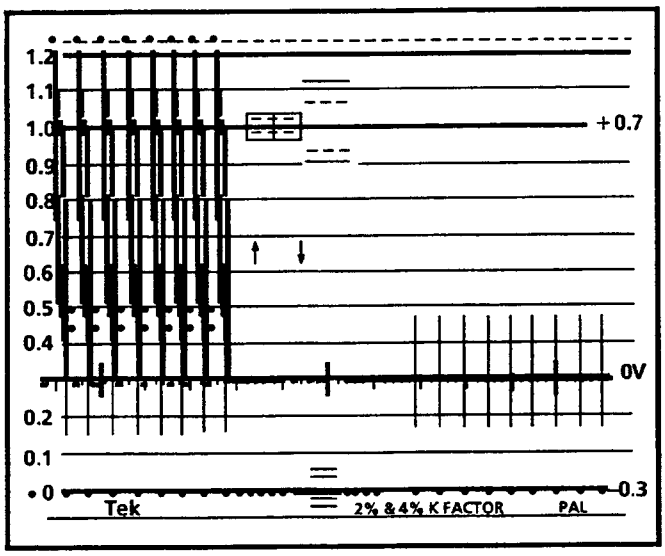


Fig. 2-15. Display of vertical interval with magnified 2 Field Sweep.

GRATICULES

There are three basic graticule patterns available for the 1730–Series. All three are internal with edge illumination. The graticule used by both the 1730 and the 1731 PAL-M is a 525 line/60 Hz NTSC Composite scale. The 1731 PAL has the CCIR 625 line/ 50 Hz graticule for the PAL color standard. The 1735 has a dual graticule which accommodates both NTSC and PAL scales.

Because the internal graticule is on the same plane as the CRT phosphor it eliminates viewing and photographic parallax errors. The graticule is illuminated, using a front-panel SCALE adjust control, so that the level of graticule brightness can be adjusted to optimum for viewing or photographing needs.

The major differences between the NTSC and PAL graticules are in the vertical scales. In the paragraphs that follow each of the vertical graticule scales will be discussed separately, while the horizontal scales are discussed together.

NTSC Composite Video Graticule Vertical Scales

The NTSC graticule has two main vertical scales to facilitate typical measurements. See Fig. 2-16. 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.

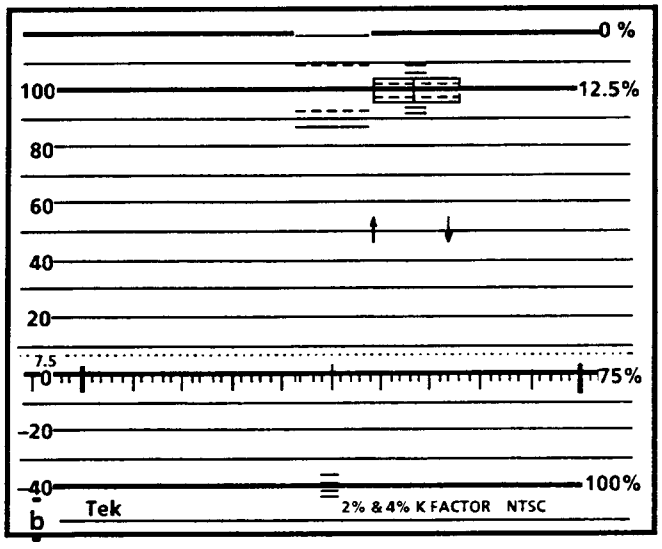


Fig. 2-16. NTSC graticule.

There are ±2 IRE and ±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 2LINE or 2FLD Sweep rates.

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 μs, 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%.

Making Measurements. To use the NTSC 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 1730–Series VAR 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.

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.)

Pulse-to-bar K-Factor measurements are made using the solid and short dashed lines to the left of the line time distortion structure. 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 (dashed lines)
K = 0.04 for 4% K-Factor (dashed lines)

Calibrated 5X Gain increases resolution to 0.4% and 0.8%.

This scaling is described in detail in CCIR Standard Volume 5, 1966.

Make sure that the center of the bar is at 100 IRE when blanking level is at 0 IRE (use VAR to adjust gain, if necessary). If necessary, use the HORIZONTAL Position control to place the 2T pulse over the measurement area and measure its amplitude. The top of the pulse falling within the dashed lines equals less than 2% K-Factor.

Horizontal Scales for NTSC and PAL Graticules

The Horizontal reference line is the baseline at 0 IRE (NTSC and PAL-M) or 0.3 V (PAL). This timing line is 12 divisions long on NTSC graticules (12.4 divisions for PAL), and takes on different timing intervals depending on the sweep rate selected. In 2LINE Sweep each major division is 10 μs, and when magnified (X10), each major division equals 1 μs. In 1LINE Sweep each major division is equal to 5 μs, and when magnified (X25) each major division equals 0.2 μs. In 2FLD Sweep the timing scale is of no real value, since this is a monitoring mode; however when 2FLD Sweep is magnified (X25) the entire vertical (field) interval can be displayed.

PAL Graticule Vertical Scales

The PAL graticule scales are from 0 to 1.2 V on the left side. See Fig. 2-17. The right side has markings at sync tip (-0.3 V), baseline (0 V), and peak white (+0.7 V). There are 2% and 4% markings at the horizontal center of the graticule on the 0 V line (sync tip level) to assist in measuring sync amplitude. The dashed horizontal line at the top of the graticule is equal to 1.234 V to indicate peak amplitude of 100% color bars.

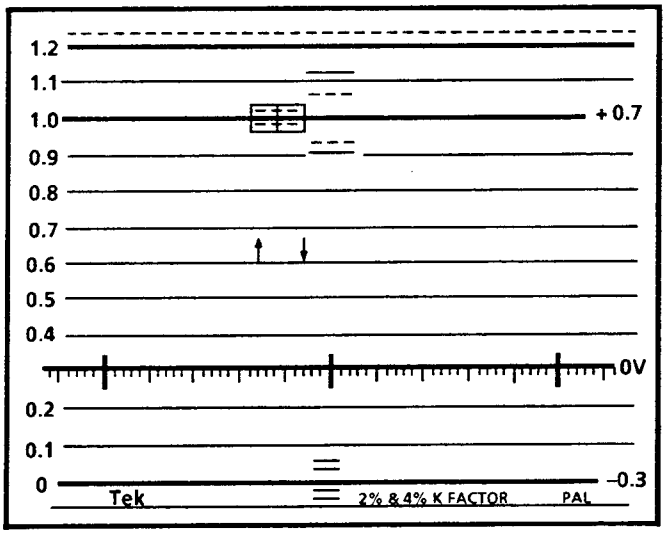


Fig. 2-17. PAL graticule.

The boxed area slightly to the left of center at the 1.0 V level is scaled for 2% and 4% K-Factor ratings for precise tilt measurements. This structure is designed to work with an 8 μs, half-amplitude duration (HAD) bar. The short dashed lines to the right of the bar tilt measurement structure are used to measure pulse-to-bar ratio; they are weighted for 2% and 4% K-Factor ratings.

Dual Graticule Vertical Scales

The PAL vertical scale, from 0 V to 1.2 V, is provided on the left side of the 1735 graticule. See Fig. 2-18.

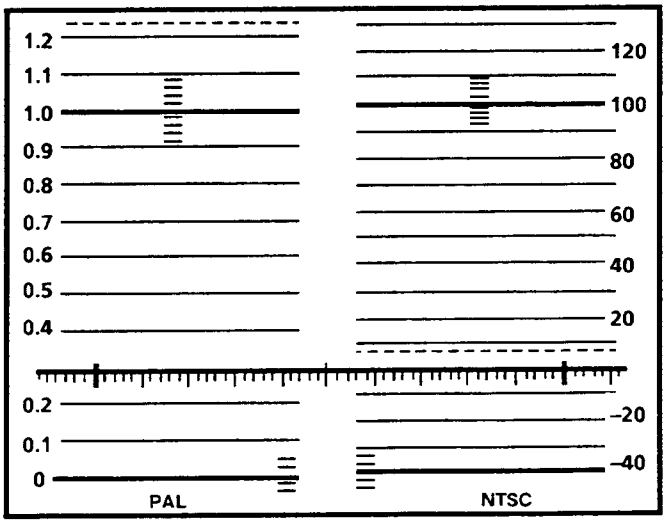


Fig. 2-18. Dual-standard graticule.

There are 2% and 4% markings near the horizontal center of the graticule on the 0 V line (sync tip level) to assist in measuring sync amplitude. The dashed horizontal line at the top of the graticule is equal to 1.234 V to indicate peak amplitude of 100% color bars. Between the 0.9 V and 1.1 V lines, there are markings at 20 mV intervals.

The NTSC vertical scale is provided on the right side of the 1735 graticule. It extends from -40 IRE to 120 IRE, in 10-IRE increments. Black level setup is denoted by a dashed line at 7.5 IRE. There are 2-IRE and 4-IRE markings near the horizontal center of the graticule, on the -40 IRE line (sync tip) to assist in measuring sync amplitude. This scale is designed to be used with the 2LINE or 2FLD Sweep rates.

Making Measurements. To use the PAL vertical scale for measuring the K-Factor for line time distortion and pulse-to-bar ratio measurements, set the signal blanking level at the graticule blanking line (0.3 V) and position the leading edge of the bar to the ascending arrow, just right of graticule center. Check to see if insertion gain is unity. If it is not, adjust the 1730–Series VAR for exactly 0.7 V of signal amplitude from baseline to middle of the white bar. Check to see that the negative-going bar transition passes through the descending arrow.

To measure the K-Factor for 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 2% line time K-Factor. (For signals with a bar half-amplitude duration (HAD) that exceeds 8 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 and trailing edge is on the appropriate arrow, the first or last 1 μs is automatically excluded from the measurement.)

Pulse-to-bar K-Factor measurements are made using the solid and short dashed lines to the right of the line time distortion structure. These lines are scaled to the following formulas:

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

Where: K = 0.02 for 2% K-Factor (dashed lines)
K = 0.04 for 4% K-Factor (dashed lines)

Calibrated 5X Gain increases resolution to 0.4% and 0.8%.

This scaling is described in detail in CCIR Standard Volume 5, 1966.

Make sure that the center of the bar is at 100 IRE when blanking level is at 0 IRE (use VAR to adjust gain, if necessary). If necessary, use the HORIZONTAL Position control to place the 2T pulse over the measurement area and measure its amplitude. The top of the pulse falling within the dashed lines equals less than 2% K-Factor.

PRESET FRONT-PANEL MEASUREMENTS

The 1730–Series has four front-panel setups stored in internal memory. A TTL low (or ground closure) on one of the PRESET enables (pins 12 through 15 of the REMOTE connector) selects one of these pre-programmed, front-panel setups. Table 2-3 shows the preset front panels that are stored in memory.

When the 1730–Series is used as a direct replacement for the TEKTRONIX 528A Waveform Monitor (which used dc voltage levels as enables), it will be necessary to use a conversion circuit to change these positive voltage levels to apparent ground closures. See Section 3 for a simple conversion circuit.

RGB/YRGB DISPLAY

RGB staircase signals, either 3- or 4-step, are input to the 1730–Series through the rear-panel REMOTE connector. A 10 V input will provide a horizontal sweep length between 7.6 and 10.4 major graticule divisions. An adjustment on the Main circuit board (R856) can be used to adjust for offsets in various staircase signals. RGB sweep is enabled by a TTL low, which can be a ground closure applied to pin 2 of the rear-panel 15-pin connector. (There is a connector drawing in Section 3, Installation, of this manual.) The staircase signal is input through pin 1 of the connector.

Table 2-3
Preset Front Panels

Front-Panel Control	Preset 1 (pin 13)	Preset 2 (pin 14)	Preset 3 (pin 15)	Preset 4 (pin 12)
INPUT				
Channel	A	A	A	A
REF	EXT	INT	INT	INT
FILTER	FLAT	FLAT	FLAT	FLAT
VERTICAL				
GAIN (VAR)	off	off	off	off
GAIN (X5)	off	off	off	off
DC REST	OFF	OFF	SLOW	SLOW
HORIZONTAL				
FIELD	FLD 1	—	ALL	FLD 1
SWEEP	2FLD	2LINE	1LINE	2LINE
MAG	off	off	off	off
FIELD		ALL	ALL	
LINE SELECT				
ON/15 LINE	off	15 LINE	ON	off
LINE		100	19	

Field and line rate displays, controlled by front-panel SWEEP settings, are available. These sweep rates can be magnified (2LINE X10 and 2FLD or 1LINE X25). In addition, a low (ground closure) at pin 3, when 2FLD Sweep is selected, provides a 1 Field Sweep.

REMOTE SYNC

Pin 10 of the REMOTE connector is a remote sync input. A 30 or 60 Hz (25 or 50 Hz for PAL) square wave signal with an amplitude of 2 to 5 volts will trigger the 1730–Series 2FLD Sweep. In addition, a 4 V composite sync signal can also be used as a remote sync signal. Pin 4, when pulled low (TTL low or ground) enables the Remote Sync triggering.

90 Hz (NTSC) or 100 Hz (PAL) TRIGGER

Pin 10 of the REMOTE connector (/REM SYNC IN) is also used as the input for 90 Hz (100 Hz PAL) triggering associated with D2 VTRs. The internal remote Sync Polarity jumper (A3J635) and 90/100 Hz Trigger Enable jumper (A3J540) will have to be moved to accept this trigger signal. See Section 3 (Installation).

When the internal jumpers have been reset and pin 4 (/REM SYNC EN) is grounded the 90 Hz (100 Hz PAL) triggering is enabled. Once the jumpers are enabled and 2FLD SWEEP is selected, a 2 V or greater 90 Hz (100 Hz PAL) square wave, applied to REMOTE connector pin 10 (/REM SYNC IN), will trigger a 1-field sweep.

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

FOR QUALIFIED SERVICE PERSONNEL ONLY

Do Not Service Alone

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

Use Care When Servicing With Power On

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

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

Power Source

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

PART II
SERVICE INFORMATION
SECTION 3
INSTALLATION

Packaging

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

ELECTRICAL INSTALLATION

Power Source

This instrument is intended to operate from a single-phase power source with one current-carrying conductor 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

1700–Series instruments operate over a frequency range of 48 to 66 Hz, and at a nominal mains voltage of 120 Vac or 220 Vac. This instrument is shipped from the factory set up for either 120 V or 220 V operation; be sure that it is operated with the selected mains voltage. The rear panel of the instrument is marked, by placement of a screw, to identify the correct operating mains voltage. See Fig. 3-1.

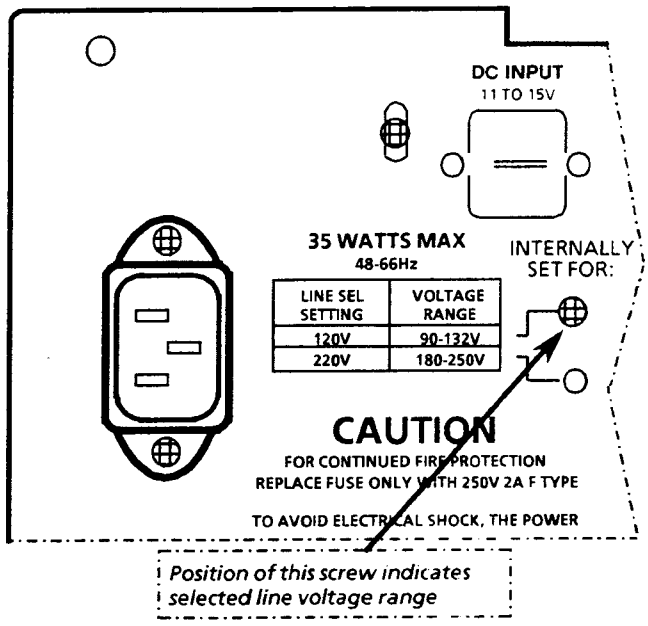


Fig. 3-1. Partial drawing of the TEKTRONIX 1730-Series rear panel showing the line voltage indicator. In this illustration the indicator shows the instrument is internally wired for 120 Vac (90 to 132 V) mains potential.

Changing the Mains Voltage

Mains voltage is set for 120 Vac by the presence of a wire strap on the Power Supply (Assembly A1) etched circuit board. See Fig. 3-2. If there is no strap in the 120 V position, the mains voltage is set for 220 Vac. To convert from 120 to 220 simply remove the strap. To convert from 220 to 120, solder in a wire strap across the 120 Vac circuit board pads. (There are two sets of pads, either the inner or outer set of pads can be used.)

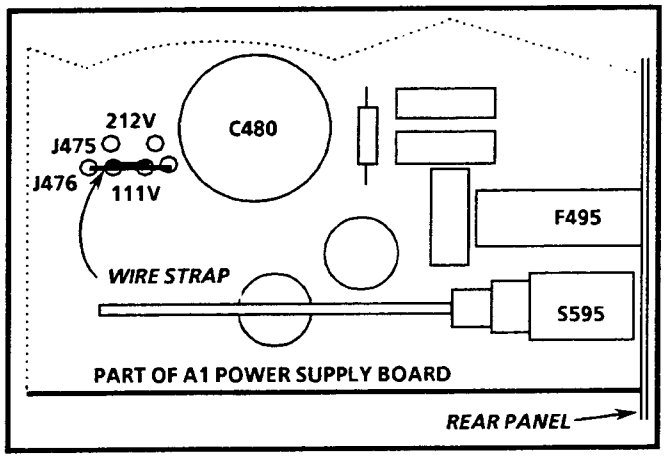


Fig. 3-2. Strap across J476 sets mains voltage to 120 V.

Operating Options

Not all installations are identical. In order to make operation of the 1730–Series Waveform Monitor as flexible as possible there are internal jumpers that can be changed to provide operating flexibility. For example, it is possible to select either the 3-step or 4-step parade to accommodate RGB or YRGB displays. With the exception of the 50–60 Hz jumper, the factory preset position is indicated by a box printed on the etched circuit board. Table 3-1 details these internal jumper selections. Be sure that all operators are aware of changes, to prevent unnecessary trouble reports, if any of these jumpers are placed in the optional position. See Fig. 3-3 for location of the internal plug jumpers.

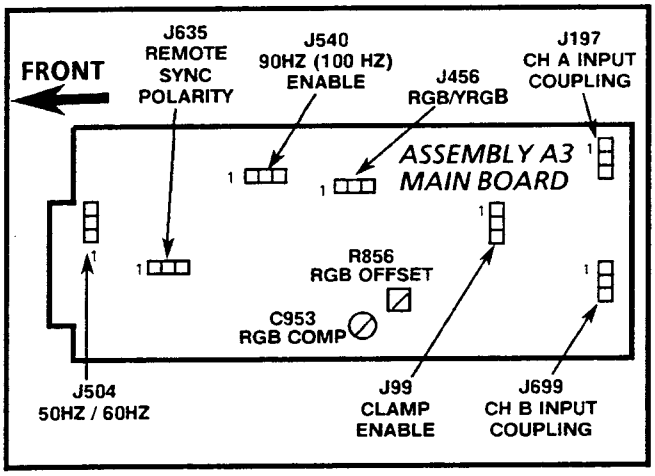


Fig. 3-3. Plug jumper locations and rgb adjustments. Pin 1 is denoted by a small numeral 1 next to the plug jumper symbol.

Table 3-1
Internal Jumper Selection

Jumper Number	Name	Position	Purpose
A3J99	Clamp Enable	1–2	not used
		2–3	Standard (factory preset)
A3J197	CH-A Input Coupling	1–2	AC coupled (factory preset)
		2–3	DC coupled
A3J699	CH-B Input Coupling	1–2	AC coupled (factory preset)
		2–3	DC coupled
A3J456	RGB/YRGB	2–3	RGB, 3-step parade (factory preset)
		1–2	YRGB, 4-step parade
A3J504	50/60 Hz	1–2	50 Hz line rate (factory set for 1731 PAL)
		2–3	60 Hz line rate (factory set for 1730 and 1731 PAL-M)
		1–2	(1735factory set) Jumper must be in 1–2 position or removed, 2–3 inhibits auto switching
A3J540	90Hz (100 Hz)	1–2	90 or 100 Hz
		2–3	1 Line/1 Field (factory preset)
A3J635	Remote Sync Polarity	1–2	Positive (factory preset)
		2–3	Negative
A3A1 J100	Light Enable	1–2	Lights Enabled (factory preset)
		2–3	Lights Disabled

REMOTE Connector

The rear-panel REMOTE connector is a 15-pin, D-type connector. It is the Remote Control Interface, the input for RGB signals and Remote Sync.

Remote functions, which provide switching and recalling of stored front-panel setups at a remote location, are enabled by ground closures (TTL lows). In addition to the four front-panel RECALL SETUPs that can be called up remotely, there are four additional factory-programmed Presets that can only be called up through the REMOTE connector. Pin assignments for the REMOTE connector are shown in Fig. 3-4 and discussed in Table 3-2.

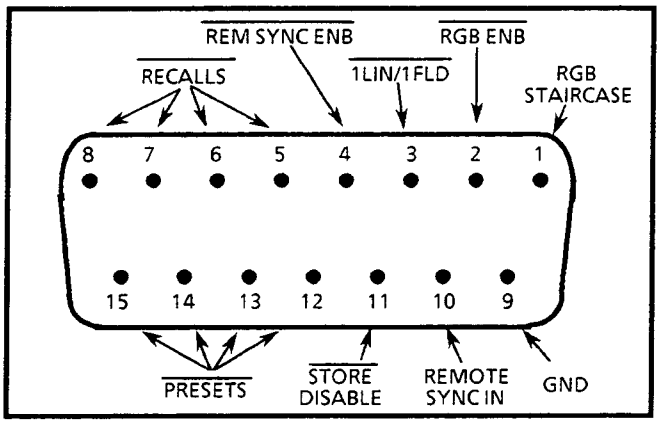


Fig. 3-4. Rear view of 1730–Series rear panel showing REMOTE connector pins with their functions.

The RGB input provides a stable, nine-division parade display of RGB or YRGB with an approximate 10 volt input.

Remote sync requires approximately 2 to 5 V input of 25–30 Hz or 50–60 Hz signal to synchronize the 1730; polarity is internal jumper selected, see Table 3-1.

Remote Sync – Provides a means of synchronizing the 1730–Series with a 2 to 5 volt 30 or 60 Hz (NTSC) or 25 or 50 Hz square wave. The display is disabled when the internal plug jumpers are moved to enable the 90 Hz (100 Hz) D-2 Trigger.

The Remote sync input is through pin 10 of the REMOTE connector. A choice of sync polarity is provided by A3J635, which is factory shipped in the positive position (1-2).

Table 3-2
REMOTE Connector Pin Assignments and Functions

Pin	Name	Function / Description*
1	RGB STAIR-CASE	The RGB Staircase input signal controls the internal sweep ramp to offset the Horizontal in time with the RGB PARADE signal.
2	/RGB ENABLE	Low = RGB Enable. Level sensitive, allows the instrument to process the RGB staircase input.
3	/1 LIN, /1 FLD	/1 LIN, /1 FLD selection available when A3W922 is installed, A3W709 is not installed, and A3J540 is on pins 2 & 3 (90 Hz Trig not enabled). Low = Enable 1 LINE or 1 FIELD. 1 LINE if line rate sweep is selected, or 1 FIELD if field-rate sweep is selected.
	/PAL	/PAL available when A3W709 is installed, A3W922 is not installed, and A3J540 is on pins 2 & 3 (90 Hz Trig not enabled). Low = Enable.
	/90 Hz	/90 Hz triggering available when A3W922 is installed, A3W709 is not installed, and A3J540 on pins 1 & 2 (90 Hz Trig enabled). Low = 1 Line when line-rate sweep is selected, or 90 Hz (100 Hz PAL) triggering when field-rate sweep is selected.
4	/REMOTE SYNC EN or /90-100 HZ TRIG EN	Low= Enable Remote Sync. enables instrument for the Remote Sync input signal or 90/100 Hz Sync input signal on pin 10.

* All remote functions are level sensitive and enabled by TTL lows (ground closures).

/ A slanted line before a signal name indicates an active low.

Table 3-2 (cont)

Pin	Name	Function / Description*
5	/RECALL 2	Remotely recalls user defined front-panel settings from non-volatile memory location #2. When pin 5 is low (pins 6, 7, & 8 high) Recall #2 is enabled. If pin 6, 7, or 8 is also low, the first pin that went low is enabled.
6	/RECALL 3	Remotely recalls user defined front-panel settings from non-volatile memory location #3. When pin 6 is low (pins 5, 7, & 8 high) Recall #3 is enabled. If pin 5, 7, or 8 is also low, the first pin that went low is enabled.
7	/RECALL 1	Remotely recalls user defined front-panel settings from non-volatile memory location #1. When pin 7 is low (pins 5, 6, & 8 high) Recall #1 is enabled. If pin 5, 6, or 8 is also low, the first pin to go low is enabled.
8	/RECALL 4	Remotely recalls user defined front-panel settings from non-volatile memory location #4. When pin 8 is low (pins 5, 6, and 7 high) Recall #4 is enabled. If pin 5, 6, or 7 is also low, the first pin that went low is enabled.
9	GROUND	Instrument ground for remote control.
10	REMOTE SYNC INPUT	Pin 10 can be used to input Remote Sync or 90 Hz (100 Hz PAL) Sync. Remote Sync is usually a field-rate square wave. It is routed around the Sync Stripper and directly to the Sweep Gating circuitry.
	90 (100) HZ INPUT	90 HZ Sync input signal is a TTL level square wave.

Table 3-2 (cont)

Pin	Name	Function / Description*
11	/STORE	Low = Store disabled. When this line is low, the front-panel STORE button is disabled. Prevents unauthorized changes to the user-defined recalls.
12	/FRONT PANEL PRESET 4	Remotely selects factory preset front-panel settings from preset location #4. When pin 12 is low (pins 13, 14, & 15 high) Preset #4 is enabled. If pin 13, 14, or 15 is also low, the first pin that went low is enabled. (Setting is defined in Section 2, "PRESET FRONT-PANEL MEASUREMENTS.")
13	/FRONT PANEL PRESET 1	Remotely selects factory preset front-panel settings from preset location #1. When pin 13 is low (pins 12, 14, & 15 high) Preset #1 is enabled. If pin 12, 14, or 15 is also low, the first pin that went low is enabled. (Setting is defined in Section 2, "PRESET FRONT-PANEL MEASUREMENTS.")
14	/FRONT PANEL PRESET 2	Remotely selects factory preset front-panel settings from preset location #2. When pin 14 is low (pins 12, 13, & 15 high) Preset #2 is enabled. If pin 12, 13, or 15 is also low, the first pin that went low is enabled. (See Section 2, "PRESET FRONT-PANEL MEASUREMENTS.")
15	/FRONT PANEL PRESET 3	Remotely selects factory preset front-panel settings from preset location #3. When pin 15 is low (pins 12, 13, and 14 high) Preset #3 is enabled. If pin 12, 13, or 14 is also low, the first pin that went low is enabled. (See Section 2, "PRESET FRONT-PANEL MEASUREMENTS.")

A TTL low (ground closure) on pin 4 is required to enable this synchronization mode.

90 Hz (100 Hz) D-2 Trigger – Allows the 1730–Series to be triggered by a 2 V, 90 Hz (NTSC) or 100 Hz (PAL) square wave output from a D-2 VTR. The display is a single field rate sweep selected when the front-panel SWEEP is set to 2FLD. 90 Hz (100 Hz) sweep triggering disables the 1730–Series Remote Sync Input.

The 90 Hz (100 Hz) sweep trigger, when enabled, is input through pin 10 of the rear-panel REMOTE connector. To enable this option (and disable Remote Sync) reposition two internal plug jumpers:

A3J540 is moved to the 90 Hz (100 Hz) position (1–2).
A3J635 is moved to the Negative Sync Polarity position (2–3).

In addition to resetting the plug jumpers, a TTL low (ground closure) on pin 4 is required to enable this trigger mode.

RGB/YRGB Parade Display – A TTL low level (ground) on pin 2 of the REMOTE connector enables the shortened RGB/YRGB sweep. A 10 volt square wave input to pin 1 provides approximately 9 divisions of sweep. Sweep can be either 1 line or 1 field depending on front-panel switch setting. Signal input through the front-panel selected CH A or CH B input is displayed.

DC Voltage Level – TTL Converter

When the 1730–Series Waveform Monitor is substituted for a TEKTRONIX 528 or 528A Waveform Monitor, in some applications the +28 V enable level must be converted to 0 Vdc. This conversion requires only a few common parts. See Fig. 3-5.

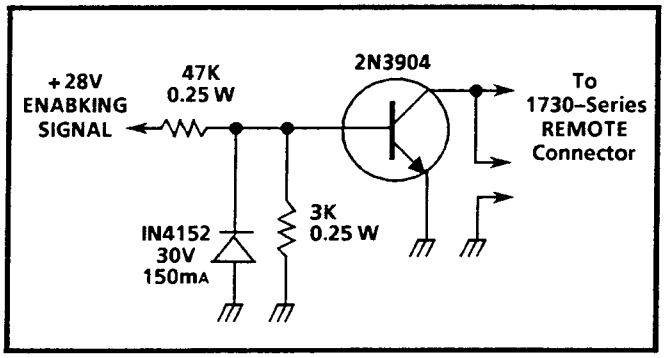


Fig. 3-5. Common parts used to convert from 28 Vdc to 0 Vdc.

RGB Offset and Compensation

Television cameras vary in output dc level; R856 is provided to compensate for this variation in dc level. See Fig. 3-3.

C953 is the input compensation that matches the Staircase Amplifier input time constant to the camera output time constant. See Fig. 3-3.

Each time the camera input to the 1730–Series is changed the RGB Offset and input time constant will probably need to be reset. The following procedure provides a simple means to make these adjustments.

Procedure for setting RGB Offset

1. Display any standard television waveform. Do not enable the rear-panel REMOTE connector RGB Enable.
2. Use the 1730–Series HORIZONTAL Position control to align the display with the graticule.
3. Ground the REMOTE connector RGB Enable and apply the camera staircase output to the RGB Staircase input.
4. Apply the camera video output to the 1730–Series INPUT (CH-A or CH-B) and select that input with the front-panel INPUT selector.
5. ADJUST — R856 to center the RGB signal on the graticule. See Fig. 3-3 for its location.
6. ADJUST — C953 for the best looking display.

AUXILIARY Connector

The rear-panel AUXILIARY connector is a 9-pin, D-type connector. It is used to control the display on a companion 1720–Series Vectorscope. Line and Field selection information is provided to the Vectorscope over the bus that is contained in this interface. Fig. 3-6 and Table 3-3 show the AUXILIARY connector pin assignments.

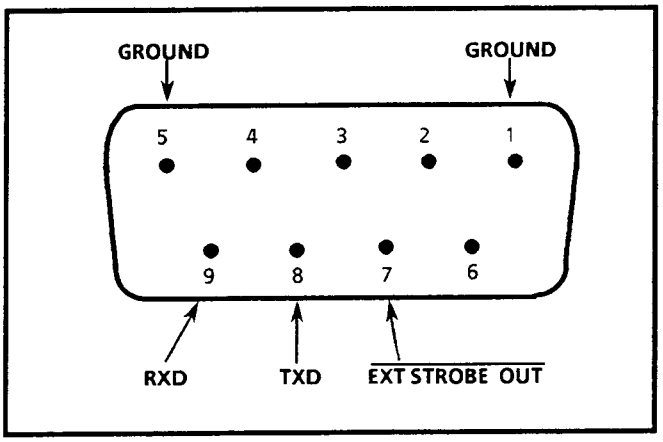


Fig. 3-6. Rear view of the 1730–Series rear panel showing AUXILIARY connector pins with their functions.

Table 3-3
AUXILIARY Connector Pin Assignments

Pin #	Use
2-3-4-6	No Connection
1-5	Ground
7	External Strobe Out for Line Select blanking output.
8	TXD (Transmit Data) 1730–Series to 1720–Series communication line.
9	RXD (Receive Data) 1720–Series to 1730–Series communication line.

MECHANICAL INSTALLATION

Rack Mounting

All qualification testing for the 1730–Series was performed in a 1700F00 cabinet. To guarantee compliance with specifications, the instrument should be operated in a cabinet. The plain cabinet, 1700F00, is shown in Fig. 3-7.

The portable cabinet, 1700F02, is shown in Fig. 3-8. The 1700F02 has a handle, four feet, a flip-up stand, and is compatible with the TEKTRONIX BP1 battery pack that can be used for a dc power source. The hole sizes and spacing are different from those of the 1700F00.

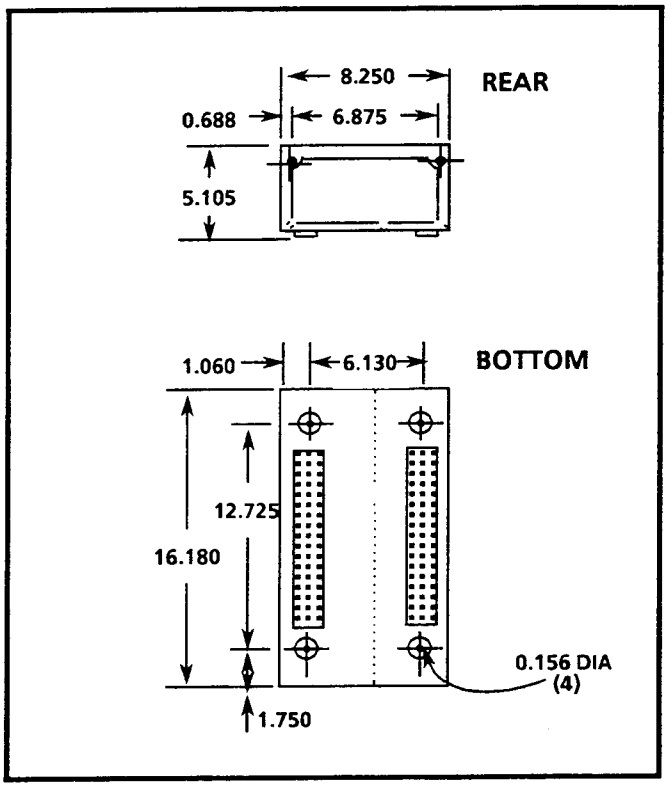


Fig. 3-7. 1700F00 plain cabinet.

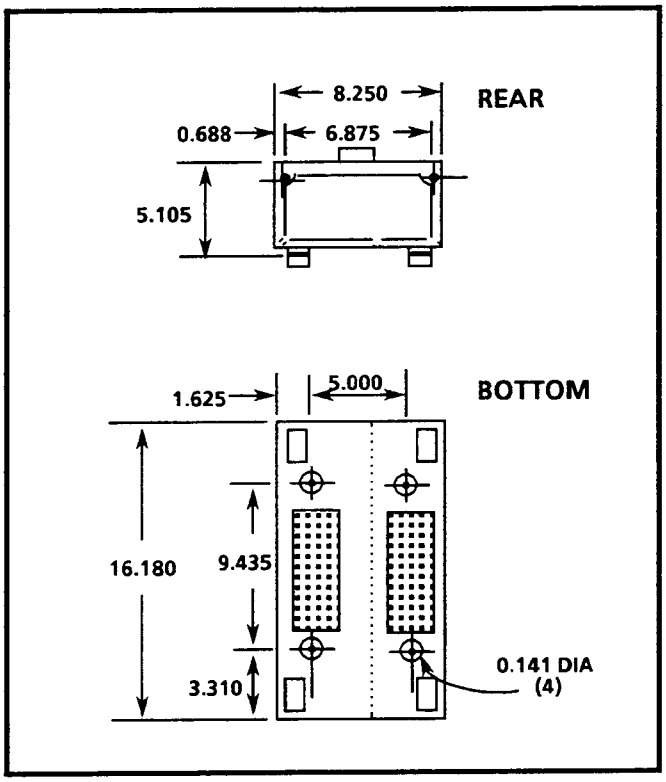


Fig. 3-8. 1700F02 portable cabinet.

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

Cabinetizing

WARNING

Do not attempt to carry a cabinetized instrument without installing the mounting screws. Without 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. 3-9.

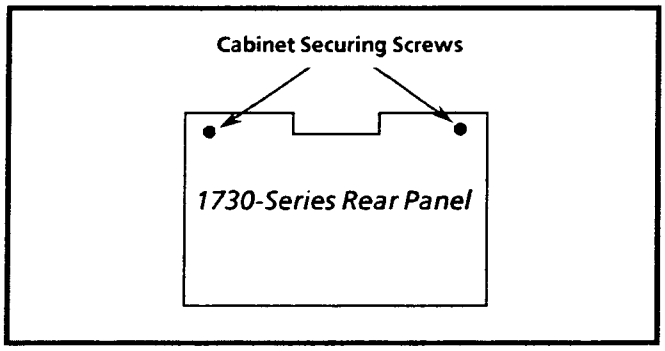


Fig. 3-9. Cabinet securing screws.

Rack Adapter

The optional 1700F05 side-by-side rack adapter, shown in Fig. 3-10, consists of two attached cabinets. It can be used to mount the 1730–Series and another half-rack width instrument in a standard 19-inch rack.

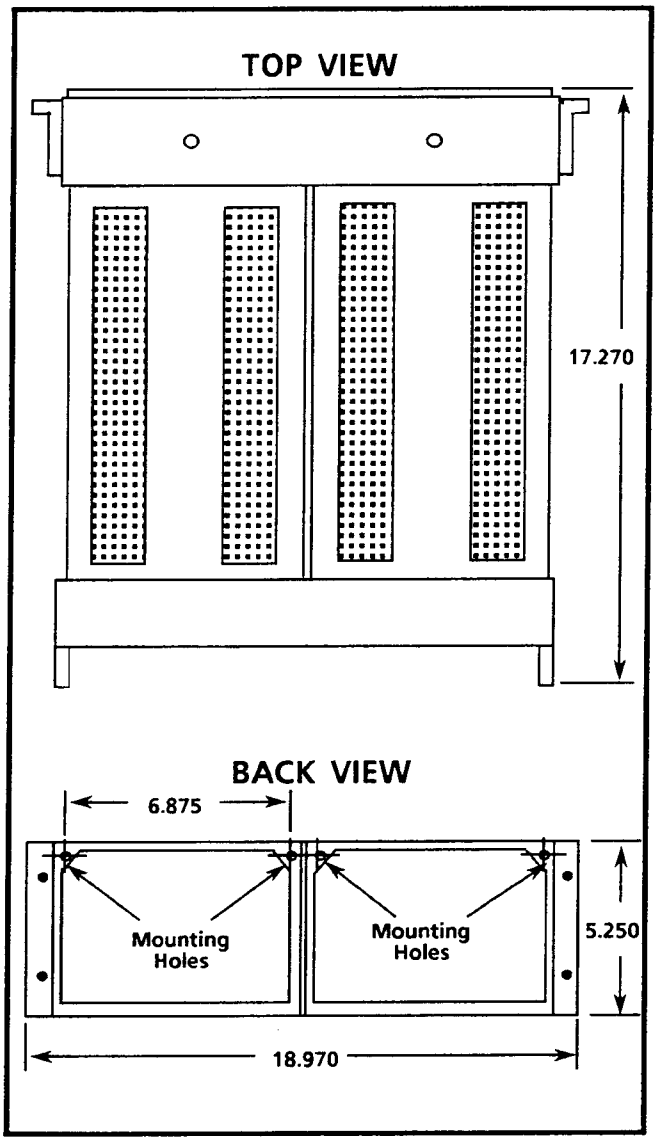


Fig. 3-10. 1700F05 Rack Adapter.

The rack adapter is adjustable, so the 1730–Series can be more closely aligned with other equipment in the rack. See Fig. 3-11.

If only one section of the rack adapter is used, a 1700F06 Blank Panel can be inserted in the unused section. See Fig. 3-12. The rack adapter and panel are available through your local Tektronix field office or representative.

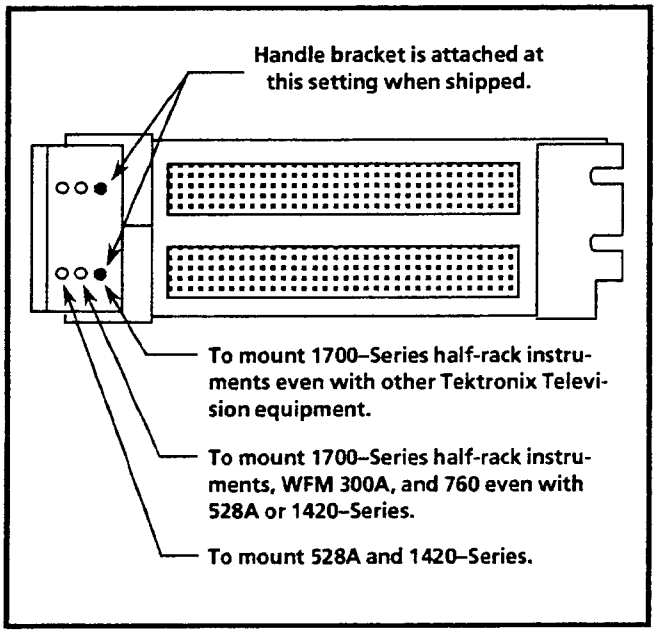


Fig. 3-11. 1700F05 Rack Adapter adjustment.

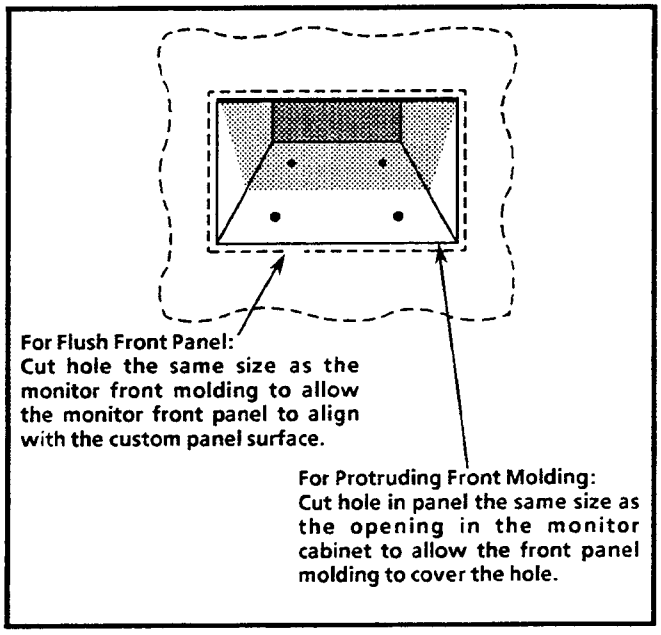


Fig. 3-13. Typical custom installation — front view of console.

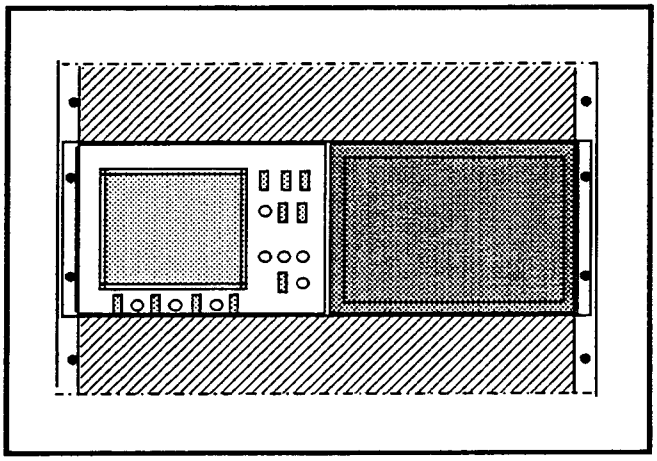


Fig. 3-12. 1730–Series and 1700F06 blank panel.

Custom Installation

For applications such as consoles, shown in Fig. 3-13, 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.

To mount the 1730–Series safely, attach it to a shelf strong enough to hold its weight. Install the mounting screws through the four 0.156-inch diameter holes in the bottom of the 1700F00 cabinet. See Fig. 3-14.

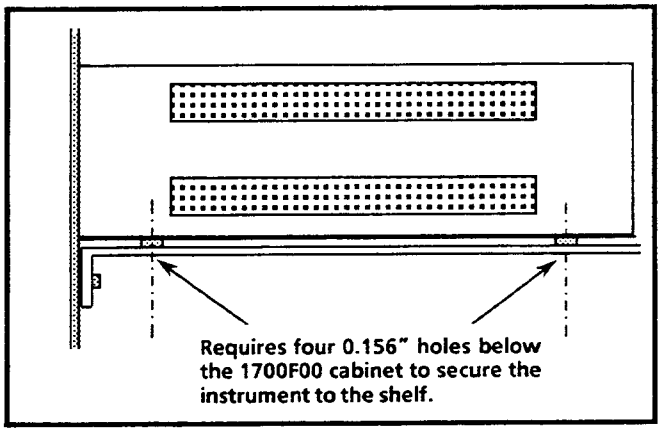


Fig. 3-14. A typical custom installation showing an inside view of a console.

SECTION 4
THEORY OF OPERATION

The material in this section is subdivided into a general description (which is supported by the main block diagram and simplified block diagrams) and detailed circuit descriptions that use the schematic diagrams as illustrations. A thorough understanding of the instrument starts with knowing how the major circuit blocks fit together, which is then followed by an understanding of the individual circuit's functions. These discussions of the 1730–Series Waveform Monitor begin with a brief, fundamental overview, then proceed on to the block diagram, and then go into individual circuit descriptions.

OVERVIEW

The 1730–Series is a specialized oscilloscope, designed to monitor and measure television baseband signals. See Fig. 4-1. Signals input through either of the rear-panel 75Ω bridging loop-through inputs are synchronously displayed on a crt. In addition, an alpha-numeric line and field readout is provided on the crt for use with the LINE SELECT mode of operation.

Front-panel mode switching is accomplished by a series of push-button switches whose status is being constantly polled by a Microprocessor. In turn, the Microprocessor controls switching functions and circuit gains so that the instrument can perform as a monitor or be used to make specific measurements. The Microprocessor is an 8051 type.

The Low Voltage Power Supply is a high-efficiency switching type. The High Voltage Power Supply provides 13 kV acceleration potential.

BLOCK DIAGRAM

The Block Diagram for the 1730–Series Waveform Monitor is located on a foldout in Section 9 of this manual. The following functional description uses the diagram as its illustration. The numbers on the circuit blocks correspond to the schematic diagram where that circuit block is detailed.

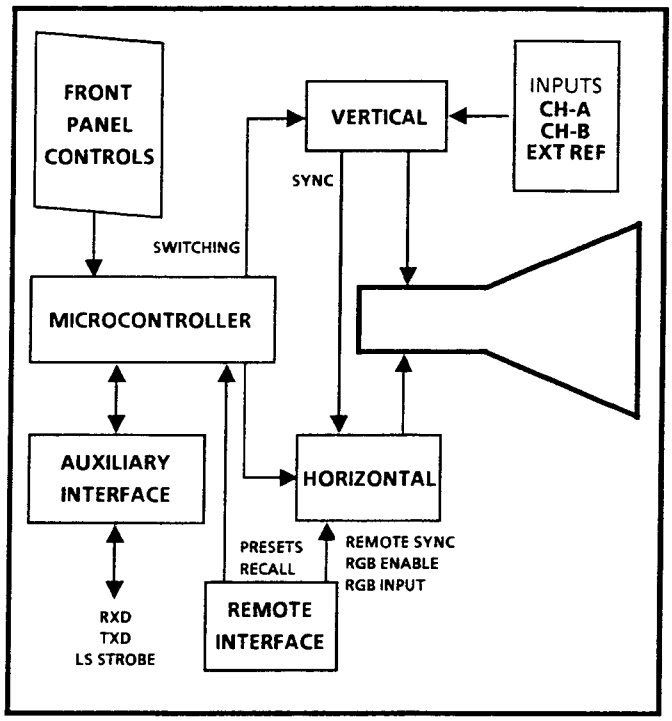


Fig. 4-1. Simplified representation of the 1730–Series Waveform Monitor.

CIRCUIT BLOCKS

Vertical

Color-encoded video signals are input through the bridging Channel A and Channel B inputs. The input amplifiers are shunted by sample-and-hold-type clamps, that are timed by a Back Porch Sample from the Back Porch Generator. This clamped signal, prior to any filtering, is also the rear-panel Picture Monitor Output. In LINE SELECT modes, a strobe, that acts as a bright-up pulse, is added to the Picture Monitor Output to identify the selected line (or block of lines in 15 Line). Switching at the output of the amplifiers provides for display of either input signal or a combination of both in all sweep modes. In the combination mode, the Channel A signal is displayed on the left of the crt with the Channel B following.

Front-panel switching can select a Flat (unfiltered), A Low-Pass, or Chroma filtered signal for display. Low-pass filtered signal can be displayed with a Flat (unfiltered signal) as part of the dual filter mode. In dual filter mode, the low-pass filtered signal is displayed to the left with the unfiltered (flat) signal following. When the calibrator signal is selected (from the front-panel switching), a 1 volt, 100 kHz signal is applied to the input of the Gain Cell instead of input video. The calibrator signal is used to set up both Vertical Gain (Volts Full Scale) or Horizontal Gain (Sweep rate) from a common, self-contained source.

Signal amplitude can be adjusted at the Gain Cell using either the front-panel V GAIN or VARIABLE gain control. The output signal from the Gain Cell drives another clamped amplifier. This second clamped amplifier has a loop-compensated sample-and-hold circuit to provide the fast clamping required for the Fast DC Restorer. Clamping, as with the first clamp, occurs at back porch time.

The Vertical Positioning voltage, along with the conditioned video signal, is input to a Switchable Gain Amplifier, to provide X5 vertical magnification. Both amplifier gain and positioning range can be increased by a factor of 5 when X5 Gain is selected at the front panel. The limiter stage that follows prevents overdriving of the Output Amplifier.

The conditioned video signal and the Y component of the Readout (from the Microcontroller) are input to the Vertical Output Amplifier to match impedances and normalizes gain (approximately 40 V for 8 cm of vertical deflection) in order to voltage drive the crt vertical deflection plates.

Horizontal

Composite video from either internal (Channel A or B) or external reference has all active video stripped away by the Sync Stripper to leave only sync to output a sweep trigger. Remote sync, which bypasses the Sync Stripper, triggers the sweep directly when enabled. Remote sync, which is input through the REMOTE connector, requires an external enable.

A plug-jumper determines the polarity of the remote sync for internal triggering: Negative provides line rate triggering off a negative edge and field rate triggering off a positive edge. Positive provides line rate triggering off a positive edge and field rate triggering off a negative edge.

90 Hz (100 Hz for 1731) triggering, for D2-type video recorders, is also input through the REMOTE connector. The 90 Hz triggering uses the Remote Sync Input, with the internal polarity jumper set to negative sync polarity, and the enabling jumper in the enabled position.

The output of the Sync Stripper (or remote sync) drives the Back Porch Generator, Vertical Sync Recognition, and Horizontal AFC. Outputs from the Vertical Sync Recognition and Horizontal AFC are used by the Field ID and Trigger Select to trigger the Sweep Generator. If Calibrator is selected, the Cal Drive signal from the Microcontroller provides the triggering signal.

The Horizontal AFC output, in conjunction with the Microcontroller, drives Line Select, which outputs a pulse that:

1. Drives the Z-Axis Control to unblank the crt at selected line(s).

2. Provides a bright-up strobe at the selected line(s) for 2 Field Sweep.

3. Provides the Picture Monitor Output bright-up strobe.

4. Generates the Auxiliary Blanking strobe that is used by a companion 1720–Series for line select.

The ramp signal, output by the Sweep Generator, drives the Mag Amplifier, which provides three gain ranges, X1 (un-magnified Sweep), X10 (1 μs/div. in 2 Line Sweep), and X25 (to display the full vertical interval in 2 Field Sweep, while providing 0.2 μs/div. sweep rate in 1 Line Sweep). The Horizontal Positioning offset voltage is input to the Magnifier Amplifier to ensure sufficient range to position any part of the display onto the graticule.

When the RGB Parade display is enabled, the sweep is shortened and offset by the RGB Staircase input signal, which produces three short ramps that are displayed (in sequence) as a normal length sweep.

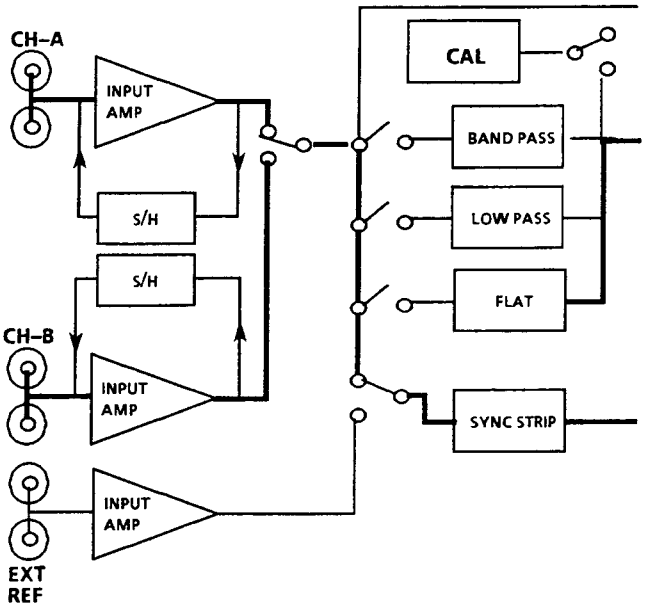
The output of the Mag Amplifier and the X component of the Readout (from the Microcontroller) drive the Horizontal Output Amplifier, which matches impedances and normalizes gain (approximately 100 V for a 10-cm sweep length) in order to voltage drive the crt horizontal deflection plates.

CRT, Unblanking, and High Voltage

The blanking signal (from Line Select) and the Intensity and Readout voltages are used by the Z-Axis Control to generate an unblanking signal for the crt during sweep time. When the sweep is magnified, the off-screen portion of the sweep is blanked to increase the on-off contrast ratio. The Focus Amplifier, which is controlled by the front-panel FOCUS control, provides a voltage to the crt focus ring.

Trace Rotation provides compensation for the magnetic field surrounding the crt. The crt is of the Post Acceleration type, which requires a relatively high potential difference between the cathode and post anode. The boost in 2nd anode voltage is provided by an encapsulated 4X Multiplier. Trace Rotation provides compensation for the magnetic field surrounding the crt.

VERTICAL INPUT DIAGRAM 1



The video signal is input to the waveform monitor through amplifiers that can be clamped at back porch time. Once buffered by the input amplifiers, whose gain is -1, a Channel Switch selects the input to be filtered, drive the picture monitor output, serve as the internal sync source, and eventually be displayed on the crt.

When an external reference (sync) source is used the composite signal is input through an ac-coupled amplifier, which also has a gain of -1. Selection of the sync source is accomplished by a switch that is made up of a common base pair and switching diodes. A clamped sync stripper is used to remove active video information and regenerate a composite sync signal for use by time related monitor circuits.

An accurate 100 kHz waveform from the Microcontroller is amplified and its amplitude set and controlled by the Calibrator. Calibrator output is enabled and output through the vertical amplifier low-pass filter. The calibrator enable is also generated by the Microprocessor.

Input Amplifiers

The rear-panel Channel A and B inputs are high-impedance bridging loop-through inputs compensated for use in 75Ω systems. Each amplifier has its own DC Restorer that is controlled by the front-panel restorer switch. Restorers are either both on or off; the $\overline{\text{ONDCR}}$ pulse enables (disables) both U395C (pins 10 & 11) and U395D (pins 14 & 15). When U395C and D close they couple the back porch sample dc level, from the input amplifier output, to the amplifier inputs. See Timing (Diagram 3) for more information about the generation of the $\overline{\text{BACKPORCH}}$ signal.

Because the Channel A and Channel B Input Amplifiers are identical, circuit numbers for the Channel A Amplifier are used to simplify the remainder of this discussion.

The Input Amplifiers are inverting feedback operational amplifiers with a gain of -1. The input resistor (R_i) is R196 and the feedback resistor (R_f) is R198. A plug and jumper is provided to select input coupling. J197 is factory set to the 1-2 position for ac coupling; it can however, be moved to the 2-3 position to provide dc coupling by bypassing C197, the ac-coupling capacitor.

The DC Restorer is a feedback sample-and-hold circuit. Sampling occurs when U395A (pins 2 & 3) close at back porch time. When the switch closes, the hold cap (C398) charges up to the dc level of the amplifier output. If $\overline{\text{ONDCR}}$, from the Microprocessor (Diagram 5) is present U395D (pins 14 & 15) closes and the loop-compensated Buffer Amplifier (U495A) drives the Input Amplifier input summing junction through R197. The time constant of the restorer does not attenuate 50/60 Hz hum by more that 10%. The choice of fast or slow dc restorer time constant is accomplished loop compensating the 2nd DC Restorer shown on Diagram 2.

Channel Switch

The Input Amplifier output signals drive the channel switch, U492, through pins 2 & 3. The signal selection is determined by the level of the $\overline{\text{CH-B}}$ signal at U492 (pin 10). When $\overline{\text{CH-B}}$ is low, CH-B is selected, and when its high CH-A is selected. The Channel Switch output (pin 6) drives a current mirror with three current sources.

One current source, through Q793, drives the rear-panel Picture Monitor Output Amplifier (SIG 2). C694 is the response adjustment that compensates the amplifier to match the 75Ω system input impedance. Q792 is the current source for the internal sync signal and Q791 is the current source for the remainder of the vertical. With a 1 V input signal there will be 1.11 mA of signal current flowing through R392 (or R393) into the channel switch. This signal current is available to drive the vertical through Q791 and the PIX MON OUT through Q793.

Only 0.5 mA of signal current is available to drive the sync stripper through Q792. Its emitter resistor, R694, is twice the resistance of R792 and R693, the emitter resistance for Q790 and Q793.

External Sync Input and Source Switch

The external sync signal from the rear-panel EXT REF loop-through is buffered by an operational amplifier consisting of U795A and B. It has a gain of -1, which is determined by the combination of input resistor (R_i) R997 and feedback resistor (R_f) R898. The operational amplifier output drives Q798, which is one current source for the Source Switch (U795D).

The internal sync current source, for the other side of the common emitter Source Switch (U795D), is Q792. It provides signal current through pin 5 of U795D which also forward biases CR696 when the switching signal ($\overline{\text{EXT}}$) is high. CR698 keeps CR696 from conducting when external sync input is selected.

When external sync is selected, $\overline{\text{EXT}}$ (from the Microprocessor Diagram 5) goes low, turning on U795 (pins 1, 2, & 3) so that signal current from Q798 (the external sync current source) forward biases CR697. The 0.5 mA of signal current from Q798 (external) or Q792 (internal) drives into a common base stage, Q799 which develops a 1 V video signal across R797.

Sync Stripper

The Sync Stripper removes the active video portions of the signal to generate the sync required for timing signals. The circuit detects the sync tip, stretches it (amplifies that portion of the signal), and generates a clean sync signal. The circuit responds well to pulses up to 1 MHz, then rolls off to eliminate any effect from subcarrier or high frequency noise at the sync level.

The Sync Stripper circuit consist of a two-stage amplifier and a clamp (or dc restorer). Fig. 4-2 shows a simplified schematic of the circuit. Both amplifier stages feed back sync level information to the clamp.

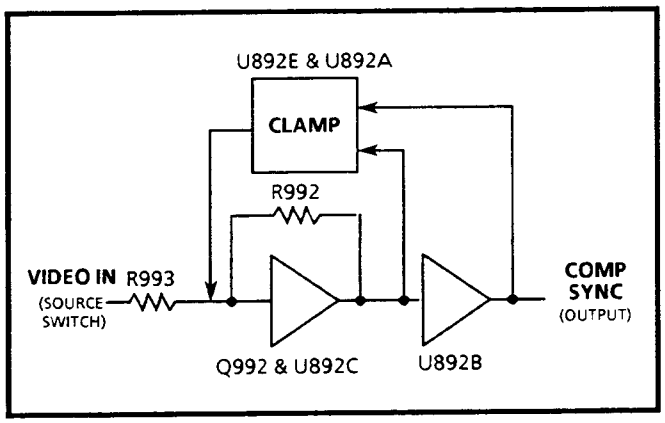


Fig. 4-2. Simplified block diagram of the Sync Stripper.

The first stage of the amplifier inverts the video signal and clips it near the sync tip. (The bandwidth of the Sync Stripper keeps the circuit from clamping to high frequency components of the video signal.) This operational amplifier stage is made up of Q992 and U892C. The gain setting resistors R993 (R_i) and R992 (R_f) let the amplifier provide high gain to the sync tip portion of the signal, but clip any signal components slightly above the sync level.

During sync time, the clamp circuit maintains the output of the first amplifier stage at about +5 V, which is fed back to the clamp circuit, through CR990, to maintain the proper level.

During non-sync times (active video), CR988 and CR989 are both on to shunt U892C and greatly reduce the gain. Shunting the active video limits the saturation of U892C, which allows it to respond quickly to the next sync transition.

An inverting amplifier, U892B, is the second amplifier stage. It provides negative-going sync and cleans up any remaining noise or active video on the signal. Output of the second stage is also fed to the clamp.

The clamp circuit is formed around U892E and U892A. U892E and CR990 form a current switch. When the first stage output level is at sync tip, current flows through U892E, which charges C887. At the same time U892B pulls down on CR887 to provide a discharge path for C887. The result of these opposing actions is to establish an equilibrium voltage on C887. At the end of sync time U892C saturates and pulls down on CR990 to shut off U892E.

Filter Selection

The three filters are driven from current source Q791 through one of the analog switch sections of U786. Only one switch section will be closed at a time, as dictated by its enable, from the Microprocessor (Diagram 5) going low. Chrominance filters are clamped to ground when low-pass filtering or flat is selected. In this condition Q777 and Q776 are turned on clamping the chrominance filter outputs to ground.

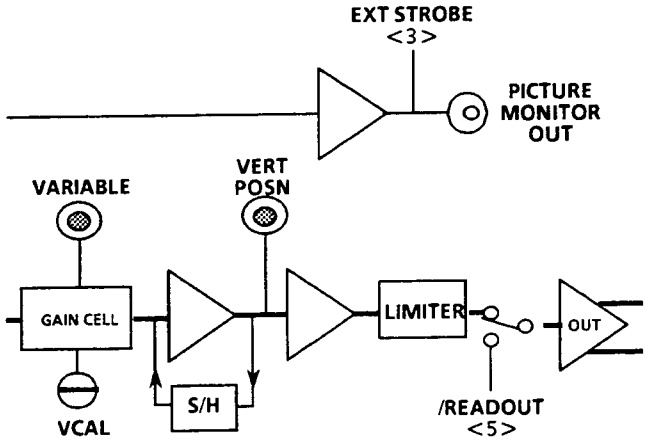
When the chrominance filter is turned on an additional bias current for the ac-coupled filters (3.58 and 4.43 MHz) is required. It is supplied by pulling the emitters of either CR671 or CR670 low with the Microprocessor-generated enable signal, which turns on Q775 to saturate Q774. When Q774 saturates its collector goes to +11.8 V. Signal current from the enabled filter drives the emitter of a common base amplifier input to the Gain Cell (Diagram 2). At a 0 V dc level 2 mA of bias current is added to 1 mA of signal current that drives the input of the Gain Cell.

When dual filter or dual input display is selected a blanking signal is required to mask any potential switching transit that might occur. Whenever CH B or FLAT goes active an RC circuit consisting of C94 (CH B) or C871 (FLAT) and R878 and R885 generates a pulse through Q764. Q765 inverts the blanking pulse, which is input to the blanking circuitry on Diagram 4.

Calibrator

The Calibrator is a common base amplifier, Q587, that is driven by a 100 kHz square wave from the Microprocessor (Diagram 5). It is switched at the 100 kHz rate. The gain is set by adjusting R689, the Cal Amp. The emitter current drives the Low-Pass filter (which is at least 30 dB down at 3.58 to 4.43 MHz) through an analog switch, U585C, which is activated by the Microprocessor-generated $\overline{\text{CAL}}$.

VERTICAL OUTPUT DIAGRAM 2



The filtered video signal drives the signal input of a gain cell whose gain is controlled by the front-panel V CAL, and when selected VAR VERTICAL GAIN. The gain normalized video signal drives an amplifier that can be clamped at back porch time with either a fast or slow time constant clamp, which is also selected by front-panel selection.

The Switchable Gain Amplifier input is the dc level shifted (Vertical Position) output of the Gain Cell Amplifier. Amplifier gain is switchable between X1 and X5 as selected by the front-panel X5 VERTICAL GAIN. Amplifier output drives a Bridge Limiter that prevents the Vertical Output Amplifier from being overdriven.

The Vertical Output Amplifier is driven by the processed video signal or, in Line Select, by an appropriate combination of video and the Y-Axis portion of the readout signal. The output amplifier has enough gain to drive the crt deflection plates, while providing the compensation for the deflection plate capacitance.

The picture monitor out signal from the Channel Switch (Diagram 1) is amplified and compensated to drive a 75Ω load by the Pix Mon Out amplifier. In addition, a bright-up pulse is added to the picture monitor output signal.

Gain Cell

Q684 drives the Gain Cell. It is a low impedance (to terminate the filters) common base amplifier. The signal voltage off collector is approximately 0.5 V.

The Gain Cell (U578) is driven differentially; pin 1 is the signal input with a -3.0 Vdc level plus the signal voltage. R675 determines the maximum gain of the Gain Cell. The amount of gain is controlled by varying the difference between the bases of the two transistor pairs controlling the signal current flowing out of pin 6 or pin 12. The front-panel V CAL control, R700, sets an input dc level on pin 10 of the Gain Cell. When Variable Gain is selected, the front-panel GAIN control alters the dc level on pin 10 through an analog switch, U585B. The switch is closed only when Variable is selected.

The current flowing out of pin 6 drives the Gain Cell Amplifier, while the current flowing out of pin 12 drives into a collector load, R480.

Gain Cell Amplifier

The Gain Cell Amplifier is a clamped inverting operational amplifier driving both the Switchable Gain Amplifier and the 2nd DC Restorer. It consists of Q673, Q674, and Q669, with Q669, an emitter follower operating as the output stage. Amplifier gain is approximately 4.

2nd DC Restorer

The DC Restorer clamps the output level of the Gain Cell Amplifier to the dc level occurring at back porch time. DC Restorer drive is coupled through R474 into an analog switch (U277B) that is activated by the $\overline{\text{BACKPORCH}}$ signal. U277B closes during back porch time to charge the hold cap, C484. The Error Amplifier (U488) drives a current summing point at the input of the Gain Cell Amplifier through U585D. For slow restorer, R484 is in the loop compensation. However; for fast dc restorer, R484 is shorted to ground through U277C to speed up the loop time constant. The enable signal for U277C is from the Microprocessor on Diagram 5 and is only present when Fast DC Restorer is selected.

Switchable Gain Amplifier

The Switchable Gain Amplifier consists of Q476, Q477, and Q478, with Q469 as the switching element. When the base of Q469 is pulled low through R472, amplifier gain is -1. R_i is R475 and R_f is the sum of R367 and R368. When its base is high, Q469 saturates and grounds the collector end of R470 to put an attenuator in the feedback path and increase gain by a factor of five. The output, at the collector of Q476, drives a bridge limiter circuit comprised of CR280 and CR380. See Fig. 4-3 for a simplified diagram of the limiter.

The purpose of the limiter is to prevent the Vertical Output Amplifier from being over driven. The bridge limiter circuit, encompassing CR280 and CR380, is quiescently balanced (equal current through all arms) with no V_{in}. When there is a signal voltage (V_{in}) applied to the bridge (CR1-CR2), the output signal voltage (CR3-CR4) is approximately equal to the input. When V_{in} moves away from the quiescent state, the current in the bridge arms becomes unbalanced.

When the bridge unbalances the current through the diodes changes, with more current flowing into the load through either CR3 (positive excursion) or CR4 (negative excursion), which turns the diode on harder. At the same time current flowing through the complementary input diode CR1 (positive excursion) or CR2 (negative excursion) is reduced and the

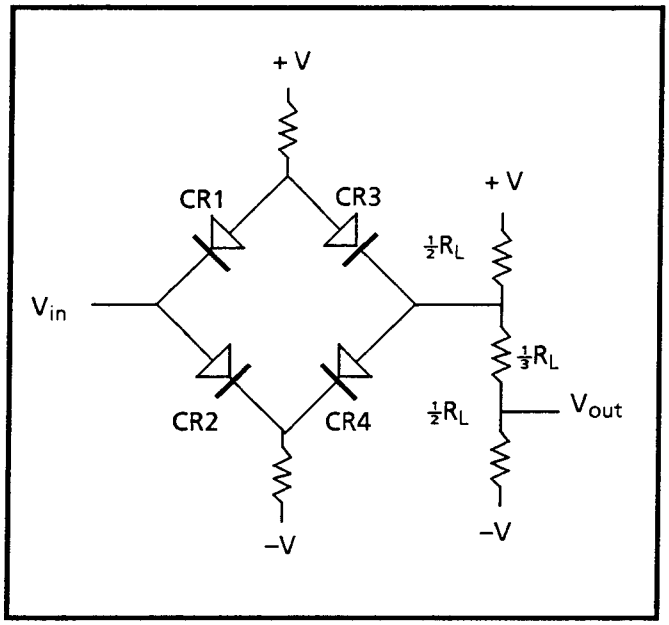


Fig. 4-3. Simplified illustration of the Bridge Limiter Circuit.

diode starts to turn it off. If the change in V_{in} is large enough, the output diode takes all of the current (which turns off the input diode) and disconnects the input from the output.

The bridge load, R378, R377, and R374, is also a voltage divider that sets the input dc level for the Vertical Output Amplifier at approximately -2 V.

Vertical Output Amplifier

The level shifted input signal drives the base of Q383 during active video signal time. The active video signal is disconnected while Line Select readout is displayed (U277D). Q383 is driven by the Y-Axis signal, through U277A, when the vertical component of the readout is displayed. The Y-Axis signal is enabled through the switch when $\overline{\text{ROEN}}$ goes low.

The combination of Q382 and Q383 forms a shunt-feedback amplifier. Q382 amplifies and inverts the collector current flowing in Q383 to provide most of the signal current through R485. Because the current across Q382 is nearly constant the input-signal voltage is applied directly across its emitter resistor, R485, with very little distortion. Negative feedback is employed to improve linearity and reduce the thermal distortions introduced by Q383. In addition, negative feedback increases the input impedance. A series compensation network consisting of R384 and C384 provides improved bandwidth and stability.

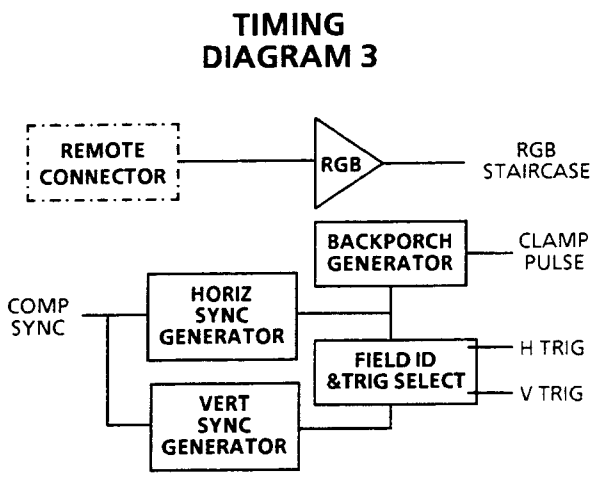
The combination of Q385 and Q387 form a shunt-feedback amplifier, identical to Q383 and Q382. The signal current for this amplifier is input through R485. Signal current through Q387 is equal in value and opposite in phase to the current change in Q382. The Limit Center, R489, balances the bias current flowing in Q382 and Q387. R387 and C387 form another series compensation to improve bandwidth and stability. R486 and C389 provide high-frequency peaking to improve the flat response; R385 and C385 improve low-frequency transient response.

Q280 and Q289 are common-base stages that couple the complementary signal currents to the non-inductive crt load resistors, R184 and R186. The resulting signal voltages drive the crt vertical deflection plates. R183 and R187 shunt the load resistors to provide the proper load resistance for the high-bandwidth output signal. L180 and L190 are adjustable shunt-peaking coils to increase the vertical bandwidth and allow precise adjustment of flat response.

Pix Monitor

The Picture Monitor Output Amplifier consists of U978 and Q877. The amplifier is driven from pin 2 of U978D by the SIG 2 input from Diagram 1. The output, that drives a 75Ω load, is the emitter of U978A (pin 7). R883 and R884, on the amplifier input, develop the signal voltage 0.554V (1 mA * 554Ω).

The overall gain for this non-inverting amplifier is set by feedback divider resistors R975 and R876. The signal amplitude at the emitter of U978A is 2 V (0.554 * (1+3570/1400)). Q973 adds an offset to the video, for LINE SELECT operation, that provides the bright-up (or strobe) pulse. The amount of the offset is set by the value of R870.



Composite sync from the Sync Separator (Diagram 1) is used to time the Horizontal and Vertical Sync Generators. Outputs from these generators are used to develop line and field rate signals that are used to display selected lines or fields of information. The Clamp Pulses used to time the vertical amplifier DC Restorers are generated by a Back Porch Generator driven by the Horizontal Sync Generator.

The input Staircase for the RGB/YRGB parade display is input to an operational amplifier through the rear-panel REMOTE connector. The compensatable (dc level and transient response) RGB Amplifier is enabled ($\overline{\text{RGB ENABLE}}$) by a TTL low.

Horizontal Sync Generator

The Comp Sync, from the Sync Separator on Diagram 1, drives the timing input to U735. U735 is a registered 16-input gate array that outputs line rate enables and $\overline{\text{SYNC}}$. The line rate $\overline{\text{SYNC}}$ output drives U844B, a non-retriggerable one-shot that outputs a pulse wide enough to lock out the twice line rate pulses in the vertical interval. The line rate signal, output from pin 5 (Q), drives the Back Porch Generator (U844A), the Horizontal AFC phase-lock loop (U644), and the sweep trigger selector (U535).

U644 is a phase-locked loop. See Fig. 4-4. In this application a second comparator, U947B, is used to drive the internal VCO. The circuit's input, through pin 14, is line rate sync. R536 and C545 form an adjustable delay network that ensures filter or input switching occurs during H Sync time.

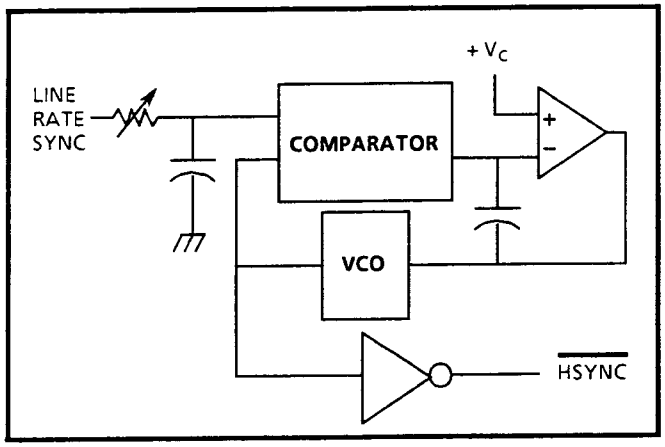


Fig. 4-4. Simplified representation of the AFC phase-lock loop.

U644 has a VCO as one of the onboard functions. Its timing components (C643, R742, and R743) keep the oscillator frequency near line sync rate. When there is line rate sync the output of the comparator will be approximately equal to the U947B + input dc level and no correction voltage will be input to the VCO.

If line rate sync is interrupted, the VCO runs at, or near, line rate until sync is restored. When line rate sync is restored it will be out of phase with the VCO and the internal comparator (U644) will have an output indicating that the loop is unlocked. With an unbalanced input, the second comparator outputs an error signal that will: 1. Attempt to charge the loop filter. 2. Drive the VCO voltage input. When the VCO output changes to a new frequency, the comparator output changes; however, the charge on the loop filter reduces the effect of this change on the comparator in order to slow the loop response. When the loop nears lock the amount of change is very small.

Having H Sync generated by this AFC circuit allows the 1730–Series to sync up on noisy syncs and remain synced up on signals with missing H rate sync pulses. U841D is used as an inverter to output the required $\overline{\text{HSYNC}}$.

The DC Restorer back porch pulse is generated by a one-shot, U844A. When $\overline{\text{SYNC}}$ occurs, U844A is cleared. The next line rate pulse output from U844B will start the one-shot, whose pulse width is determined by C848 and R849. The output pulse from Q99, an emitter follower, is time coincident with the back porch of the input sync signal. The Q output of U844B sets the position of the pulse, and C848 and R849 determine the pulse width.

Vertical Sync Generator

U947A is an integrator whose output is normally low. The broad pulse in the vertical interval will cause its output to ramp up. When the broad pulse ends, and the serrated pulses begin, the output starts ramping back down. This negative-going signal is coupled through C853 to comparator U753B, to output the vertical rate sync pulses (V SYNC).

RGB Amplifier

Under normal operation the base of Q856 is pulled down by CR955, which causes Q855 to saturate and ground the amplifier output. When exerted the $\overline{\text{RGB ENABLE}}$, from the REMOTE connector, is inverted to provide a discharge path for the emitter of CR955, which enables the RGB Staircase Amplifier.

The staircase signal from the REMOTE connector drives an operational amplifier composed of Q856 and Q855, whose gain is approximately 0.5. The amplifier is compensated, for optimum step definition (transient response), by C953. R856, the RGB Offset adjustment, compensates for input dc level variation.

Field ID and Trigger Select

U535 is a 16-input, registered gate array containing a D-type flip-flop. Line rate sync (from U644) drives its Data input, which is clocked through by vertical sync from U753B. Because of the half-line offset between fields, in the vertical sync, alternately a high or a low line rate sync level is clocked out to enable the flip-flop outputs. $\overline{\text{FIELD}}$ is a frame rate square wave that is high for one field and low for the other, that provides field rate timing information to the Microprocessor. The V TRIG output triggers the Field Rate Sweep Generator. There is no field identification for RGB and Remote Sync operating modes.

Non-standard sync inputs may cause the field identifying circuit to stop producing a field rate trigger signal for the Sweep Generator. When this happens, V SYNC is automatically used for triggering (without any field identification taking place). Q806 detects the absence of field identified vertical sync. The field rate square wave output as $\overline{\text{FIELD}}$, keeps C906 charged, which holds pin 19 of U535 high when there is field identification.

A one-field trigger can be used, in normal configured instruments, by pulling the REMOTE $\overline{\text{1LIN-1FLD}}$ input low to turn on Q821. Turning on Q821 shuts off Q806 and allows C906 to discharge. The resulting low input on pin 19 of U535 switches the V SYNC pulse output to U535 pin 14 to trigger the Sweep Generator at the field rate.

V TRIG is the field rate trigger signal enabling the Sweep Generator, which is positive edge triggered. Field 1 or Field 2 sweep triggering is selected by the $\overline{\text{FLD1/FLD2}}$ control line from the processor. A positive edge is output at the start of the selected field.

In addition, U535 decodes instructions for selecting either the applied sync ($\overline{\text{CAL}}$ high) or the Calibrator ($\overline{\text{CAL}}$ low) for the source of line rate sync (H TRIG).

Displaying the appropriate lines in the LINE SELECT mode is achieved by blanking the crt beam the rest of the time. The LIN SEL signal from the Microprocessor is used by U735 to generate $\overline{\text{LINSTRB}}$, which is the blanking signal, and $\overline{\text{PIXSTRB}}$, which is the strobe signal for the rear-panel Picture Monitor Output. See Fig. 4-5 for timing details.

Fig. 4-6 and Fig. 4-7 are timing diagrams that show the signal relationships for 2 Line and 1 Line sweep rates in the LINE SELECT mode.

Horizontal and vertical triggering signals enable integrator sweep generators, by dictating when retrace occurs. The output of the selected sweep generator drives a Magnifier Amplifier, which provides sweep magnification, RGB staircase input, and positioning control. The output of the Magnifier Amplifier drives the Output Amplifier to match gain and impedance for the crt deflection plates. When 1 or 2-line Line Select is displayed readout is switched into the Output Amplifier, for crt display, on a time sharing basis with the sweep information.

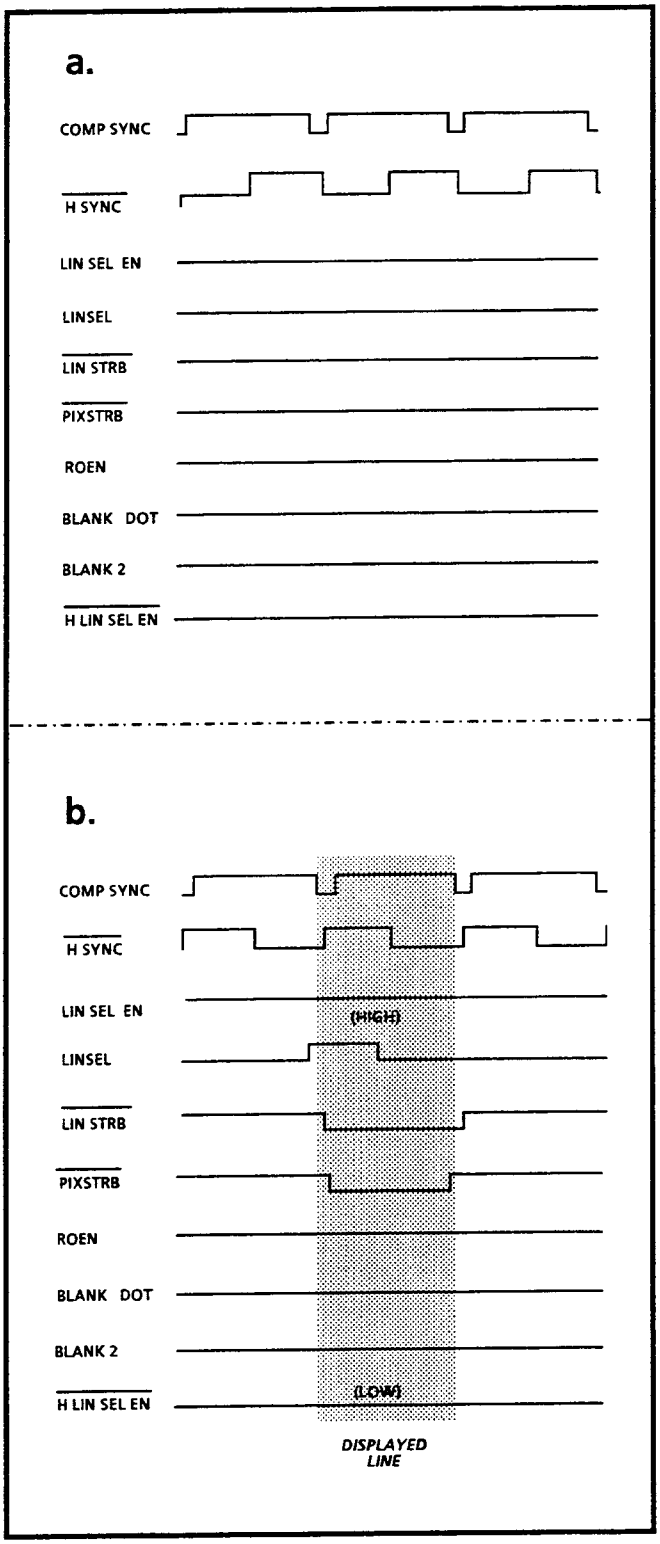


Fig. 4-5. Elements for line select timing: a) Line select off. b) 2 Field line select.

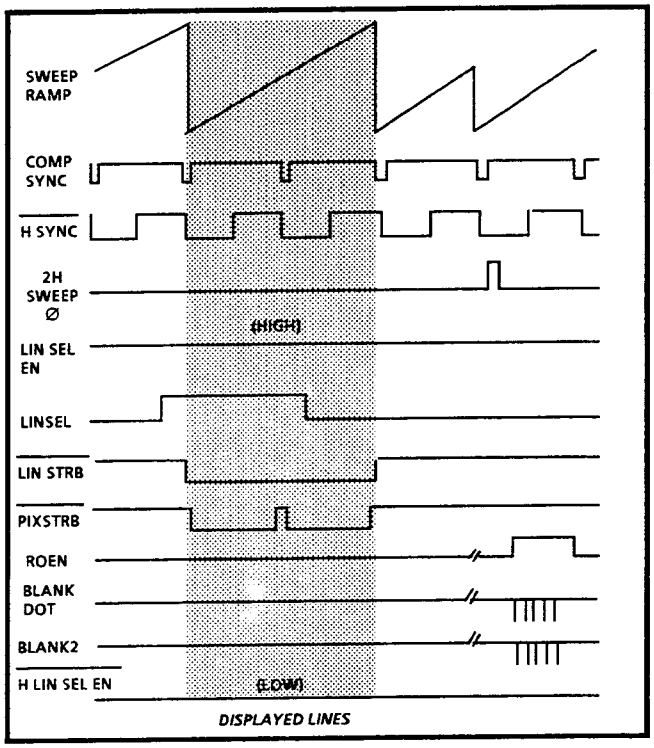


Fig. 4-6. Relative line select timing elements for the 2 Line display.

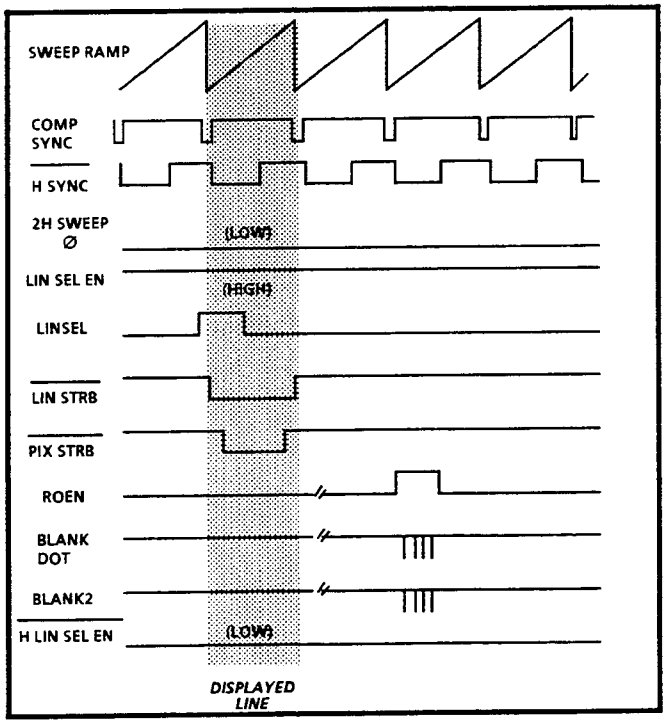
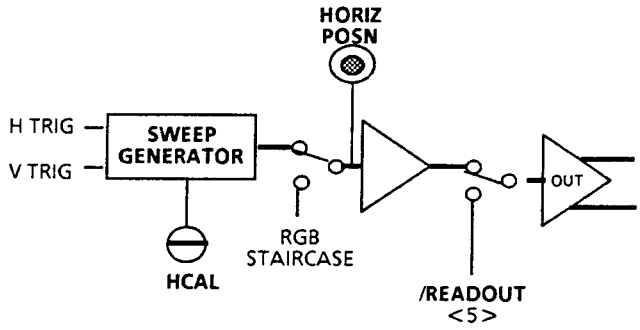


Fig. 4-7. Relative line select timing elements for the 1 Line display.

SWEEP GENERATORS AND HORIZ OUTPUT DIAGRAM 4



Sweep Generator

U552B (Line Rate Sweep Generator) and U552A (Field Rate Sweep Generator) are integrators, one of which is disabled while the other is running. The selection is controlled by the H and V Trigger signals from the Sync Generators (Diagram 3) and the LIN/$\overline{\text{FLD}}$ control line from the Microcontroller. When a trigger arrives, for the selected sweep, the D-type flip-flop (U541A or B) Clear is high and Preset is low, to set Q high and turn on Q451 or Q450, which discharges the integrating capacitor (C448 or C453). See Fig. 4-8. The Q output of U541A or B going high also starts a one-shot (U741A or B) which pulls the flip-flop Preset low which assures at least 2 μs (line-sweep one-shot time constant) of discharge (retrace) time. Field sweep one-shot time constant is 2 ms. At the end of the time constant Preset goes high and Clear goes low causing the flip-flop Q output to go low and turn off Q451 or Q450 to start charging the integrating capacitor.

Current source for the integrators is through R654. When a one line or field sweep (including RGB parade) is selected, pin 3 of U735A is pulled low and effectively shorts out R654 to provide more current for a faster sweep. Q750 provides a compensation for 50 Hz sweep by taking away a small amount of current when operating with 625/50 Hz sweep rates.

If there is no H or V Trigger, the output of the running Sweep Generator is self retriggered. When the ramp amplitude reaches about 3/4 of its maximum amplitude U445B trips and sets the flip-flop Preset high to turn on Q451 or Q450 to start retrace. Just before retrace begins U445A also trips and pulls the flip-flop Clear high to lock out the trigger signal.

The Microcontroller-generated 2H SWP PH retriggers the Line Rate Sweep Generator by turning on

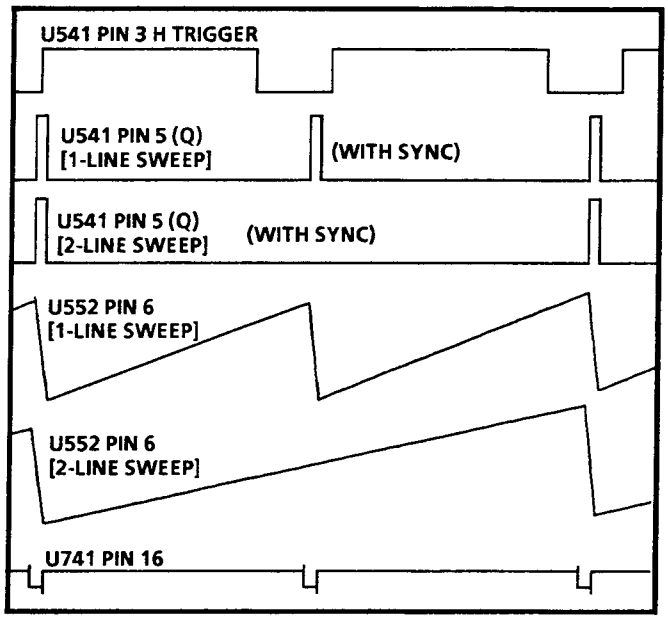


Fig. 4-8 Timing signals for 1-line and 2-line sweep.

Q451 (which discharges the integrator capacitor, C453) to synchronize the sweep for Line Select or when dual filtering or input switching is selected.

The output of either one-shot, or LINSEL BLNK, is gated through U334B to become the blanking enable, which ensures that the crt will be blanked during retrace and unblanked during the portion of active sweep that is to be displayed.

Magnifier Amplifier

An operational amplifier consisting of U564C and D and Q566 positions and magnifies the sweep signal. R557 and R558 are the central elements of the feedback resistor network. The value of the network is altered by R552 (1 μs Cal) and R553 (0.2 μs Cal) when magnified sweep rates are selected. The junction of input resistance (R559) and the feedback resistance network (R557 and R558) is the amplifier input summing junction.

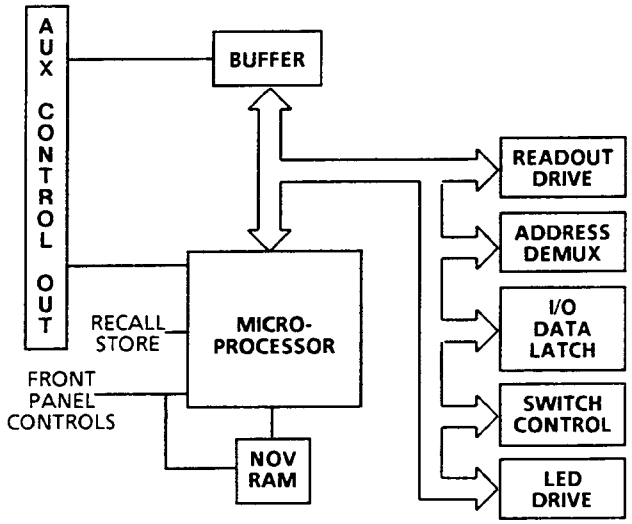
Horizontal positioning voltage is input to an operational amplifier, U655B, which drives the Magnifier Amplifier summing point (along with the RGB staircase signal, when RGB/YRGB operation is selected). The length of the sweep, in RGB mode, is set by jumper J456 to accommodate either three- or four-step sweeps (for RGB and YRGB modes).

U465A and U465B are comparators used to sense when the output of the Magnifier and Position Amplifier have driven the crt beam to the edge of the crt screen. When the beam is horizontally overdriven, the input to U234C is pulled low to generate the BLANK enabling level for the Z-Axis Amplifier (Diagram 6).

Horizontal Output Amplifier

The Horizontal Output Amplifier is composed of Q858, Q860, Q862, and Q864, with Q868 and Q865 serving as current source. R960 provides the differential mode feedback; R958 and R959 provide the common mode feedback that biases the outputs to approximately 50 volts. The gain of the amplifier is determined by a voltage divider with two adjustments, R660 (Sweep Length Adj.), and magnified sweep registration R661 (Mag Registration Adj.). In LINE SELECT, Q762 and Q763 switch out the horizontal sweep and switch in the horizontal X-Axis component of the line select readout.

MICROCONTROLLER DIAGRAM 5



The Microcontroller is the brain of the 1730–Series Waveform Monitor. It monitors the front panel, Store/Recall functions, and the Remote interface. Changes to any switch setting or remote line is converted into appropriate control levels for circuits in the rest of the monitor.

Microprocessor

The 8052 Microprocessor (U522), used as the 1730–Series Microcontroller, contains 8K of masked ROM. The on-board masked ROM holds the Microprocessor machine instructions. Crystal-controlled oscillator frequency is 12 MHz.

The processor operates with an eight-bit multiplexed address/data bus that interfaces through Port 0 (pins 32-39). Front-panel switches and Recall selections are sensed by Port 1 (pins 1-8). Each front-panel momentary contact switch (along with the Recall switches) has a specific row and column address. Functions are changed by simply pushing (to toggle) or pushing and holding a front-panel momentary contact switch. As an example: When row 1 and column 1 are connected together (by switch closure) the sweep rate toggles between the 2-line and 2-field sweep rate; however, if the switch is held in for a discernible interval the processor will switch sweep rate to 1 line.

The I/O Port 2 provides eight additional interface lines. Three lines communicate with the NOVRAM (Clock–pin 21, Data–pin 22, and Chip Enable–pin 23). Four lines (pins 25-28) output high levels to drive analog switching functions (X5, BLANK DOT, LINSEL, and 2H SWP PH). Pin 24 is the external communications enable that controls the Auxiliary interface.

Pins 13, 14, and 15 input horizontal (line) sync and vertical (field) sync, to decipher line select data and real-time switching functions (A/B and Low-Pass/Flat switching). The period for the FIELD, pin 12, determines the phase of the $\overline{60/50}$ control line. The status of this line is held permanently high (1730) or permanently low (1731) for single standard instruments by the positioning of J504. In the 1735 the jumper is not used and the Microprocessor determines the level output on this line. 60 Hz (NTSC) mode of operation is selected for field rates greater than 55 Hz, and 50 Hz (PAL) mode for field rates less than 55 Hz. If signal field rate is close to 55 Hz, the standard selection may be indeterminate and oscillate between 50 and 60 Hz. Automatic standard switching is delayed from the signal switching by several video frames, to ensure that false switching does not occur. If loss of reference occurs, the current standard is maintained until reference is restored. The level of the 60/50 output dictates selection of the Chroma filter and the line numbering for LINE SELECT.

Pins 10 and 11 are the Auxiliary bus (TXD pin 11 and RXD pin 10). U809B and C are buffers for this bus structure which connects directly to a 1720–Series through the rear-panel AUXILIARY connector.

Pin 17 ($\overline{RD}$) is the remote input enable for U731, the REMOTE input buffer and U809A, the REMOTE STORE buffer. Pin 16 ($\overline{WR}$) enables readout DAC (U325), clocks the I/O Data Latch (U532), and enables the internal registers in the LED Driver (U407)

The functions of the control lines, originating on the Microcontroller diagram, are shown in Table 4-1. The active condition of the line, and the expected result, when active, are detailed here.

Table 4-1
Control Line Functions

Signal Line	State	Result
X5	High	Enables 5X Vertical Magnifier. (U522)
BLANK DOT	High	Blanks between dots in Line Select readout. (U522)
LINSEL	High	Unblanks the crt for Line Selected line. (U522)
2H SWP PHASE	High	Resets 2H Sweep Generator for Line Select and real-time switching functions. (Q626)
RXD	----	Used in serial port diagnostics and Auxiliary. (U809B)
TXD	----	Sends data to companion 1720–Series. (U809A)
CAL DR		100 kHz pulse to Calibrator. (U331B)
CAL	Low	Enables Calibrator. (U532)
ROEN	High	Enables readout in Line Select. (U532)
LIN/FLD	High Low	1 or 2 Line display. 2 Field display. (U532)
TWO /ONE	High Low	2 Field or 2 Line display. 1 Line (no single field display possible). (U532)
MAG	High	Enables Horizontal Magnifier. (U532)
EXT	High Low	Enables internal sync reference. Enables external sync reference. (U532)

Table 4-1 (Cont.)

Signal Line	State	Result
FLD 1 /FLD 2	High Low	(NTSC) Field 1 trigger in 2 Field Sweep. (PAL and PAL-M) Field 2 trigger in 2 Field Sweep. (U532) (NTSC) Field 2 trigger in 2 Field Sweep. (PAL and PAL-M) Field 1 trigger in 2 Field Sweep. (U532)
LIN SEL EN	High	Blanks crt for Line Select, except during LINSEL high. (U532)
X-AXIS	----	Analog signal to horizontal deflection amplifier for Line Select readout. (U231A)
Y-AXIS		Analog signal to vertical deflection amplifier for Line Select readout. (U231B)
CH B	High Low	Enables CH–A input. Enables CH–B input. (U884)
ON DCR	Low	Enables DC Restorer. (U884)
3.58	Low	Enables NTSC AND PAL-M Chrominance filter. (U884)
4.43	Low	Enables PAL Chrominance filter. (U884)
LPASS	Low	Enables Low Pass filter. (U884)
FLAT	Low	Enables Flat (no filter). (U884)
VAR	Low	Enables vertical variable gain. (U884)
IF 1730 DCRF	Low	Enables fast DC Restorer if ON DCR is high. (U884)

NOVRAM

U725 is the Non-Volatile Random Access Memory (NOVRAM) used to retain the current front-panel status and the front-panel status for the Stored Recalls (Auxiliary). Data is written in and read out through pins 3 and 4; pin 22 of U522 controls the flow of data. The NOVRAM serial clock is output by U522 (pin 21), the Chip Enable is output from U522 pin 23. These three lines (Clock, Data In/Data Out, and Chip Enable) are active when:

1. Power is turned on.
2. Any front-panel switch is pressed.
3. A Store or Recall is requested.

U726 is the power down detection circuit. It detects the loss of instrument power in time for the NOVRAM (U725) to execute a save operation. When the +5 V supply drops a few hundred millivolts, pin 7 is pulled low, which in turn pulls the $\overline{\text{STR}}$ for U725 down, causing it to Store its current status. The front-panel and Auxiliary (Store/Recall) data is saved in a matter of milliseconds when the power starts to drop below safe operating levels. U727 is a three-terminal regulator operating from the +15 V supply, which comes onto the circuit board from the main Power Supply. As soon as the +15 V raises enough to provide a +5 V output from U727, U725 recalls the data saved so that it will be available to the Microprocessor when all supplies are up to their operating tolerances.

Switch Control

U884 is a serial-in/parallel-out register that is loaded with the real-time switching data from the Microprocessor serial port (pin 10) whenever pin 24 of U522, goes high. When pin 24 is high, the serial input of U884 is enabled and the external communications input, through U809B, is disabled. The eight bits of serial data now in the internal register are clocked out, in parallel, by the leading edge of H (line) Sync, which is the clock signal driving U884 pin 12.

Address Demux

U527 is the Address DE-MUltipleXer (Demux) used to decode the lower eight bits of the address line. Even though both addresses and data share the same Microprocessor port, only addresses are present when U527 is clocked by the Microprocessor ALE output.

Readout Drive

U325, through U231A and B, drives the X and Y axes of the dot-scanned line select CRT readout. U325 is a dual D/A Converter (DAC) whose internal registers are loaded from the Data/Address bus and clocked by the Microprocessor $\overline{\text{WR}}$ output.

I/O Data Latch

U532 is the data latch outputting control signals to the 1730–Series non real-time switching and the readout enable (ROEN). The addresses are loaded from the Address Demux (U527) and clocked out by the Microprocessor $\overline{\text{WR}}$ output. The ROEN operates in conjunction with the Microprocessor Blank Dot output (pin 26) in order to display the data output from U325 on the crt.

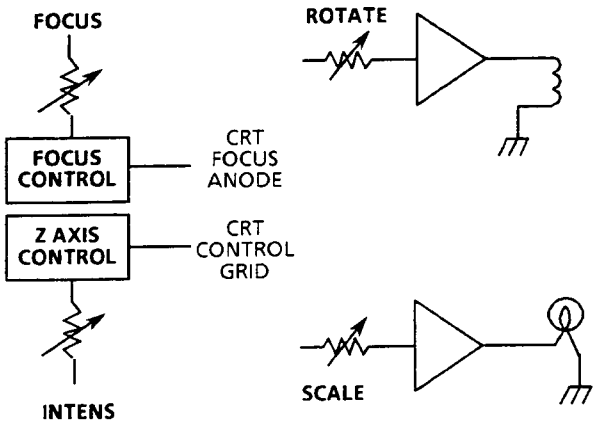
Cal Drive

U331 divides down the Microprocessor ALE output to generate Cal Drive. U331 is enabled by the $\overline{\text{CAL}}$ from the I/O Data Latch, U532.

LED Drive

The front-panel LEDs are driven in six common banks by U407. U305 provides a common current drain that is enabled by U407. Data registers in U407 are written into by the Microprocessor over the eight-bit address bus and read out to front-panel LEDs when $\overline{\text{WR}}$ goes low.

CONTROL CIRCUIT DIAGRAM 6



Blanking signals, for video and readout, are input to an intensity switching matrix along with a dc voltage level set by the front-panel INTENS control. Focus level, for the crt focus anode, is set by regulating the current through a transistor current source. The amount of focus current through the transistor depends on the setting of the front-panel FOCUS control. The effects of small variations in the magnetic field surrounding the instrument are compensated for by an adjustable magnetic field placed around the crt bulb. Scale Illumination for the crt face plate is set by controlling the output amplitude of a triangle generator that drives the scale illumination bulbs.

Focus Control

The Focus control operation must also control two different display criteria. In the normal mode of operation, the Focus voltage will be selected by the control setting only (Q242 is off). When a Line Select Un-Blanking pulse occurs, U239B turns off and additional current flows through Q242. R245, the LS Focus adjustment, is adjusted for optimum focus in LINE SELECT at the normal display focus setting.

Z-Axis Control

U252 is a transistor array with two of the transistors connected as a differential current switch. The static output level (pin 8) is set by the front-panel INTENSity control using Q243 (in the Focus Control) as a current source. The Blanking signal is input to the transistor switching array through U252B (pin 9). When it goes high, the current output, collector of U252A (pin 8), is shut off and the Z-Axis Amplifier (Diagram 9) blanks the crt. See Fig. 4-9.

In LINE SELECT mode, the intensity setting has to change to brighten up the line or lines. This is accomplished by increasing the current through the current source (Q243). U239A is an open collector, dual comparator whose output goes low during Line Select Blanking to allow the full current available, across R238 and R241, to flow in the circuit.

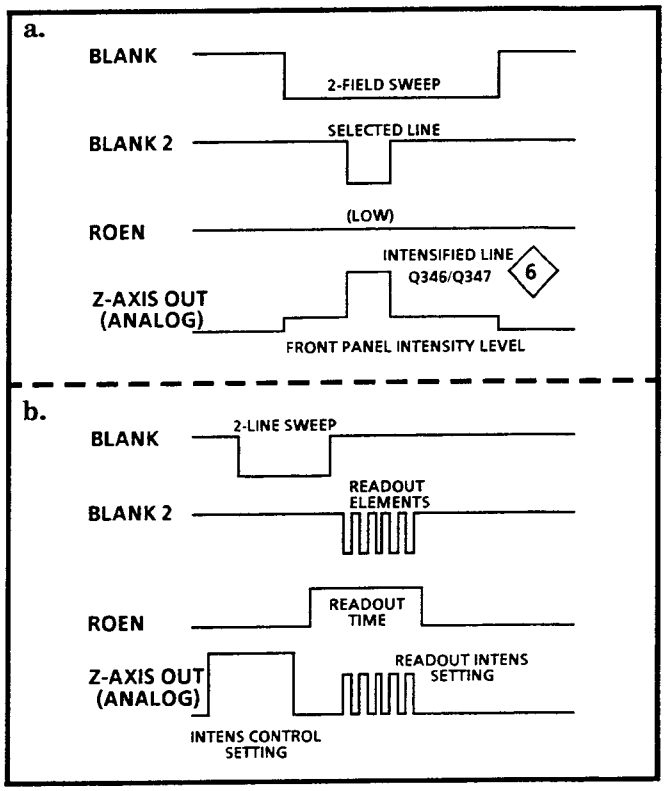


Fig. 4-9. Z-Axis timing for readout: a. 2 Field display intensifies the line (lines) to provide a bright-up strobe. b. In 1 or 2 line sweep, alpha-numeric readout in the upper left corner of the CRT is used to convey the number of the first selected line.

Trace Rotation

Trace rotation compensates for changes in the magnetic field surrounding the 1730–Series. Q142 and Q143 are emitter followers that provide the Trace Rotation current to the crt surrounding coil located inside the crt shield. Current amplitude and polarity are controlled by the front-panel ROTATE screwdriver adjustment.

Graticule Illumination

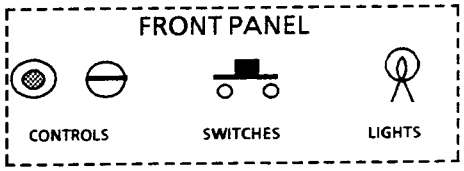
U263A is a triangle generator whose output is compared to the front-panel SCALE control output level, by U263B (a comparator). Whenever the output of U263A is higher than the level from the front-panel SCALE control, Q158 is turned on and current is drawn through the bulbs (DS100, DS200, and DS300) to ground. The duty cycle of Q158 is determined by the level set by the front-panel SCALE control.

J100 is normally in the 1-2 (Lights Enabled) position. In the 2-3 position, the graticule scale illumination is disabled.

± 11.8 V Regulators

The + and -15 V supplies generated by the main low voltage power supply are further regulated to meet the power requirements of the Main (A3) circuit board. U164 is the regulator; its reference level is set by R167, the -11.8 V Adjust. U172 is the +11.8 V supply regulator and its reference level is set by R168, the +11.8 V Adjust.

FRONT PANEL
DIAGRAM 7



The front-panel indicators are driven from Microcontroller light driver register and LED drivers from Diagram 5. The front-panel switches are momentary closure (with some hold for additional function capabilities) that are monitored by the Microprocessor, which is also on the Microcontroller (Diagram 5). In addition a series of front-panel controls provide variable dc operating levels as a means of compensating for variable operating requirements and conditions.

Indicators and Switches

The front-panel LED indicators are arranged in six columns returned to a current source by four returns, designated as rows, in order to provide the Microprocessor with a set of column/row matrix addresses. An LED indicator lights when there is a complete circuit from the Light Driver (Diagram 5) through the LED and back to the Light Driver.

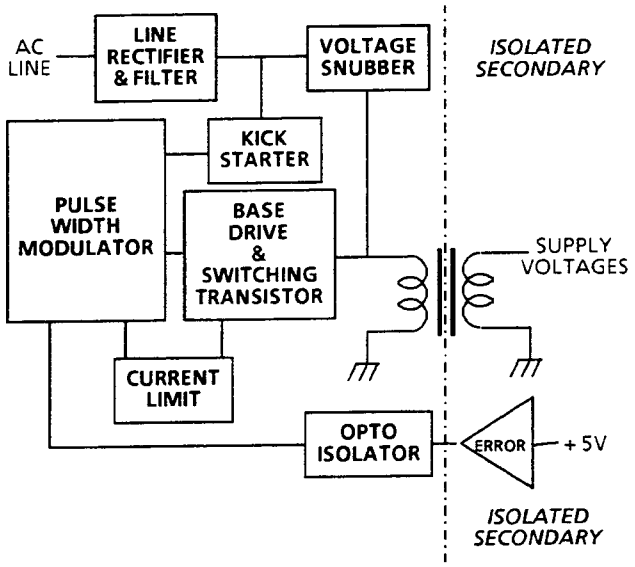
Switches complete a simple matrix that is read by Port 1 of the Microprocessor. A completed circuit through the processor (switch closure) dictates an output through the Data I/O that changes one or more operating conditions. Some of the switches are read in two different ways by the Microprocessor. When touched and released they cause the Microprocessor to toggle to the next item on that switches menu. When held in, the Microprocessor selects a specific operation. Hold for function switching options are outlined in blue on the front panel.

Controls

A set of variable controls consisting of the Horizontal Position, Vertical Position, Vertical Calibration, Scale, and Focus controls select a dc voltage level between +11.8 V and -11.8 V.

The INTENSity control operates in conjunction with the Z-Axis Control circuit on Diagram 6. Dc levels for Intens 1, Intens 2, and Intens 3 depend on the operating mode selected, which dictates the level on each of the leads.

LOW VOLTAGE POWER SUPPLY
DIAGRAM 8



The Low Voltage Power Supply converts the mains line voltage (either 120 or 220 volts) to supply the power requirements of the instrument. The low voltages supplied from the central power supply are +40 V, +15 V, +5 V, and -15 V.

Line Rectifier and Filter

The input line voltage is filtered to prevent any noise that is on the ac line from interfering with instrument performance, and to prevent any noise generated within the waveform monitor from getting back to the ac line. RT484 and RT582 are surge protection to limit initial turn-on current through the rectifier and capacitors.

The rectifier operates as a full-wave bridge for 220 V input, or as a full-wave doubler for 120 V input. Operating voltage is selected by the position of W476, which is soldered in place for 120 V input and removed for 220 V input. E576 is a spark gap that fires and blows the line fuse when 220 V is applied if W476 is installed for 120 V input. DS185, along with R192, C192, and R196, are a relaxation oscillator, with DS185 flashing whenever line voltage is present.

Kick Starter

When the instrument is first turned on, C287 is charged from the rectified power line through R197. When the voltage on the anode of Q293 gets 0.6 V higher than the gate (20 V), it saturates and turns on Q290, and the charge on C287 is impressed across the base drive and switching transistor to allow the Low Voltage Power Supply to start. Once the supply has started, the housekeeping winding supplies the base drive through CR357. If the Power Supply does not start, Q290, R186, and VR186 force the Kick Starter to cycle until it does start. The current through Q293 is diverted through Q290 so that most of the load consists of VR186 and R186. Once the voltage on C287 falls below about 6 V, the load current in Q293 falls off to such a small value that it turns off along with Q290 to allow C287 to recharge.

Base Drive and Switching Transistor

The Low Voltage Power Supply is of the flyback type. Q367 is the main switching transistor, with T466 providing the base drive. R466 limits the forward base current used to turn on Q367. C471 charges to 0.6 V, with CR566 limiting the charge. This holds the base of Q367 negative when Q367 is off. T466 is polarized so that when Q463 is on, Q367 is driven on.

To efficiently turn Q367 off, base current must be drawn backwards from the base. This reverse base current is derived from magnetizing current stored in T466 and stabilized by Q363 and Q362. The resulting reverse base current in Q367 is at a relatively constant value. VR465 limits voltage spikes on Q463 to 30 V.

For troubleshooting purposes: The forward base current is about 130 mA and the reverse base current should vary between 70 mA and 130 mA, depending on line voltage and load current.

Pulse Width Modulator

The Pulse Width Modulator uses U558 for pulse width control. C557 and R557 set the operating frequency to about 30 kHz. Pin 15 is the power input, pin 16 supplies a 5 V reference, and pin 10 is the shutdown.

When pin 10 of U558 is pulled high by the Current Limit it shuts off. Pin 12 is the output that controls the base driver. As the voltage on pin 9 is varied the duty cycle at pin 12 changes from 0% to 50%. The duty cycle changes with line voltage and load changes in order to keep the output voltage constant. One volt or less on pin 9 produces a 0% duty cycle.

Error Amplifier

In order to isolate the load from the power line, all supplies are derived from the secondary of the power transformer. The control voltage fed back to the Pulse Width Modulator, from the Error Amplifier, is also isolated from the power line. An Opto-isolator, U455, is used to drive pin 9 of the Pulse Width Modulator.

The intensity of the light from an internal LED, driven by the Error Amplifier, sets the collector voltage for the light-sensitive transistor in U455. The resulting output voltage becomes the comparison input for U558 (pin 9) that, in turn, determines its duty cycle. R562, between pin 9 and the emitter of Q568, is the load resistor for U455.

The Opto-isolator is driven by the output of the Error Amplifier, U242, through Q344. The +5 V Adjust, R445, is part of the input voltage divider for U242. When it is adjusted it sets the duty cycle of U558 (through U455).

Current Limit

Q565, Q570, and Q568 form the Current Limit circuit. R270 is the current sense resistor, providing base current to Q570 through a divider consisting of R568 and R567. C568 snubs high frequency voltage spikes. If the current in R270 gets high enough to turn on Q570, Q565 is turned off and the voltage across R564 pulls pin 10 of U558 high and shuts off U558.

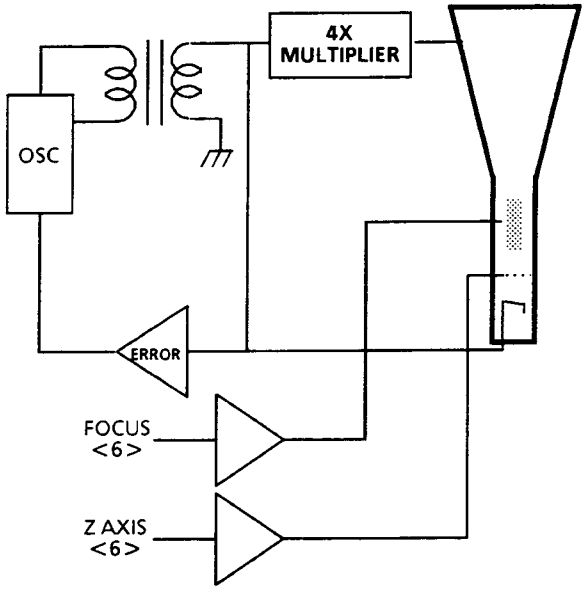
In the Current Limit mode, the Power Supply runs in and out of current limit in an oscillatory fashion, which produces a high-pitched squealing sound, in short bursts. If the load causes the Current Limit to be active for more than a few hundred milliseconds, C567 charges and turns on Q568. Q568 and Q570 then turn each other on in a positive feedback reaction, which holds pin 9 of U558 low and shuts the Power Supply down until the housekeeping supply is depleted.

Once the housekeeping supply is depleted, the kick start capacitor charges from the power line and starts another kick start cycle.

Voltage Snubber

R170, L177, CR170, CR266, and C267 form a voltage snubber. The voltage spikes on the collector of Q367 are limited to around 850 V by this circuit. During voltage limiting, C267 is charged through CR266. When Q367 is turned on, CR170 conducts and C267 discharges through L177, readying it for the next snub cycle.

HIGH VOLTAGE POWER SUPPLY DIAGRAM 9



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. Q134 and T332 are the principal elements of an Armstrong oscillator running at about 25 kHz. The Error Amplifier, U242, regulates the +100 V output, and keeps the High Voltage Power Supply constant under varying load conditions by controlling the base current to Q134, through Q237 and Q238. The +100 V output is monitored directly, while the High Voltage Power Supply is monitored through a feedback circuit.

R427, C427, and R143 form the High Voltage Power Supply positive feedback circuit. As the current from the High Voltage Power Supply is increased, the voltage to the + side of the Error Amplifier (U242) increases, which reduces the base drive to Q134, the HV Osc. This positive feedback compromises the regulation of the 100 V supply to keep the high voltage constant with varying intensities.

C138 and Q137 are a start delay circuit that holds the Error Amplifier output low, through CR138, until C138 is charged from the 15 V supply. Delaying the start of the high voltage oscillator allows the Low Voltage Power Supply to start, unencumbered by the load from the high voltage oscillator.

Power Supply Outputs

CR222 is the high voltage rectifier. Smoothing capacitors C217 and C218 work with CR222 to provide -2750 volts to the crt cathode. U226 is a four-times multiplier, providing +11 kV to the crt anode.

Focus Amplifier

Q413 and Q313 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 CTR Focus control, R213, is set for optimum beam focus, as viewed on the crt, with the front-panel FOCUS control set to mid range. Once the CTR 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 grid and the cathode of the crt are at a -2750 V potential with the grid effectively dc-coupled to the Z-Axis Amplifier by the grid drive circuit. The unrectified, 25 kHz sine wave output from the +100 V supply winding is input to a modulating circuit, where it is clipped and rectified for use as crt control grid bias.

The sine wave from the 100 V supply winding of T332 is coupled through C428 to a clipping circuit consisting of CR425 and CR426. Clipping level for the positive excursion of the sine wave is set by the crt Bias adjustment, R536; negative clipping level is set by the INTENSity control through the Z-Axis Amplifier. The clipped sine wave is coupled through C220 to a rectifier made up of CR121 and CR122. The rectified, clipped sine wave is the crt control grid bias voltage. C219 is a speedup capacitor for the fast transitions of the blanking signal, from the Z-Axis Amplifier. DS118 and E119 limit the crt grid to cathode voltage at instrument turn on and off.

Z-Axis Amplifier

This is a high gain inverting amplifier, with feedback. R410 stabilizes the gain at a low value. The input is the summing junction at R511, which is set to +5 V by R412 and R418, so that the Z-Axis Control circuit on the Main (A3) circuit board can drive this amplifier. When there is no input current from the Z-Axis Control, the output is set to +10 V by R411. When there is input current, the output is driven more positive. Q516 is an emitter follower that drives Q518, which with Q519 forms a cascade pair for good high frequency performance. Q419 is a constant current source collector load for Q519. The collector of Q519 is the output of the Z-Axis Amplifier. C520 speeds up the constant current source, Q419, for the fast transitions of the blanking pulses. DS417 and DS416 are neon bulbs intended to prevent damage to the Z-Axis Amplifier if there is a crt high voltage discharge.

SECTION 5
CHECKS AND ADJUSTMENTS

This section consists of two separate procedures. The first, a Performance Check, is used to determine compliance with the Performance Requirements in the Specification. The second is the Adjustment Procedure that provides the instructions on how to adjust the instrument and return it to operation within the specification.

In both procedures, front- and rear-panel controls and connectors on the instrument under test are fully capitalized (e.g., 2LINE SWEEP). Control and connector names on test equipment and internal controls and adjustments for the instrument under test are initial capitalized (e.g., Time/Div, Geometry, etc.).

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

RECOMMENDED EQUIPMENT LIST

The following equipment and accessory items are required to do the Performance Check and/or Adjustment Procedures. Broad specifications are followed by an example of equipment that meets these specifications; in most cases, the recommended instrument was used in preparing the procedures that follow.

Electrical Instruments

1. **Test Oscilloscope**

Vertical Amplifier:
30 MHz Bandwidth, 1 mV Sensitivity.
Time Base:
10 ns/div to 5 ms/div sweep speeds, triggering to 5 MHz.

For example: a TEKTRONIX 7603 Oscilloscope with a 7A18 Dual-Trace Amplifier, a 7A13 Differential Comparator (needed for use with the TEKTRONIX Return Loss Bridge), and a 7B53A Dual Time Base. Also 10X probes, P6106 (Tektronix Part No. 010-6106-03), and a 1X probe, P6101 (Tektronix Part No. 010-6101-03).

2. **Television Signal Generator**

Color test signals for the television standard of the monitor to be tested: color bar signal, linearity staircase with variable APL, pulse and bar (with 2T pulse, 2T bar, and modulated pulse signals, and field square wave signal), multiburst signal, and black burst signal.

For example: NTSC TEKTRONIX 1410 with Option AA and Option AB (modified SPG2 and TSG7), TSG3, TSG5, and TSG6.

PAL TEKTRONIX 1411 with Option AA and Option AB (modified SPG12 and TSG11), TSG13, TSG15, and TSG16.

PAL-M TEKTRONIX 1412 with Option AA and Option AB (modified SPG22 and TSG21), TSG23, TSG25, and TSG26.

NOTE

The 1410–Series generators with standard SPG and TSG modules can be used, but not all checks and adjustments can be made. A standard SPG2, SPG12, or SPG22 module will not check lock to changes in sync amplitude, cw lock to changes in burst amplitude, and frequency lock to burst offset frequency changes.

The 1410, 1411, and 1412 Option AB are mainframes with modified TSG7 and TSG11 Color Bar generators that provide more accurately controlled output amplitudes.

The signal generators can be ordered with one or both options (AA and AB).

The TSG3, 13, and 23 are Modulated Staircase generators with variable APL.

The TSG5, 15, and 25 are Pulse and Bar generators with modulated pulse and field square wave signals.

The TSG6, 16, and 26 are Multiburst generators.

3. **Sine wave generator**, at least 250 kHz to 10 MHz.

   For example: A TEKTRONIX SG503 Leveled Sine Wave Generator installed in a TEKTRONIX TM500 Series Power Module.

4. **Function Generator**

   Sine Wave frequencies: 90 Hz to 2 kHz.
   Amplitude: 0.1 V to 10 V p-p when loaded by 75Ω.

   For example: TEKTRONIX FG501A Function Generator installed in a TEKTRONIX TM500 Series Power Module.

5. **Voltmeter**

   Range, 0 to greater than 100 Vdc; accuracy, ±0.1%.

   For example: TEKTRONIX DM501A in a TM500 Series Power Module.

6. **Frequency Counter**

   Range, 100 kHz to 5 MHz; accuracy, ±0.001%.

   For example: TEKTRONIX DC503A in a TM500 Series Power Module.

7. **Video Amplitude Calibrator**

   Signal, adjustable square wave 0.0 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 in a TM500 Series Power Module.

8. **Power Module** for powering and housing TEKTRONIX DM501A, DC503A, FG503, 067-0916-00, and 015-0408-00.

   For example: A TEKTRONIX TM506 Power Module.

9. **Variable Autotransformer**

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

Auxiliary Equipment

10. **Step Attenuator**

    75Ω constant impedance attenuator variable from 0 to 40 dB in 1 dB steps.

    For example: A Wavetek 75803 Step Attenuator.

11. **Return Loss Bridge**

    Range, at least 46 dB return loss sensitivity, 50 kHz to 6 MHz.

    For example: TEKTRONIX 015-0149-00.

12. **75Ω Terminators**

    Three required, one should be a feed-through type.

    For example: End-line, 75Ω terminator (Tektronix Part No. 011-0102-00) and a feed-through 75Ω terminator (Tektronix Part No. 011-0103-02).

13. **75Ω Coaxial Cable**

Three required.

For example: 42-inch RG59U (Tektronix Part No. 012-0159-00).

14. **10X, 75Ω Attenuator**

For example: Tektronix Part No. 011-0061-00.

15. **Alligator Clip to BNC Adapter**

For example: Tektronix Part No. 013-0076-00.

16. **Dual Input Coupler**

Matched BNC cable-T for making phase comparisons between two inputs. Matched length of the two arms within ±0.1 inch.

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

17. **Precision 50Ω Coaxial Cable**

For example: Tektronix Part No. 012-0482-00 (used with the SG503).

18. **A 50Ω-to-75Ω Minimum Loss Attenuator**

For example: Tektronix Part No. 011-0057-00.

19. **Parade Display Test Connector**

15-pin sub-miniature D-type connector (for example: Tektronix Part No. 131-0459-00), modified to enable and test the RGB Parade input. See Fig. 5-1.

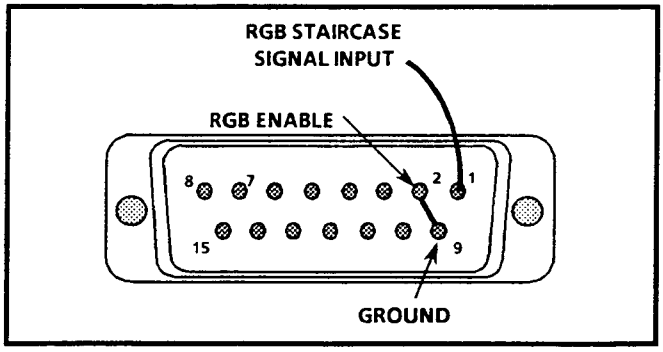


Fig. 5-1. Remote connector modified for RGB input.

20. **90/100 Hz Test Connector**

15-pin sub-miniature D-type connector (for example: Tektronix Part No. 131-0459-00), modified to enable and test the 90/100 Hz triggering. See Fig. 5-2.

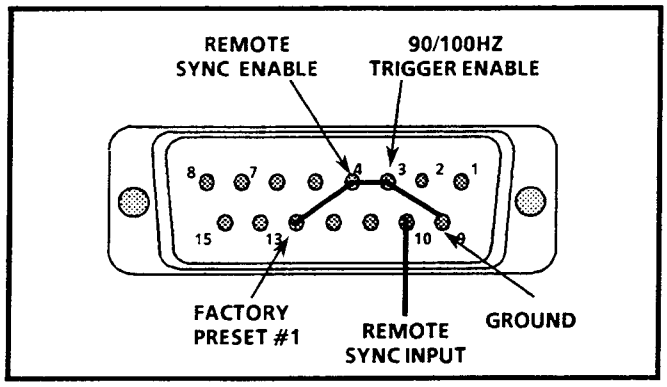


Fig. 5-2. REMOTE connector modified for 90/100 Hz triggering.

PERFORMANCE CHECK

The Short-Form Procedure is intended for those who are familiar with the complete Performance Check procedure. Step numbers and sub-step designations correlate directly to the steps in the Performance Check Procedure; this makes it possible to use the Short-Form Procedure as a table of contents.

SHORT-FORM PROCEDURE

1. **Preliminary Setup**

b. Connect autotransformer.
c. Connect composite color bar signal.

2. **Check Power Supply Operation**

c. Check for stable operation over the prescribed voltage range.

3. **Calibrator Frequency**

c. Check Calibrator frequency.
d. Check that Calibrator is synchronized in 1LINE and 2LINE SWEEP.
e. Check that Calibrator free runs in 2FLD SWEEP.

4. **Sync Separation**

a. Check instrument synchronization.

5. **Sweep Operation**

b. Check sweep modes.
d. Check for 1LINE and 2LINE SWEEP rates.
e. Check for 2FLD SWEEP.
g. Check that some portion of field blanking is displayed. (2H Mag.)
i. Check that some portion of horizontal blanking is displayed. (2 Line Mag.)
j. Check that each field in 2LINE MAG SWEEP can be positioned onto the screen.

6. **Sweep Calibration**

c. Check 2LINE SWEEP accuracy and linearity.
e. Check 1 μs SWEEP accuracy and linearity.
k. Check 0.2 μs SWEEP accuracy and linearity.

7. **RGB/YRGB Parade Display**

d. Check shortened sweep length.
e. Check sweep rate and magnification.
f. Check range of HORIZONTAL Position control.
h. Check added deflection.

8. **90/100 Hz Triggering**

j. Check for stable display while varying generator frequency.

9. **Vertical Gain and X5 Gain Registration**

f. Check 5X gain accuracy.
i. Check positioning range.
n. Check X5 Gain registration.
r. Check CH-B amplifier range.

10. **Calibrator Amplitude**

b. Check Calibrator amplitude.

11. **PIX MON OUT Operation**

c. Check PIX MON OUT level.
h. Check dc level shift for intensified line.
j. Check PIX MON OUT amplitude.

12. **DC Restorer Operation**

b,c. Check that DC Restorer operates.
i. Check SLOW DC RESTORER.
k. Check FAST DC RESTORER.
p. Check DC RESTORER with APL change.
s. Check DC RESTORER with loss of burst.

13. **Flat Response**

d. Check CH-B flat response.
g. Check CH-B X5 flat response.
j. Check CH-A X5 flat response.
l. Check CH-A flat response.

14. **PIX MON OUT Frequency Response**

d. Check Frequency Response.

15. **Transient Response**

c. Check preshoot, overshoot, and ringing.
d. Check pulse-to-bar ratio.
e. Check bar tilt.
g. Check field tilt.
k. Check chrominance-to-luminance gain and delay error.

16. **Check X5 Transient Response**

d. Check preshoot, overshoot, and ringing.
e. Check pulse-to-bar ratio.

17. **Low-Pass Filter Response**

e. Check amplitude difference from Flat to Filter.

18. **Chroma Filter Response**

d. Check CHROMA Filter gain.
g. Check CHROMA Filter cutoff.

19. **Return Loss**

e. Check Input loop-through return loss.
h. Check PIX MON OUT return loss.

PERFORMANCE CHECK PROCEDURE

1. Preliminary Setup

a. Set up the 1730–Series front-panel controls as shown in Table 5-1.

Table 5-1
Preliminary Control Settings

POWER	ON
INTENSITY	Set to preference
FOCUS	---
SCALE	---
VERTICAL Position	Set later
HORIZONTAL Position	Set later
FILTER	FLAT
REF	INT
INPUT	B
GAIN (switch)	off
DC REST	OFF
MAG	off
SWEEP	2LINE
FIELD	FLD1
LINE SELECT	off

b. Connect the 1730–Series ac power cord to the variable autotransformer. Turn power on and set the autotransformer for the voltage shown by the rear-panel line voltage indication.

c. Connect a composite color bar signal with 100% peak white bar and 75% amplitude color bars to the CH-B INPUT and terminate the opposite side of the loop-through with a 75Ω termination. See Fig. 5-3.

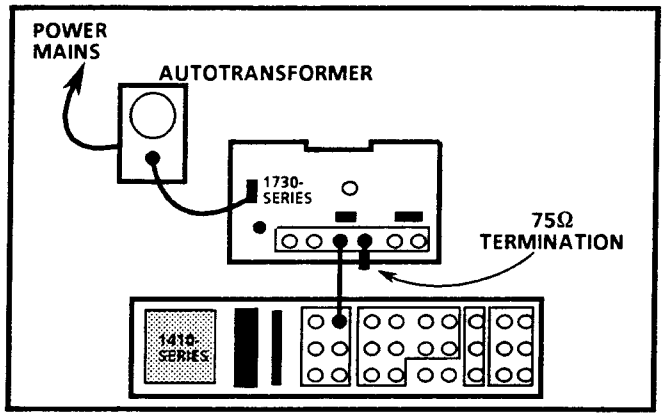


Fig. 5-3. Initial equipment hook-up for the Performance Check Procedure.

2. Check Power Supply Operation

REQUIREMENT — Check ac input range, 90-132 V or 180-250 V as determined by the line voltage indication.

a. Turn on the 1730–Series and adjust the controls for a usable display.

b. Vary the autotransformer from low-line to high-line voltage (as dictated by the rear-panel line voltage indication).

c. CHECK — for stable operation over the prescribed voltage range.

3. Check Calibrator Frequency

REQUIREMENT — Frequency 100 kHz ±100 Hz, Synchronizes 1LINE and 2LINE SWEEP (free runs in 2FLD).

a. Connect a X10 probe from the frequency counter to the blue crt lead on the 1730–Series Main circuit board.

b. Display the CAL signal at the 2LINE SWEEP rate.

c. CHECK — that the frequency of the Calibrator is 99.9 to 100.1 kHz.

d. CHECK — that the Calibrator is synchronized in both 1LINE and 2LINE SWEEP.

e. CHECK — that sweep free runs in 2FLD.

4. Sync Separation

REQUIREMENT — Check for stable sweep synchronization; internally 40 IRE (300 mV) ±6 dB, and externally 143 mV to 4 V.

a. CHECK — that the 1730–Series instrument can be synchronized to the amplitudes shown in Table 5-2, using the 1410–Series Option AA test signal generator. Check both 2LINE and 2FLD SWEEP for stable triggering.

Table 5-2
Amplitude

REFERENCE SOURCE	SIGNAL	AMPLITUDE OF SYNC
Internal	Composite Video	143 mV to 572 mV (NTSC and PAL-M) 150 mV to 600 mV (PAL)
EXT REF	Composite Sync or Video	143 mV to 4 V (NTSC and PAL-M)150 mV to 4 V (PAL)

NOTE

Use the 1410-Series Option AA Variable Sync Amplitude control to change composite video sync amplitude. If the 1410–Series Option AA is not available, use the step attenuator with a non-terminated input. The step attenuator, set to 0 dB and 12 dB attenuation, yields 0.5 and 2X sync amplitude.

5. Sweep Operation

REQUIREMENT — Check that the correct sweep rate can be selected. Check that some part of the blanking interval is displayed when magnifying the centered 2LINE and 2FLD sweeps.

a. Display INPUT A with nothing connected.

b. CHECK — that a sweep occurs at each SWEEP rate (2LINE, 2FLD, and 1LINE).

c. Select CH-B INPUT.

d. CHECK — that the 1LINE and 2LINE SWEEP modes display one line and two lines of the color bar, respectively.

e. CHECK — for a 2FLD SWEEP display of the color bar signal.

f. Select and center the 2FLD SWEEP, then push the MAG button.

g. CHECK — that some portion of the vertical (field) blanking interval is displayed.

h. Select and center the 2LINE SWEEP, then push the MAG button.

i. CHECK — that some portion of the horizontal (line) blanking interval is displayed.

j. CHECK — that both lines of the 2LINE MAG SWEEP can be positioned onto the display with the HORIZONTAL Position control.

6. Check Sweep Calibration

REQUIREMENT — Timing accuracy: For 10 μs/div. (2 LINE), 5 μs/div. (1 LINE), and 1 μs/div. (2 LINE+MAG): ±2%. For 0.2 μs/div. (1 LINE+MAG): ±3%. Linearity: ±1%.

a. Hold the 1730–Series REF button in until the calibrator signal is displayed.

b. Turn off the HORIZONTAL MAG and select 2 LINE.

c. Use the HORIZONTAL position control to place the first falling calibrator tansition on the 10 μs graticule mark (the timing mark on the left side of the graticule that goes completely through the blanking line). See Fig. 5-4.

d. CHECK — for 10 full cycles of calibrator signal in the 10 center major graticule divisions, ±2% (1 minor division). Adjust the front panel H CAL to place the 11th falling transition *exactly* on the 110 μs graticule mark (the timing mark on the right side of the graticule).

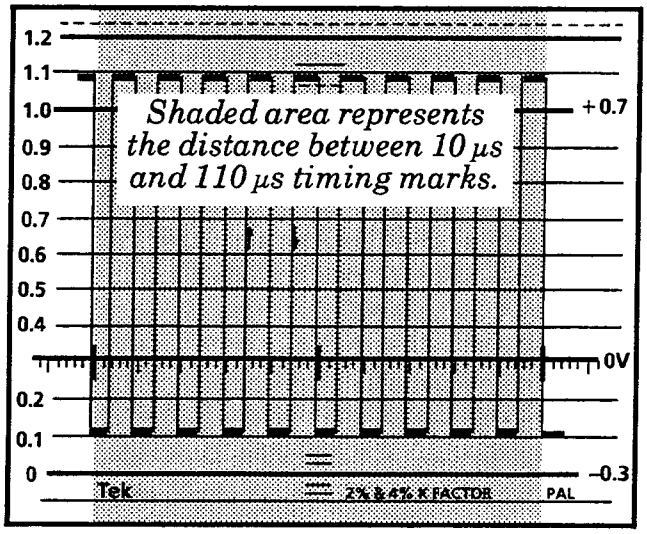


Fig. 5-4. 10 full cycles of calibrator signal between timing marks.

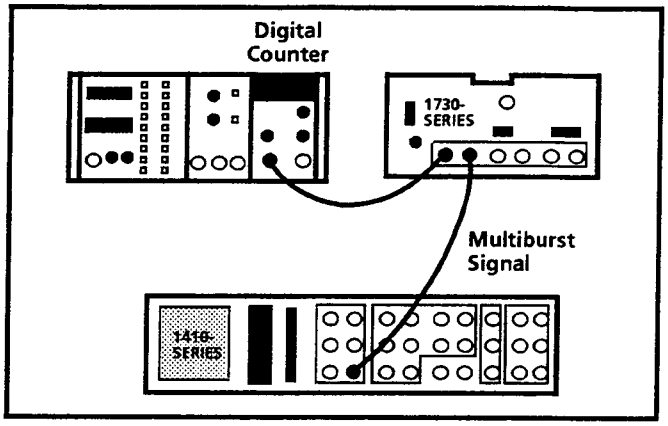


Fig. 5-5. Equipment hookup for checking 0.2 μs timing .

e. CHECK — that no falling transition between the 10 μs and the 110 μs graticule marks is more than 1% (0.5 minor division) from a major graticule mark.

f. Select 1 LINE SWEEP (push and hold).

g. Use the HORIZONTAL position control to place the first calibrator transition on the 5 μs graticule mark (left side graticule timing mark).

h. CHECK — for five full cycles of calibrator signal in the center 10 major graticule divisions, ±2% (1 minor division).

i. Select 2 LINE SWEEP and turn on the HORIZONTAL MAG.

j. CHECK — for 1 full cycle of calibrator signal in the center 10 divisions of the graticule, ±2% (1 minor division).

k. Connect the multiburst output from the television signal generator to the 1730–Series CH-A INPUT, and loop-through connect the signal to the digital counter. See Fig. 5-5.

l. Set the multiburst generator to Low, Continuous, and Manual. Turn Markers off.

m. Adjust the multiburst Frequency for a 5 MHz sine wave as measured on the digital counter.

n. Select the 1730–Series INT REF and 1 LINE SWEEP. Turn on the MAG and VAR GAIN. Adjust the VAR GAIN control for approximately six vertical divisions of display.

o. Set the multiburst generator to Composite.

p. Use the 1730–Series HORIZONTAL position control to display all but the first and last 10% of the sweep.

q. CHECK — for 10 cycles over 10 graticule divisions, ±1.5 minor divisions.

r. Switch the multiburst generator to Continuous and check that its frequency, as measured on the digital counter, remains set at 5 MHz. Return to Composite.

s. Repeat parts q. and r. several times to ensure an accurate check.

7. RGB/YRGB Parade Display

REQUIREMENT — Attenuated sweep: 3.4 to 4.1 div for 3-step or 2.5 to 3.1 div for 4-step. Staircase input gain: 10 V = 9 horizontal divisions ±1.4 div. Attenuated sweep responds to sweep rate and magnification controls.

a. Connect the color bar signal to the CH-A INPUT. Terminate the open side of the loop-through with a 75Ω end-line terminator.

b. Display the color bar in 1LINE. Center the display. Note the position of the plug on J456 on Assembly A3 that selects the 3- or 4-step Parade display. The 2-3 position selects attenuation for a 3-step display.

c. Connect the Parade Display Test Connector to the REMOTE connector. See Fig. 5-1.

d. CHECK — that the sweep has shortened to 3.4 to 4.1 div if P456 is set to a 3-step display, or 2.5 to 3.1 div if the plug on J456 (1-2) is set for a 4-step display.

e. CHECK — that the shortened sweep is 1LINE or 2FLD, according to the SWEEP controls, and that the sweep can be magnified.

f. CHECK — that the display can be moved to the sides of the screen with the HORIZONTAL Position control. It may be necessary to adjust R856.

g. Position the display to the right side of the screen; it may be necessary to adjust R856, RGB Offset, to increase range of positioning. Fig. 5-14 shows the location of R856. Connect a 0 to +10 V, 2 kHz square wave to the bnc connector of the Parade Display Test Connector, as shown in the equipment list.

h. CHECK — that 7.6 to 10.4 divisions of deflection have been added by the square wave.

8. Check 90/100 Hz Triggering

REQUIREMENT — 90 Hz, ±15% (100 Hz, ±15%).

a. Connect the function generator output through a dual input coupler and an in-line 75Ω terminator to the 1730–Series CH-A INPUT.

b. Set the function generator for a 90 Hz (100 Hz PAL) 2 V p-to-p square wave.

c. Install the bnc to aligator clip adapter on the remaining side of the dual input coupler.

d. Install the 90/100 Hz sub-miniature D-connector on the 1730–Series REMOTE connector. See Fig. 5-2.

e. Connect the alligator clip from the center connector (red) to pin 10 of the sub-miniature D-connector adapter.

f. Move the plug jumper for J540 (90/100 Hz Enable) to the 1-2 position. See Fig. 5-14.

g. Move the plug jumper for J635 to the negative position (2-3). See Fig. 5-14.

h. Select 2FLD SWEEP.

i. Set the 1730–Series VAR GAIN for a 1 V p-to-p square wave, 90 Hz output (100 Hz PAL).

j. CHECK — that the display remains stable (although sweep length varies) while varying the generator from 76 to 104 Hz (85-115 Hz PAL).

k. If 90/100 Hz triggering is not going to be used, move the plug jumpers on J540 to the 2-3 position and J635 to the 1-2 position.

l. Remove the adapter from the 1730–Series rear panel REMOTE connector.

9. Check Vertical Gain and X5 Gain Registration

REQUIREMENT — Gains within 1% for both CH-A and CH-B INPUT. X5 gain within 5%. Input signals between 0.8 and 2 V can be adjusted to full-scale video amplitude with the VARIABLE gain. Less than 1 major division shift from baseline between unmagnified and magnified signal.

a. Connect the Video Amplitude Calibrator (VAC) to the CH-A INPUT. Connect the linearity output of the television test signal generator to the CH-B INPUT. Do not terminate either loop-through. See Fig. 5-6.

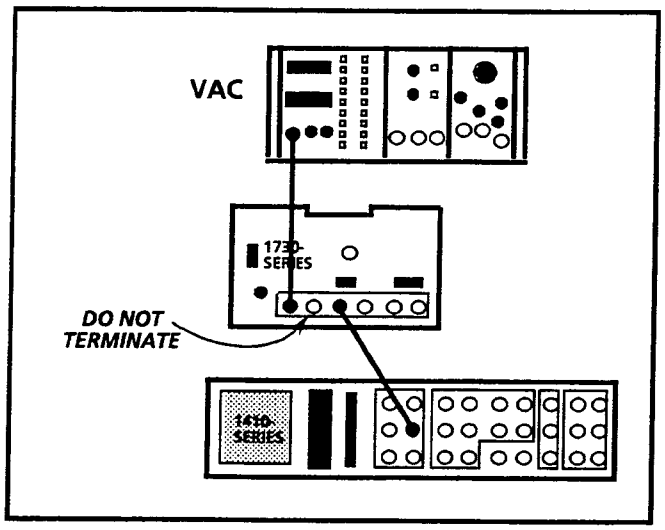


Fig. 5-6. Equipment hook-up for checking vertical gain.

b. Set the VAC to 999.9 mV.

c. Select CH-A.

d. Adjust VCAL for exactly 140 IRE (1.00 V).

e. Set the VAC to 0.200 V and change the 1730–Series gain to X5.

f. CHECK — that the display is 133 to 147 IRE (0.950 V to 1.05 V).

g. Select CH-B INPUT.

h. CHECK — Turn on the 1730–Series VARIABLE gain (X5 is off) and adjust the VARIABLE control for a sync pulse amplitude greater than 100 IRE (720 mV).

i. CHECK — Adjust the 1730–Series VARIABLE control for a display amplitude of 140 IRE (1.0 V) or less.

j. Turn off 1730–Series VAR GAIN.

k. Terminate the CH-B loop-through with a 75Ω termination.

l. Use the VERTICAL Position control to place the signal blanking level on the baseline.

m. Select X5 GAIN.

n. CHECK — for less than 1 major division of baseline shift when switching between X1 (Gain off) and X5 GAIN.

o. Turn off X5 GAIN.

p.. Connect the VAC to the CH-B INPUT. Do not terminate the loop-through.

q. Set the VAC for a 999.9 mV square wave.

r. CHECK — that the vertical amplitude of the display of the 1730–Series is 138.6 to 141.4 IRE (0.990 V to 1.010 V).

s. Disconnect the VAC from the 1730–Series.

10. Check Calibrator Amplitude

REQUIREMENT — Amplitude 1 V ±1%.

a. Push the REF and hold it in until the calibrator signal is displayed.

b. CHECK — the 1730–Series for a displayed amplitude of 139.3 to 140.7 IRE (0.995 V to 1.005 V).

11. Check PIX MON OUT Operation

REQUIREMENT — Gain from Input 1:1 ±5% at 15 kHz. Dc level within ±0.5 V of 0 V. Selected line dc offset by approximately 180 mV.

a. Install a 75Ω terminator on the CH-A INPUT.

b. Select CH-A and 2LINE SWEEP.

c. Connect a coaxial cable from the PIX MON OUT to the test oscilloscope. Use an in-line terminator at the test oscilloscope. Connect the Composite Sync from the television test signal generator to the 1730–Series EXT REF and terminate remaining side of the loop-through input. See Fig. 5-7.

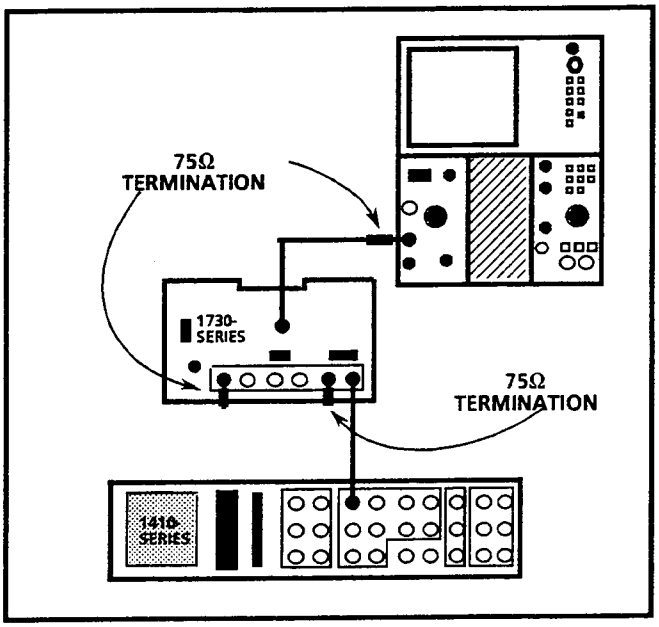


Fig. 5-7. Using the test oscilloscope to check 1730–Series PIX MON OUT.

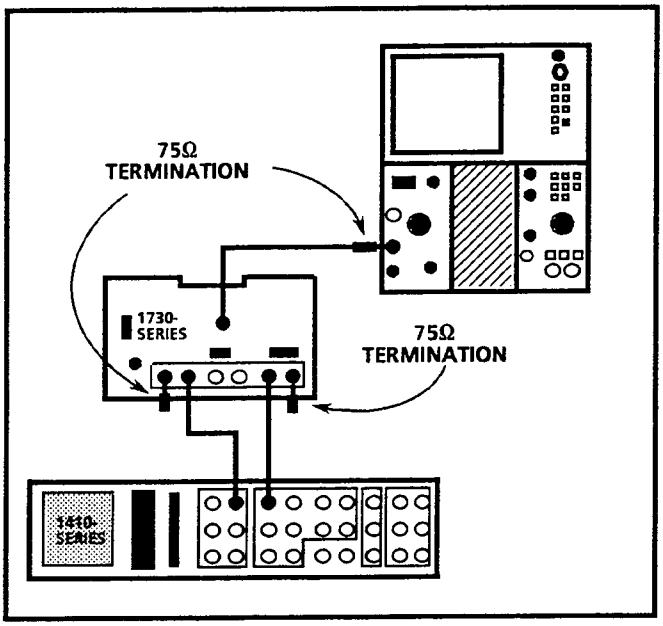


Fig. 5-8. Checking PIX MON OUT signal amplitude.

d. Set the 1730–Series REF switch to EXT.

e. CHECK — that the level at the PIX MON OUT is 0 V ±0.5 V.

f. Turn on the 1730–Series LINE SELECT and set the test oscilloscope sweep rate to display at least one field.

g. Using the test oscilloscope Magnifier and horizontal position control, display the dc level (intensified) shifted line.

h. CHECK — that the dc level shift for the intensified line is approximately 180 mV.

i. Connect the color bar signal to the CH-A INPUT. See Fig. 5-8.

j. CHECK — that the amplitude of the color bar is within 0.95 to 1.05 V from sync tip to the 100% peak white bar, as displayed on the test oscilloscope. Turn OFF the 1730–Series LINE SELECT.

k. Disconnect all signal cables from the 1730–Series Waveform Monitor.

12. Check DC Restorer Operation

REQUIREMENT — Attenuation of 60 Hz input signal 20% or less. Blanking level shift with APL change, less than 1 IRE (7 mV). Blanking level shift with presence or absence of burst, less than 1 IRE (7 mV).

a. Display a modulated 5-step linearity signal (with AC Bounce on) to the CH-B INPUT. Display the signal with the 2H SWEEP. Turn ON FAST DC REST. Position the blanking level of the signal to the 0 IRE (0 V) line.

b. CHECK — that the blanking level does not move when the VARIABLE gain is rotated.

c. CHECK — that the blanking level moves when the DC REST is turned off. Leave DC REST OFF.

d. Connect the black burst signal to the EXT REF and terminate the remaining side of the loop-through input.

e. Connect the function generator output through an X10 (75Ω) Attenuator to the CH-A INPUT.

f. Select CH-A and EXT REF.

g. Set the function generator frequency to 60 Hz (50 Hz PAL). Set the amplitude for a 100 IRE (700 mV PAL) 1730 display.

h. Turn ON SLOW DC REST.

i. CHECK — that the display amplitude is 80 IRE (560 mV PAL) or greater.

j. Turn ON FAST DC REST.

k. CHECK — that the display amplitude is 10 IRE (70 mV PAL) or less.

l. Remove the function generator output and replace it with the linearity signal and terminate the remaining side of the loop-through input.

m. Select 2LINE SWEEP.

n. Turn ON SLOW DC REST.

o. Switch linearity signal APL between 50% and 10% and between 50% and 90%.

p. CHECK — that the signal blanking level moves less than 1 IRE (7 mV).

q. Connect the multiburst signal to the CH-A INPUT and terminate the remaining side of the loop-through input.

r. Switch multiburst generator Burst off and on.

s. CHECK — that the blanking level changes less than 1 IRE (7 mV).

t. Turn OFF DC REST.

u. Remove the signal cables from the 1730–Series.

13. Check Flat Response

REQUIREMENT — Flat response with 50 kHz as a reference; 250 kHz to 6 MHz within 2%. X5 Flat response with 50 kHz as a reference; 250 kHz to 6 MHz within 5%.

a. Connect the sine wave generator signal output to the CH-B INPUT. See Fig. 5-9.

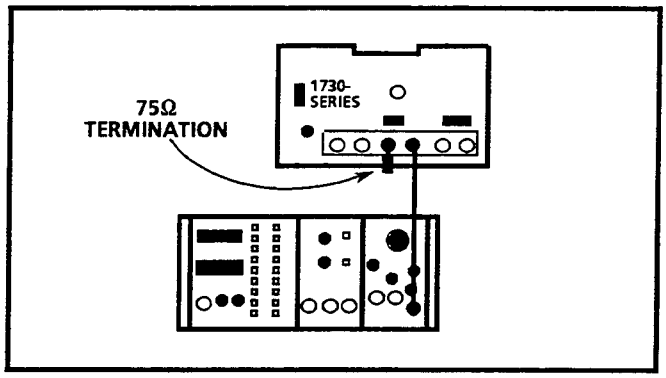


Fig. 5-9. Equipment connections for CH-B flatness checks.

b. Select EXT REF.

c. Set the sine wave generator to 50 kHz (reference frequency) and set the output amplitude for a 100 IRE (0.7V) display amplitude.

d. CHECK — the flat response using the 50 kHz response as a reference. Changing the frequency of the sine wave generator, check that the response is within ±2% from 250 kHz to 6 MHz.

e. Change the 1730–Series VERTICAL GAIN to X5.

f. Set the sine wave generator to 50 kHz and set the output amplitude for a 100 IRE (0.7 V) display amplitude.

g. CHECK — flat response using the 50 kHz response as a reference. Check that the amplitude is 100 IRE (0.7 V) ±5% from 250 kHz to 6 MHz.

h. Move sine wave generator output to CH-A and terminate the remaining side of the loop-through INPUT with a 75Ω termination. See Fig. 5-10.

i. Select CH-A INPUT.

j. CHECK — flat response using the 50 kHz response as a reference. Check that the amplitude is 100 IRE (0.7 V) ±5% from 250 kHz to 6 MHz.

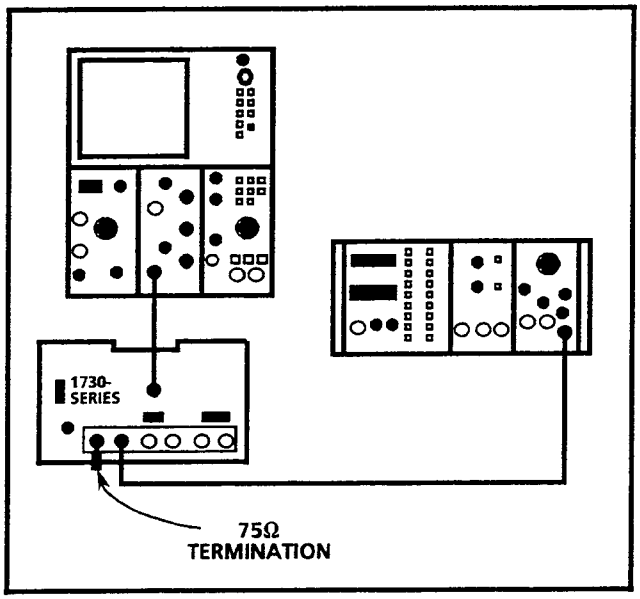


Fig. 5-10. Equipment connections for CH-A flatness checks and PIX MON OUT frequency response check.

k. Turn off X5 VERTICAL GAIN.

l. CHECK — the flat response using the 50 kHz response as a reference. Check that the response is within ±2% from 250 kHz to 6 MHz.

14. Check PIX MON OUT Frequency Response

REQUIREMENT — Frequency Response within 3% of 50 kHz up to 6 MHz.

a. Connect a coax cable from the 1730–Series PIX MON OUT to the test oscilloscope Vertical Input.

b. Set the 1730–Series GAIN to normal.

c. Adjust the sine wave generator for 50 kHz (reference frequency) and a 1 V display on the test oscilloscope.

d. CHECK — the frequency response, on the test oscilloscope display, using the 50 kHz response as a reference. Check that the response is within ±3% from 250 kHz to 6 MHz.

NOTE

Other checks in this procedure assure that frequency response is within specification; however, the low frequency response can be checked using an LF sine wave generator (see sine wave generator in equipment required list) and substitute 50 kHz for 250 kHz in the preceding step c.

15. Check Transient Response

REQUIREMENT — Transient response for the 2T pulse and 2T bar: preshoot 1% or less. Pulse-to-bar ratio: 1:1 within 1%. Overshoot: 2% or less. Ringing: 2% or less. Tilt: 1% or less for field-rate square wave or 25 μs bar. Variation of the 12.5T modulated pulse (20T for PAL) baseline (Overscan), less than 2% as the display is positioned over the middle 80% of the display (with ac-coupled inputs).

a. Connect the pulse and bar signal to the CH-B INPUT, and terminate the remaining side of the loop-through connector with a 75Ω termination.

b. Select the full amplitude 2T pulse and bar signal from the television test signal generator. Display the signal with the 1LINE SWEEP.

c. CHECK — for less than 1% preshoot and less than 2% overshoot and ringing for the pulse and bar transitions.

d. CHECK — for a pulse-to-bar ratio within 1% of unity.

e. CHECK — for less than 1% tilt across the bar.

f. Select the field square wave signal. Display the signal with the 2FLD SWEEP.

g. CHECK — for less than 1% tilt across the high APL portion of the display.

h. Set the 1730–Series VERTICAL to X5 gain.

i. Select 2LINE SWEEP and SWEEP MAG ON.

j. Display the 12.5T modulated pulse for NTSC and PAL-M (20T for PAL). Position the baseline over the center 140 IRE (1 V).

k. CHECK — that the baseline of the modulated pulse varies less than 2%.

16. Check X5 Transient Response

REQUIREMENT — Transient response for the 2T pulse and 2T bar: preshoot 1% or less. Pulse-to-bar ratio: 1:1 within 2%. Overshoot: 4% or less. Ringing: 4% or less.

a. Connect the black burst signal to the 1730–Series EXT REF and terminate the remaining side of the loop-through input.

b. Turn SWEEP MAG OFF. Select X5 VERTICAL GAIN and EXT REF.

c. Install the Step Attenuator and insert 14 dB of attenuation in the input signal path.

d. CHECK — for 1% or less preshoot and 4% or less overshoot and ringing for the pulse and bar transitions.

e. CHECK — for a pulse-to-bar ratio within 2% of unity.

f. Disconnect signal from the CH-B INPUT.

17. Check Low-Pass Filter Response

REQUIREMENT — Response at 15 kHz does not vary between FLAT and LPASS by more than 1%.

a. Connect the modulated, 5-step linearity signal to the CH-B INPUT.

b. Select the 100-IRE (100%) FLAT FIELD/ALT LINEARITY setting of the generator.

c. Select the 1730–Series LPASS FILTER and turn off X5 GAIN (X1).

d. Switch between LPASS and FLAT.

e. CHECK — that the amplitude of the linearity signal, in LPASS, is within ±1% of the amplitude of the display in the FLAT mode.

18. Check Chroma Filter Response

REQUIREMENT — Response at 3.58 MHz (4.43 MHz for PAL) does not vary between FLAT and CHROMA by more than 1%. Attenuation at 7.2 MHz (8.9 MHz for PAL): greater than 20 dB.

a. Connect the color bar signal to the CH-B INPUT and terminate the remaining side of the loop-through input.

b. Turn the Luminance (Y) portion of the signal off. Unlock the SCH phasing of the generator.

c. Display the signal in FLAT with the 2LINE SWEEP and INT REF. Use the 1730–Series VARIABLE gain control to adjust the amplitude of the largest Chroma packet to equal the amplitude from blanking to 100% peak white. Switch the FILTER to CHROMA.

d. CHECK — that the amplitude of the largest chrominance bar is 99 to 101% of the amplitude in part b.

e. Select FLAT filter. Connect the sine wave generator to the CH-B INPUT and set the frequency to 50 kHz. Adjust the amplitude so that the display is 100 IRE (700 mV for PAL).

f. Set the frequency of the sine wave generator to 7.2 MHz (8.9 MHz for PAL). Select CHROMA filter.

g. CHECK — that less than 10% of the reference amplitude remains.

19. Check Return Loss

REQUIREMENT — Return Loss for INPUT at least 40 dB from 50 kHz to 6 MHz (instrument on or off, any deflection factor setting). Return Loss of the PIX MON OUT at least 30 dB (50 kHz to 6 MHz) with the instrument on.

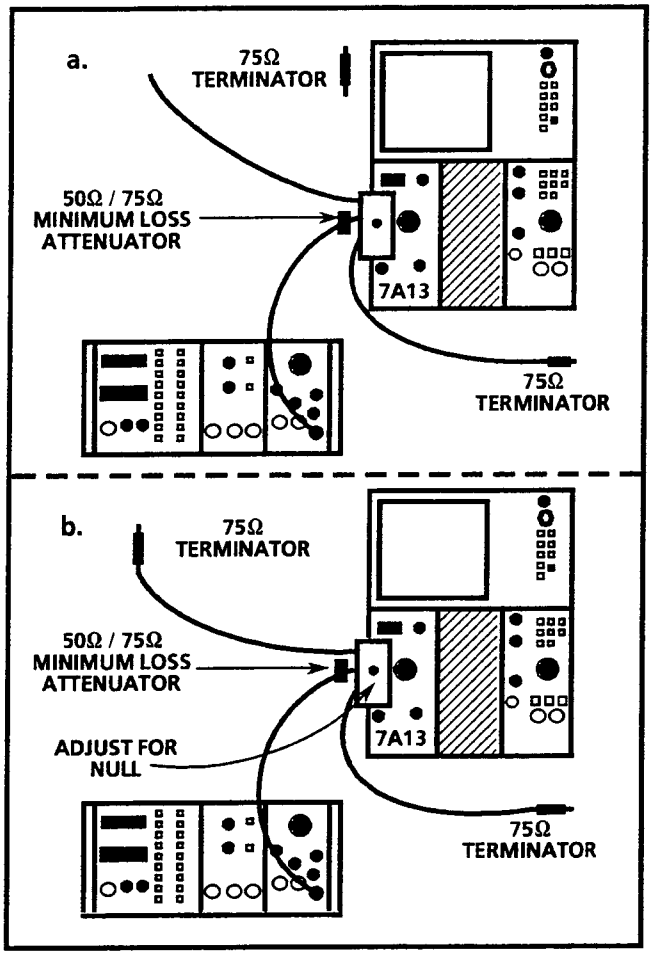


Fig. 5-11. Setting up the Return Loss Bridge: a) Set-up 500 mV amplitude. b) Null bridge.

a. Connect the output from the sine wave generator, through a minimum loss attenuator, to the input of the Return Loss Bridge. Set the sine wave generator to 50 kHz. See Fig. 5-11.

b. Connect the output of the Bridge to the oscilloscope and set the amplitude of the display to 500 mV p-p with the terminator removed from the Unknown arm of the Bridge.

c. Change the generator frequency to 6 MHz. Reconnect the terminator to the Unknown arm, set the 7A13 for 1 mV per division, and balance the Bridge. See Fig. 5-11b.

d. Connect the Unknown arm to the CH-A INPUT of the 1730–Series instrument and the terminator to the opposite side of the loop-through. See Fig. 5-12.

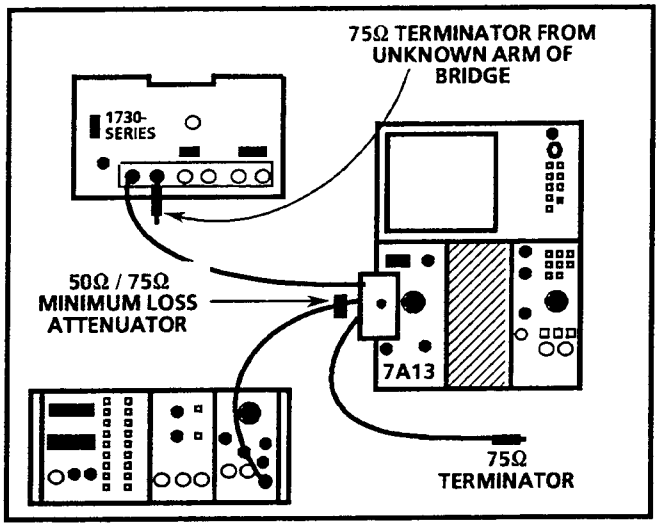


Fig. 5-12. Measuring return loss of 1730–Series CH-A input.

e. CHECK — that the return loss of the CH-A INPUT is better than 40 dB, from 50 kHz to 6 MHz. Make this check (within this frequency range) with the instrument power on and off. Using the Nomograph supplied with the Return Loss Bridge, 40 dB converts to 5 mV on the test oscilloscope vertical scale.

f. Repeat parts c. and d. for the CH-B and EXT REF INPUTs.

g. Check that the 1730–Series inputs are not terminated and that there is no signal applied. Connect the Unknown arm of the Bridge to the PIX MON OUT connector.

h. CHECK — that the return loss of the PIX MON OUT is better than 30 dB (15.8 mV), from 50 kHz to 6 MHz. Make this measurement with instrument power on and no signal output.

End of 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 the adjustments, while the longer (more detailed) procedure is provided for those who need it.

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

SHORT-FORM PROCEDURE

The Short-Form Adjustment Procedure has the adjustment steps in the same order as the longer form of the procedure. Adjustment circuit numbers are also included with the step title. Note also that the Short-Form Procedure can be used as an index for the long-form.

1. **Adjust +5 Volts Supply (R445)**
2. **Adjust crt Bias (R536)**
3. **Adjust Focus (R213) and Astigmatism (R528)**
4. **Adjust Trace Rotation and Geometry (R525)**
5. **Adjust On-Board Regulated Supplies (R167 and R168)**
6. **Adjust 2-Line and 1 µs Sweep Calibration (R660 and R552)**
7. **Adjust 0.2 µs Sweep Calibration (R553)**
8. **Adjust Dual Filter Switching Phase (R636)**
9. **Adjust Magnifier Registration (R661)**
10. **Adjust RGB Offset (R856)**
11. **Adjust RGB Compensation (C953)**
12. **Adjust Output Bias (R489)**
13. **Adjust Calibration Signal Amplitude (R689)**
14. **Adjust Dual Input dc Level (R492)**
15. **Adjust X5 Magnifier Registration (R274)**
16. **Adjust Channel-A Input Compensation (C195) and Flat Response (L180 and L190)**
17. **Adjust Channel-B Input Compensation (C696)**
18. **Adjust X5 Gain HF Response (C372)**
19. **Adjust Video Out Response (C694)**
20. **Adjust Low-Pass Filter (C777 and C775)**
21. **Adjust Chroma Filter (1730–R683, C683, and C783; 1731–R680, C778, and C784; 1735–R680, C778, C784, R683, C683, and C783)**
22. **Adjust Readout Position (R209)**
23. **Adjust crt Bias (R536) and Line Select Focus (R245)**

STANDARD ADJUSTMENT PROCEDURE

The Front-Panel Presets and Signal Connections for initiating the Adjustment Procedure are shown in Fig. 5-13. The correct settings of the front-panel controls to start this procedure are shown in Table 5-2.

Preliminary Setup

a. Connect the 1730–Series ac power cord to the variable autotransformer. Turn power on and set the autotransformer for the voltage shown by the rear-panel line voltage indication.

b. Connect the multiburst signal to the CH-B INPUT and terminate the opposite side of the loop-through with a 75Ω termination. See Fig. 5-13.

Table 5-3
Initial Front-Panel Control Settings for Calibration

POWER	ON
INTENSITY	Set to preference
FOCUS	---
SCALE	---
VERTICAL Position	Set later
HORIZONTAL Position	Set later
FILTER	FLAT
REF	INT
INPUT	B
GAIN (switch)	off
DC REST	OFF
MAG	off
SWEEP	2LINE
FIELD	FLD1
LINE SELECT	off

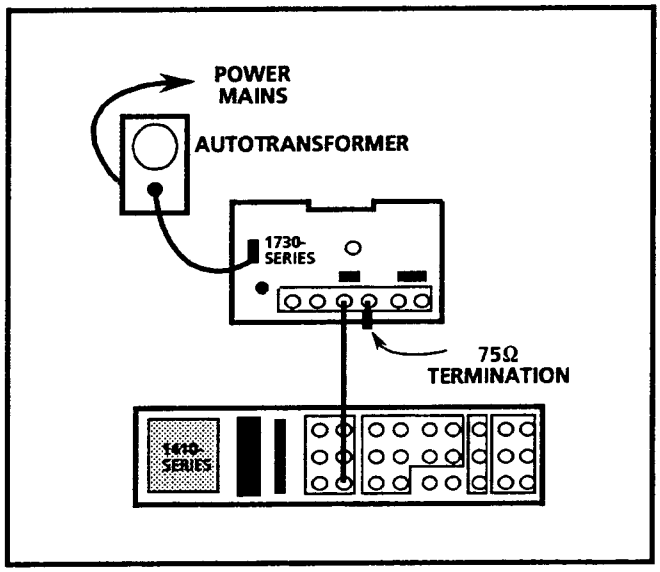


Fig. 5-13. Initial equipment hook-up for the Adjustment Procedure.

A1 POWER SUPPLY BOARD

1. Adjust +5 volts Supply

NOTE

Do not adjust R445 unless full recalibration is to be performed. If the +5 V supply is set very close and doing the Performance Check turned up a need to make only a couple of adjustment, do not change the setting of the +5 V supply.

a. Connect the voltmeter to the +5 V test point (W542). See Fig. 5-14.

b. ADJUST — R445 (+5 ADJ) for +5 volts.

2. Adjust crt Bias

a. Turn the INTENSity control fully counter-clockwise.

b. ADJUST — R536 (CRT BIAS) so that the display is just extinguished.

c. Set the INTENSity control to desired level.

3. Adjust Focus and Astigmatism

a. Select CH-B INPUT.

b. Set the FOCUS control on the front panel so that it is approximately at the center of its rotation.

c. ADJUST — R213 (CTR FOCUS) and R528 (ASTIG) for the most clearly-defined multi-burst display.

4. Adjust Trace Rotation and Geometry

a. Select CH-A INPUT.

b. ADJUST — the front-panel TRACE ROT potentiometer for a level trace across the crt's 0-IRE line (0.3-V line for PAL).

c. With the 1730–Series REF switch select the CAL signal.

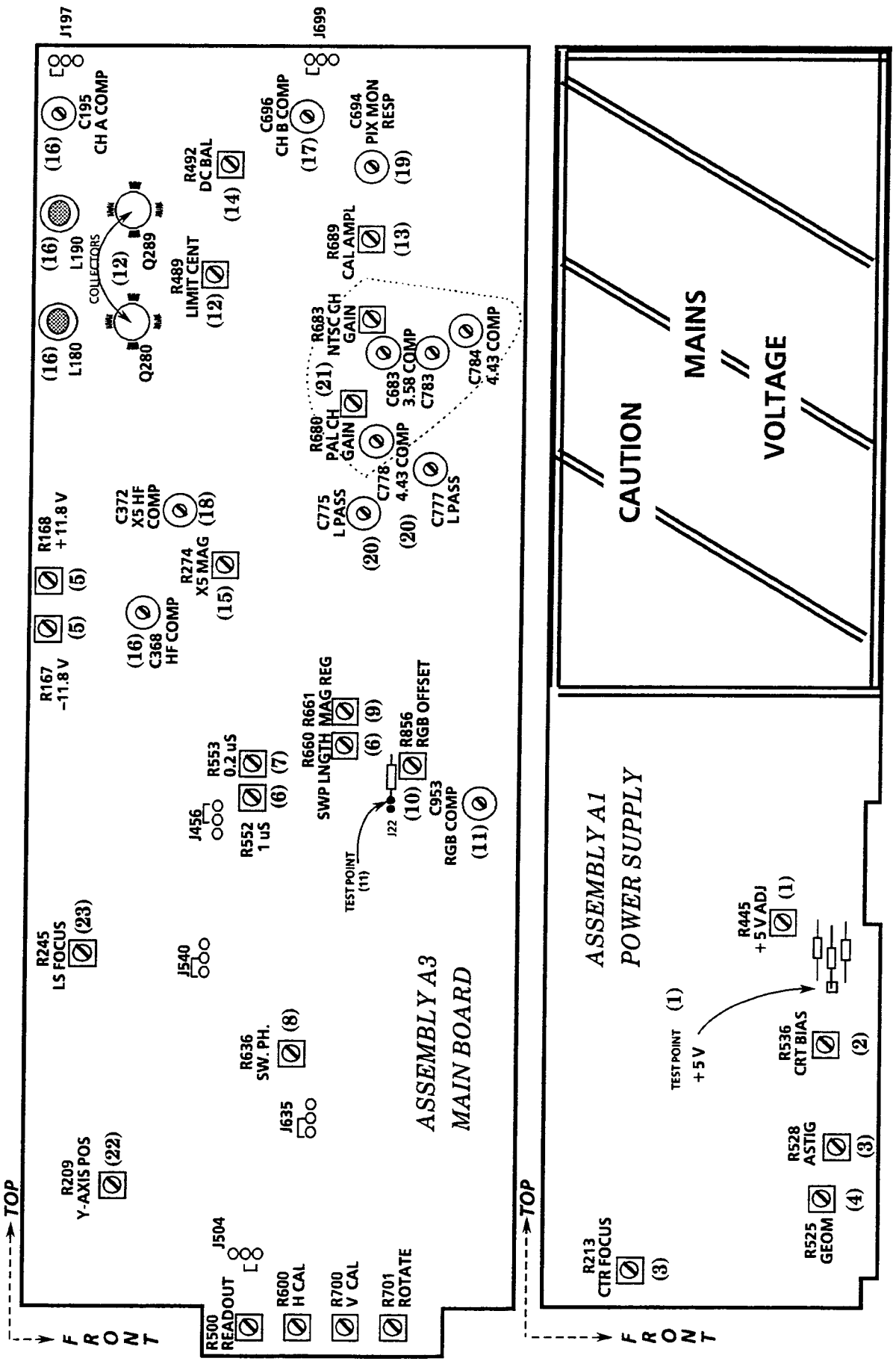


Fig. 5-14 Adjustment locations for the Main and Power Supply circuit board assemblies. Variable resistors are shown as rectangles with slotted adjustment, variable capacitors are shown as circles with slotted adjustments, and variable inductors are shown as circles with solid centers. Numbers enclosed by parens are adjustment step numbers. Some test points and all plug jumpers are shown.

d. Select X5 VERTICAL GAIN.

e. ADJUST — R525 (GEOM) for straight vertical lines.

f. Turn off X5 VERTICAL GAIN and return the REF to INT.

A3 MAIN BOARD

5. Adjust On-Board Regulated Power Supplies

NOTE

The power supply adjustments should not be made unless the entire procedure is going to be performed. If supplies are within tolerances listed below, any individual adjustment should be possible without having to perform a complete readjustment.

a. Connect the voltmeter ground lead to one of the rear-panel ground lugs and the active lead to the -11.8 V test point. See Fig. 5-15.

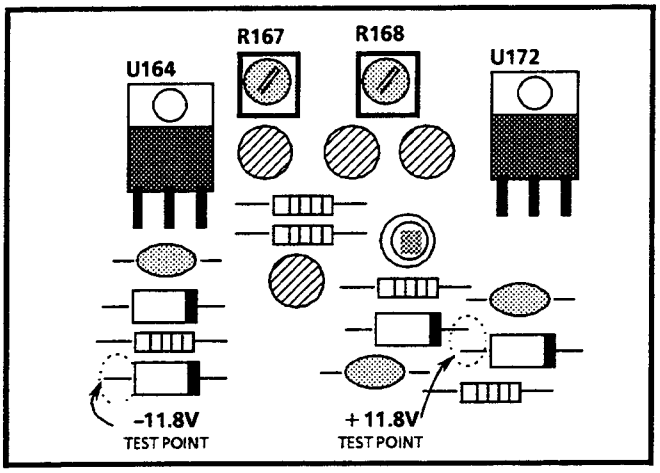


Fig. 5-15. Enlargement of a small portion of the Main circuit board (A3) showing the test points and adjustment location for the + and – 11.8 V supplies.

b. ADJUST — R167 (-11.8 V ADJ) for -11.78 to -11.82 volts.

c. Connect the voltmeter active lead to the +11.8 V test point. See Fig. 5-15.

d. ADJUST — R168 (+11.8 V ADJ) for +11.78 to +11.82 volts.

6. Adjust 2 Line and 1 µs Sweep Calibration

a. Display the CAL signal on the waveform monitor in the 2LINE SWEEP.

b. ADJUST — R660 (Sweep Length) for one cycle of the CAL signal per major division over the center 10 divisions.

c. Turn on the MAG.

d. ADJUST — R552 (1 µs Cal) for one full cycle over the 10 major divisions.

7. Adjust 0.2 µs Sweep Calibration

a. Set REF to INT and select CH-A INPUT.

b. Loop-through connect the multiburst output from the 1410–Series generator to the CH-A INPUT of the 1730–Series and the Digital Counter. See Fig. 5-16.

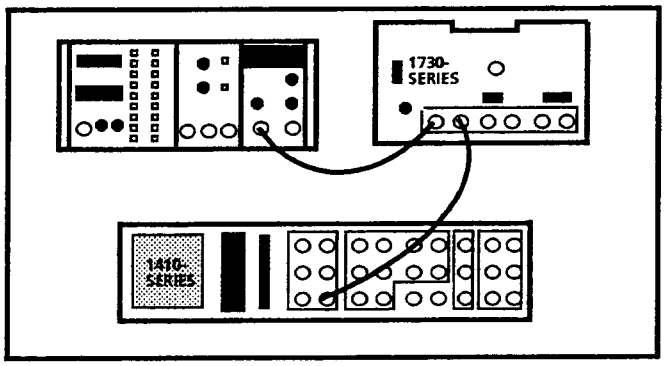


Fig. 5-16. Equipment hook-up to adjust 0.2 µs timing using the 1410–Series sine wave output from the multiburst generator.

c. Set the multiburst generator to Low, Continuous, and Manual. Turn Markers off.

d. Adjust the multiburst Frequency for a 5 MHz sine wave as measured on the Digital Counter.

e. Select the 1730–Series VAR VERTICAL GAIN and adjust the VAR GAIN control for a display amplitude of approximately 6 divisions.

f. Change the multiburst generator to Composite.

g. Select 1LINE SWEEP and MAG.

h. ADJUST — R553 for 10 cycles of subcarrier over 10 divisions ±1 minor division. Recheck multiburst generator frequency by switching it back to Continuous.

i. Disconnect the cable that goes to the Digital Counter and terminate the open side of the CH-A input with a 75Ω end-line terminator.

8. Adjust Dual Filter Switching Phase

a. Select 2LINE SWEEP and MAG off.

b. Hold the waveform monitor FILTER button in until both the FLAT and LPASS indicators are lit.

c. Position the tip of the sync pulse, that occurs between the two lines, so that the switching transition is visible.

d. ADJUST — R636 (Sw. Ph) to placed the switching transition at the center of the sync tip.

9. Adjust Magnifier Registration

a. Set the multiburst generator for High Range Multiburst.

b. Turn on the 1730–Series MAG.

c. Use the HORIZONTAL Position control to position the leading edge of the sync pulse to the center major graticule division.

d. Turn the waveform monitor MAG off.

e. ADJUST — R661 (MAG REG) so that the leading edge of sync is at the center major graticule division. It may be necessary to repeat this step several times to achieve magnifier registration.

f. With the MAG off check that both ends of the trace can be positioned to at least the center of the screen.

10. Adjust RGB Offset

a. Disconnect the multiburst signal and connect the color bar signal.

b. Set the 1730–Series SWEEP rate to 1LINE.

c. Set the HORIZONTAL Position control to mid range.

d. Connect pin 2 of the rear-panel REMOTE socket to ground.

e. Note that the color bar display compresses to 1/4 to 1/3 of its previous length.

f. ADJUST — R856 (RGB Offset) to center the display at mid screen.

11. Adjust RGB Compensation

a. Remove the color bar signal from the CH-A INPUT.

b. Input a 10 V, 2 kHz square-wave signal, from the function generator, to pin 1 (with pin 2 still grounded) of the 1730–Series rear-panel REMOTE connector.

c. Connect a probe from the test oscilloscope to the junction of R854 and R755. See Fig. 5-14 for locations.

d. ADJUST — C953 (RGB Comp) for best transient response.

e. Remove the connections from the REMOTE connector.

12. Adjust Output Bias

a. Set the VERTICAL Position control fully clockwise.

b. Connect the voltmeter lead to the collector (transistor case) of Q280. See Fig. 5-14.

c. ADJUST — R489 (Limit Cent) for +0.8 V.

d. Set the VERTICAL Position control fully counterclockwise.

e. Connect the voltmeter lead to the collector (transistor case) of Q289. See Fig. 5-14.

f. CHECK — that the voltage is +0.8 V. If it is not, repeat parts a. through f. until the collector voltages are balanced at the same dc level.

13. Adjust Calibration Signal Amplitude

a. Connect the VAC signal to the 1730–Series CH-A INPUT; do not terminate. See Fig. 5-17.

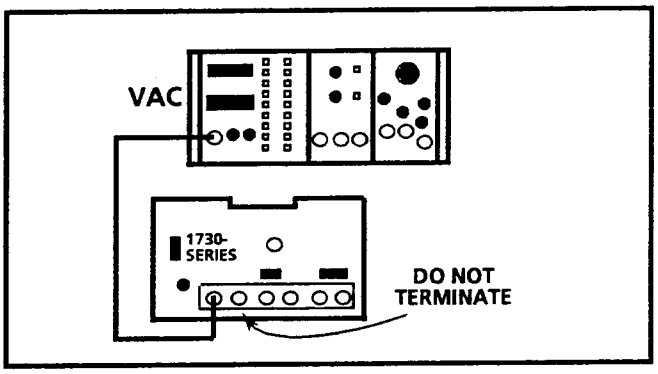


Fig. 5-17. Test equipment hook-up for setting calibrator amplitude.

b. Set the VAC for 999.9 mV.

c. Adjust the 1730–Series front-panel V CAL so that the VAC signal is displayed as exactly 1 V p-to-p (140 IRE on the NTSC graticule) on the crt graticule.

d. Hold the waveform monitor REF button until the CAL signal replaces the function generator signal on the display.

e. ADJUST — R689 (Cal Ampl) so that the Calibrator amplitude is 1 V p-to-p as displayed on the crt graticule.

14. Adjust Dual Input dc Level

a. Connect the color bar signal through a 75Ω in-line terminator and a Dual Input Coupler to the CH-A and CH-B INPUTs. Do not terminate the loop-through inputs.

b. Connect the black burst signal to the 1730–Series EXT REF and terminate the remaining side of the loop-through input with a 75Ω in-line terminator.

c. Set the 1730–Series INPUT to BOTH (CH-A and CH-B).

d. ADJUST — R492 (DC Bal) for overlayed displays.

15. Adjust X5 Magnifier Registration

a. Select CH-A INPUT and GAIN off (no GAIN LED lit).

b. Use VERTICAL Position control to position the signal blanking level on the graticule baseline.

c. Select X5 GAIN.

d. ADJUST — R274 (X5 Mag) to reposition blanking level to the baseline.

e. Select GAIN off and repeat parts b., c., and d. until there is no baseline shift when switching between off and X5 GAIN

16. Adjust Channel-A Input Compensation and Flat Response

a. Connect the multiburst signal through an in-line 75Ω termination to the CH-A INPUT. Connect the black burst signal to the EXT REF and terminate. Connect a 75Ω cable from the 1730–Series PIX MON OUT to the test oscilloscope vertical input (30 MHz vertical plug in). See Fig. 5-18.

b. Set multiburst generator to Sweep, High Range, Composite, Markers, and Full Amplitude.

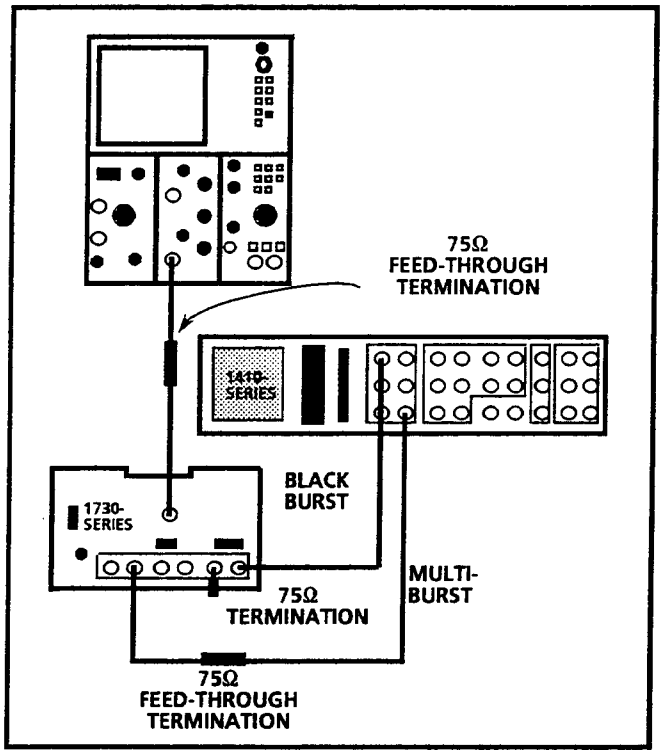


Fig. 5-18. Connecting multiburst signal to CH–A and CH–B for high-frequency compensation.

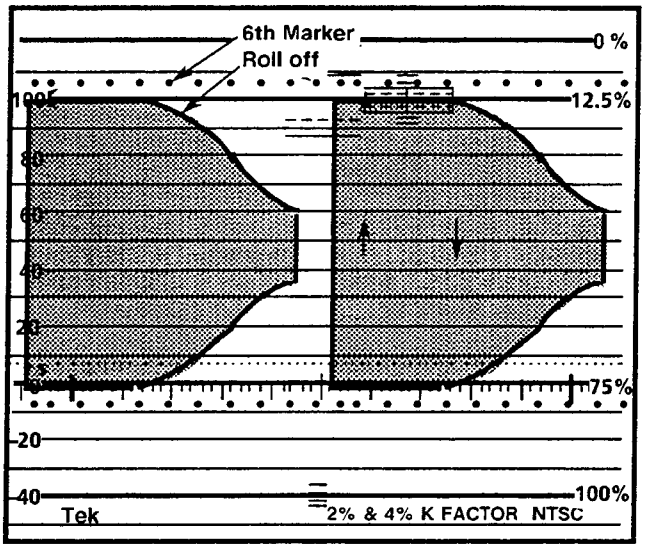


Fig. 5-19. Adjusting for best flat response.

c. Set the 1730–Series SWEEP to 2FLD and EXT REF.

d. Set the test oscilloscope Vertical Volts/Div to 100 mV.

e. ADJUST — C195 (CH-A Comp.) for flat response at 6 MHz on the test oscilloscope. See Fig. 5-19.

f. Check the response in the 2-4 MHz region. If it is bumped up: ADJUST both L180 and L190 in a small amount (both cores should be adjusted together).

   If it is dipped: ADJUST both L180 and L190 out a small amount (both cores should be adjusted together).

g. Repeat parts e. and f. until the best response to 6 MHz is achieved. C368 (HF Comp) may need to be adjusted slightly (it affects response in the 6-8 MHz region).

h. Disconnect the multiburst signal from the CH-A INPUT and remove the 75Ω termination from the remaining side of the loop-through connector.

i. Connect the output of the leveled sine wave generator, through the precision 50Ω cable, to a 50-75Ω minimum-loss attenuator, and the Dual Input connector to the CH-A and CH-B INPUTs.

j. Set the leveled sine wave generator Frequency to 50 kHz and adjust its Amplitude for a 140 IRE (NTSC or PAL-M) or 1 V (PAL) output as displayed on the 1730–Series.

k. Set the leveled sine wave generator Frequency to 6 MHz.

l. ADJUST — C195 (CH-A Comp) for 140 IRE (NTSC and PAL-M) or 1 V (PAL).

m. Set the leveled sine wave generator Frequency to 3.58 MHz (NTSC or PAL-M) or 4.43 (PAL) and check for 140 IRE or 1 V ±2% (2.8 IRE or 20 mV). Check both frequencies for the 1735.

n. If not in specification at 3.58 or 4.43 MHz, repeat steps e. through g. (as setup by steps a. and b).

17. Adjust Channel-B Input Compensation

a. Make sure the 1730–Series INPUT is in BOTH (CH-A and CH-B indicators lit).

b. Select 2LINE SWEEP.

c. Set the leveled sine wave generator Frequency to 6 MHz.

d. ADJUST — C696 (CH-B Comp) to overlay the CH-A display with the CH-B display.

e. Set the leveled sine wave generator Frequency to 3.58 MHz (NTSC or PAL-M) or 4.43 (PAL) and check for 140 IRE or 1 V ±2% (2.8 IRE or 20 mV). Check both frequencies for the 1735.

18. Adjust X5 Gain HF Resposnse

a. Select the CH-A INPUT.

b. Select X5 VERTICAL GAIN.

c. Set the sine wave generator for 50 kHz.

d. Select CH-A INPUT, EXT REF, and 1LINE SWEEP.

e. Adjust the sine wave generator for a displayed amplitude of 100 IRE (or 700 mV).

f. Set the sine wave generator Frequency to 3.58 MHz (NTSC and PAL-M) or 4.43 MHz (PAL). For dual-standard waveform monitors, make the NTSC adjustment only for this step.

g. ADJUST — C372 (X5 Comp) for an amplitude of 100 IRE (NTSC and PAL-M) or 700 mV (PAL).

h. Set the sine wave generator frequency to 6 MHz and check that displayed amplitude is still 100 IRE, ±5 IRE or 700 mV, ±35 mV.

19. Adjust Video Out Response

a. Connect the multiburst output to the 1730–Series CH-A INPUT.

b. Set multiburst for high range and full amplitude.

c. ADJUST — C694 (Pix Mon Res) for flat display (even tops of the first three multiburst packets) on the test oscilloscope. See Fig. 5-20.

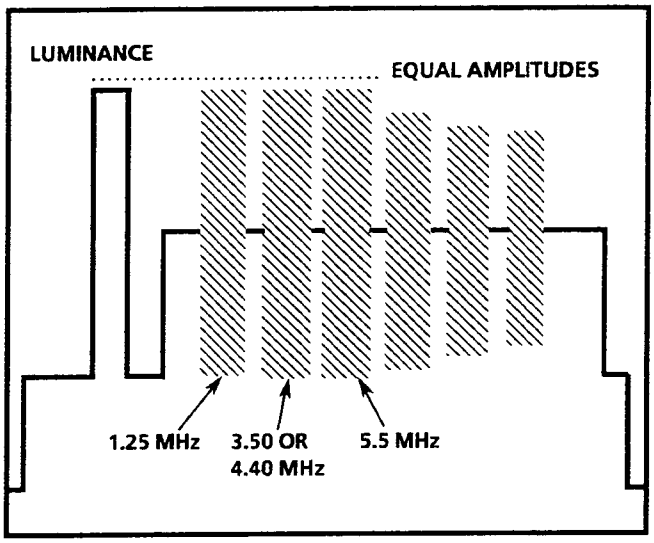


Fig. 5-20. Using high range multiburst signal to set flatness.

d. Disconnect the cable from the 1730–Series PIX MON OUT.

20. Adjust Low-Pass Filter

a. Set the 1730–Series SWEEP rate to 2LINE.

b. Turn off DC REST.

c. Connect color bar signal to the CH-A INPUT.

d. Select INPUT A and LPASS FILTER.

e. Turn on HORIZONTAL MAG and X5 VERTICAL GAIN.

f. ADJUST — C777 (LPASS Filter) for minimum chrominance (minimum trace width on the back porch, following color burst).

g. Position the sync pulse to the baseline at center screen.

h. ADJUST — C775 (LPASS Filter) for the best corner on the leading edge of the sync pulse.

Perform parts j. through n. for dual-standard waveform monitors only.

i. Connect the output of the sine wave generator to the 1730–Series CH-A INPUT.

j. Set the sine wave generator for 50 kHz.

k. Adjust the sine wave generator for an amplitude, on the 1730–Series, of 100 IRE (700 mV).

l. Set the sine wave generator Frequency to 4.00 MHz.

m. Re-adjust C777 for minimum chrominance.

21. Adjust Chroma Filter

a. Connect a color bar signal to the 1730–Series CH-A INPUT. See Fig. 5-21.

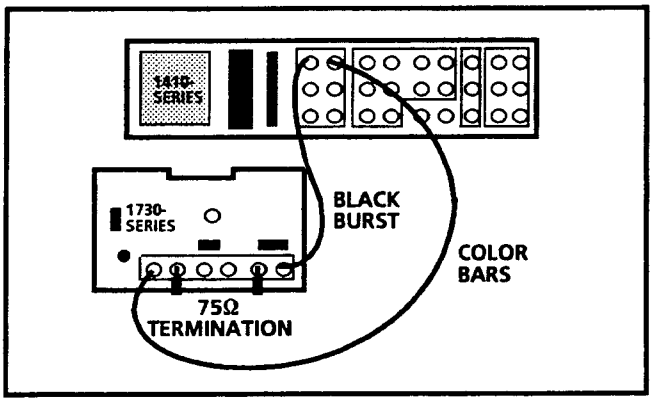


Fig. 5-21. Connecting color bars signal to waveform monitor (EXT REF is black burst).

b. Set the color bar generator for Full Field and turn off Luminance (Y) and Setup. Set color bar amplitude to 75%.

c. Set the 1730–Series to CH-A, FLAT FILTER, 1LINE SWEEP, DC REST OFF, VERTICAL GAIN VAR, and SWEEP MAG off.

d. Use the 1730–Series VAR to set the displayed amplitude of the largest color bar packet to be from blanking level to peak white (100 IRE for NTSC and PAL-M, or 700 mV for PAL).

e. Change 1730–Series FILTER to CHRM.

f. ADJUST — R683 (NTSC and PAL-M Chroma Filter Gain) or R680 (PAL Chroma Filter Gain) so that the amplitude of the largest color packet is again 100 IRE or 700 mV, depending on the color standard employed. For dual-standard waveform monitors, make both the NTSC and PAL adjustments, using the appropriate signal generator.

g. ADJUST — C683 (3.58 NTSC and PAL-M) or C778 (4.43 PAL) for the squarest envelope (minimum burst envelope decay time). It may be necessary to readjust C783 (NTSC or PAL-M) or C774 (PAL) for maximum amplitude. For dual-standard waveform monitors, make both adjustments, using the appropriate signal generator.

h. It may be necessary to perform parts f. and g. several times before reaching the optimum setting for both Gain and Chroma Filter Compensation.

i. Turn off VAR GAIN.

j. Turn on Color Bar Luminance.

22. Adjust Readout Position

a. Select FLAT FILTER and 2LINE SWEEP for the 1730–Series.

b. Set the 1730–Series FOCUS control for optimum display definition.

c. Select LINE SELECT ON and LINE 19 (crt readout)

d. Position the display to overlay the waveform blanking level on the crt blanking level line, and position the center sync pulse on the sync amplitude measurement scale.

e. ADJUST — R209 (Y-Axis Position) so that the 19 in the readout is just above the peak white graticule line (110 IRE or 1.10 V)

23. Adjust crt Bias and Line Select Focus

a. Turn the INTENSity control fully clockwise.

b. Set the front-panel READOUT (screwdriver adjustment) for minimum intensity.

c. ADJUST — A1R536 (CRT BIAS) so that the 1730–Series on screen readout is dim, and the vertical interval line is not blanked.

d. ADJUST — A3R245 (LS Focus) for optimum display definition.

e. Turn the LINE SELECT Off, and adjust the INTENSity control for a usable display.

f. Turn LINE SELECT ON and check that the display is visible. Set the READOUT intensity (front-panel screwdriver adjustment) to match the readout and waveform display intensity.

g. Turn LINE SELECT Off.

End of Adjustment Procedure.

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 checking, and, if needed, readjustment. The preventive maintenance schedule established for the instrument should be based on the environment in which it is operated and the amount of use. Under average conditions, scheduled preventive maintenance should be performed every 2000 hours of operation.

Cleaning

NOTE

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 or dirt from accumulating. Dirt acts as a thermal insulating blanket that prevents effective heat dissipation, and can provide high-resistance electrical leakage paths between conductors or components in a humid environment.

Exterior. Clean the dust from the outside of the instrument by wiping with a soft cloth or small brush. A brush is especially useful to remove dust from around the selector buttons, knobs, and connectors. Hardened dirt may be removed with a cloth dampened in water that contains a mild detergent. Abrasive cleaners should not be used.

Crt. Clean the crt protective shield, light filter, and crt face with a soft, lint-free cloth dampened in denatured alcohol.

Interior. Clean the interior of the instrument by loosening the accumulated dust with a dry, soft brush. Once the dirt is loosened remove it with low-pressure air (high-velocity air can damage some parts). Hardened dirt or grease may be removed with a cotton-tipped applicator dampened with a solution of mild detergent and water. 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 thoroughly dry before applying power to the instrument.

CAUTION

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

Visual Inspection

After cleaning, carefully check the instrument for defective connections, damaged parts, and improperly seated transistors or integrated circuits. The remedy for most visible defects is obvious; however, if heat-damaged parts are discovered, determine the cause of overheating before replacing the damaged part, to prevent additional damage.

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 1 kV to 30 kV are common in unprotected environments. Table 6-1 shows the relative static discharge susceptibility of various semiconductor classes.

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 μCIRCUITS	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 100Ω).**

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.

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

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

5. Keep the component leads shorted together whenever possible.

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

7. Do not slide the components over any surface.

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

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

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

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 to 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.

TROUBLESHOOTING

The material contained here is general and is not intended to cover specific cases. Note that the manual itself is considered a troubleshooting aid, and as such a brief discussion of its content is in order.

The procedural information that appears as General Troubleshooting Techniques should be familiar to most technicians; however, a quick review may save some time and reduce "wheel spinning."

Troubleshooting Aids

Foldout Pages

The foldout pages at the back of the manual contain information that is useful in troubleshooting the instrument. Block and schematic diagrams, circuit board illustrations, and parts locating charts are found there. See Fig. 6-1.

Diagrams. Schematic diagrams are the most often used troubleshooting aids. The circuit number and electrical value of each component is shown on the diagram. The first tabbed page has definitions of the symbology used on the schematic diagrams. Refer to the Replaceable Electrical Parts List for a complete description of each component. Circuits that are mounted on circuit boards or assemblies are enclosed in a border, with the name and assembly number shown on the border.

NOTE

Check the Change Information section in the rear of the manual for corrections and modifications to the instrument and the manual.

Waveform Pictures. Most of the 1730–Series schematic diagrams have had waveform pictures taken at strategic points as troubleshooting aids. Locations on the schematic diagrams, where waveform pictures were taken are marked by an octagon containing a number. Waveform pictures to the left of the schematic diagram are marked with the same number. Conditions under which the pictures were taken appear at the beginning of Section 9.

Circuit Board Illustrations. Electrical components, connectors, and test points are identified on circuit board illustrations, which are located on the back of the preceding schematic diagram. Circuit boards are grid numbered, with the lowest number in the upper left corner; highest number in the lower right.

Parts Locating Charts. Generally, components that are mounted on etched circuit boards are assigned circuit numbers according to their geographic location within the assembly, beginning with the lowest numbers at the upper left corner (as pictured in the illustration). The schematic diagrams are assigned location grids, and a parts locating chart (for each schematic diagram) gives grid locations of components on that schematic.

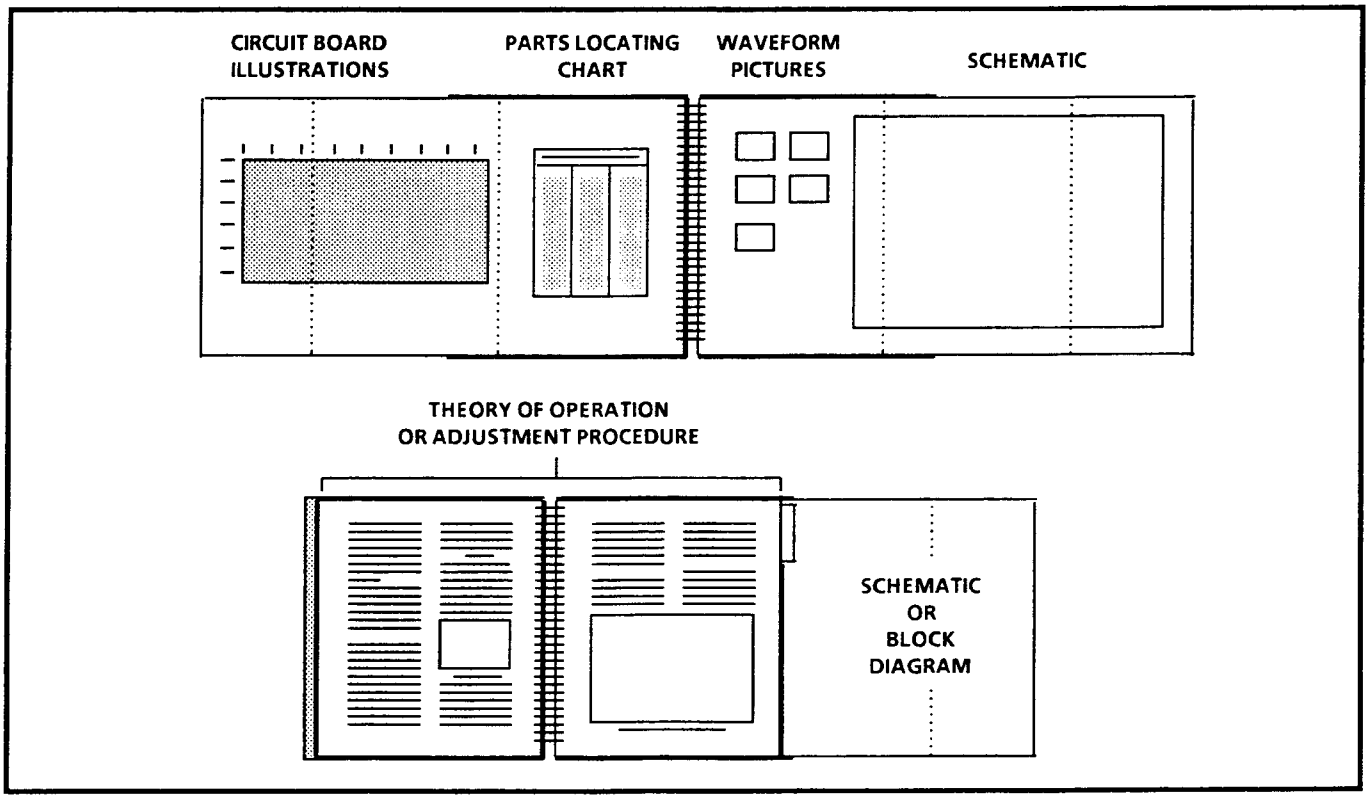


Fig. 6-1. Using foldout pages for troubleshooting or learning about the instrument.

Assembly and Circuit Numbering. The circuit board assemblies are assigned assembly numbers. Fig. 6-2 shows the circuit board assembly locations for this instrument.

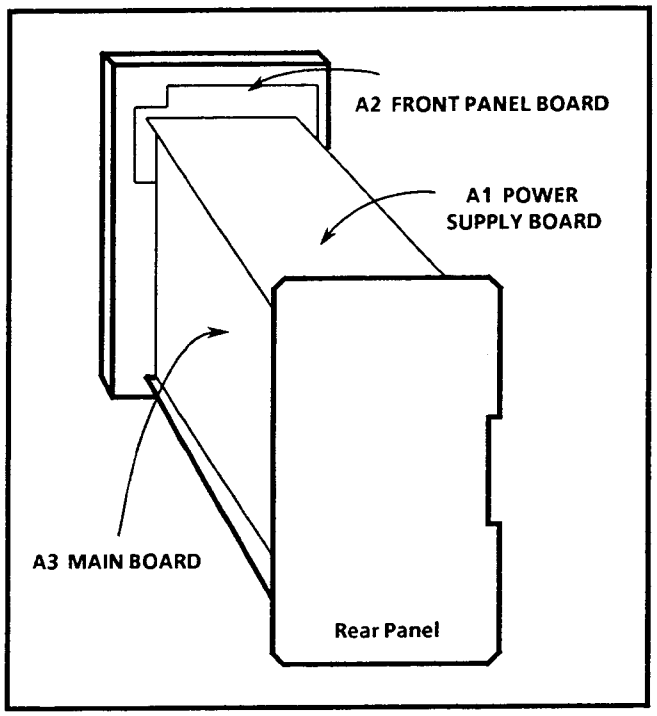


Fig. 6-2. Circuit board assembly locations.

Adjustment Locations. Section 5 has illustrations that have the adjustments and test points called out as calibration and troubleshooting aids.

Parts Lists

There are two separate parts lists in this manual. The Replaceable Electrical Parts List (Section 8) precedes the schematic diagrams and circuit board illustrations. The of Replaceable Mechanical Parts List (Section 10), accompanied by exploded view drawings, follows the schematic diagrams and circuit board illustrations.

Replaceable Electrical Parts. This list is arranged by assembly as designated in ANSI Standard Y32.16-1975. The list begins with the part numbers for the major assemblies (etched circuit boards). Each circuit board is identified by an A# (Assembly Number).

The circuit numbers of the individual components in the parts list are made up by combining the assembly number with the individual circuit number.

EXAMPLE: R117 on Assembly (circuit board) A3 would be listed in the Replaceable Electrical Parts List as A3R117.

NOTE

Always consult the parts list for part numbers and descriptions when ordering replacement parts. Some parts may have been replaced or have a different part number in an individual instrument. Also check the "Change Information" at the back of the manual for the most recent changes.

Replaceable Mechanical Parts. This list is arranged so that it corresponds to the exploded view drawing for major instrument components. The list and exploded view drawing comprise Section 10 of this manual. Standard Accessories, which are also included in the parts list, are also in the exploded view drawing.

Major Assembly Interconnection

Signals and power supply voltages are passed through the instrument with a system of interconnecting cables. The connector holders, on these cables, have numbers that identify terminal connectors; numerals are used from 2 up. A triangular key symbol is used to identify pin 1 on the circuit board to assist in aligning connector with correct square pins. Fig. 6-3 shows the numbering scheme (and the triangular marking) on the etched circuit board.

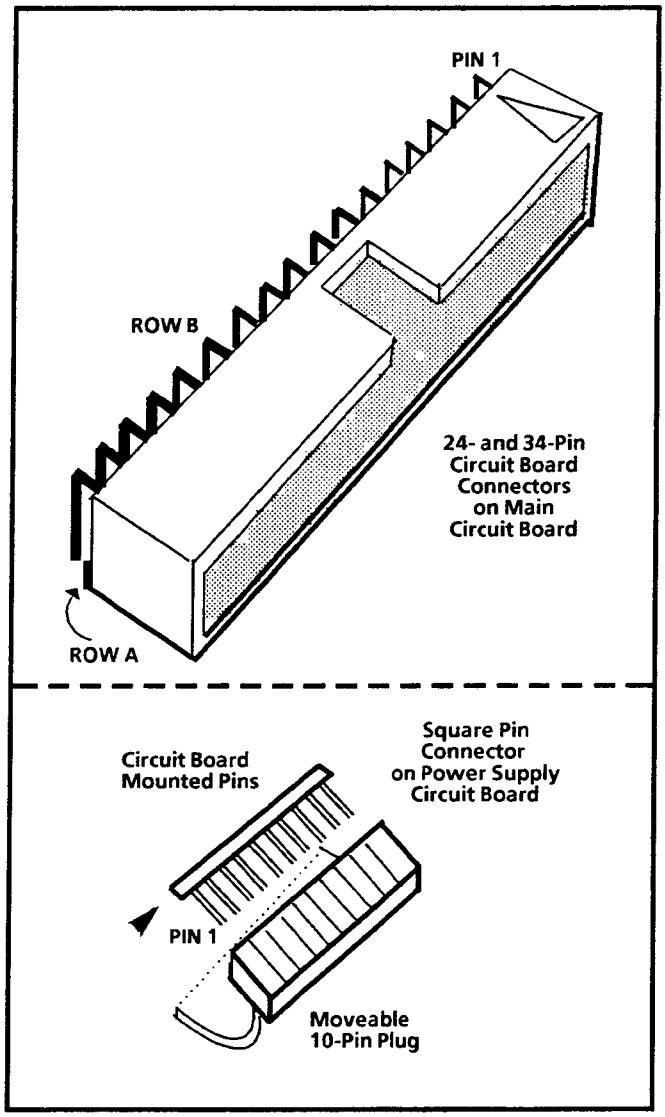


Fig. 6-3. Multiple pin connectors used in the 1730-Series Waveform Monitor.

General Troubleshooting Techniques

The following procedure is designed to assist in isolating problems, which in turn expedites repairs and minimizes down time.

1. Ensure that the malfunction exists in the instrument. This is done by making sure that the instrument is operating as intended by Tektronix (see Operating Instructions in Section 2), and by checking that a malfunction has not occurred up stream from the waveform monitor.

2. Determine and evaluate all trouble symptoms. This is accomplished by isolating the problem to a general area such as an assembly. The block diagram is a valuable aid in signal tracing and circuit isolation.

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.

3. Determine the nature of the problem. Attempt to make the determination of whether the instrument is out of calibration or if there has been a component failure. Once the type of failure has been determined, proceed on to identify the functional area most likely at fault.

4. Visually inspect the suspect assembly for obvious defects. Most commonly these will be broken or loose components, improperly seated components, overheated or burned components, chafed insulation, etc. Repair or replace all obvious defects. In the case of overheated components, determine the cause of overheating and correct the cause 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 (located in Section 5) to determine if a circuit is operating within specifications. At times it may be necessary to change a calibration adjustment to determine if a circuit is operational, but since this can destroy instrument calibration, care should be exercised. Before changing an adjustment, note its position so that it can be returned to its original setting.

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.

CAUTION

Always remove the assembly from the instrument prior to attempting to replace a soldered in component. See Corrective Maintenance for the correct procedure.

SPECIFIC TROUBLESHOOTING TECHNIQUES

The 1730–Series Waveform Monitor has two areas where ordinary troubleshooting techniques do not apply.

This instrument contains internal diagnostics for the serial port and the front-panel LED indicators. Specific instructions for these diagnostics follow the Power Supply troubleshooting procedure.

Power Supply

The power supply is of the high-efficiency type and requires a specific troubleshooting procedure and an isolation transformer to avoid personal danger or instrument damage.

The 1730–Series power supply presents special troubleshooting problems, if a fault occurs. Besides having a sizeable area where dangerous potentials can be contacted, the type of circuitry employed can not be trouble shot by conventional means.

WARNING

Do not attempt to troubleshoot the 1730–Series power supply without reading these instructions.

Circuitry in this power supply, for troubleshooting purposes, can be divided into two categories: Control and Primary. The first area to troubleshoot is the control circuits. Once the control circuitry has been eliminated as the source of the problem, then move on to the primary. Carefully follow instructions regarding placement of ground leads and disconnecting of loads to avoid personal hazards and potential circuit damage.

WARNING

Do not attempt to work on the power supply primary circuitry without using an isolation transformer.

Troubleshooting Equipment

Several pieces of equipment, that may not be found on a typical service bench, are required to service this instrument's low voltage power supply. These are items that are in addition to the equipment called out in the Performance Check and Readjustment Procedures in Section 5 of this manual. An isolation transformer is required to work on the power supply primary circuits.

Equipment Required List

Isolation Transformer:
For example: Stancor GIS 1000.

Test Oscilloscope:
See Equipment Required List for the Checkout Procedure (Section 5) or Calibration Procedure (Section 6).

A X100 Probe
For example: Tektronix P6009.

A Resistive Dummy Load:
See Fig. 6-4 and Table 6-2.

Procedure

1. Turn off the 1730–Series POWER switch.

2. Plug the 1730–Series power cord into the Isolation Transformer. See Fig. 6-5.

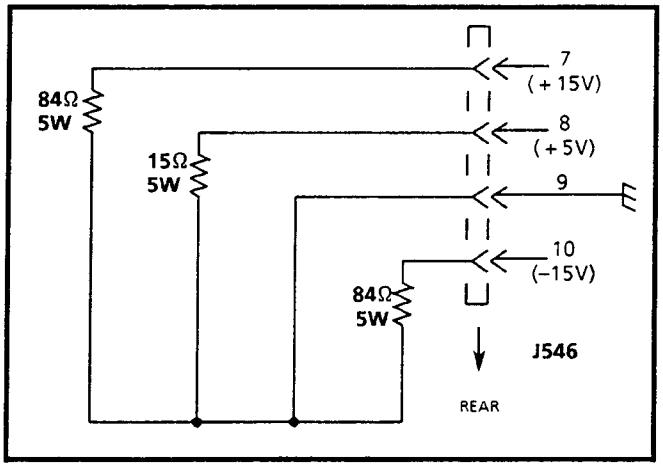


Fig. 6-4. Partial load used to troubleshoot the 1730-Series high-efficiency power supply. If full load is required, substitute the values from Table 6-2.

Table 6-2
Power Supply External Load Resistances

Supply	Resistance for Power Supply Troubleshooting	Resistance for Simulated Full Instrument Load
+5 V	15Ω 5W	5Ω 10W
+15 V	84Ω 3W	30Ω 15W
-15 V	84Ω 3W	30Ω 15W

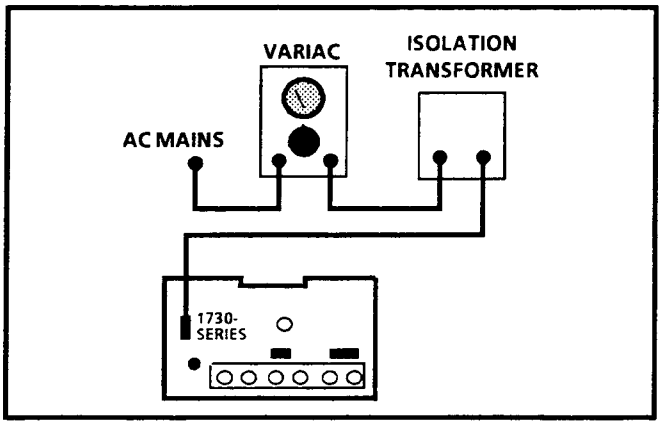


Fig. 6-5. Connecting the ac mains to the 1730-Series, for troubleshooting.

3. Connect the Power Supply Load to J546. Set the Load for 5V — 15Ω, +12V — 84Ω, and -12V — 84Ω.

4. Connect a X100 probe from the test oscilloscope probe to the case of Q367, connect the probe ground lead to the primary ground (▸ end of R270).

5. **Remove HV Oscillator as a Load:** Disconnect one end of R544 (component is machine inserted; it will be necessary to clip the lead and resolder a shorter lead, or replace component, after troubleshooting). R544, shown on Schematic Diagram <7> connects the +40 V supply to the HV Oscillator.

6. **Disconnect Housekeeping Supply from T257:** Remove P458.

7. Turn on 1730-Series POWER switch.

8. **Snubber Circuit check:** Power Supply will run in short bursts; if not, the problem may be in the Kick-Starter. Check test oscilloscope display for 1200 V or less spikes.

9. **Output Filter check:** Use an X10 probe (from test oscilloscope A Vertical Input), with the ground clip connected to chassis ground, to look at each supply output. Each output should rise to its proper voltage during the short bursts of supply operation.

10. **Preliminary Error Amp check:** Connect the X10 probe to rear pin of J458 (test oscilloscope Internal Triggering source). Connect another X10 probe (from the test oscilloscope B Vertical Input) to the emitter of Q344. Trigger test oscilloscope. Display should be a square pulse of 10 to 15 ms duration at approximately 1 second intervals, with no oscillations. Pulse amplitude should be no greater than 8V.

11. **Preliminary Current Limit check:** Short the +5V supply to ground (strap from W542 to ground.) Check that the supply runs in short bursts with about a 1 second interval. *Do not keep the +5 V grounded for more than a second or two if it does not run in short bursts; supply could be damaged.*

12. Move the B Vertical X10 probe to the collector of Q565 and check for about 1V of "hash" during the short bursts.

DANGER

Mains potential is accessible on both the Low Voltage Power Supply.

WARNING

Do not attempt to apply mains power, and troubleshoot the 1730–Series instrument, without using an isolation transformer.

13. **Operate Supply:** Remove the test oscilloscope probes and reinstall P458. Power supply should turn on and run. Connect Digital Voltmeter leads between the +5 V and chassis ground. If supply is out of specification, adjust R455 (+5 V ADJ). Adjusting the +5 V supply affects the rest of the 1730–Series calibration; if the +5 V supply is within specification, it may be better to leave it as is.

14. **Check Base Drive:** Connect the test oscilloscope Channel 1 Vertical Input probe to the front end of R466 (15Ω) and the Channel 2 Vertical Input probe to the back end of R466. Invert Channel 2 and switch Vertical Mode to Add. Set the Variac to 130V. Ground test oscilloscope Vertical Inputs and center the crt trace. Waveshape should have a period of ≈33 μs with a positive excursion of ≈ +3 V (excluding overshoot) and a negative excursion of -1.5 V. See Fig. 6-6.

15. Set the variac for 115 V or 230 V (depending on the primary strap) and check the meter for ≈11W.

16. Turn off 1730–Series POWER, and disconnect the power plug.

17. Resolder the lead for R544, to reconnect the +40 V supply to the HV Oscillator.

18. Reconnect power cord and turn on 1730–Series POWER.

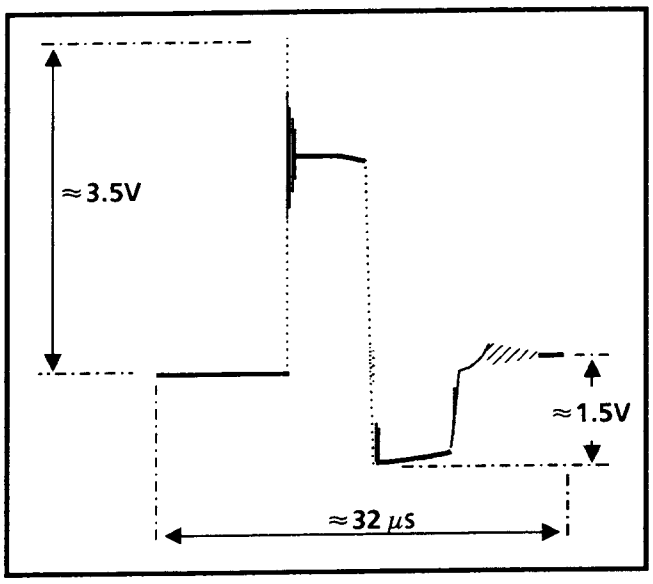


Fig. 6-6. Power supply base drive waveform.

19. Fully load the supplies by either reconnecting P546 or applying the full load resistance. See Table 6-3 for values.

20. Check variac watt meter for a reading of ≈25W.

21. **Check 5V Supply ripple:** Connect a X1 probe, from the test oscilloscope, to the +5 V supply. Reduce the variac to 90 V (or 180 V) and check for less than 2 mV of line rate ripple.

Serial Port and LED Driver Diagnostics

A non-destructive diagnostic program is built into the 1730–Series. All that is required to perform these diagnostics is a male, 9-pin, sub-miniature D-type connector with pins 8 and 9 connected together. The procedure contained here will isolate non-operating front-panel indicators and open or shorted receive and transmit lines in the serial interface.

1. Turn off instrument POWER.

2. Install the male, sub-miniature D-type connector on the rear-panel AUXILIARY connector.

3. Hold in the LINE SELECT and POWER switches until all front-panel indicators light. This step checks:

   a. LEDs and LED Drivers
   b. Interface continuity (RXD in and TXD out)

   When all indicators are lit there is continuity from the Microprocessor, out through the TXD Buffer, and back through the RXD Buffer. If all front-panel indicators do not light, check indicator or Driver. If indicators blink, check RXD Buffer (U809B) or TXD Buffer (U809C).

4. Remove the male connector from the rear-panel AUXILIARY connector and check for blinking indicators. This step checks for shorted RXD and TXD lines.

   If lights remain on, the RXD and TXD lines are shorted together.

5. Turn off POWER. This ends the Diagnostic Procedure. When the 1730–Series is powered up again it will be operating in the normal waveform monitor configuration.

CORRECTIVE MAINTENANCE

NOTE

No repair should be attempted during the warranty period.

NOTE

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.

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.

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 003-0966-00). The exception is #2 Pozidrive® screws which can be removed with a #1 Pozidrive® tip (003-0443-00).

Bezel Removal

1. Remove the two bezel screws. See Fig. 6-7.

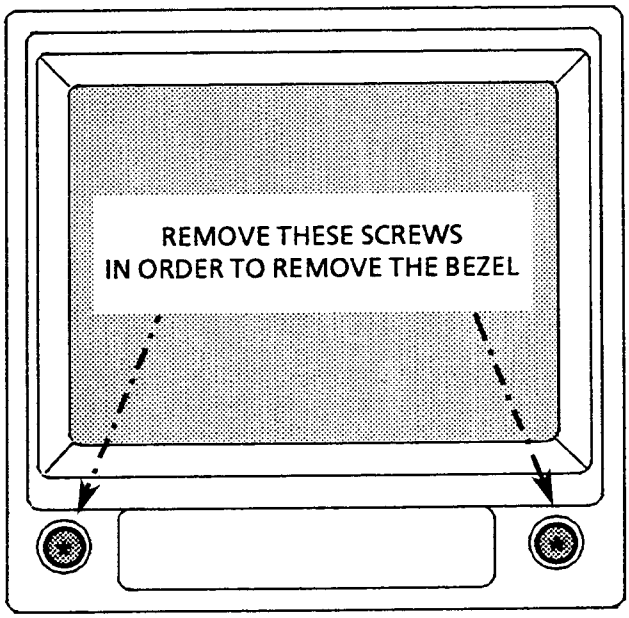


Fig. 6-7. Screws that need to be removed to remove the bezel.

2. Grasping the bottom of the bezel, 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. To replace, reverse the procedure.

Graticule Light Removal and Replacement (1730-SNB038557 & Up, 1731-B032967 & Up, 1735-B030485 & Up)

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 the 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.

Graticule Light Removal and Replacement (1730-SNB0385576 & Below, 1731-B032966 & Below, 1735-B030484 & Below)

1. Remove the bezel

2. Using a pair of needle nose pliers, grasp the graticule light and carefully pull straight out.

3. To install a bulb, carefully line up the holder and wires. Use the needle nose pliers to lock them back into place.

4. Replace the bezel.

Crt Removal

1. Remove the bezel.

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.

2. Disconnect the anode, by separating the connector. Do not touch the exposed tip of the connector. Discharge the connector tip to the chassis.

3. Disconnect J225 (trace rotation connector) on 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.

4. 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).

Replacement of the crt

5. Reposition the metal crt shield on the crt base mounting.

6. Remove the clear plastic cover from the back of the crt holder. This will make it easier to line up the connections on the crt holder.

7. Slip the crt part way back into position, so that the wires (and plug) from the trace rotation coil can be fed back through the hole in the Main board.

8. Slide the crt back into the rear crt socket. Align the socket and crt base. The screws holding the rear mount down may be loosened slightly, if necessary. The crt should fit securely in place.

9. Press the crt the rest of the way in by pressing straight back on the corners of the faceplate.

10. Replace the clear rear cover on the crt holder and screw the holder screws back down (if they were loosened).

11. Wipe off the faceplate of the crt to remove fingerprints.

12. Reconnect the anode connector and the trace rotation (J225 Main board) plug. (To ensure the correct orientation of J225, the red lead is toward the front of the instrument.)

13. Replace the bezel.

Removing the Rear Panel

1. Remove the five rear screws. See Fig. 6-8.

2. Unsolder the six bnc and one ground connection. (If 1700F10 Field Upgrade is installed, unsolder leads from the battery connector.)

3. Pull the rear panel free from the chassis; be careful not to pull the unsoldered wires.

4. To replace, reverse the procedure.

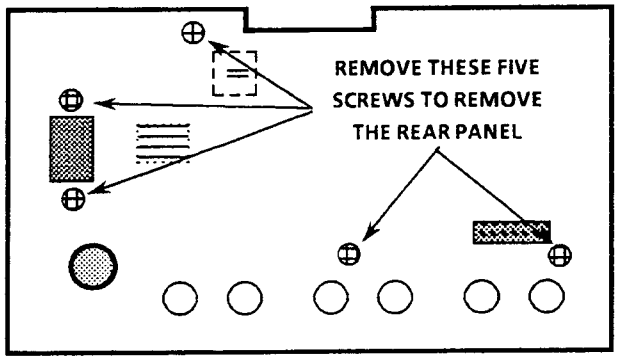


Fig. 6-8. Screws that need to be removed to remove the rear panel.

Removing the Front Panel and the Front-Panel Circuit Board

1. Remove the blue multiwire connector from J154.

2. Remove the two screws holding the board in place. See Fig. 6-9 for location.

3. Remove the board by slipping it through the front-panel opening.

4. To access the Front Panel board components:

   a. Remove the knobs from the front.

   b. Remove the four screws from the rear.

   c. The board should now separate from the front panel making the components accessible.

5. To re-assemble, reverse the procedure.

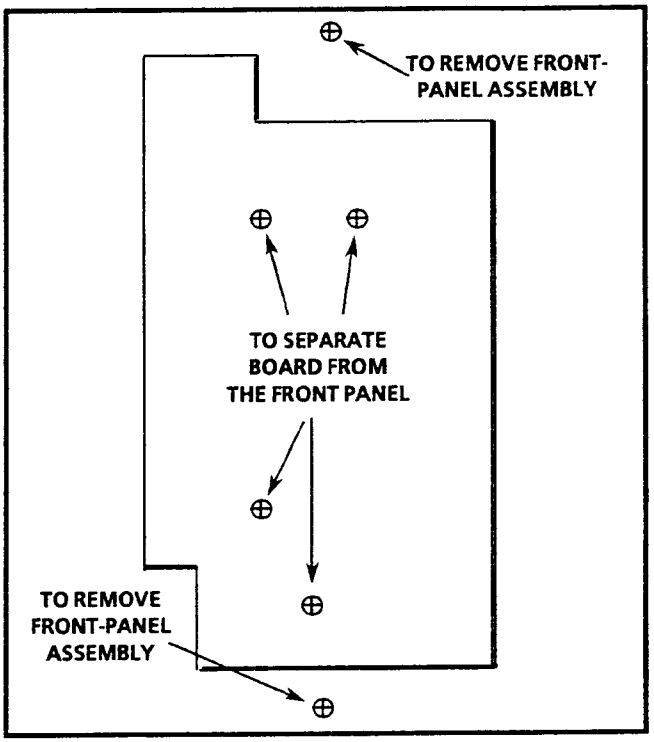


Fig. 6-9. Screws that hold the Front Panel board (A2) in place.

Removing the Main Board

1. Remove the plugs from the following connectors: J107 to the Front Panel board, J546 on the Power Supply board, and J225 on the Main board (the trace rotation leads to the crt).

2. Unsolder the leads to the six bnc connectors and three ground from the rear panel, the two horizontal crt leads (red and green), the PIX MON OUT, and the two vertical crt leads (blue and brown).

3. Slip the crt and trace rotation leads through the appropriate holes in the Main board.

4. Remove the eight screws that are holding the board in place. See Fig. 6-10 for their locations.

5. Remove the board by sliding it toward the rear panel until the toe of the board clears the front, then lift out.

6. To replace the Main board, lay the board flat and slide it back into place.

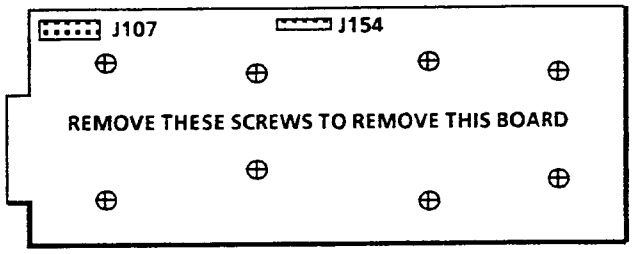


Fig. 6-10. Screws holding the Main board (A3) in place.

7. To complete the replacement of the board, reverse the rest of the steps.

Removing the Power Supply Board

1. Remove the plug from J546 on the Power Supply board, it is the connection to the Main board.

2. Remove the anode connection 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. Unsolder the following connections: J122 pins 1 through 4, J133 pins 1 through 4, and J215 the focus lead. (If 1700F10 Field Upgrade Kit is installed, unsolder leads to the rear-panel DC Connector.)

4. Disconnect the ac line filter from the rear panel by unscrewing its two mounting screws.

5. Use a #1 Pozidrive® tip to disconnect the power on/off switch from the front casting.

6. Remove the seven screws that are holding the Power Supply board down. See Fig. 6-11.

7. Remove the board by sliding it forward and lifting it up.

8. To replace the board, reverse this procedure.

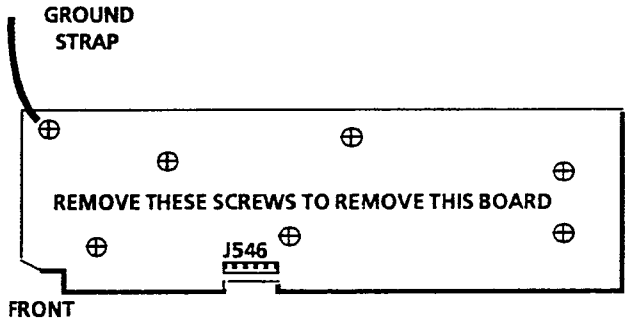


Fig. 6-11. Screws holding the Power Supply board (A1) in place.

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 to provide adequate protection (see Fig. 6-12). 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. 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.

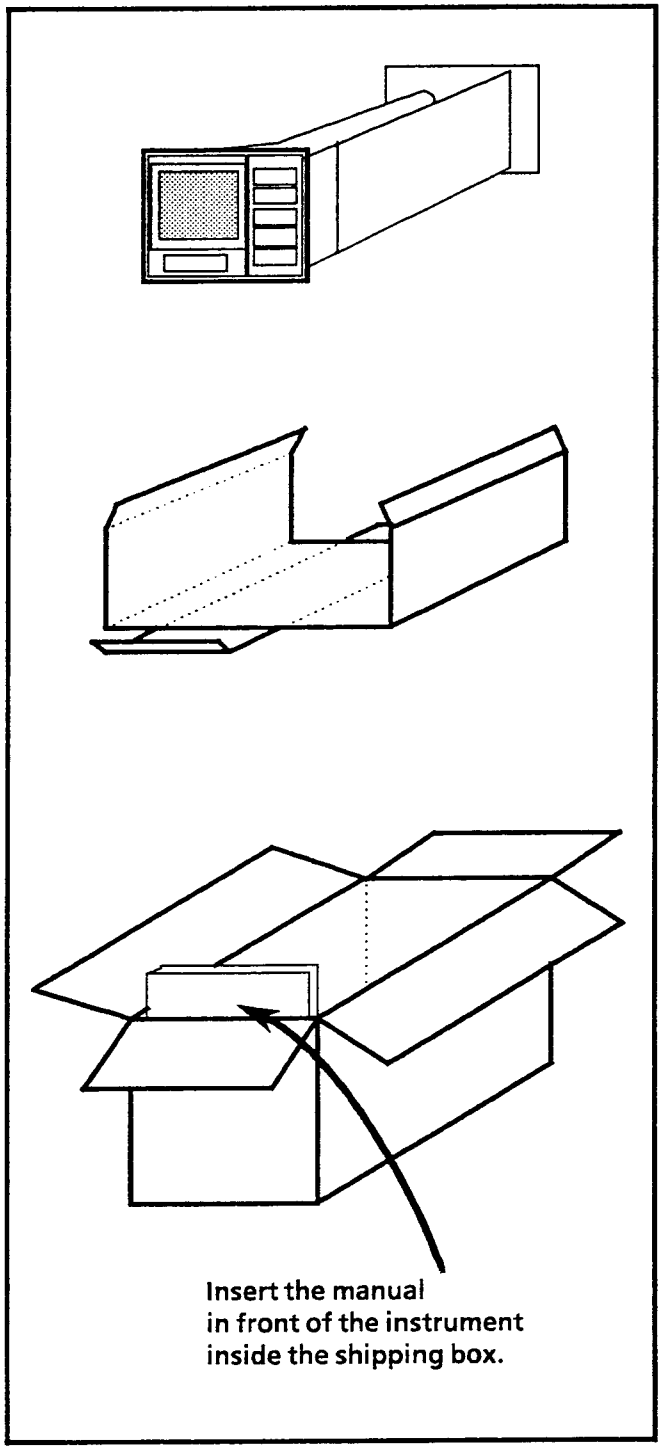


Fig. 6-12. Repackaging.

4. Seal the carton with shipping tape or an industrial stapler.

SECTION 7
OPTIONS

CRT Options

The standard instrument is shipped with a P31 (green) phosphor crt installed. If Option 74 is ordered, the instrument is shipped with a P4 (white) phosphor crt installed. The Option 74 crt part number is given at the end of the Replaceable Electrical Parts List.

Power Cord Options

Any of the following power cord options can be ordered for the 1730–Series. If no power cord option is ordered, instruments are shipped with a North American 125 V power cord and one replacement fuse.

Option A1 Universal Europe 220V/16A Locking Power Plug (Power cord and one replacement fuse).
Option A2 United Kingdom 240V/15A Power Plug (Power cord and one replacement fuse)
Option A3 Australian 240V/10A Power Plug (Power cord and one replacement fuse)
Option A4 North American 250V/18A Power Plug (Power cord and one repalcement fuse)
Option A5 Swiss 240V/6A Power Plug (Power cord and one replacement fuse)

Unless otherwise specified, power cords for use in North America are UL listed and CSA certified. Cords for use in areas other than North America are approved by at least one test house acceptable in the country to which the product is shipped. Power cord part numbers are shown on the pull-out in Section 10.

CABINETS

All of the Safety and EMI tests used to qualify the 1730–Series were performed in a cabinet. There are two optional cabinets and a dual rack adapter available for the installation of these instruments. Only a brief description is provided here, for more information contact a Tektronix field office or distributor.

Plain Cabinet (1700F00)

This is a plain, silver-grey cabinet that is designed for permanent mounting. The pattern of ventilating holes in top, bottom, and sides provides adequate air circulation for any heat generated within the instrument. When being permanently mounted, care must be taken to allow the free circulation of air to and from these ventilating holes. A drawing of this cabinet, that can be used in mounting the cabinet, is located in Section 3 (Installation) of this manual.

Carrying Case (1700F02)

This is a silver-grey, metal cabinet, with feet and carrying handle designed for portable applications. A TEKTRONIX BP1 can easily be mounted to this cabinet to provide a 12 Vdc power source for portable operation.

Side-by-Side Rack Adapter (1700F05)

This is a 19-inch, rack mounting adapter that accepts two 1700–Series instruments in a side-by-side configuration. Instrument cabinets are 1700F00 that are connected together for this installation. If only one 1700–Series instrument is to be installed in the Side-by-Side Rack Adapter, a blank panel (1700F06) can be installed for air flow protection, and appearance.

Blank Panel (1700F06)

When only one side of a 1700F05 dual rack adapter is used, this blank panel can be installed in the other half to improve appearance and protect air flow.

Utility Drawer (1700F07)

When only one side of a 1700F05 dual rack adapter is used, an alternate to the 1700F06 blank panel is the 1700F07 utility drawer. This drawer provides over 1/3 cubic foot of storage space for accessories. The drawer kit includes a tray, which is permanently mounted to the 1700F05. The drawer opens and closes readily, unless latched for transport. The drawer can also be removed from the drawer tray by lifting up and out.

DC POWER SUPPLY

DC Power Supply Field Upgrade Kit (1700F10)

The 1700F10 Field Upgrade Kit adds dc power capability to the 1730–Series instrument. The kit consists of a manual, DC Converter circuit board, a rear-panel DC Power connector (with power cable), and an interconnecting cable for connection between the DC Converter circuit board and the 1730–Series Low Voltage Power Supply.

The 1700F10 kit allows the instrument to operate from an ac or dc source, or a combination of both. The DC Converter contains a relay and sensing circuit; the relay closes (for dc operation) whenever the +5 V supply, developed from the ac supply, is not powered and the front-panel POWER switch is on. When the ac source returns and is again outputting the +5 V, the relay opens and power is provided from the ac source.

When a 1700F10 kit is installed, a 12 Vdc supply or battery can be used as a power source. A cable, that has a cable to mate with the rear-panel connector, is supplied as part of the kit. The rear-panel connector also mates directly with the TEKTRONIX BP1 Battery Pack cable, which makes it possible to use the same battery power source designed for the 1740–Series Waveform/Vector Monitors.

Battery Pack (BP1)

The BP1 can attach directly to the bottom of the 1730–Series, when the waveform monitor is mounted in a 1700F02 Carrying Case. It contains 22 D-size, rechargeable, nickel cadmium cells that provide approximately 13.2 Vdc. A 1730–Series instrument with BP1 attached weighs approximately 9.3 kilograms (20.5 pounds).

ORDERING

Any of these items can be ordered with the 1730–Series instrument. In addition, these items are available, along with accessory items listed in this manual, from your nearest Tektronix field office or distributor. Be sure to include both the name and number of any Field Upgrade Kits ordered.

REPLACEABLE ELECTRICAL PARTS LIST

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc., field office or representative.

It is important, when ordering parts, to include the following information in your order. Part number, instrument type and number, serial number, and modification number if applicable.

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

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

LIST OF ASSEMBLIES

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

CROSS INDEX-MFR. CODE NUMBER TO MANUFACTURER

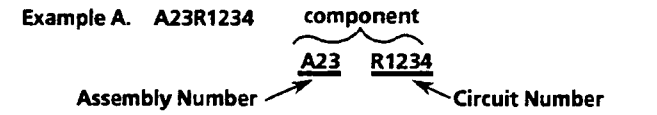
The Mfr. Code Number to Manufacturer index for the Electrical Parts List is located immediately after this page. The Cross Index provides codes, names, and addresses of manufacturers of components listed in the Electrical Parts List.

ABBREVIATIONS

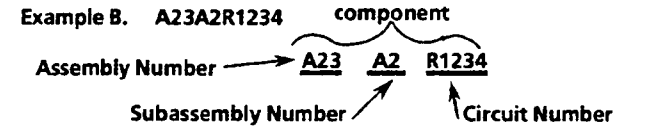
Abbreviations conform to American National Standard Y1.1.

COMPONENT NUMBER
(Column 1 of the Electrical Parts List)

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



Read: Resistor 1234 of Assembly 23.



Read: Resistor 1234 of Subassembly 2 of Assembly 23.

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

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

Mechanical subparts to the circuit boards are listed in the Electrical Parts List. These mechanical subparts are listed with their associated electrical parts. 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 of the Electrical Parts List)

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

SERIAL/ASSEMBLY NO.
(Columns 3 and 4 of the Electrical Parts List)

Column 3 indicates the serial or assembly number at which the part was first used. Column 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 of the Electrical Parts List)

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible. The Mechanical subparts are shown as *ATTACHED PARTS* / *END ATTACHED PARTS* or *MOUNTING PARTS* / *END MOUNTING PARTS* in column 5.

MFR. CODE
(Column 6 of the Electrical Parts List)

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

MFR. PART NUMBER
(Column 7 of the Electrical Parts List)

Indicates actual manufacturer's part number.

CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip Code
00779	AMP INC	2800 FULLING MILL PO BOX 3608	HARRISBURG PA 17105
00853	SANGAMO WESTON INC COMPONENTS DIV	SANGAMO RD PO BOX 128	PICKENS SC 29671-9716
01121	ALLEN-BRADLEY CO	1201 S 2ND ST	MILWAUKEE WI 53204-2410
01295	TEXAS INSTRUMENTS INC SEMICONDUCTOR GROUP	13500 N CENTRAL EXPY PO BOX 655012	DALLAS TX 75265
02735	RCA CORP SOLID STATE DIVISION		
04222	AVX CERAMICS 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
05397	UNION CARBIDE CORP MATERIALS SYSTEMS DIV	11901 MADISON AVE	CLEVELAND OH 44101
05820	EG AND G WAKEFIELD ENGINEERING	60 AUDUBON RD	WAKEFIELD MA 01880-1203
05828	GENERAL INSTRUMENT CORP GOVERNMENT SYSTEMS DIV	600 W JOHN ST	HICKSVILLE NY 11802
07088	KELVIN ELECTRIC CO	5907 NOBLE AVE	VAN NUYS CA 91411
07263	FAIRCHILD SEMICONDUCTOR CORP		
07716	TRW INC TRW IRC FIXED RESISTORS/BURLINGTON	2850 MT PLEASANT AVE	BURLINGTON IA 52601
09023	CORNELL-DUBILIER ELECTRONICS DIV FEDERAL PACIFIC ELECTRIC CO	2652 DALRYMPLE ST	SANFORD NC 27330
09922	BURNDY CORP	RICHARDS AVE	NORWALK CT 06852
09969	DALE ELECTRONICS INC	EAST HIGHWAY 50 P O BOX 180	YANKTON SD 57078
12697	CLAROSTAT MFG CO INC	LOWER WASHINGTON ST	DOVER NH 03820
14433	ITT SEMICONDUCTORS DIV		WEST PALM BEACH FL
14552	MICROSEMI CORP	2830 S FAIRVIEW ST	SANTA ANA CA 92704-5948
15912	THOMAS AND BETTS CORP ELECTRONICS GROUP	4371 VLY BLVD	LOS ANGELES CA 90032-3632
16037	SPRUCE PINE MICA CO INC	PO BOX 219	SPRUCE PINE NC 28777-0219
17856	SILICONIX INC	2201 LAURELWOOD RD	SANTA CLARA CA 95054-1516
18796	MURATA ERIE NORTH AMERICAN 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	DU PONT E I DE NEMOURS AND CO INC DU PONT ELECTRONICS DEPT	515 FISHING CREEK RD	NEW CUMBERLAND PA 17070-3007
24165	SPRAGUE ELECTRIC CO	267 LOWELL ROAD	HUDSON NH 03051
24226	GOWANDA ELECTRONICS CORP	NO 1 INDUSTRIAL PL	GOWANDA NY 14070-1409
25088	SIEMENS CORP	186 WOOD AVE S	ISELIN NJ 08830-2704
27014	NATIONAL SEMICONDUCTOR CORP	2900 SEMICONDUCTOR DR	SANTA CLARA CA 95051-0606
2M627	ROHM CORPORATION	PO BOX 19515	IRVINE CA 92713
31918	ITT SCHADOW INC	8081 WALLACE RD	EDEN PRAIRIE MN 55344-2224
34333	SILICON GENERAL INC	11651 MONARCH ST	GARDEN GROVE CA 92641-1816
34361	OMRON ELECTRONICS INC.		SUNNYVALE CA
52769	SPRAGUE-GOODMAN ELECTRONICS INC	134 FULTON AVE	GARDEN CITY PARK NY 11040-5352
54473	MATSUSHITA ELECTRIC CORP OF AMERICA	ONE PANASONIC WAY PO BOX 1501	SECAUCUS NJ 07094-2917
55112	WESTLAKE CAPACITORS INC	5334 STERLING CENTER DRIVE	WESTLAKE VILLAGE CA 91361
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 CORP	8 WHATNEY PO BOX 19515	IRVINE CA 92713
58050	TEKA PRODUCTS INC	45 SALEM ST	PROVIDENCE RI 02907
59660	TUSONIX INC	7741 N BUSINESS PARK DR PO BOX 37144	TUCSON AZ 85740-7144
60395	XICOR INC	851 BUCKEYE CT	MILPITAS CA 95035-7408
71744	CHICAGO MINIATURE LAMP INC	CHEVY CHASE BUSINESS PARK 1080 JOHNSON DRIVE	BUFFALO GROVE IL 60089
73743	FISCHER SPECIAL MFG CO	111 INDUSTRIAL RD	COLD SPRING KY 41076-9749
75915	LITTELFUSE INC SUB TRACOR INC	800 E NORTHWEST HWY	DES PLAINES IL 60016-3049

CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip Code
76493	BELL INDUSTRIES INC JW MILLER DIV	19070 REYES AVE PO BOX 5825	COMPTON CA 90224-5825
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
86928	SEASTROM MFG CO INC	701 SONORA AVE	GLENDALE CA 91201-2431
91637	DALE ELECTRONICS INC	2064 12TH AVE PO BOX 609	COLUMBUS NE 68601-3632
93907	TEXTRON INC CAMCAR DIV	600 18TH AVE	ROCKFORD IL 61108-5181
S0167	FUJITSU LTD	2-3-13 TORANOMON MINATO-KU	TOKYO JAPAN
S3629	SCHURTER AG H C/O PANEL COMPONENTS CORP	2015 SECOND STREET	BERKELEY CA 94170
S4307	SCHAFFNER ELECTRONIK AG		LUTERBACH SWITZERLAND
TK1345	ZMAN & ASSOCIATES		
TK1424	MARCON AMERICA CORP		
TK1450	TOKYO COSMOS ELECTRIC CO LTD	2-268 SOBUDAI ZAWA	KANAGAWA 228 JAPAN
TK1462	YAMAICHI ELECTRONICS CO LTD 2ND FLOOR NEW KYOEI BLDG 17-11	3-CHROME SHIBAURA MINATO-KU	TOKYO JAPAN
TK1573	WILHELM WESTERMAN	PO BOX 2345 AUGUSTA-ANLAGE 56	6800 MANNHEIM 1 WEST GERMANY

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1	671-1537-00	B030000	B038751	CIRCUIT BD ASSY:POWER	80009	671-1537-00
A1	671-1537-01	B038792	B040422	CIRCUIT BD ASSY:	80009	671-1537-01
A1	671-1537-02	B040423	B040999	CIRCUIT BD ASSY:	80009	671-1537-02
A1	671-1537-03	B041000	B041107	CIRCUIT BD ASSY:	80009	671-1537-03
A1	671-1537-04	B041108	B042769	CIRCUIT BD ASSY:	80009	671-1537-04
A1	671-1537-05	B042770		CIRCUIT BD ASSY: (1730 ONLY)	80009	671-1537-05
A1	671-1537-00	B030000	B033056	CIRCUIT BD ASSY:POWER	80009	671-1537-00
A1	671-1537-01	B033057	B033686	CIRCUIT BD ASSY:	80009	671-1537-01
A1	671-1537-02	B033687	B034018	CIRCUIT BD ASSY:	80009	671-1537-02
A1	671-1537-03	B034019	B034315	CIRCUIT BD ASSY:	80009	671-1537-03
A1	671-1537-04	B034316	B035843	CIRCUIT BD ASSY:	80009	671-1537-04
A1	671-1537-05	B035844		CIRCUIT BD ASSY: (1731 ONLY)	80009	671-1537-05
A1	671-1537-01	B030496	B030785	CIRCUIT BD ASSY:	80009	671-1537-01
A1	671-1537-02	B030786	B030857	CIRCUIT BD ASSY:	80009	671-1537-02
A1	671-1537-03	B030858	B030975	CIRCUIT BD ASSY:	80009	671-1537-03
A1	671-1537-04	B030976	B031216	CIRCUIT BD ASSY:	80009	671-1537-04
A1	671-1537-05	B031217		CIRCUIT BD ASSY: (1735 ONLY)	80009	671-1537-05
A2	670-9388-00			CIRCUIT BD ASSY:FRONT PNL;;389-0636-XX WIRE D	80009	670-9388-00
A3	672-1229-00	B030000	B039131	CIRCUIT BD ASSY:MAIN,389-0636-XX & 671-1796 -XX WIRED	80009	672-1229-00
A3	672-1229-01	B039132	B039666	CIRCUIT BD ASSY:MAIN;;1730/31,389-0636-XX & 671-1796-XX WIRED	80009	672-1229-01
A3	672-1229-02	B039667	B040343	CIRCUIT BD ASSY:MAIN;;1730/31,389-0636-XX & 671-1796-XX WIRED	80009	672-1229-02
A3	672-1229-03	B040344	B041303	CIRCUIT BD ASSY:MAIN;;1730/31,389-0636-XX & 671-1796-XX WIRED	80009	672-1229-03
A3	672-1229-04	B041304	B042969	CIRCUIT BD ASSY:MAIN;;1730,389-0636-XX &67 1-1796-XX WIRED	80009	672-1229-04
A3	672-1229-05	B042970		CIRCUIT BD ASSY:MAIN;;1730,389-0636-XX & 67 1-1796-XX WIRED (1730 ONLY)	80009	672-1229-05
A3	672-1229-00	B030000	B033228	CIRCUIT BD ASSY:MAIN,389-0636-XX & 671-1796 -XX WIRED	80009	672-1229-00
A3	672-1229-01	B033229	B033370	CIRCUIT BD ASSY:MAIN;;1730/31,389-0636-XX & 671-1796-XX WIRED	80009	672-1229-01
A3	672-1229-02	B033371	B033908	CIRCUIT BD ASSY:MAIN;;1730/31,389-0636-XX & 671-1796-XX WIRED	80009	672-1229-02
A3	672-1229-03	B033909	B034312	CIRCUIT BD ASSY:MAIN;;1730/31,389-0636-XX & 671-1796-XX WIRED	80009	672-1229-03
A3	672-1229-04	B034313	B034728	CIRCUIT BD ASSY:MAIN;;1730,389-0636-XX &67 1-1796-XX WIRED	80009	672-1229-04
A3	672-1381-00	B034729	B034766	CIRCUIT BD ASSY:MAIN;;1731,389-0636-XX & 67 1-1792-XX WIRED	80009	672-1381-00
A3	672-1229-04	B034767	B036026	CIRCUIT BD ASSY:MAIN;;1730,389-0636-XX &67 1-1796-XX WIRED	80009	672-1229-04
A3	672-1229-05	B036027		CIRCUIT BD ASSY:MAIN;;1730,389-0636-XX & 67 1-1796-XX WIRED (1731 ONLY)	80009	672-1229-05
A3	672-1266-00	B030000	B030582	CIRCUIT BD ASSY:MAIN,1735,389-0636-XX & 671 1-1796-XX WIRED	80009	672-1266-00
A3	672-1266-01	B030583	B030680	CIRCUIT BD ASSY:MAIN;;1735,389-0636-XX & 67 1-1796-XX WIRED	80009	672-1266-01
A3	672-1266-02	B030681	B030841	CIRCUIT BD ASSY:MAIN;;1735,389-0636-XX &67 1-1796-XX WIRED	80009	672-1266-02
A3	672-1266-03	B030842	B030895	CIRCUIT BD ASSY:MAIN;;1735,389-0636-XX & 67 1-1796-XX WIRED	80009	672-1266-03
A3	672-1266-04	B030896	B030974	CIRCUIT BD ASSY:MAIN;;1735,389-0636-XX & 67 1-1796-XX WIRED	80009	672-1266-04
A3	672-1266-05	B030975	B031248	CIRCUIT BD ASSY:MAIN;1735;;389-0636-XX & 67 1-1796-XX WIRED	80009	672-1266-05
A3	672-1266-05	B031249		CIRCUIT BD ASSY:MAIN;1735;;389-0636-XX & 67 1-1796-XX WIRED (1735 ONLY)	80009	672-1266-05

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A3	672-0225-00	B030000	B033228	CIRCUIT BD ASSY:MAIN,PAL-M,389-0636-XX & 671-1796-XX WIRED	80009	672-0225-00
A3	672-0225-01	B033229	B033370	CIRCUIT BD ASSY:MAIN;;PAL-M,389-0636-XX & 671-1796-XX WIRED	80009	672-0225-01
A3	672-0225-02	B033371	B033908	CIRCUIT BD ASSY:MAIN;;PAL M,389-0636-XX & 671-1796-XX WIRED	80009	672-0225-02
A3	672-0225-03	B033909	B034312	CIRCUIT BD ASSY:MAIN;;PAL M,389-0636-XX & 671-1796-XX WIRED	80009	672-0225-03
A3	672-0225-04	B034313	B036026	CIRCUIT BD ASSY:MAIN;;PAL M,389-0636-XX & 671-1796-XX WIRED	80009	672-0225-04
A3	672-0225-05	B036027		CIRCUIT BD ASSY:MAIN;;PAL M,389-0636-XX & 671-1796-XX WIRED (1731 PM ONLY)	80009	672-0225-05
A3A1	671-1796-00			CIRCUIT BD ASSY:GRATICULE LIGHT,388-9768-XX WIRED	80009	671-1796-00
A1	671-1537-00	B030000	B038751	CIRCUIT BD ASSY:POWER	80009	671-1537-00
A1	671-1537-01	B038792	B040422	CIRCUIT BD ASSY:	80009	671-1537-01
A1	671-1537-02	B040423	B040999	CIRCUIT BD ASSY:	80009	671-1537-02
A1	671-1537-03	B041000	B041107	CIRCUIT BD ASSY:	80009	671-1537-03
A1	671-1537-04	B041108	B042769	CIRCUIT BD ASSY:	80009	671-1537-04
A1	671-1537-05	B042770		CIRCUIT BD ASSY: (1730 ONLY)	80009	671-1537-05
A1	671-1537-00	B030000	B033056	CIRCUIT BD ASSY:POWER	80009	671-1537-00
A1	671-1537-01	B033057	B033686	CIRCUIT BD ASSY:	80009	671-1537-01
A1	671-1537-02	B033687	B034018	CIRCUIT BD ASSY:	80009	671-1537-02
A1	671-1537-03	B034019	B034315	CIRCUIT BD ASSY:	80009	671-1537-03
A1	671-1537-04	B034316	B035843	CIRCUIT BD ASSY:	80009	671-1537-04
A1	671-1537-05	B035844		CIRCUIT BD ASSY: (1731 ONLY)	80009	671-1537-05
A1	671-1537-01	B030496	B030785	CIRCUIT BD ASSY:	80009	671-1537-01
A1	671-1537-02	B030786	B030857	CIRCUIT BD ASSY:	80009	671-1537-02
A1	671-1537-03	B030858	B030975	CIRCUIT BD ASSY:	80009	671-1537-03
A1	671-1537-04	B030976	B031216	CIRCUIT BD ASSY:	80009	671-1537-04
A1	671-1537-05	B031217		CIRCUIT BD ASSY: (1735 ONLY)	80009	671-1537-05
A1C136	290-0974-03			CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A1C138	290-0974-03			CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A1C151	290-1069-00			CAP,FXD,ELCTLT:1000UF,20%,6.3V	80009	290-1069-00
A1C157	290-1103-00			CAP,FXD,ELCTLT:330UF/50V	TK1424	CESFM1H331
A1C163	285-1331-00			CAP,FXD,MTLZD:0.47UF,5%,400V	TK1573	MKS4 .47/400/5
A1C192	285-1332-00			CAP,FXD,PLASTIC:0.1UF,20%,160V	TK1573	MKS4 .1/160/20
A1C216	283-0021-00			CAP,FXD,CER DI:0.001UF,20%,5000V	18796	DE1310Y5P102M6KV
A1C217	285-1184-00			CAP,FXD,MTLZD:0.01 UF,20%,4000V	80009	285-1184-00
A1C218	285-1184-00			CAP,FXD,MTLZD:0.01 UF,20%,4000V	80009	285-1184-00
A1C219	285-1184-00			CAP,FXD,MTLZD:0.01 UF,20%,4000V	80009	285-1184-00
A1C220	283-0021-00			CAP,FXD,CER DI:0.001UF,20%,5000V	18796	DE1310Y5P102M6KV
A1C234	290-0939-00			CAP,FXD,ELCTLT:10UF,+100-10%,100V	24165	672D106H100CG2C
A1C237	285-1189-00			CAP,FXD,MTLZD:0.1 UF,5%,100 V	55112	160/.1/J/100/C
A1C244	283-0339-00			CAP,FXD,CER DI:0.22UF,10%,50V	04222	SR305C224KAA
A1C245	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C267	285-1329-00			CAP,FXD,PLASTIC:METALIZED FILM;680PF,10%,1600V,POLYPROPYLENE,.70X.43; RADIAL,T/A	80009	285-1329-00
A1C286	290-1070-00			CAP,FXD,ELCTLT:220UF,20%,200V	80009	290-1070-00
A1C287	290-0943-00			CAP,FXD,ELCTLT:47UF,+50-20%,25V	55680	UVX1V470MPA
A1C313	283-0021-00			CAP,FXD,CER DI:0.001UF,20%,5000V	18796	DE1310Y5P102M6KV
A1C337	285-1328-00			CAP,FXD,PLASTIC:METALIZED FILM;0.01UF,5%,200V,POLYPROPYLENE,1.25X.95;RADIAL,T/A	TK1573	FKP1 .01/2000/5
A1C342	283-0238-00			CAP,FXD,CER DI:0.01UF,10%,50V	80009	283-0238-00
A1C351	290-1034-00			CAP,FXD,ELCTLT:330UF,25V,20%	TK1424	CEUFM1E331
A1C352	290-1034-00			CAP,FXD,ELCTLT:330UF,25V,20%	TK1424	CEUFM1E331

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1C362	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C387	285-1196-00			CAP,FXD,PPR DI:0.01UF,20%,250V	80009	285-1196-00
A1C388	285-1196-00			CAP,FXD,PPR DI:0.01UF,20%,250V	80009	285-1196-00
A1C411	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C417	283-0639-00			CAP,FXD,MICA DI:56PF,1%,500V	80009	283-0639-00
A1C421	285-1341-00			CAP,FXD,PLASTIC:METALIZED FILM;0.1UF,20%,100V,POLYESTER,.275X.375;	TK1573	MKS2 0.1/100/20
A1C426	283-0189-00			CAP,FXD,CER DI:0.1UF,20%,400V	04222	SR508C104MAA
A1C427	290-0974-03			CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A1C428	283-0084-00			CAP,FXD,CER DI:270PF,5%,1000V	80009	283-0084-00
A1C436	290-0880-00			CAP,FXD,ALUM:10UF,+50-20%,160V,0.394 X0.623 ;RADIAL,BULK	80009	290-0880-00
A1C446	290-1101-00			CAP,FXD,ELCTLT:100UF,50V	80009	290-1101-00
A1C448	290-1100-00			CAP,FXD,ELCTLT:100UF,25V	TK1424	CEUFM1E101
A1C452	290-1034-00			CAP,FXD,ELCTLT:330UF,25V,20%	TK1424	CEUFM1E331
A1C458	290-0974-03	671-1537-00	671-1537-01	CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A1C458	283-0212-02	671-1537-02		CAP,FXD,CER DI:2UF,20%,50V	80009	283-0212-02
A1C471	290-0770-00			CAP,FXD,ELCTLT:100UF,+50-20%,25VDC	54473	ECE-A25V100L
A1C474	285-1196-00			CAP,FXD,PPR DI:0.01UF,20%,250V	80009	285-1196-00
A1C480	290-1070-00			CAP,FXD,ELCTLT:220UF,20%,200V	80009	290-1070-00
A1C487	285-1222-00			CAP,FXD,PLASTIC:0.068UF,20%,250V	55112	158/.068/M/250/H
A1C518	283-0339-00			CAP,FXD,CER DI:0.22UF,10%,50V	04222	SR305C224KAA
A1C520	283-0000-00			CAP,FXD,CER DI:0.001UF,+100-0%,500V	80009	283-0000-00
A1C521	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C526	285-1341-00			CAP,FXD,PLASTIC:METALIZED FILM;0.1UF,20%,100V,POLYESTER,.275X.375;	TK1573	MKS2 0.1/100/20
A1C527	285-1341-00			CAP,FXD,PLASTIC:METALIZED FILM;0.1UF,20%,100V,POLYESTER,.275X.375;	TK1573	MKS2 0.1/100/20
A1C528	285-1341-00			CAP,FXD,PLASTIC:METALIZED FILM;0.1UF,20%,100V,POLYESTER,.275X.375;	TK1573	MKS2 0.1/100/20
A1C529	283-0189-00			CAP,FXD,CER DI:0.1UF,20%,400V	04222	SR508C104MAA
A1C532	283-0189-00			CAP,FXD,CER DI:0.1UF,20%,400V	04222	SR508C104MAA
A1C546	290-0880-00			CAP,FXD,ALUM:10UF,+50-20%,160V,0.394 X0.623 ;RADIAL,BULK	80009	290-0880-00
A1C552	290-1100-00			CAP,FXD,ELCTLT:100UF,25V	TK1424	CEUFM1E101
A1C557	283-0594-00			CAP,FXD,MICA DI:0.001UF,1%,100V	80009	283-0594-00
A1C558	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A1C561	281-0774-00			CAP,FXD,CER DI:0.022MFD,20%,100V	80009	281-0774-00
A1C567	290-0974-03			CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A1C568	281-0812-00			CAP,FXD,CER DI:1000PF,10%,100V	04222	SA101C102KAA
A1CR121	152-0061-00			DIODE,SIG:,;200V,0.1A,700NS,4.0PF;FDH2161,T &R	07263	FDH2161
A1CR122	152-0061-00			DIODE,SIG:,;200V,0.1A,700NS,4.0PF;FDH2161,T &R	07263	FDH2161
A1CR137	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A1CR138	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A1CR154	152-0400-00			DIODE,RECT:,FAST RCVRY;400V,1A,200NS;1N4936,DO-41,T&R	80009	152-0400-00
A1CR159	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A1CR170	152-0897-00			DIODE,RECT:,FAST RCVRY;1000V,1.5A,300NS,SOFT RCVRY;BYV96E,T&R	80009	152-0897-00
A1CR222	152-0409-00			DIODE,RECT:,FAST RCVRY;12KV,10MA,250NS;CRVT 150,AXIAL LEAD	80009	152-0409-00
A1CR238	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02

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A1CR248	152-0720-00			DIODE,RECT:,ULTRA FAST;100V,8A,25NS,100A IF SM;BYW29-100,TO-220	80009	152-0720-00
				ATTACHED PARTS		
	214-3848-00			HEAT SINK,ELEC:LOW COST CLIP-ON,TO-126/TO-220	80009	214-3848-00
				END ATTACHED PARTS		
A1CR249	152-0400-00			DIODE,RECT:,FAST RCVRY;400V,1A,200NS;1N4936,DO-41,T&R	80009	152-0400-00
A1CR266	152-0897-00			DIODE,RECT:,FAST RCVRY;1000V,1.5A,300NS,SOFT RCVRY;BYV96E,T&R	80009	152-0897-00
A1CR292	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A1CR357	152-0400-00			DIODE,RECT:,FAST RCVRY;400V,1A,200NS;1N4936,DO-41,T&R	80009	152-0400-00
A1CR417	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A1CR425	152-0061-00			DIODE,SIG:,;200V,0.1A,700NS,4.0PF;FDH2161,T&R	07263	FDH2161
A1CR426	152-0061-00			DIODE,SIG:,;200V,0.1A,700NS,4.0PF;FDH2161,T&R	07263	FDH2161
A1CR437	152-0400-00			DIODE,RECT:,FAST RCVRY;400V,1A,200NS;1N4936,DO-41,T&R	80009	152-0400-00
A1CR448	152-0400-00			DIODE,RECT:,FAST RCVRY;400V,1A,200NS;1N4936,DO-41,T&R	80009	152-0400-00
A1CR461	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A1CR521	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A1CR522	152-0061-00			DIODE,SIG:,;200V,0.1A,700NS,4.0PF;FDH2161,T&R	07263	FDH2161
A1CR532	152-0400-00			DIODE,RECT:,FAST RCVRY;400V,1A,200NS;1N4936,DO-41,T&R	80009	152-0400-00
A1CR533	152-0400-00			DIODE,RECT:,FAST RCVRY;400V,1A,200NS;1N4936,DO-41,T&R	80009	152-0400-00
A1CR566	152-0400-00			DIODE,RECT:,FAST RCVRY;400V,1A,200NS;1N4936,DO-41,T&R	80009	152-0400-00
A1CR576	152-0750-00			DIODE,RECT:,FAST RCVRY;BRIDGE,600V,3A,IFSM=125A,250NS,SAFETY CONTROLLED;RKBPC606	80009	152-0750-00
A1DS118	150-0035-00			LAMP,GLOW:90V MAX,0.3MA,AID-T,WIRE LD	71744	A1B-120
A1DS185	150-0035-00			LAMP,GLOW:90V MAX,0.3MA,AID-T,WIRE LD	71744	A1B-120
A1DS416	150-0035-00			LAMP,GLOW:90V MAX,0.3MA,AID-T,WIRE LD	71744	A1B-120
A1DS417	150-0035-00			LAMP,GLOW:90V MAX,0.3MA,AID-T,WIRE LD	71744	A1B-120
A1E119	119-0181-00			ARSR,ELEC SURGE:230,GAS FILLED,+/-15%	25088	B1-A230T
A1E576	119-0181-00			ARSR,ELEC SURGE:230,GAS FILLED,+/-15%	25088	B1-A230T
A1F495	159-0021-00			FUSE,CARTRIDGE:3AG,2A,250V,FAST BLOW	75915	312 002
				MOUNTING PARTS		
	200-2264-00			CAP,FUSEHOLDER:3AG FUSES	S3629	FEK 031 1666
	204-0906-00			BODY,FUSEHOLDER:3AG & 5 X 20MM FUSES	S3629	TYPEFAU031.3573
				END MOUNTING PARTS		
A1J122	131-5337-00	671-1537-03		CONN,HDR:	80009	131-5337-00
A1J133	131-5337-00	671-1537-03		CONN,HDR:	80009	131-5337-00
A1J295	119-1946-00			FILTER,RFI:1A,250V,400HZ W/PC TERMINAL	S4307	FN326-1/02-K-D-T
A1J458	131-4794-00			CONN,HDR::PCB,;MALE,STR,1 X 2,0.1 CTR,0.235 MLG X 0.112 TAIL,30 GOLD,0.035 DIA PCB;,,	80009	131-4794-00
A1J546	131-3392-00			CONN,HDR:PCB,;MALE,STR,1 X 10,0.1 CTR,0.230 MLG X 0.120 TAIL,30 GOLD,BD RETENTION;,,	80009	131-3392-00
A1L147	108-1263-00			COIL,RF:FXD,10UH, 10%,Q=70,SRF 27 MHZ,DCR 0.043 OHM,I MAX 2.1ARADIAL LEAD	80009	108-1263-00

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A1L152	108-1262-00			COIL,RF:FXD,100UH,10%,Q=30,SRF 8.2MHZ,DCR 0 .23 OHM,I MAX 0.75ARADIAL LEAD	80009	108-1262-00
A1L177	108-1267-00			COIL,RF:FXD 1 MH, +/- 10%, DCR 4 OHM MAX, P OT CORE, POTTED, PCMOUNT, CORE 84-99	24226	108-1267-00
A1L277	108-0205-00			COIL,RF:FIXED,1MH	76493	8209
A1L347	108-1262-00			COIL,RF:FXD,100UH,10%,Q=30,SRF 8.2MHZ,DCR 0 .23 OHM,I MAX 0.75ARADIAL LEAD	80009	108-1262-00
A1L348	108-1262-00			COIL,RF:FXD,100UH,10%,Q=30,SRF 8.2MHZ,DCR 0 .23 OHM,I MAX 0.75ARADIAL LEAD	80009	108-1262-00
A1L434	108-1262-00			COIL,RF:FXD,100UH,10%,Q=30,SRF 8.2MHZ,DCR 0 .23 OHM,I MAX 0.75ARADIAL LEAD	80009	108-1262-00
A1L437	108-1262-00			COIL,RF:FXD,100UH,10%,Q=30,SRF 8.2MHZ,DCR 0 .23 OHM,I MAX 0.75ARADIAL LEAD	80009	108-1262-00
A1P458	131-0993-00			CONN,BOX:SHUNT/SHORTING,;FEMALE,STR,1 X 2,0 .1 CTR,0.385 H,30 GOLD,BLACK,JUMPER;	22526	65474-006
A1Q134	151-0701-00			TRANSISTOR,PWR:BIPOLAR,NPN;120V,10A,60MHZ,A MPLIFIER;2SC2527G,TO-220	S0167	2SC2527G
				ATTACHED PARTS		
	214-3848-00			HEAT SINK,ELEC:LOW COST CLIP-ON,TO-126/TO-2 20	80009	214-3848-00
				END ATTACHED PARTS		
A1Q137	151-0216-04			TRANSISTOR,SIG:BIPOLAR,PNP;25V,100MA,170MHZ ,AMPLIFIER;MPS6523,TO-92 EBC,T&A	80009	151-0216-04
A1Q237	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ ,AMPLIFIER;2N3906,TO-92 EBC	80009	151-0188-00
A1Q238	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A1Q290	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A1Q293	151-0508-00			THYRISTOR,SIG:BIPOLAR,PUT;40V,150MA;2N6027, TO-92 AGK	80009	151-0508-00
A1Q313	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A1Q344	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A1Q362	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A1Q363	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A1Q367	151-0346-00	671-1537-00	671-1537-03	TRANSISTOR,PWR:BIPOLAR,NPN;1500V,2.5A,SWITC HING;MJ12002,TO-3	04713	SJ2914
A1Q367	151-0966-00	671-1537-04		TRANSISTOR,PWR:BIPOLAR,NPN;800V VCEO,1500V VCES,10A,DEFLECTION/SWITCHING;MJ16018,TO-3	80009	151-0966-00
				MOUNTING PARTS		
	210-0586-00			NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL (QUANTITY 2)	78189	211-041800-00
	211-0012-00			SCREW,MACHINE:4-40 X 0.375,PNH,STL (QUANTITY 2)	93907	ORDER BY DESCR
	386-0978-00	671-1537-01		INSULATOR,PLATE:TRANSISTOR,MICA	16037	#130
				END MOUNTING PARTS		
A1Q413	151-0749-00			TRANSISTOR,SIG:BIPOLAR,PNP;400V,500MA,50MHZ ,AMPLIFIER;MPSA94,TO-92 EBC	80009	151-0749-00
A1Q419	151-0350-00			TRANSISTOR,SIG:BIPOLAR,PNP;150V,600MA,100MH Z,AMPLIFIER;2N5401,TO-92 EBC	04713	2N5401
A1Q462	151-0223-00			TRANSISTOR,SIG:BIPOLAR,NPN;15V,500MA,SWITCH ING;MPS2369A,TO-92 EBC	80009	151-0223-00
A1Q463	151-0710-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,1.0A,50MHZ,A MPLIFIER;2N6715/MPSW01A,TO-237/TO-226AE	80009	151-0710-00
A1Q516	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ ,AMPLIFIER;2N3906,TO-92 EBC	80009	151-0188-00

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A1Q518	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A1Q519	151-0347-00			TRANSISTOR,SIG:BIPOLAR,NPN;160V,600MA,100MH Z,AMPLIFIER;2N5551,TO-92 EBC	80009	151-0347-00
A1Q565	151-0223-00			TRANSISTOR,SIG:BIPOLAR,NPN;15V,500MA,SWITCH ING;MPS2369A,TO-92 EBC	80009	151-0223-00
A1Q568	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ ,AMPLIFIER;2N3906,TO-92 EBC	80009	151-0188-00
A1Q570	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A1R119	315-0223-03			RES,FXD,CMPSN:22K OHM,5%,0.25 W	80009	315-0223-03
A1R120	315-0226-00			RES,FXD,FILM:22M OHM,5%,0.25W	80009	315-0226-00
A1R121	315-0471-03			RES,FXD,CMPSN:470 OHM,5%,0.25W	80009	315-0471-03
A1R124	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A1R125	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	80009	315-0473-00
A1R131	322-3001-00			RES,FXD,FILM:10 OHM,1%,0.2W,TC=T0	80009	322-3001-00
A1R132	322-3001-00			RES,FXD,FILM:10 OHM,1%,0.2W,TC=T0	80009	322-3001-00
A1R133	322-3001-00			RES,FXD,FILM:10 OHM,1%,0.2W,TC=T0	80009	322-3001-00
A1R134	322-3001-00			RES,FXD,FILM:10 OHM,1%,0.2W,TC=T0	80009	322-3001-00
A1R135	315-0102-03			RES,FXD,CMPSN:1K OHM,5%,0.25W	80009	315-0102-03
A1R136	315-0150-00	671-1537-00	671-1537-00	RES,FXD,FILM:15 OHM,5%,0.25W	80009	315-0150-00
A1R136	322-3051-00	671-1537-00		RES,FXD,FILM:33.2 OHM,1%,0.2W,TC=T0	57668	CRB20FXE301K
A1R137	315-0105-00			RES,FXD,FILM:1M OHM,5%,0.25W	80009	315-0105-00
A1R138	315-0102-03			RES,FXD,CMPSN:1K OHM,5%,0.25W	80009	315-0102-03
A1R141	315-0122-00			RES,FXD,FILM:1.2K OHM,5%,0.25W	80009	315-0122-00
A1R142	322-3260-00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K99
A1R143	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	80009	315-0104-00
A1R170	308-0212-00			RES,FXD,WW:10K OHM,5%,3W	80009	308-0212-00
A1R185	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	80009	315-0104-00
A1R186	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	80009	315-0222-00
A1R192	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315-0103-00
A1R193	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315-0103-00
A1R196	301-0106-00			RES,FXD,FILM:10M OHM,5%,0.50W	80009	301-0106-00
A1R197	301-0474-00	671-1537-00	671-1537-04	RES,FXD,FILM:470K OHM,5%,0.5W	01121	EB4745
A1R197	301-0514-01	671-1537-05		RES,FXD,CMPSN:510K OHM,5%,0.5W	01121	EB5145
A1R198	301-0105-00	671-1537-00	671-1537-04	RES,FXD,FILM:1M OHM,5%,0.50W	19701	5053CX1M000J
A1R198	301-0105-01	671-1537-05		RES,FXD,CMPSN:1M OHM,5%,0.5W	80009	301-0105-01
A1R210	301-0225-02			RES,FXD,CMPSN:2.2M OHM,5%,0.5W	80009	301-0225-02
A1R212	303-0155-00			RES,FXD,CMPSN:1.5M OHM,5%,1W	80009	303-0155-00
A1R213	311-1256-00			RES,VAR,NONWW:TRMR,2.5M OHM,0.5W	80009	311-1256-00
A1R236	315-0272-00			RES,FXD,FILM:2.7K OHM,5%,0.25W	80009	315-0272-00
A1R237	315-0102-03			RES,FXD,CMPSN:1K OHM,5%,0.25W	80009	315-0102-03
A1R238	315-0102-03			RES,FXD,CMPSN:1K OHM,5%,0.25W	80009	315-0102-03
A1R239	315-0102-03			RES,FXD,CMPSN:1K OHM,5%,0.25W	80009	315-0102-03
A1R242	322-3385-00			RES,FXD,FILM:100K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 100K
A1R243	315-0512-00			RES,FXD,FILM:5.1K OHM,5%,0.25W	80009	315-0512-00
A1R244	315-0333-00			RES,FXD,FILM:33K OHM,5%,0.25W	80009	315-0333-00
A1R270	308-0441-00			RES,FXD,WW:3 OHM,5%,3W	07088	
A1R287	315-0220-00			RES,FXD,FILM:22 OHM,5%,0.25W	80009	315-0220-00
A1R292	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	80009	315-0104-00
A1R310	303-0155-00			RES,FXD,CMPSN:1.5M OHM,5%,1W	80009	303-0155-00
A1R311	303-0155-00			RES,FXD,CMPSN:1.5M OHM,5%,1W	80009	303-0155-00
A1R312	303-0155-00			RES,FXD,CMPSN:1.5M OHM,5%,1W	80009	303-0155-00
A1R313	315-0333-00			RES,FXD,FILM:33K OHM,5%,0.25W	80009	315-0333-00
A1R314	315-0914-00			RES,FXD,FILM:910K OHM,5%,0.25W	80009	315-0914-00
A1R315	315-0102-03			RES,FXD,CMPSN:1K OHM,5%,0.25W	80009	315-0102-03
A1R316	315-0470-03			RES,FXD,CMPSN:47 OHM,5%,0.25W	80009	315-0470-03
A1R317	315-0153-00			RES,FXD,FILM:15K OHM,5%,0.25W	80009	315-0153-00
A1R322	315-0471-03			RES,FXD,CMPSN:470 OHM,5%,0.25W	80009	315-0471-03

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A1R323	315-0471-03			RES,FXD,CMPSN:470 OHM,5%,0.25W	80009	315-0471-03
A1R341	315-0102-03			RES,FXD,CMPSN:1K OHM,5%,0.25W	80009	315-0102-03
A1R342	315-0153-00			RES,FXD,FILM:15K OHM,5%,0.25W	80009	315-0153-00
A1R343	315-0102-03			RES,FXD,CMPSN:1K OHM,5%,0.25W	80009	315-0102-03
A1R344	321-0247-00			RES,FXD,FILM:3.65K OHM,1%,0.125W,TC=T0	80009	321-0247-00
A1R362	315-0270-00			RES,FXD,FILM:27 OHM,5%,0.25W	80009	315-0270-00
A1R382	301-0474-00			RES,FXD,FILM:470K OHM,5%,0.5W	01121	EB4745
A1R410	322-3344-00			RES,FXD,FILM:37.4K OHM,1%,0.2W,TC=T0	80009	322-3344-00
A1R411	322-3385-00			RES,FXD,FILM:100K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 100K
A1R412	322-3251-00			RES,FXD,FILM:4.02K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K02
A1R416	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	80009	315-0101-00
A1R417	315-0121-00			RES,FXD,FILM:120 OHM,5%,0.25W	80009	315-0121-00
A1R418	321-0300-00			RES,FXD,FILM:13.0K OHM,1%,0.125W,TC=T0	07716	CEAD13001F
A1R420	315-0471-03			RES,FXD,CMPSN:470 OHM,5%,0.25W	80009	315-0471-03
A1R421	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	80009	315-0202-00
A1R422	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	80009	315-0104-00
A1R425	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	80009	315-0104-00
A1R426	315-0682-00			RES,FXD,FILM:6.8K OHM,5%,0.25W	80009	315-0682-00
A1R427	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25W	80009	315-0302-00
A1R441	321-0272-00			RES,FXD,FILM:6.65K OHM,1%,0.125W,TC=T0	80009	321-0272-00
A1R442	322-3310-00			RES,FXD,FILM:16.5K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 16K5
A1R443	322-3242-00			RES,FXD,FILM:3.24K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 3K24
A1R444	315-0223-03			RES,FXD,CMPSN:22K OHM,5%,0.25 W	80009	315-0223-03
A1R445	311-2238-00			RES,VAR,TRMR:CERMET;50K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST;T&R	TK1450	GF06UT 50 K
A1R461	315-0102-03			RES,FXD,CMPSN:1K OHM,5%,0.25W	80009	315-0102-03
A1R462	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	80009	315-0332-00
A1R463	315-0122-00			RES,FXD,FILM:1.2K OHM,5%,0.25W	80009	315-0122-00
A1R464	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315-0103-00
A1R466	315-0150-00			RES,FXD,FILM:15 OHM,5%,0.25W	80009	315-0150-00
A1R484	301-0474-00			RES,FXD,FILM:470K OHM,5%,0.5W	01121	EB4745
A1R510	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	80009	315-0101-00
A1R511	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	80009	315-0101-00
A1R513	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	80009	315-0101-00
A1R516	315-0471-03			RES,FXD,CMPSN:470 OHM,5%,0.25W	80009	315-0471-03
A1R517	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	80009	315-0202-00
A1R518	315-0220-00			RES,FXD,FILM:22 OHM,5%,0.25W	80009	315-0220-00
A1R523	315-0102-03			RES,FXD,CMPSN:1K OHM,5%,0.25W	80009	315-0102-03
A1R524	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	80009	315-0104-00
A1R525	311-2239-00			RES,VAR,TRMR:CERMET;100K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST;T&R	TK1450	GF06UT 100K
A1R527	315-0682-00			RES,FXD,FILM:6.8K OHM,5%,0.25W	80009	315-0682-00
A1R528	311-2239-00			RES,VAR,TRMR:CERMET;100K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST;T&R	TK1450	GF06UT 100K
A1R533	315-0223-03			RES,FXD,CMPSN:22K OHM,5%,0.25 W	80009	315-0223-03
A1R534	315-0223-03			RES,FXD,CMPSN:22K OHM,5%,0.25 W	80009	315-0223-03
A1R536	311-2239-00			RES,VAR,TRMR:CERMET;100K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST;T&R	TK1450	GF06UT 100K
A1R544	307-0106-00			RES,FXD,CMPSN:4.7 OHM,5%,0.25W	01121	CB47G5
A1R557	322-3314-00			RES,FXD,FILM:18.2K OHM,1%,0.2W,TC=T0	80009	322-3314-00
A1R561	315-0220-00			RES,FXD,FILM:22 OHM,5%,0.25W	80009	315-0220-00
A1R562	315-0152-00			RES,FXD,FILM:1.5K OHM,5%,0.25W	80009	315-0152-00
A1R563	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	80009	315-0101-00
A1R564	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315-0103-00
A1R565	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	80009	315-0472-00
A1R566	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	80009	315-0473-00
A1R567	315-0911-00			RES,FXD,FILM:910 OHM,5%,0.25W	80009	315-0911-00
A1R568	315-0681-00			RES,FXD,FILM:680 OHM,5%,0.25W	80009	315-0681-00
A1R569	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	80009	315-0473-00

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A1RT484	307-0353-00			RES,THERMAL:5 OHM,10%	80009	307-0353-00
A1RT582	307-0353-00			RES,THERMAL:5 OHM,10%	80009	307-0353-00
A1S595	260-2274-02			SWITCH,PUSH:DPDT,6A,250VAC	31918	602905
A1T257	120-1649-00			XFMR,PWR,STU:HIGH EFFICIENCY FLYBACK	80009	120-1649-00
A1T332	120-1695-00			TRANSFORMER,PWR:HIGH VOLTAGE,FEEDBACK 3V, RESONANT 231V, 100V 1MA,	80009	120-1695-00
A1T466	120-1646-00			TRANSFORMER,RF:BASE DRIVE	80009	120-1646-00
A1U226	152-0900-00			MODULE,HV:,;7.5KVAC IN,15KVDC OUT;MSL2556	80009	152-0900-00
				ATTACHED PARTS		
	334-2363-00			MARKER,IDENT:MKD DANGER,HIGH VOLTAGE	80009	334-2363-00
				END ATTACHED PARTS		
A1U242	156-0158-00			IC,LINEAR:BIPOLAR,OP-AMP;DUAL;MC1458P1,DIP08.3	80009	156-0158-00
A1U455	156-0885-00			CPLR,OPTOELECTR:LED,5KV ISOLATION	04713	SOC 123A
A1U558	156-0933-02			IC,LINEAR:BIPOLAR,SW-REGULATOR CONTROLLER;PWM,PUSH-PULL,OC/OE;SG3524BN,DIP16.3	34333	SG3524BN
A1VR185	152-0304-00			DIODE,ZENER:,;20V,5%,0.4W;1N968B,DO-35 OR 7,TR	80009	152-0304-00
A1VR186	152-0175-00			DIODE,ZENER:,;5.6V,5%,0.4W;1N752A,DO-7 OR 35,TR	14552	TD3810976
A1VR342	152-0461-00			DIODE,SIG:,;6.2V,5%,0.4W;1N821,DO-7	04713	IN821
A1VR465	152-0282-00			DIODE,ZENER:,;30V,2%,0.4W;1N972C,DO-35 OR 7,TR	80009	152-0282-00
A1W347	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L	80009	131-0566-00
A1W476	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L	80009	131-0566-00
A1W541	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L	80009	131-0566-00
A1W542	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L	80009	131-0566-00
A1W543	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L	80009	131-0566-00
A2	670-9388-00			CIRCUIT BD ASSY:FRONT PNL;;389-0636-XX WIRED	80009	670-9388-00
				ATTACHED PARTS		
	352-0779-00			HOLDER,LED:PLASTIC	80009	352-0779-00
				END ATTACHED PARTS		
A2DS117	150-1109-00			DIODE,OPTO:	80009	150-1109-00
A2DS118	150-1109-00			DIODE,OPTO:	80009	150-1109-00
A2DS119	150-1109-00			DIODE,OPTO:	80009	150-1109-00
A2DS136	150-1109-00			DIODE,OPTO:	80009	150-1109-00
A2DS137	150-1109-00			DIODE,OPTO:	80009	150-1109-00
A2DS138	150-1109-00			DIODE,OPTO:	80009	150-1109-00
A2DS144	150-1109-00			DIODE,OPTO:	80009	150-1109-00
A2DS145	150-1109-00			DIODE,OPTO:	80009	150-1109-00
A2DS227	150-1138-00			DIODE,OPTO:,LED;RED,626NM,1MCD AT 20MA,RECTANGULAR CASE;HLMP-0300	80009	150-1138-00
A2DS228	150-1109-00			DIODE,OPTO:	80009	150-1109-00
A2DS240	150-1109-00			DIODE,OPTO:	80009	150-1109-00
A2DS241	150-1109-00			DIODE,OPTO:	80009	150-1109-00
A2DS242	150-1109-00			DIODE,OPTO:	80009	150-1109-00
A2DS314	150-1109-00			DIODE,OPTO:	80009	150-1109-00
A2DS315	150-1109-00			DIODE,OPTO:	80009	150-1109-00
A2DS316	150-1109-00			DIODE,OPTO:	80009	150-1109-00
A2DS327	150-1109-00			DIODE,OPTO:	80009	150-1109-00
A2DS328	150-1109-00			DIODE,OPTO:	80009	150-1109-00
A2DS329	150-1109-00			DIODE,OPTO:	80009	150-1109-00
A2DS340	150-1109-00			DIODE,OPTO:	80009	150-1109-00
A2DS341	150-1109-00			DIODE,OPTO:	80009	150-1109-00
A2P107	175-9773-01			CA ASSY,SP,ELEC:34,26 AWG,5.0 L	TK1462	ORDER BY DESCR
A2R212	311-2287-00			RES,VAR,NONWW:PNL,20K OHM,10%,0.5W	12697	CM45210
A2R245	311-2321-00			RES,VAR,WW:CLAROSTAT,3 TURN POT	80009	311-2321-00
				MOUNTING PARTS		

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
	210-0583-00			NUT,PLAIN,HEX:0.25-32 X 0.312,BRS CD PL	73743	2X-20319-402
	210-1435-00			WASHER,FLAT:0.254 X 0.311 X 0.016,SST	86928	5710-56-15P
				END MOUNTING PARTS		
A2R412	311-2287-00			RES,VAR,NONWW:PNL,20K OHM,10%,0.5W	12697	CM45210
A2R429	311-2287-00			RES,VAR,NONWW:PNL,20K OHM,10%,0.5W	12697	CM45210
A2R435	311-2321-00			RES,VAR,WW:CLAROSTAT,3 TURN POT	80009	311-2321-00
				MOUNTING PARTS		
	210-0583-00			NUT,PLAIN,HEX:0.25-32 X 0.312,BRS CD PL	73743	2X-20319-402
	210-1435-00			WASHER,FLAT:0.254 X 0.311 X 0.016,SST	86928	5710-56-15P
				END MOUNTING PARTS		
A2R443	311-2287-00			RES,VAR,NONWW:PNL,20K OHM,10%,0.5W	12697	CM45210
A2S112	260-2300-00			SWITCH,PUSH:SPST,25MA,15VAC	34361	B3F1152
A2S130	260-2300-00			SWITCH,PUSH:SPST,25MA,15VAC	34361	B3F1152
A2S145	260-2300-00			SWITCH,PUSH:SPST,25MA,15VAC	34361	B3F1152
A2S222	260-2300-00			SWITCH,PUSH:SPST,25MA,15VAC	34361	B3F1152
A2S235	260-2300-00			SWITCH,PUSH:SPST,25MA,15VAC	34361	B3F1152
A2S309	260-2300-00			SWITCH,PUSH:SPST,25MA,15VAC	34361	B3F1152
A2S322	260-2300-00			SWITCH,PUSH:SPST,25MA,15VAC	34361	B3F1152
A2S335	260-2300-00			SWITCH,PUSH:SPST,25MA,15VAC	34361	B3F1152
A2S509	260-2300-00			SWITCH,PUSH:SPST,25MA,15VAC	34361	B3F1152
A2S521	260-2300-00			SWITCH,PUSH:SPST,25MA,15VAC	34361	B3F1152
A2S534	260-2300-00			SWITCH,PUSH:SPST,25MA,15VAC	34361	B3F1152
A3	672-1229-00	B030000	B039131	CIRCUIT BD ASSY:MAIN,389-0636-XX & 671-1796 -XX WIRED	80009	672-1229-00
A3	672-1229-01	B039132	B039666	CIRCUIT BD ASSY:MAIN;;1730/31,389-0636-XX & 671-1796-XX WIRED	80009	672-1229-01
A3	672-1229-02	B039667	B040343	CIRCUIT BD ASSY:MAIN;;1730/31,389-0636-XX & 671-1796-XX WIRED	80009	672-1229-02
A3	672-1229-03	B040344	B041303	CIRCUIT BD ASSY:MAIN;;1730/31,389-0636-XX & 671-1796-XX WIRED	80009	672-1229-03
A3	672-1229-04	B041304	B042969	CIRCUIT BD ASSY:MAIN;;1730,389-0636-XX &67 1-1796-XX WIRED	80009	672-1229-04
A3	672-1229-05	B042970		CIRCUIT BD ASSY:MAIN;;1730,389-0636-XX & 67 1-1796-XX WIRED (1730 ONLY)	80009	672-1229-05
A3	672-1229-00	B030000	B033228	CIRCUIT BD ASSY:MAIN,389-0636-XX & 671-1796 -XX WIRED	80009	672-1229-00
A3	672-1229-01	B033229	B033370	CIRCUIT BD ASSY:MAIN;;1730/31,389-0636-XX & 671-1796-XX WIRED	80009	672-1229-01
A3	672-1229-02	B033371	B033908	CIRCUIT BD ASSY:MAIN;;1730/31,389-0636-XX & 671-1796-XX WIRED	80009	672-1229-02
A3	672-1229-03	B033909	B034312	CIRCUIT BD ASSY:MAIN;;1730/31,389-0636-XX & 671-1796-XX WIRED	80009	672-1229-03
A3	672-1229-04	B034313	B034728	CIRCUIT BD ASSY:MAIN;;1730,389-0636-XX &67 1-1796-XX WIRED	80009	672-1229-04
A3	672-1381-00	B034729	B034766	CIRCUIT BD ASSY:MAIN;;1731,389-0636-XX & 67 1-1792-XX WIRED	80009	672-1381-00
A3	672-1229-04	B034767	B036026	CIRCUIT BD ASSY:MAIN;;1730,389-0636-XX &67 1-1796-XX WIRED	80009	672-1229-04
A3	672-1229-05	B036027		CIRCUIT BD ASSY:MAIN;;1730,389-0636-XX & 67 1-1796-XX WIRED (1731 ONLY)	80009	672-1229-05
A3	672-1266-00	B030000	B030582	CIRCUIT BD ASSY:MAIN,1735,389-0636-XX & 671 1-1796-XX WIRED	80009	672-1266-00
A3	672-1266-01	B030583	B030680	CIRCUIT BD ASSY:MAIN;;1735,389-0636-XX & 67 1-1796-XX WIRED	80009	672-1266-01
A3	672-1266-02	B030681	B030841	CIRCUIT BD ASSY:MAIN;;1735,389-0636-XX &67 1-1796-XX WIRED	80009	672-1266-02
A3	672-1266-03	B030842	B030895	CIRCUIT BD ASSY:MAIN;;1735,389-0636-XX & 67 1-1796-XX WIRED	80009	672-1266-03
A3	672-1266-04	B030896	B030974	CIRCUIT BD ASSY:MAIN;;1735,389-0636-XX & 67 1-1796-XX WIRED	80009	672-1266-04
A3	672-1266-05	B030975	B031248	CIRCUIT BD ASSY:MAIN;1735;;389-0636-XX & 67 1-1796-XX WIRED	80009	672-1266-05

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A3	672-1266-05	B031249		CIRCUIT BD ASSY:MAIN;1735;;389-0636-XX & 671-1796-XX WIRED (1735 ONLY)	80009	672-1266-05
A3	672-0225-00	B030000	B033228	CIRCUIT BD ASSY:MAIN,PAL-M,389-0636-XX & 671-1796-XX WIRED	80009	672-0225-00
A3	672-0225-01	B033229	B033370	CIRCUIT BD ASSY:MAIN;;PAL-M,389-0636-XX & 671-1796-XX WIRED	80009	672-0225-01
A3	672-0225-02	B033371	B033908	CIRCUIT BD ASSY:MAIN;;PAL M,389-0636-XX & 671-1796-XX WIRED	80009	672-0225-02
A3	672-0225-03	B033909	B034312	CIRCUIT BD ASSY:MAIN;;PAL M,389-0636-XX & 671-1796-XX WIRED	80009	672-0225-03
A3	672-0225-04	B034313	B036026	CIRCUIT BD ASSY:MAIN;;PAL M,389-0636-XX & 671-1796-XX WIRED	80009	672-0225-04
A3	672-0225-05	B036027		CIRCUIT BD ASSY:MAIN;;PAL M,389-0636-XX & 671-1796-XX WIRED (1731 PM ONLY)	80009	672-0225-05
				ATTACHED PARTS		
	174-0334-00			CABLE ASSY,RF:50 OHM COAX,5.25 L,9-N	80009	174-0334-00
	337-0607-00			PLATE,ELEC SHLD:CIRCUIT BOARD (QUANTITY 3)	80009	337-0607-00
				END ATTACHED PARTS		
A3C87	281-0776-00			CAP,FXD,CER DI:120PF,5%,100V	04222	SA102A121JAA
A3C88	281-0823-00			CAP,FXD,CER DI:470PF,10%,50V	04222	SA101A471KAA
A3C89	290-0974-00			CAP,FXD,ELCTLT:10UF,20%,50VDC	55680	UVX1H100MAA
A3C90	290-0974-00			CAP,FXD,ELCTLT:10UF,20%,50VDC	55680	UVX1H100MAA
A3C91	281-0537-00			CAP,FXD,CER DI:0.68PF,20%,600V	80009	281-0537-00
A3C92	281-0826-00			CAP,FXD,CER DI:2200PF,10%,100V	04222	SA101C222KAA
A3C93	281-0762-00			CAP,FXD,CER DI:27PF,20%,100V	80009	281-0762-00
A3C94	281-0762-00			CAP,FXD,CER DI:27PF,20%,100V	80009	281-0762-00
A3C95	281-0764-00			CAP,FXD,CER DI:82PF,5%,100V	04222	SA102A820JAA
A3C96	281-0788-00			CAP,FXD,CER DI:470PF,10%,100V	04222	SA102C471KAA
A3C97	281-0799-00			CAP,FXD,CER DI:62PF,2%,100V	80009	281-0799-00
A3C98	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C99	290-0943-00			CAP,FXD,ELCTLT:47UF,+50-20%,25V	55680	UVX1V470MPA
A3C126	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C129	290-0839-00			CAP,FXD,ELCTLT:330UF,+50-20%,35V	55680	TLB1V331MCA
A3C134	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	80009	281-0773-00
A3C135	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C146	290-0974-03			CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A3C147	290-0973-00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A3C152	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C156	290-0973-00			CAP,FXD,ELCTLT:100UF,20%,25VDC	24165	513D107M025BB4D
A3C165	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	SA101C102MAA
A3C167	290-0974-03			CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A3C168	290-0974-03			CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A3C169	290-0974-03			CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A3C185	283-0167-00			CAP,FXD,CER DI:0.1UF,10%,100V	80009	283-0167-00
A3C195	281-0302-00			CAP,VAR,PLASTIC:1.2-4PF,100V	52769	GXL4R000
A3C196	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	SA101C102MAA
A3C197	290-0848-00			CAP,FXD,ELCTLT:47UF,+100-20%,16V	54473	ECE-A16N47U
A3C198	281-0756-00			CAP,FXD,CER DI:2.2PF,+/-0.5PF,200V	04222	SA102A2R2DAA
A3C199	281-0903-00			CAP,FXD,CER DI:3.9PF,100V	80009	281-0903-00
A3C225	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C226	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C231	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C248	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C249	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C254	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C263	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C264	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C267	290-0974-03			CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A3C269	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	SA101C102MAA
A3C272	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C294	281-0819-00			CAP,FXD,CER DI:33 PF,5%,50V	04222	SA102A330JAA
A3C298	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C321	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C322	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C324	290-0748-00			CAP,FXD,ELCTLT:10UF,+50-20%,25WVDC	24165	501D106F063LL4
A3C331	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	SA101C102MAA
A3C363	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C367	281-0810-00			CAP,FXD,CER DI:5.6PF,+/-0.5PF,100V	04222	SA101A5R6DAA
A3C368	281-0302-00			CAP,VAR,PLASTIC:1.2-4PF,100V	52769	GXL4R000
A3C372	281-0158-00			CAP,VAR,CER DI:7-45PF,100WVDC SUBMIN CER DI SC TOP ADJ	80009	281-0158-00
A3C374	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C375	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C376	290-0974-03			CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A3C377	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C384	283-0625-01			CAP,FXD,MICA DI:220PF,1%,500V	09023	CDA10FD221F03
A3C385	281-0814-00			CAP,FXD,CER DI:100 PF,10%,100V	80009	281-0814-00
A3C387	283-0625-01			CAP,FXD,MICA DI:220PF,1%,500V	09023	CDA10FD221F03
A3C388	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C389	283-0631-00			CAP,FXD,MICA DI:95PF,1%,500V	80009	283-0631-00
A3C392	281-0960-00			CAP,FXD,CERAMIC:MLC;10PF,+/-.25PF,200V,NPO, .170X.100;AXIAL,T&R	80009	281-0960-00
A3C393	281-0960-00			CAP,FXD,CERAMIC:MLC;10PF,+/-.25PF,200V,NPO, .170X.100;AXIAL,T&R	80009	281-0960-00
A3C394	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	SA101C102MAA
A3C395	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C396	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C398	281-0815-00			CAP,FXD,CER DI:0.027UF,20%,50V	04222	SA205C273MAA
A3C428	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C430	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C431	281-0763-00			CAP,FXD,CER DI:47PF,10%,100V	04222	SA102A470KAA
A3C448	285-1133-00			CAP,FXD,PLASTIC:0.33MF,1%,100V	80009	285-1133-00
A3C453	283-0655-00			CAP,FXD,MICA DI:3300PF,1%,500V	80009	283-0655-00
A3C468	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C473	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	SA101C102MAA
A3C476	283-0642-00			CAP,FXD,MICA DI:33PF,+/-0.5PF,500V	00853	D105E330G0
A3C481	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C484	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C487	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C488	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C493	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C495	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C496	281-0815-00			CAP,FXD,CER DI:0.027UF,20%,50V	04222	SA205C273MAA
A3C497	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	SA101C102MAA
A3C498	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C545	283-0660-00			CAP,FXD,MICA DI:510PF,2%,500V	80009	283-0660-00
A3C546	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C547	281-0767-00			CAP,FXD,CER DI:330PF,20%,100V	04222	SA102C331MAA
A3C548	281-0763-00			CAP,FXD,CER DI:47PF,10%,100V	04222	SA102A470KAA
A3C549	281-0814-00			CAP,FXD,CER DI:100 PF,10%,100V	80009	281-0814-00
A3C555	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C557	281-0811-00			CAP,FXD,CER DI:10PF,10%,100V	04222	SA102A100KAA
A3C561	290-0943-00			CAP,FXD,ELCTLT:47UF,+50-20%,25V	55680	UVX1V470MPA
A3C567	290-0943-00			CAP,FXD,ELCTLT:47UF,+50-20%,25V	55680	UVX1V470MPA
A3C569	281-0816-00			CAP,FXD,CER DI:82 PF,5%,100V	80009	281-0816-00
A3C570	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C571	290-0943-00			CAP,FXD,ELCTLT:47UF,+50-20%,25V	55680	UVX1V470MPA

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A3C574	290-0943-00			CAP,FXD,ELCTLT:47UF,+50-20%,25V	55680	UVX1V470MPA
A3C579	290-0974-03			CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A3C595	281-0814-00			CAP,FXD,CER DI:33 PF,5%,50V	04222	SA102A330JAA
A3C596	281-0756-00			CAP,FXD,CER DI:2.2PF,+/-0.5PF,200V	04222	SA102A2R2DAA
A3C597	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	SA101C102MAA
A3C606	281-0819-00			CAP,FXD,CER DI:33 PF,5%,50V	04222	SA102A330JAA
A3C607	281-0819-00			CAP,FXD,CER DI:33 PF,5%,50V	04222	SA102A330JAA
A3C627	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C629	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C631	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C641	283-0634-00			CAP,FXD,MICA DI:65PF,1%,100V	80009	283-0634-00
A3C643	283-0645-00			CAP,FXD,MICA DI:790PF,1%,300V	80009	283-0645-00
A3C658	290-0943-00			CAP,FXD,ELCTLT:47UF,+50-20%,25V	55680	UVX1V470MPA
A3C663	281-0903-00			CAP,FXD,CER DI:3.9PF,100V	80009	281-0903-00
A3C676	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	SA101C102MAA
A3C681	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C683	281-0158-00			CAP,VAR,CER DI:7-45PF,100WVDC SUBMIN CER DI SC TOP ADJ (1730/1735 ONLY)	80009	281-0158-00
A3C683	281-0158-00	672-1229-00	672-1381-00	CAP,VAR,CER DI:7-45PF,100WVDC SUBMIN CER DI SC TOP ADJ	80009	281-0158-00
A3C683	281-0158-00	672-1229-04		CAP,VAR.CER DI:7-45PF,100WVDC SUBMIN CER DI SC TOP ADJ (1731 ONLY)	80009	281-0158-00
A3C693	283-0757-00			CAP,FXD,MICA DI:100PF,5%,100V	80009	283-0757-00
A3C694	281-0182-00			CAP,VAR,PLASTIC:1.8-10PF,300V	19701	2805DIR810BH03F0
A3C695	281-0797-00			CAP,FXD,CER DI:15PF,10%,100V	80009	281-0797-00
A3C696	281-0302-00			CAP,VAR,PLASTIC:1.2-4PF,100V	52769	GXL4R000
A3C697	290-0848-00			CAP,FXD,ELCTLT:47UF,+100-20%,16V	54473	ECE-A16N47U
A3C699	281-0903-00	672-1229-00	672-1229-01	CAP,FXD,CER DI:3.9PF,100V	80009	281-0903-00
A3C699	281-0895-00	672-1229-02		CAP,FXD,CER DI:6.8PF,100VDC	80009	281-0895-00
A3C699	281-0903-00	672-1266-00	672-1266-01	CAP,FXD,CER DI:3.9PF,100V	80009	281-0903-00
A3C699	281-0895-00	672-1266-02		CAP,FXD,CER DI:6.8PF,100VDC	80009	281-0895-00
A3C699	281-0903-00	672-0225-00	672-0225-01	CAP,FXD,CER DI:3.9PF,100V	80009	281-0903-00
A3C699	281-0895-00	672-0225-02		CAP,FXD,CER DI:6.8PF,100VDC	80009	281-0895-00
A3C722	290-0748-00			CAP,FXD,ELCTLT:10UF,+50-20%,25WVDC	24165	501D106F063LL4
A3C728	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C740	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	80009	281-0773-00
A3C743	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	80009	281-0773-00
A3C745	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	80009	281-0773-00
A3C746	281-0813-00			CAP,FXD,CER DI:0.047UF,20%,50V	04222	SA105E473MAA
A3C752	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C775	281-0158-00			CAP,VAR,CER DI:7-45PF,100WVDC SUBMIN CER DI SC TOP ADJ	80009	281-0158-00
A3C776	281-0786-00			CAP,FXD,CER DI:150PF,10%,100V	04222	SA101A151KAA
A3C777	281-0158-00			CAP,VAR,CER DI:7-45PF,100WVDC SUBMIN CER DI SC TOP ADJ	80009	281-0158-00
A3C778	281-0158-00			CAP,VAR,CER DI:7-45PF,100WVDC SUBMIN CER DI SC TOP ADJ	80009	281-0158-00
A3C779	283-0629-00			CAP,FXD,MICA DI:62PF,1%,500V	80009	283-0629-00
A3C780	283-0677-00			CAP,FXD,MICA DI:82PF,1%,500V	80009	283-0677-00
A3C781	283-0629-00			CAP,FXD,MICA DI:62PF,1%,500V	80009	283-0629-00
A3C782	283-0639-00			CAP,FXD,MICA DI:56PF,1%,500V	80009	283-0639-00
A3C783	281-0123-00			CAP,VAR,CER DI:5-25PF,100V (1730/1735 ONLY)	59660	518-000A5-25
A3C783	281-0123-00	672-1229-00	672-1381-00	CAP,VAR,CER DI:5-25PF,100V	59660	518-000A5-25
A3C783	281-0123-00	672-1229-04		CAP,VAR,CER DI:5-25PF,100V (1731 ONLY)	59660	518-000A5-25
A3C784	281-0123-00			CAP,VAR,CER DI:5-25PF,100V	59660	518-000A5-25
A3C805	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C809	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA

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A3C825	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C843	283-0667-00			CAP,FXD,MICA DI:420PF,1%,500V	80009	283-0667-00
A3C848	283-0634-00			CAP,FXD,MICA DI:65PF,1%,100V	80009	283-0634-00
A3C853	281-0773-00			CAP,FXD,CER DI:0.01UF,10%,100V	80009	281-0773-00
A3C854	281-0810-00			CAP,FXD,CER DI:5.6PF,+/-0.5PF,100V	04222	SA101A5R6DAA
A3C859	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C861	281-0811-00			CAP,FXD,CER DI:10PF,10%,100V	04222	SA102A100KAA
A3C865	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C871	281-0762-00			CAP,FXD,CER DI:27PF,20%,100V	80009	281-0762-00
A3C872	290-0782-02			CAP,FXD,ELCTLT:4.7UF,+75-10%,35VDC	55680	UVX1V4R7MAA1TD
A3C873	281-0810-00			CAP,FXD,CER DI:5.6PF,+/-0.5PF,100V	04222	SA101A5R6DAA
A3C887	281-0815-00			CAP,FXD,CER DI:0.027UF,20%,50V	04222	SA205C273MAA
A3C893	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C898	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C906	290-0183-00			CAP,FXD,ELCTLT:1UF,10%,35V	05397	T3228105K035AS
A3C907	290-0183-00			CAP,FXD,ELCTLT:1UF,10%,35V	05397	T3228105K035AS
A3C938	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C944	283-0660-00			CAP,FXD,MICA DI:510PF,2%,500V	80009	283-0660-00
A3C945	290-0974-03			CAP,FXD,ELCTLT:10UF,20%,60VDC	55680	UVX1H100MAA1TD
A3C950	283-0634-00			CAP,FXD,MICA DI:65PF,1%,100V	80009	283-0634-00
A3C952	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C953	281-0302-00			CAP,VAR,PLASTIC:1.2-4PF,100V	52769	GXL4R000
A3C964	281-0775-01			CAP,FXD,CER DI:0.1UF,20%,50V	04222	SA105E104MAA
A3C972	290-0782-02			CAP,FXD,ELCTLT:4.7UF,+75-10%,35VDC	55680	UVX1V4R7MAA1TD
A3C974	281-0756-00			CAP,FXD,CER DI:2.2PF,+/-0.5PF,200V	04222	SA102A2R2DAA
A3C976	281-0762-00			CAP,FXD,CER DI:27PF,20%,100V	80009	281-0762-00
A3C979	290-0782-02			CAP,FXD,ELCTLT:4.7UF,+75-10%,35VDC	55680	UVX1V4R7MAA1TD
A3C980	290-0782-02			CAP,FXD,ELCTLT:4.7UF,+75-10%,35VDC	55680	UVX1V4R7MAA1TD
A3C981	290-0782-02			CAP,FXD,ELCTLT:4.7UF,+75-10%,35VDC	55680	UVX1V4R7MAA1TD
A3C984	283-0221-00			CAP,FXD,CER DI:0.47UF,20%,50V	04222	SR305C474MAA
A3C989	281-0762-00			CAP,FXD,CER DI:27PF,20%,100V	80009	281-0762-00
A3C997	290-0778-00			CAP,FXD,ELCTLT:1UF,20%,50V,NPLZD	54473	ECE-A50N1
A3C998	290-0183-00			CAP,FXD,ELCTLT:1UF,10%,35V	05397	T3228105K035AS
A3CR99	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR146	152-0400-00			DIODE,RECT:,FAST RCVRY;400V,1A,200NS;1N4936,DO-41,T&R	80009	152-0400-00
A3CR154	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR235	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR238	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR246	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR247	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR248	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR254	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR255	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR256	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR257	152-0400-00			DIODE,RECT:,FAST RCVRY;400V,1A,200NS;1N4936,DO-41,T&R	80009	152-0400-00
A3CR264	152-0066-00			DIODE,RECT:,;400V,1A,IFSM = 30A;GP10G,DO-41,T&R,SAFETY CONTROLLED	05828	GP10G-020

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A3CR268	152-0066-00			DIODE,RECT:,;400V,1A,IFSM = 30A;GP10G,DO-41 ,T&R,SAFETY CONTROLLED	05828	GP10G-020
A3CR272	152-0066-00			DIODE,RECT:,;400V,1A,IFSM = 30A;GP10G,DO-41 ,T&R,SAFETY CONTROLLED	05828	GP10G-020
A3CR280	152-0307-00			DIODE,SIG:,ULTRA FAST;100V,4.0NS,1.5PF,DUAL COM-CATHODE;MSD6100,TO-92	04713	SSD1150
A3CR326	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4 152,DO-35,T&R	80009	152-0141-02
A3CR334	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4 152,DO-35,T&R	80009	152-0141-02
A3CR364	152-0066-00			DIODE,RECT:,;400V,1A,IFSM = 30A;GP10G,DO-41 ,T&R,SAFETY CONTROLLED	05828	GP10G-020
A3CR380	152-0501-01			DIODE,SIG:,FAST RCVRY;70V,200MA,100NS,COM-A NODE;MSD6150,TO-92,TR	80009	152-0501-01
A3CR459	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4 152,DO-35,T&R	80009	152-0141-02
A3CR462	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4 152,DO-35,T&R	80009	152-0141-02
A3CR463	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4 152,DO-35,T&R	80009	152-0141-02
A3CR476	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4 152,DO-35,T&R	80009	152-0141-02
A3CR534	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4 152,DO-35,T&R	80009	152-0141-02
A3CR540	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4 152,DO-35,T&R	80009	152-0141-02
A3CR541	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4 152,DO-35,T&R	80009	152-0141-02
A3CR542	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4 152,DO-35,T&R	80009	152-0141-02
A3CR543	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4 152,DO-35,T&R	80009	152-0141-02
A3CR544	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4 152,DO-35,T&R	80009	152-0141-02
A3CR566	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4 152,DO-35,T&R	80009	152-0141-02
A3CR582	152-0307-00			DIODE,SIG:,ULTRA FAST;100V,4.0NS,1.5PF,DUAL COM-CATHODE;MSD6100,TO-92	04713	SSD1150
A3CR588	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4 152,DO-35,T&R	80009	152-0141-02
A3CR589	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4 152,DO-35,T&R	80009	152-0141-02
A3CR636	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4 152,DO-35,T&R	80009	152-0141-02
A3CR647	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4 152,DO-35,T&R	80009	152-0141-02
A3CR648	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4 152,DO-35,T&R	80009	152-0141-02
A3CR662	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4 152,DO-35,T&R	80009	152-0141-02
A3CR664	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4 152,DO-35,T&R	80009	152-0141-02
A3CR665	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4 152,DO-35,T&R	80009	152-0141-02
A3CR670	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA.4NS,2PF;1N4 152,DO-35,T&R	80009	152-0141-02
A3CR671	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4 152,DO-35,T&R	80009	152-0141-02

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A3CR682	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR696	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR697	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR698	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR699	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR746	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR757	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR758	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR759	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR760	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR761	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR762	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR763	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR778	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR779	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR825	152-0400-00	671-1229-05		DIODE,RECT:,FAST RCVRY;400V,1A,200NS;1N4936,DO-41,T&R	80009	152-0400-00
A3CR825	152-0400-00	671-1266-06		DIODE,RECT:,FAST RCVRY;400V,1A,200NS;1N4936,DO-41,T&R	80009	152-0400-00
A3CR825	152-0400-00	671-0225-05		DIODE,RECT:,FAST RCVRY;400V,1A,200NS;1N4936,DO-41,T&R	80009	152-0400-00
A3CR826	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR840	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR850	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR865	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR887	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR924	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR955	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR988	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR989	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3CR990	152-0141-02			DIODE,SIG:,ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A3J97	131-4752-00			CONN,HDR::PCB,;MALE,45 DEG,1 X 2,0.1 CTR,0.240 MLG X 0.110 TAIL,30 GOLD;,,	80009	131-4752-00

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A3J98	131-4794-00			CONN,HDR::PCB,;MALE,STR,1 X 2,0.1 CTR,0.235 MLG X 0.112 TAIL,30 GOLD,0.035 DIA PCB;,,	80009	131-4794-00
A3J99	131-4530-00			CONN,HDR::PCB,;MALE,STR,1 X 3,0.1 CTR,0.230 MLG X 0.120 TAIL,30 GOLD,BD RETENTION;,,	80009	131-4530-00
A3J107	131-3571-00			CONN,HDR::	80009	131-3571-00
A3J154	175-9797-00			CA ASSY,SP,ELEC:10,28 AWG,2.5 L,RIBBON,1 X 10 BOX,0.1 CTR BY 0.625 STRIPPED & TINNED	00779	487729-1
A3J155	174-1195-00			CA ASSY,SP,ELEC:10 CON,8.0 L,FLAT FLEX	80009	174-1195-00
A3J197	131-4530-00			CONN,HDR::PCB,;MALE,STR,1 X 3,0.1 CTR,0.230 MLG X 0.120 TAIL,30 GOLD,BD RETENTION;,,	80009	131-4530-00
A3J225	131-4752-00			CONN,HDR::PCB,;MALE,45 DEG,1 X 2,0.1 CTR,0.240 MLG X 0.110 TAIL,30 GOLD;,,	80009	131-4752-00
A3J456	131-4530-00			CONN,HDR::PCB,;MALE,STR,1 X 3,0.1 CTR,0.230 MLG X 0.120 TAIL,30 GOLD,BD RETENTION;,,	80009	131-4530-00
A3J504	131-4187-00			CONN,PLUG,ELEC:PCB,MALE,1 X 3,0.1 CTR,0.240 MLG X 0.110 TAIL,45 DEG	58050	082-0343-AS10
A3J540	131-4530-00			CONN,HDR::PCB,;MALE,STR,1 X 3,0.1 CTR,0.230 MLG X 0.120 TAIL,30 GOLD,BD RETENTION;,,	80009	131-4530-00
A3J635	131-4187-00			CONN,PLUG,ELEC:PCB,MALE,1 X 3,0.1 CTR,0.240 MLG X 0.110 TAIL,45 DEG	58050	082-0343-AS10
A3J699	131-4530-00			CONN,HDR::PCB,;MALE,STR,1 X 3,0.1 CTR,0.230 MLG X 0.120 TAIL,30 GOLD,BD RETENTION;,,	80009	131-4530-00
A3J932	131-3528-00			CONN,HDR::	15912	609-2407
A3L157	108-1262-00			COIL,RF:FXD,100UH,10%,Q=30,SRF 8.2MHZ,DCR 0.23 OHM,I MAX 0.75ARADIAL LEAD	80009	108-1262-00
A3L180	114-0308-00			COIL,RF:VARIABLE,3.48-5.20UH FORM 276-0231-00 W/MODIFIED LEADS	80009	114-0308-00
A3L190	114-0308-00			COIL,RF:VARIABLE,3.48-5.20UH FORM 276-0231-00 W/MODIFIED LEADS	80009	114-0308-00
A3L548	108-1268-00			COIL,RF:FIXED,56UH,10%,ON POWDER	24226	10M562K
A3L643	108-1268-00			COIL,RF:FIXED,56UH,10%,ON POWDER	24226	10M562K
A3L777	108-1351-00			COIL,RF:	80009	108-1351-00
A3L778	108-1268-00			COIL,RF:FIXED,56UH,10%,ON POWDER	24226	10M562K
A3L779	108-0317-00	672-1229-00	672-1229-04	COIL,RF:FIXED,15 UH	TK1345	108-0317-00
A3L779	108-0317-02	672-1229-04		COIL,RF:INDUCTOR,15UH	80009	108-0317-02
A3L781	108-1352-00			COIL,RF:	80009	108-1352-00
A3L782	108-1351-00			COIL,RF:	80009	108-1351-00
A3P99	131-0993-00			CONN,BOX:SHUNT/SHORTING,;FEMALE,STR,1 X 2,0.1 CTR,0.385 H,30 GOLD,BLACK,JUMPER;	22526	65474-006
A3P197	131-0993-00			CONN,BOX:SHUNT/SHORTING,;FEMALE,STR,1 X 2,0.1 CTR,0.385 H,30 GOLD,BLACK,JUMPER;	22526	65474-006
A3P456	131-0993-00			CONN,BOX:SHUNT/SHORTING,;FEMALE,STR,1 X 2,0.1 CTR,0.385 H,30 GOLD,BLACK,JUMPER;	22526	65474-006
A3P504	131-0993-00			CONN,BOX:SHUNT/SHORTING,;FEMALE,STR,1 X 2,0.1 CTR,0.385 H,30 GOLD,BLACK,JUMPER;	22526	65474-006
A3P540	131-0993-00			CONN,BOX:SHUNT/SHORTING,;FEMALE,STR,1 X 2,0.1 CTR,0.385 H,30 GOLD,BLACK,JUMPER;	22526	65474-006
A3P635	131-0993-00			CONN,BOX:SHUNT/SHORTING,;FEMALE,STR,1 X 2,0.1 CTR,0.385 H,30 GOLD,BLACK,JUMPER;	22526	65474-006
A3P699	131-0993-00			CONN,BOX:SHUNT/SHORTING,;FEMALE,STR,1 X 2,0.1 CTR,0.385 H,30 GOLD,BLACK,JUMPER;	22526	65474-006
A3Q99	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ,AMPLIFIER;2N3906,TO-92 EBC	80009	151-0188-00
A3Q142	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ,AMPLIFIER;2N3906,TO-92 EBC	80009	151-0188-00
A3Q143	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A3Q158	151-0710-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,1.0A,50MHZ,AMPLIFIER;2N6715/MPSW01A,TO-237/TO-226AE	80009	151-0710-00

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A3Q178	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A3Q242	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ ,AMPLIFIER;2N3906,TO-92 EBC	80009	151-0188-00
A3Q243	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ ,AMPLIFIER;2N3906,TO-92 EBC	80009	151-0188-00
A3Q272	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A3Q280	151-0211-00			TRANSISTOR,SIG:BIPOLAR,NPN;30V VCEO,55V VCB 0,400MA,500MHZ,AMPLIFIER;2N3866,TO-39	80009	151-0211-00
				ATTACHED PARTS		
	214-1291-00			HEAT SINK,XSTR:TO-5,SIL BRZ PTD BLACK	05820	207SB
	342-0324-00			INSULATOR,DISK:TRANSISTOR,NYLON	80009	342-0324-00
				END ATTACHED PARTS		
A3Q289	151-0211-00			TRANSISTOR,SIG:BIPOLAR,NPN;30V VCEO,55V VCB 0,400MA,500MHZ,AMPLIFIER;2N3866,TO-39	80009	151-0211-00
				ATTACHED PARTS		
A3Q289	214-1291-00			HEAT SINK,XSTR:TO-5,SIL BRZ PTD BLACK	05820	207SB
A3Q289	342-0324-00			INSULATOR,DISK:TRANSISTOR,NYLON	80009	342-0324-00
				END ATTACHED PARTS		
A3Q297	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ ,AMPLIFIER;2N3906,TO-92 EBC	80009	151-0188-00
A3Q298	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A3Q299	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A3Q346	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A3Q347	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A3Q382	151-0220-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,400MHZ ,AMPLIFIER;2N3906(SEL),TO-92 EBC	80009	151-0220-00
A3Q383	151-0198-00			TRANSISTOR,SIG:BIPOLAR,NPN;15V,50MA,600 MHZ ,AMPLIFIER;MPS918,TO-92 EBC	80009	151-0198-00
A3Q385	151-0198-00			TRANSISTOR,SIG:BIPOLAR,NPN;15V,50MA,600 MHZ ,AMPLIFIER;MPS918,TO-92 EBC	80009	151-0198-00
A3Q387	151-0220-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,400MHZ ,AMPLIFIER;2N3906(SEL),TO-92 EBC	80009	151-0220-00
A3Q450	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A3Q451	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A3Q457	151-0207-01			TRANSISTOR,SIG:BIPOLAR,NPN;45V,300MA,250MHZ ,AMPLIFIER;PN100A,TO-92 EBC,T&A	80009	151-0207-01
A3Q458	151-0207-01			TRANSISTOR,SIG:BIPOLAR,NPN;45V,300MA,250MHZ ,AMPLIFIER;PN100A,TO-92 EBC,T&A	80009	151-0207-01
A3Q459	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A3Q469	151-0198-00			TRANSISTOR,SIG:BIPOLAR,NPN;15V,50MA,600 MHZ ,AMPLIFIER;MPS918,TO-92 EBC	80009	151-0198-00
A3Q476	151-0220-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,400MHZ ,AMPLIFIER;2N3906(SEL),TO-92 EBC	80009	151-0220-00
A3Q477	151-0198-00			TRANSISTOR,SIG:BIPOLAR,NPN;15V,50MA,600 MHZ ,AMPLIFIER;MPS918,TO-92 EBC	80009	151-0198-00
A3Q478	151-0198-00			TRANSISTOR,SIG:BIPOLAR,NPN;15V,50MA,600 MHZ ,AMPLIFIER;MPS918,TO-92 EBC	80009	151-0198-00
A3Q497	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ ,AMPLIFIER;2N3906,TO-92 EBC	80009	151-0188-00

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A3Q498	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A3Q499	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A3Q540	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A3Q541	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A3Q542	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A3Q558	151-0207-01			TRANSISTOR,SIG:BIPOLAR,NPN;45V,300MA,250MHZ ,AMPLIFIER;PN100A,TO-92 EBC,T&A	80009	151-0207-01
A3Q566	151-0216-04			TRANSISTOR,SIG:BIPOLAR,PNP;25V,100MA,170MHZ ,AMPLIFIER;MPS6523,TO-92 EBC,T&A	80009	151-0216-04
A3Q587	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ ,AMPLIFIER;2N3906,TO-92 EBC	80009	151-0188-00
A3Q590	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A3Q626	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A3Q669	151-0198-00			TRANSISTOR,SIG:BIPOLAR,NPN;15V,50MA,600 MHZ ,AMPLIFIER;MPS918,TO-92 EBC	80009	151-0198-00
A3Q673	151-0221-08			TRANSISTOR,SIG:BIPOLAR,PNP;12V,80MA,SWITCHI NG;MPS4258,TO-92 EBC,T&A	80009	151-0221-08
A3Q674	151-0221-08			TRANSISTOR,SIG:BIPOLAR,PNP;12V,80MA,SWITCHI NG;MPS4258,TO-92 EBC,T&A	80009	151-0221-08
A3Q684	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ ,AMPLIFIER;2N3906,TO-92 EBC	80009	151-0188-00
A3Q737	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ ,AMPLIFIER;2N3906,TO-92 EBC	80009	151-0188-00
A3Q750	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ ,AMPLIFIER;2N3906,TO-92 EBC	80009	151-0188-00
A3Q762	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A3Q763	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A3Q764	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A3Q765	151-0190-00			TRANSISTOR,SIG:BIPOLAR,NPN;40V,200MA,300MHZ ,AMPLIFIER;2N3904,TO-92 EBC	80009	151-0190-00
A3Q774	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ ,AMPLIFIER;2N3906,TO-92 EBC	80009	151-0188-00
A3Q775	151-0192-05			TRANSISTOR,SIG:BIPOLAR,NPN;25V,100MA,200MHZ ,AMPLIFIER;MPS6521,TO-92 EBC,T&A	80009	151-0192-05
A3Q776	151-0223-00			TRANSISTOR,SIG:BIPOLAR,NPN;15V,500MA,SWITCH ING;MPS2369A,TO-92 EBC	80009	151-0223-00
A3Q777	151-0223-00			TRANSISTOR,SIG:BIPOLAR,NPN;15V,500MA,SWITCH ING;MPS2369A,TO-92 EBC	80009	151-0223-00
A3Q788	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ ,AMPLIFIER;2N3906,TO-92 EBC	80009	151-0188-00
A3Q790	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ ,AMPLIFIER;2N3906,TO-92 EBC	80009	151-0188-00
A3Q791	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ ,AMPLIFIER;2N3906,TO-92 EBC	80009	151-0188-00
A3Q792	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ ,AMPLIFIER;2N3906,TO-92 EBC	80009	151-0188-00
A3Q793	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ ,AMPLIFIER;2N3906,TO-92 EBC	80009	151-0188-00

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A3Q798	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ ,AMPLIFIER;2N3906,TO-92 EBC	80009	151-0188-00
A3Q799	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ ,AMPLIFIER;2N3906,TO-92 EBC	80009	151-0188-00
A3Q805	151-0192-05			TRANSISTOR,SIG:BIPOLAR,NPN;25V,100MA,200MHZ ,AMPLIFIER;MPS6521,TO-92 EBC,T&A	80009	151-0192-05
A3Q806	151-0216-04			TRANSISTOR,SIG:BIPOLAR,PNP;25V,100MA,170MHZ ,AMPLIFIER;MPS6523,TO-92 EBC,T&A	80009	151-0216-04
A3Q821	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ ,AMPLIFIER;2N3906,TO-92 EBC	80009	151-0188-00
A3Q855	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ ,AMPLIFIER;2N3906,TO-92 EBC	80009	151-0188-00
A3Q856	151-0192-05			TRANSISTOR,SIG:BIPOLAR,NPN;25V,100MA,200MHZ ,AMPLIFIER;MPS6521,TO-92 EBC,T&A	80009	151-0192-05
A3Q858	151-0216-04			TRANSISTOR,SIG:BIPOLAR,PNP;25V,100MA,170MHZ ,AMPLIFIER;MPS6523,TO-92 EBC,T&A	80009	151-0216-04
A3Q860	151-0216-04			TRANSISTOR,SIG:BIPOLAR,PNP;25V,100MA,170MHZ ,AMPLIFIER;MPS6523,TO-92 EBC,T&A	80009	151-0216-04
A3Q862	151-0347-00			TRANSISTOR,SIG:BIPOLAR,NPN;160V,600MA,100MH Z,AMPLIFIER;2N5551,TO-92 EBC	80009	151-0347-00
A3Q864	151-0347-00			TRANSISTOR,SIG:BIPOLAR,NPN;160V,600MA,100MH Z,AMPLIFIER;2N5551,TO-92 EBC	80009	151-0347-00
A3Q865	151-0350-00			TRANSISTOR,SIG:BIPOLAR,PNP;150V,600MA,100MH Z,AMPLIFIER;2N5401,TO-92 EBC	04713	2N5401
A3Q868	151-0350-00			TRANSISTOR,SIG:BIPOLAR,PNP;150V,600MA,100MH Z,AMPLIFIER;2N5401,TO-92 EBC	04713	2N5401
A3Q877	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ ,AMPLIFIER;2N3906,TO-92 EBC	80009	151-0188-00
A3Q973	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ ,AMPLIFIER;2N3906,TO-92 EBC	80009	151-0188-00
A3Q992	151-0188-00			TRANSISTOR,SIG:BIPOLAR,PNP;40V,200MA,250MHZ ,AMPLIFIER;2N3906,TO-92 EBC	80009	151-0188-00
A3R81	322-3481-00			RES,FXD,FILM:1M OHM,1%,0.2W,TC=T0	80009	322-3481-00
A3R82	322-3285-00			RES,FXD,FILM:9.09K OHM,1%,0.2W,TC=T0	80009	322-3285-00
A3R83	322-3262-00			RES,FXD,FILM:5.23K OHM,1%,0.2W,TC=T0	80009	322-3262-00
A3R84	322-3105-00			RES,FXD,FILM:121 OHM,1%,0.2W,TC=T0	80009	322-3105-00
A3R85	322-3414-00			RES,FXD,FILM:200K OHM,1%,0.2W,TC=T0	91637	CCF501G20002F
A3R86	322-3105-00			RES,FXD,FILM:121 OHM,1%,0.2W,TC=T0	80009	322-3105-00
A3R87	322-3268-00			RES,FXD,FILM:6.04K OHM,1%,0.2W,TC=T0	80009	322-3268-00
A3R88	322-3239-00			RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 3K01
A3R89	322-3231-00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322-3231-00
A3R90	322-3273-00			RES,FXD,FILM:6.81K OHM,1%,0.2W,TC=T0	80009	322-3273-00
A3R91	322-3302-00			RES,FXD,FILM:13.7K OHM,1%,0.2W,TC=T0	80009	322-3302-00
A3R92	322-3218-00			RES,FXD,FILM:1.82K OHM,1%,0.2W,TC=T0	80009	322-3218-00
A3R93	322-3339-00			RES,FXD,FILM:33.2K OHM,1%,0.2W,TC=T0	80009	322-3339-00
A3R94	322-3193-00			RES,FXD,FILM:1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K00
A3R95	322-3258-00			RES,FXD,FILM:4.75K OHM,1%,0.2W,TC=T0	80009	322-3258-00
A3R96	322-3097-00			RES,FXD,FILM:100 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 100E
A3R97	322-3297-00			RES,FXD,FILM:12.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 12K1
A3R98	322-3269-02	672-1229-00	672-1229-03	RES,FXD,FILM:6.19K OHM,0.2W,5%	80009	322-3269-02
A3R98	322-3294-00	672-1229-04		RES,FXD,FILM:11.3K OHM,1%,0.2W,TC=T0	80009	322-3294-00
A3R98	322-3269-02	672-1266-00	672-1266-03	RES,FXD,FILM:6.19K OHM,0.2W,5%	80009	322-3269-02
A3R98	322-3294-00	672-1266-04		RES,FXD,FILM:11.3K OHM,1%,0.2W,TC=T0	80009	322-3294-00
A3R98	322-3269-02	672-0225-00	672-0225-03	RES,FXD,FILM:6.19K OHM,0.2W,5%	80009	322-3269-02
A3R98	322-3294-00	672-0225-04		RES,FXD,FILM:11.3K OHM,1%,0.2W,TC=T0	80009	322-3294-00
A3R99	322-3175-00			RES,FXD,FILM:649 OHM,1%,0.2W,TC=T0	80009	322-3175-00
A3R136	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	80009	315-0101-00
A3R137	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	80009	315-0101-00
A3R138	315-0683-00			RES,FXD,FILM:68K OHM,5%,0.25W	80009	315-0683-00

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A3R139	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315-0103-00
A3R143	301-0181-00			RES,FXD,FILM:180 OHM,5%,0.5W	80009	301-0181-00
A3R149	322-3330-00			RES,FXD,FILM:26.7K OHM,1%,0.2W,TC=T0	80009	322-3330-00
A3R161	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315-0103-00
A3R162	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	80009	315-0104-00
A3R163	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	80009	315-0104-00
A3R164	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	80009	315-0223-00
A3R166	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	80009	315-0473-00
A3R167	311-2230-00			RES,VAR,TRMR:CERMET;500 OHM,20%,0.5W,0.197 SQ,TOP ADJUST;T&R	TK1450	GF06UT 500
A3R168	311-2230-00			RES,VAR,TRMR:CERMET;500 OHM,20%,0.5W,0.197 SQ,TOP ADJUST;T&R	TK1450	GF06UT 500
A3R175	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	80009	315-0472-00
A3R176	315-0752-00			RES,FXD,FILM:7.5K OHM,5%,0.25W	80009	315-0752-00
A3R177	315-0752-00			RES,FXD,FILM:7.5K OHM,5%,0.25W	80009	315-0752-00
A3R180	315-0220-00			RES,FXD,FILM:22 OHM,5%,0.25W	80009	315-0220-00
A3R183	301-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.5W	80009	301-0472-00
A3R184	308-0783-00			RES,FXD,WW:1K OHM,1%,3W,TC=30PPM	80009	308-0783-00
A3R186	308-0783-00			RES,FXD,WW:1K OHM,1%,3W,TC=30PPM	80009	308-0783-00
A3R187	301-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.5W	80009	301-0472-00
A3R189	315-0220-00			RES,FXD,FILM:22 OHM,5%,0.25W	80009	315-0220-00
A3R192	322-3066-00			RES,FXD,FILM:47.5 OHM,1%,0.2W,TC=T0	09969	CCF502G47R50F
A3R196	321-0603-07			RES,FXD,FILM:15K OHM,0.1%,0.125W,TC=T9	80009	321-0603-07
A3R197	315-0184-00			RES,FXD,FILM:180K OHM,5%,0.25W	80009	315-0184-00
A3R198	321-0603-07			RES,FXD,FILM:15K OHM,0.1%,0.125W,TC=T9	80009	321-0603-07
A3R199	315-0821-00			RES,FXD,FILM:820 OHM,5%,0.25W	80009	315-0821-00
A3R206	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A3R207	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A3R209	311-2236-00			RES,VAR,TRMR:CERMET;20K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST;T&R	TK1450	GF06UT 20K
A3R221	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315-0103-00
A3R225	315-0133-00			RES,FXD,FILM:13K OHM,5%,0.25W	80009	315-0133-00
A3R226	315-0132-00			RES,FXD,FILM:1.3K OHM,5%,0.25W	80009	315-0132-00
A3R227	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	80009	315-0472-00
A3R233	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	80009	315-0392-00
A3R236	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	80009	315-0223-00
A3R237	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315-0103-00
A3R238	315-0823-00			RES,FXD,FILM:82K OHM,5%,0.25W	80009	315-0823-00
A3R240	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	80009	315-0473-00
A3R241	315-0823-00			RES,FXD,FILM:82K OHM,5%,0.25W	80009	315-0823-00
A3R242	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	80009	315-0102-00
A3R243	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	80009	315-0203-00
A3R244	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315-0103-00
A3R245	311-2238-00			RES,VAR,TRMR:CERMET;50K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST;T&R	TK1450	GF06UT 50 K
A3R246	315-0470-00			RES,FXD,FILM:47 OHM,5%,0.25W	80009	315-0470-00
A3R247	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	80009	315-0473-00
A3R248	322-3226-00			RES,FXD,FILM:2.21K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 2K21
A3R249	322-3193-00			RES,FXD,FILM:1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K00
A3R254	315-0432-00			RES,FXD,FILM:4.3K OHM,5%,0.25W	80009	315-0432-00
A3R255	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	80009	315-0102-00
A3R258	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315-0103-00
A3R263	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	80009	315-0102-00
A3R264	321-0172-00			RES,FXD,FILM:604 OHM,1%,0.125W,TC=T0	80009	321-0172-00
A3R266	322-3258-00			RES,FXD,FILM:4.75K OHM,1%,0.2W,TC=T0	80009	322-3258-00
A3R267	322-3258-00			RES,FXD,FILM:4.75K OHM,1%,0.2W,TC=T0	80009	322-3258-00
A3R268	321-0172-00			RES,FXD,FILM:604 OHM,1%,0.125W,TC=T0	80009	321-0172-00
A3R272	322-3289-00			RES,FXD,FILM:10K OHM,1%,0.2W,TC=T0	80009	322-3289-00
A3R273	322-3363-00			RES,FXD,FILM:59K OHM,1%,0.2W,TC=T0	80009	322-3363-00

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A3R274	311-2240-00			RES,VAR,NONWW:TRMR,200K OHM,20%,0.5W LINEAR	TK1450	GF06UT 200K
A3R276	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	80009	315-0101-00
A3R294	315-0152-00			RES,FXD,FILM:1.5K OHM,5%,0.25W	80009	315-0152-00
A3R295	315-0220-00			RES,FXD,FILM:22 OHM,5%,0.25W	80009	315-0220-00
A3R296	322-3097-00			RES,FXD,FILM:100 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 100E
A3R297	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25W	80009	315-0302-00
A3R298	322-3243-00			RES,FXD,FILM:3.32K OHM,1%,0.2W,TC=T0	91637	CCF50-1-G33200F
A3R299	322-3097-00			RES,FXD,FILM:100 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 100E
A3R304	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A3R305	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A3R306	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A3R307	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A3R327	315-0273-00			RES,FXD,FILM:27K OHM,5%,0.25W	80009	315-0273-00
A3R331	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	80009	315-0102-00
A3R343	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315-0103-00
A3R344	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315-0103-00
A3R356	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	80009	315-0222-00
A3R358	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25W	80009	315-0302-00
A3R363	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315-0103-00
A3R367	322-3203-00			RES,FXD,FILM:1.27K OHM,1%,0.2W,TC=T0	80009	322-3203-00
A3R368	322-3203-00			RES,FXD,FILM:1.27K OHM,1%,0.2W,TC=T0	80009	322-3203-00
A3R370	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	80009	315-0101-00
A3R371	322-3300-02			RES,FXD,FILM:13K OHM,0.5%,0.2W,TC=T2	57668	CRB20 DYE 13K0
A3R372	322-3185-00			RES,FXD,FILM:825 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 825E
A3R373	322-3165-00			RES,FXD,FILM:511 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 511E
A3R374	321-0190-00			RES,FXD,FILM:931 OHM,1%,0.125W,TC=T0	80009	321-0190-00
A3R376	322-3114-00			RES,FXD,FILM:150 OHM,1%,0.2W,TC=T0	91637	CCF50-2-G1500F
A3R377	322-3141-00			RES,FXD,FILM:287 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 287E
A3R378	322-3201-00			RES,FXD,FILM:1.21K OHM,1%,0.2W,TC=T0	80009	322-3201-00
A3R379	315-0470-00			RES,FXD,FILM:47 OHM,5%,0.25W	80009	315-0470-00
A3R380	322-3256-00			RES,FXD,FILM:4.53K OHM,1%,0.2W,TC=T0	80009	322-3256-00
A3R381	322-3256-00			RES,FXD,FILM:4.53K OHM,1%,0.2W,TC=T0	80009	322-3256-00
A3R382	322-3155-00			RES,FXD,FILM:402 OHM,1%,0.2W,TC=T0	80009	322-3155-00
A3R383	322-3271-00			RES,FXD,FILM:6.49K OHM,1%,0.2W,TC=T0	91637	CCF502G64900FT
A3R384	315-0220-00			RES,FXD,FILM:22 OHM,5%,0.25W	80009	315-0220-00
A3R385	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	80009	315-0203-00
A3R386	322-3271-00			RES,FXD,FILM:6.49K OHM,1%,0.2W,TC=T0	91637	CCF502G64900FT
A3R387	315-0220-00			RES,FXD,FILM:22 OHM,5%,0.25W	80009	315-0220-00
A3R388	322-3244-00			RES,FXD,FILM:3.4K OHM,1%,0.2W,TC=T0	80009	322-3244-00
A3R389	321-0274-00			RES,FXD,FILM:6.98K OHM,1%,0.125W,TC=T0	80009	321-0274-00
A3R390	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	80009	315-0101-00
A3R392	321-0754-07			RES,FXD,FILM:900 OHM,0.1%,0.125W,TC=T9	2M627	
A3R393	321-0754-07			RES,FXD,FILM:900 OHM,0.1%,0.125W,TC=T9	2M627	
A3R394	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25W	80009	315-0331-00
A3R395	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315-0103-00
A3R409	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A3R423	307-0446-00			RES NTWK,FXD,FI:10K OHM,20%,(9)RES	80009	307-0446-00
A3R435	315-0123-00			RES,FXD,FILM:12K OHM,5%,0.25W	80009	315-0123-00
A3R440	322-3385-00			RES,FXD,FILM:100K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 100K
A3R441	322-3258-00			RES,FXD,FILM:4.75K OHM,1%,0.2W,TC=T0	80009	322-3258-00
A3R442	322-3258-00			RES,FXD,FILM:4.75K OHM,1%,0.2W,TC=T0	80009	322-3258-00
A3R443	322-3356-00			RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=T0	80009	322-3356-00
A3R444	322-3356-00			RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=T0	80009	322-3356-00
A3R445	322-3429-00			RES,FXD,FILM:287K OHM,1%,0.2W,TC=T0	80009	322-3429-00
A3R446	321-0486-00			RES,FXD,FILM:1.13 MEG OHM,1%,0.125W,T=T0	80009	321-0486-00
A3R447	315-0225-00			RES,FXD,FILM:2.2M OHM,5%,0.25W	01121	CB2255
A3R454	322-3231-00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322-3231-00
A3R455	322-3231-00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322-3231-00
A3R456	321-0089-00			RES,FXD,FILM:82.5 OHM,1%,0.125W,TC=T0	80009	321-0089-00

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A3R457	321-0121-00			RES,FXD,FILM:178 OHM,1%,0.125W,TC=T0	07716	CEAD178R0F
A3R458	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	80009	315-0472-00
A3R459	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315-0103-00
A3R462	315-0822-00			RES,FXD,FILM:8.2K OHM,5%,0.25W	80009	315-0822-00
A3R463	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	80009	315-0223-00
A3R464	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	80009	315-0472-00
A3R465	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	80009	315-0332-00
A3R466	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	80009	315-0472-00
A3R470	322-3114-00			RES,FXD,FILM:150 OHM,1%,0.2W,TC=T0	91637	CCF50-2-G150OF
A3R471	322-3289-00			RES,FXD,FILM:10K OHM,1%,0.2W,TC=T0	80009	322-3289-00
A3R472	322-3210-00			RES,FXD,FILM:1.5K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K50
A3R473	322-3226-00			RES,FXD,FILM:2.21K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 2K21
A3R474	322-3147-00			RES,FXD,FILM:332 OHM,1%,0.2W,TC=T0	80009	322-3147-00
A3R475	322-3222-00			RES,FXD,FILM:2K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 2K00
A3R477	322-3311-00			RES,FXD,FILM:16.9K OHM,1%,0.2W,TC=T0	56845	CCF-50-2-1692F
A3R478	322-3193-00			RES,FXD,FILM:1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K00
A3R479	322-3243-00			RES,FXD,FILM:3.32K OHM,1%,0.2W,TC=T0	91637	CCF50-1-G33200F
A3R480	322-3235-00			RES,FXD,FILM:2.74K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 2K74
A3R481	322-3001-00			RES,FXD,FILM:10 OHM,1%,0.2W,TC=T0	80009	322-3001-00
A3R482	321-0156-00			RES,FXD,FILM:412 OHM,1%,0.125W,TC=T0	07716	CEAD412R0F
A3R483	321-0156-00			RES,FXD,FILM:412 OHM,1%,0.125W,TC=T0	07716	CEAD412R0F
A3R484	322-3322-00			RES,FXD,FILM:22.1K OHM,1%,0.2W,TC=T0	80009	322-3322-00
A3R485	321-0062-00			RES,FXD,FILM:43.2 OHM,0.5%,0.125W,TC=T0	80009	321-0062-00
A3R486	315-0680-00			RES,FXD,FILM:68 OHM,5%,0.25W	80009	315-0680-00
A3R487	322-3222-00			RES,FXD,FILM:2K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 2K00
A3R489	311-2230-00			RES,VAR,TRMR:CERMET;500 OHM,20%,0.5W,0.197 SQ,TOP ADJUST;T&R	TK1450	GF06UT 500
A3R491	315-0184-00			RES,FXD,FILM:180K OHM,5%,0.25W	80009	315-0184-00
A3R492	311-0614-00			RES,VAR,NONWW:TRMR,30K OHM,0.5W	80009	311-0614-00
A3R493	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	80009	315-0101-00
A3R495	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315-0103-00
A3R497	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25W	80009	315-0331-00
A3R498	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	80009	315-0101-00
A3R499	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	80009	315-0332-00
A3R500	311-2269-00			RES,VAR,NONWW:TRMR,20K OHM,20%,0.5W	80009	311-2269-00
A3R503	315-0333-00			RES,FXD,FILM:33K OHM,5%,0.25W	80009	315-0333-00
A3R504	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	80009	315-0102-00
A3R505	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	80009	315-0102-00
A3R506	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	80009	315-0102-00
A3R507	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	80009	315-0102-00
A3R526	322-3147-00			RES,FXD,FILM:332 OHM,1%,0.2W,TC=T0	80009	322-3147-00
A3R532	322-3318-00			RES,FXD,FILM:20K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 20K0
A3R538	322-3289-00			RES,FXD,FILM:10K OHM,1%,0.2W,TC=T0	80009	322-3289-00
A3R539	322-3289-00			RES,FXD,FILM:10K OHM,1%,0.2W,TC=T0	80009	322-3289-00
A3R540	322-3343-00			RES,FXD,FILM:36.5K OHM,1%,0.2W,TC=T0	80009	322-3343-00
A3R541	322-3318-00			RES,FXD,FILM:20K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 20K0
A3R542	322-3354-00			RES,FXD,FILM:47.5K OHM,1%,0.2W,TC=T0	80009	322-3354-00
A3R544	322-3246-00			RES,FXD,FILM:3.57K OHM,1%,0.2W,TC=T0	80009	322-3246-00
A3R545	322-3277-00			RES,FXD,FILM:7.5K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 7K50
A3R546	322-3162-00			RES,FXD,FILM:475 OHM,1%,0.2W,TC=T0	80009	322-3162-00
A3R547	322-3258-00			RES,FXD,FILM:4.75K OHM,1%,0.2W,TC=T0	80009	322-3258-00
A3R548	322-3339-00			RES,FXD,FILM:33.2K OHM,1%,0.2W,TC=T0	80009	322-3339-00
A3R549	322-3354-00			RES,FXD,FILM:47.5K OHM,1%,0.2W,TC=T0	80009	322-3354-00
A3R550	315-0220-00			RES,FXD,FILM:22 OHM,5%,0.25W	80009	315-0220-00
A3R551	322-3329-00			RES,FXD,FILM:26.1K OHM.1%,0.2W,TC=T0	57668	CRB20 FXE 26K1
A3R552	311-2226-00			RES,VAR,NONWW:TRMR,50 OHM,20%,0.5W LINEARTAPE & REEL	TK1450	GF06UT 50 OHM
A3R553	311-2226-00			RES,VAR,NONWW:TRMR,50 OHM,20%,0.5W LINEARTAPE & REEL	TK1450	GF06UT 50 OHM

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A3R554	321-0089-00			RES,FXD,FILM:82.5 OHM,1%,0.125W,TC=T0	80009	321-0089-00
A3R555	321-0029-00			RES,FXD,FILM:19.6 OHM,1%,0.125W,TC=T0	80009	321-0029-00
A3R556	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	80009	315-0223-00
A3R557	322-3218-00			RES,FXD,FILM:1.82K OHM,1%,0.2W,TC=T0	80009	322-3218-00
A3R558	322-3218-00			RES,FXD,FILM:1.82K OHM,1%,0.2W,TC=T0	80009	322-3218-00
A3R559	322-3200-00			RES,FXD,FILM:1.18K OHM,1%,0.2W,TC=T0	80009	322-3200-00
A3R562	322-3251-00			RES,FXD,FILM:4.02K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K02
A3R563	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	80009	315-0222-00
A3R564	322-3097-00			RES,FXD,FILM:100 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 100E
A3R565	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315-0103-00
A3R566	321-0380-00			RES,FXD,FILM:88.7K OHM,1%,0.125W,TC=T0	07716	CEAD88701F
A3R567	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	80009	315-0472-00
A3R569	322-3418-00			RES,FXD,FILM:221K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 221K
A3R570	322-3210-00			RES,FXD,FILM:1.5K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K50
A3R571	322-3306-00			RES,FXD,FILM:15K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 15K0
A3R572	322-3066-00			RES,FXD,FILM:47.5 OHM,1%,0.2W,TC=T0	09969	CCF502G47R50F
A3R573	322-3204-00			RES,FXD,FILM:1.3K OHM,1%,0.2W,TC=T0	80009	322-3204-00
A3R574	322-3204-00			RES,FXD,FILM:1.3K OHM,1%,0.2W,TC=T0	80009	322-3204-00
A3R575	322-3216-00			RES,FXD,FILM:1.74K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K74
A3R576	322-3175-00			RES,FXD,FILM:649 OHM,1%,0.2W,TC=T0	80009	322-3175-00
A3R577	322-3066-00			RES,FXD,FILM:47.5 OHM,1%,0.2W,TC=T0	09969	CCF502G47R50F
A3R578	322-3242-00			RES,FXD,FILM:3.24K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 3K24
A3R579	322-3235-00			RES,FXD,FILM:2.74K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 2K74
A3R580	322-3206-00			RES,FXD,FILM:1.37K OHM,1%,0.2W,TC=T0	80009	322-3206-00
A3R581	322-3001-00			RES,FXD,FILM:10 OHM,1%,0.2W,TC=T0	80009	322-3001-00
A3R582	322-3293-00	672-1229-00	672-1229-00	RES,FXD,FILM:11K OHM,1%,0.2W,TC=T0	80009	322-3293-00
A3R582	322-3333-02	672-1229-01		RES,FXD,FILM:28.7K OHM,0.2W,.5%,TAPED&REELED,SMALL BODY	80009	322-3333-02
A3R582	322-3293-00	672-1266-00	672-1266-00	RES,FXD,FILM:11K OHM,1%,0.2W,TC=T0	80009	322-3293-00
A3R582	322-3333-02	672-1266-01		RES,FXD,FILM:28.7K OHM,0.2W,.5%,TAPED&REELED,SMALL BODY	80009	322-3333-02
A3R582	322-3293-00	672-0225-00	672-0225-00	RES,FXD,FILM:11K OHM,1%,0.2W,TC=T0	80009	322-3293-00
A3R582	322-3333-02	672-0225-01		RES,FXD,FILM:28.7K OHM,0.2W,.5%,TAPED&REELED,SMALL BODY	80009	322-3333-02
A3R583	322-3328-02	672-1229-00	672-1229-00	RES,FXD,FILM:25.5K OHM,0.5%,0.2W,TC=T2	57668	CRB20 DYE 25K5
A3R583	322-3367-00	672-1229-01		RES,FXD,FILM:64.9K OHM,1%,0.2W,TC=T0	80009	322-3367-00
A3R583	322-3328-02	672-1266-00	672-1266-00	RES,FXD,FILM:25.5K OHM,0.5%,0.2W,TC=T2	57668	CRB20 DYE 25K5
A3R583	322-3367-00	672-1266-01		RES,FXD,FILM:64.9K OHM,1%,0.2W,TC=T0	80009	322-3367-00
A3R583	322-3328-02	672-0225-00	672-0225-00	RES,FXD,FILM:25.5K OHM,0.5%,0.2W,TC=T2	57668	CRB20 DYE 25K5
A3R583	322-3367-00	672-0225-01		RES,FXD,FILM:64.9K OHM,1%,0.2W,TC=T0	80009	322-3367-00
A3R584	322-3318-00	672-1229-00	672-1229-00	RES,FXD,FILM:20K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 20K0
A3R584	322-3367-00	672-1229-01		RES,FXD,FILM:64.9K OHM,1%,0.2W,TC=T0	80009	322-3367-00
A3R584	322-3318-00	672-1266-00	672-1266-00	RES,FXD,FILM:20K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 20K0
A3R584	322-3367-00	672-1266-01		RES,FXD,FILM:64.9K OHM,1%,0.2W,TC=T0	80009	322-3367-00
A3R584	322-3318-00	672-0225-00	672-0225-00	RES,FXD,FILM:20K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 20K0
A3R584	322-3367-00	672-0225-01		RES,FXD,FILM:64.9K OHM,1%,0.2W,TC=T0	80009	322-3367-00
A3R588	322-3242-00			RES,FXD,FILM:3.24K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 3K24
A3R589	322-3289-00			RES,FXD,FILM:10K OHM,1%,0.2W,TC=T0	80009	322-3289-00
A3R590	322-3260-00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K99
A3R591	322-3297-00			RES,FXD,FILM:12.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 12K1
A3R592	322-3097-00			RES,FXD,FILM:100 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 100E
A3R593	322-3235-00			RES,FXD,FILM:2.74K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 2K74
A3R594	322-3250-00			RES,FXD,FILM:3.92K OHM,1%,0.2W,TC=T0	91637	CCF50-2F39200F
A3R595	315-0152-00			RES,FXD,FILM:1.5K OHM,5%,0.25W	80009	315-0152-00
A3R596	321-0603-07			RES,FXD,FILM:15K OHM,0.1%,0.125W,TC=T9	80009	321-0603-07
A3R597	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	80009	315-0203-00
A3R598	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25W	80009	315-0302-00
A3R599	315-0821-00			RES,FXD,FILM:820 OHM,5%,0.25W	80009	315-0821-00
A3R600	311-2269-00			RES,VAR,NONWW:TRMR,20K OHM,20%,0.5W	80009	311-2269-00

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A3R603	322-3289-00	672-1229-00	672-1229-00	RES,FXD,FILM:10K OHM,1%,0.2W,TC=T0	80009	322-3289-00
A3R603	322-3001-00	672-1229-01		RES,FXD,FILM:10 OHM,1%,0.2W,TC=T0	80009	322-3001-00
A3R603	322-3289-00	672-1266-00	672-1266-00	RES,FXD,FILM:10K OHM,1%,0.2W,TC=T0	80009	322-3289-00
A3R603	322-3001-00	672-1266-01		RES,FXD,FILM:10 OHM,1%,0.2W,TC=T0	80009	322-3001-00
A3R603	322-3289-00	672-0225-00	672-0225-00	RES,FXD,FILM:10K OHM,1%,0.2W,TC=T0	80009	322-3289-00
A3R603	322-3001-00	672-0225-01		RES,FXD,FILM:10 OHM,1%,0.2W,TC=T0	80009	322-3001-00
A3R608	315-0333-00			RES,FXD,FILM:33K OHM,5%,0.25W	80009	315-0333-00
A3R609	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25W	80009	315-0331-00
A3R627	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	80009	315-0101-00
A3R636	311-2238-00			RES,VAR,TRMR:CERMET;50K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST;T&R	TK1450	GF06UT 50 K
A3R637	322-3235-00			RES,FXD,FILM:2.74K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 2K74
A3R638	322-3354-00			RES,FXD,FILM:47.5K OHM,1%,0.2W,TC=T0	80009	322-3354-00
A3R639	322-3404-00			RES,FXD,FILM:158K OHM,1%,0.2W,TC=T0	91637	CCF50-2F15802F
A3R640	322-3418-00			RES,FXD,FILM:221K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 221K
A3R641	322-3318-00			RES,FXD,FILM:20K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 20K0
A3R642	322-3162-00			RES,FXD,FILM:475 OHM,1%,0.2W,TC=T0	80009	322-3162-00
A3R643	322-3354-00			RES,FXD,FILM:47.5K OHM,1%,0.2W,TC=T0	80009	322-3354-00
A3R644	322-3258-00			RES,FXD,FILM:4.75K OHM,1%,0.2W,TC=T0	80009	322-3258-00
A3R646	322-3258-00			RES,FXD,FILM:4.75K OHM,1%,0.2W,TC=T0	80009	322-3258-00
A3R647	315-0184-00			RES,FXD,FILM:180K OHM,5%,0.25W	80009	315-0184-00
A3R649	322-3356-00			RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=T0	80009	322-3356-00
A3R650	322-3318-00			RES,FXD,FILM:20K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 20K0
A3R651	322-3322-00			RES,FXD,FILM:22.1K OHM,1%,0.2W,TC=T0	80009	322-3322-00
A3R652	322-3354-00			RES,FXD,FILM:47.5K OHM,1%,0.2W,TC=T0	80009	322-3354-00
A3R653	322-3222-00			RES,FXD,FILM:2K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 2K00
A3R654	322-3220-00			RES,FXD,FILM:1.91K OHM,1%,0.2W,TC=T0	80009	322-3220-00
A3R655	322-3310-00			RES,FXD,FILM:16.5K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 16K5
A3R656	321-0380-00			RES,FXD,FILM:88.7K OHM,1%,0.125W,TC=T0	07716	CEAD88701F
A3R657	322-3251-00			RES,FXD,FILM:4.02K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K02
A3R658	322-3200-00			RES,FXD,FILM:1.18K OHM,1%,0.2W,TC=T0	80009	322-3200-00
A3R659	322-3066-00			RES,FXD,FILM:47.5 OHM,1%,0.2W,TC=T0	09969	CCF502G47R50F
A3R660	311-2234-00			RES,VAR,TRMR:CERMET;5K OHM,20%,0.5W,0.197 SQ,TOP ADJUST;T&R	TK1450	GF06UT 5K
A3R661	311-2234-00			RES,VAR,TRMR:CERMET;5K OHM,20%,0.5W,0.197 SQ,TOP ADJUST;T&R	TK1450	GF06UT 5K
A3R662	322-3322-00			RES,FXD,FILM:22.1K OHM,1%,0.2W,TC=T0	80009	322-3322-00
A3R663	322-3481-00			RES,FXD,FILM:1M OHM,1%,0.2W,TC=T0	80009	322-3481-00
A3R664	315-0511-00			RES,FXD,FILM:510 OHM,5%,0.25W	80009	315-0511-00
A3R665	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	80009	315-0472-00
A3R666	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	80009	315-0223-00
A3R669	322-3377-00			RES,FXD,FILM:82.5K OHM,1%,0.2W,TC=T0	91637	CCF50-2F82501F
A3R670	322-3222-00			RES,FXD,FILM:2K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 2K00
A3R671	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25W	80009	315-0302-00
A3R672	322-3193-00			RES,FXD,FILM:1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K00
A3R673	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	80009	315-0202-00
A3R674	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	80009	315-0202-00
A3R675	322-3172-00			RES,FXD,FILM:604 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 604E
A3R676	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315-0103-00
A3R677	315-0123-00			RES,FXD,FILM:12K OHM,5%,0.25W	80009	315-0123-00
A3R678	315-0303-00			RES,FXD,FILM:30K OHM,5%,0.25W	80009	315-0303-00
A3R679	315-0303-00			RES,FXD,FILM:30K OHM,5%,0.25W	80009	315-0303-00
A3R680	311-2232-00			RES,VAR,TRMR:CERMET,2K OHM,20%,0.5W,0.197 SQ,TOP ADJUST;T&R	TK1450	GF06UT 2K
A3R681	322-3304-00	672-1229-00	672-1229-00	RES,FXD,FILM:14.3K OHM,1%,0.2W,TC=T0	80009	322-3304-00
A3R681	322-3346-00	672-1229-01		RES,FXD,FILM:39.2K OHM,1%,0.2W,TC=T0	80009	322-3346-00
A3R681	322-3304-00	672-1266-00	672-1266-00	RES,FXD,FILM:14.3K OHM,1%,0.2W,TC=T0	80009	322-3304-00
A3R681	322-3346-00	672-1266-01		RES,FXD,FILM:39.2K OHM,1%,0.2W,TC=T0	80009	322-3346-00
A3R681	322-3304-00	672-0225-00	672-0225-00	RES,FXD,FILM:14.3K OHM,1%,0.2W,TC=T0	80009	322-3304-00

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A3R681	322-3346-00	672-0225-01		RES,FXD,FILM:39.2K OHM,1%,0.2W,TC=T0	80009	322-3346-00
A3R682	322-3179-00			RES,FXD,FILM:715 OHM,1%,0.2W,TC=T0	80009	322-3179-00
A3R683	311-2233-00			RES,VAR,TRMR:CERMET;3K OHM,20%,0.5W,0.197 S Q,TOP ADJUST;T&R	80009	311-2233-00
A3R687	322-3275-00			RES,FXD,FILM:7.15K OHM,1%,0.2W,TC=T0	80009	322-3275-00
A3R688	322-3268-00			RES,FXD,FILM:6.04K OHM,1%,0.2W,TC=T0	80009	322-3268-00
A3R689	311-2234-00			RES,VAR,TRMR:CERMET;5K OHM,20%,0.5W,0.197 S Q,TOP ADJUST;T&R	TK1450	GF06UT 5K
A3R690	322-3297-00			RES,FXD,FILM:12.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 12K1
A3R691	322-3297-00			RES,FXD,FILM:12.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 12K1
A3R692	322-3239-00			RES,FXD,FILM:3.01K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 3K01
A3R693	322-3164-00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A3R694	322-3193-00			RES,FXD,FILM:1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K00
A3R695	322-3164-00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E
A3R696	321-0603-07			RES,FXD,FILM:15K OHM,0.1%,0.125W,TC=T9	80009	321-0603-07
A3R697	315-0184-00			RES,FXD,FILM:180K OHM,5%,0.25W	80009	315-0184-00
A3R698	315-0220-00			RES,FXD,FILM:22 OHM,5%,0.25W	80009	315-0220-00
A3R700	311-2269-00			RES,VAR,NONWW:TRMR,20K OHM,20%,0.5W	80009	311-2269-00
A3R701	311-2269-00			RES,VAR,NONWW:TRMR,20K OHM,20%,0.5W	80009	311-2269-00
A3R732	307-0446-00			RES NTWK,FXD,FI:10K OHM,20%,(9)RES	80009	307-0446-00
A3R734	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315-0103-00
A3R736	307-0696-00			RES NTWK,FXD,FI:7,10K OHM,2%,0.15W EACH	80009	307-0696-00
A3R740	322-3322-00			RES,FXD,FILM:22.1K OHM,1%,0.2W,TC=T0	80009	322-3322-00
A3R741	322-3235-00			RES,FXD,FILM:2.74K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 2K74
A3R742	322-3412-00			RES,FXD,FILM:191K OHM,1%,0.2W,TC=T0	80009	322-3412-00
A3R743	322-3412-00			RES,FXD,FILM:191K OHM,1%,0.2W,TC=T0	80009	322-3412-00
A3R746	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	80009	315-0472-00
A3R750	322-3412-00			RES,FXD,FILM:191K OHM,1%,0.2W,TC=T0	80009	322-3412-00
A3R751	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	80009	315-0473-00
A3R752	321-0337-00			RES,FXD,FILM:31.6K OHM,1%,0.125W,TC=T0	07716	CEAD31601F
A3R753	321-0429-00			RES,FXD,FILM:287K OHM,1%,0.125W,TC=T0	07716	CEAD28702F
A3R754	322-3402-00			RES,FXD,FILM:150K OHM,1%,0.2W,TC=T0	80009	322-3402-00
A3R755	315-0911-00			RES,FXD,FILM:910 OHM,5%,0.25W	80009	315-0911-00
A3R756	322-3285-00			RES,FXD,FILM:9.09K OHM,1%,0.2W,TC=T0	80009	322-3285-00
A3R757	322-3308-00			RES,FXD,FILM:15.8K OHM,1%,0.2W,TC=T0	80009	322-3308-00
A3R758	322-3308-00			RES,FXD,FILM:15.8K OHM,1%,0.2W,TC=T0	80009	322-3308-00
A3R759	322-3179-00			RES,FXD,FILM:715 OHM,1%,0.2W,TC=T0	80009	322-3179-00
A3R761	321-0172-00			RES,FXD,FILM:604 OHM,1%,0.125W,TC=T0	80009	321-0172-00
A3R762	321-0172-00			RES,FXD,FILM:604 OHM,1%,0.125W,TC=T0	80009	321-0172-00
A3R764	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315-0103-00
A3R765	315-0204-00			RES,FXD,FILM:200K OHM,5%,0.25W	80009	315-0204-00
A3R766	321-0300-00			RES,FXD,FILM:13.0K OHM,1%,0.125W,TC=T0	07716	CEAD13001F
A3R767	322-3293-00			RES,FXD,FILM:11K OHM,1%,0.2W,TC=T0	80009	322-3293-00
A3R768	322-3356-00	672-1229-00	672-1229-02	RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=T0	80009	322-3356-00
A3R768	322-3352-00	672-1229-03		RES,FXD,FILM:45.3K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 45K3
A3R768	322-3356-00	672-1266-00	672-1266-02	RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=T0	80009	322-3356-00
A3R768	322-3352-00	672-1266-03		RES,FXD,FILM:45.3K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 45K3
A3R768	322-3356-00	672-0225-00	672-0225-02	RES,FXD,FILM:49.9K OHM,1%,0.2W,TC=T0	80009	322-3356-00
A3R768	322-3352-00	672-0225-03		RES,FXD,FILM:45.3K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 45K3
A3R771	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25W	80009	315-0302-00
A3R772	315-0123-00			RES,FXD,FILM:12K OHM,5%,0.25W	80009	315-0123-00
A3R773	322-3268-00			RES,FXD,FILM:6.04K OHM,1%,0.2W,TC=T0	80009	322-3268-00
A3R774	315-0333-00			RES,FXD,FILM:33K OHM,5%,0.25W	80009	315-0333-00
A3R775	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	80009	315-0101-00
A3R776	322-3193-00			RES,FXD,FILM:1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K00
A3R777	322-3385-00			RES,FXD,FILM:100K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 100K
A3R783	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	80009	315-0202-00
A3R784	322-3385-00			RES,FXD,FILM:100K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 100K
A3R792	322-3164-00			RES,FXD,FILM:499 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 499E

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A3R793	315-0123-00			RES,FXD,FILM:12K OHM,5%,0.25W	80009	315-0123-00
A3R794	315-0272-00			RES,FXD,FILM:2.7K OHM,5%,0.25W	80009	315-0272-00
A3R795	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315-0103-00
A3R796	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	80009	315-0472-00
A3R797	315-0432-00			RES,FXD,FILM:4.3K OHM,5%,0.25W	80009	315-0432-00
A3R805	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	80009	315-0104-00
A3R823	315-0243-00			RES,FXD,FILM:24K OHM,5%,0.25W	80009	315-0243-00
A3R824	322-3251-00			RES,FXD,FILM:4.02K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K02
A3R825	322-3254-00			RES,FXD,FILM:4.32K OHM,1%,0.2W,TC=T0	80009	322-3254-00
A3R826	322-3402-00			RES,FXD,FILM:150K OHM,1%,0.2W,TC=T0	80009	322-3402-00
A3R827	322-3402-00			RES,FXD,FILM:150K OHM,1%,0.2W,TC=T0	80009	322-3402-00
A3R834	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	80009	315-0101-00
A3R835	315-0225-00			RES,FXD,FILM:2.2M OHM,5%,0.25W	01121	CB2255
A3R836	315-0225-00			RES,FXD,FILM:2.2M OHM,5%,0.25W	01121	CB2255
A3R837	322-3310-00			RES,FXD,FILM:16.5K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 16K5
A3R838	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A3R839	315-0102-00			RES,FXD,FILM:1K OHM,5%,0.25W	80009	315-0102-00
A3R840	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	80009	315-0202-00
A3R845	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	80009	315-0473-00
A3R846	322-3293-00			RES,FXD,FILM:11K OHM,1%,0.2W,TC=T0	80009	322-3293-00
A3R847	315-0272-00			RES,FXD,FILM:2.7K OHM,5%,0.25W	80009	315-0272-00
A3R848	322-3258-00			RES,FXD,FILM:4.75K OHM,1%,0.2W,TC=T0	80009	322-3258-00
A3R849	321-0317-00			RES,FXD,FILM:19.6K OHM,1%,0.125W,TC=T0	07716	CEAD19601F
A3R850	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	80009	315-0473-00
A3R851	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315-0103-00
A3R852	322-3193-00			RES,FXD,FILM:1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K00
A3R853	322-3293-00			RES,FXD,FILM:11K OHM,1%,0.2W,TC=T0	80009	322-3293-00
A3R854	321-0452-00			RES,FXD,FILM:499K OHM,1%,0.125W,TC=T0	80009	321-0452-00
A3R855	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	80009	315-0473-00
A3R856	311-2236-00			RES,VAR,TRMR:CERMET;20K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST;T&R	TK1450	GF06UT 20K
A3R857	322-3308-00			RES,FXD,FILM:15.8K OHM,1%,0.2W,TC=T0	80009	322-3308-00
A3R858	322-3308-00			RES,FXD,FILM:15.8K OHM,1%,0.2W,TC=T0	80009	322-3308-00
A3R859	321-0300-00			RES,FXD,FILM:13.0K OHM,1%,0.125W,TC=T0	07716	CEAD13001F
A3R860	322-3293-00			RES,FXD,FILM:11K OHM,1%,0.2W,TC=T0	80009	322-3293-00
A3R861	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	80009	315-0203-00
A3R865	322-3233-00			RES,FXD,FILM:2.61K OHM,1%,0.2W,TC=T0	80009	322-3233-00
A3R866	322-3097-00			RES,FXD,FILM:100 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 100E
A3R867	322-3097-00			RES,FXD,FILM:100 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 100E
A3R868	322-3233-00			RES,FXD,FILM:2.61K OHM,1%,0.2W,TC=T0	80009	322-3233-00
A3R870	322-3193-00			RES,FXD,FILM:1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K00
A3R871	322-3385-00			RES,FXD,FILM:100K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 100K
A3R873	315-0100-00			RES,FXD,FILM:10 OHM,5%,0.25W	19701	5043CX10RR00J
A3R874	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	80009	315-0472-00
A3R875	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	80009	315-0472-00
A3R876	322-3207-00			RES,FXD,FILM:1.4K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K4
A3R878	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315-0103-00
A3R881	322-3258-00			RES,FXD,FILM:4.75K OHM,1%,0.2W,TC=T0	80009	322-3258-00
A3R882	322-3097-00			RES,FXD,FILM:100 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 100E
A3R883	322-3170-00			RES,FXD,FILM:576 OHM,1%,0.2W,TC=T0	80009	322-3170-00
A3R884	322-3274-00			RES,FXD,FILM:6.98K OHM,1%,0.2W,TC=T0	91637	CCF502G69800FT
A3R885	322-3385-00			RES,FXD,FILM:100K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 100K
A3R887	315-0822-00			RES,FXD,FILM:8.2K OHM,5%,0.25W	80009	315-0822-00
A3R888	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	80009	315-0473-00
A3R889	315-0122-00			RES,FXD,FILM:1.2K OHM,5%,0.25W	80009	315-0122-00
A3R890	315-0202-00			RES,FXD,FILM:2K OHM,5%,0.25W	80009	315-0202-00
A3R891	315-0153-00			RES,FXD,FILM:15K OHM,5%,0.25W	80009	315-0153-00
A3R892	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	80009	315-0101-00
A3R893	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	80009	315-0222-00

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A3R894	315-0332-00			RES,FXD,FILM:3.3K OHM,5%,0.25W	80009	315-0332-00
A3R895	315-0302-00			RES,FXD,FILM:3K OHM,5%,0.25W	80009	315-0302-00
A3R896	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	80009	315-0472-00
A3R897	315-0222-00			RES,FXD,FILM:2.2K OHM,5%,0.25W	80009	315-0222-00
A3R898	315-0153-00			RES,FXD,FILM:15K OHM,5%,0.25W	80009	315-0153-00
A3R899	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315-0103-00
A3R907	315-0203-00			RES,FXD,FILM:20K OHM,5%,0.25W	80009	315-0203-00
A3R923	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	80009	315-0472-00
A3R924	315-0473-00			RES,FXD,FILM:47K OHM,5%,0.25W	80009	315-0473-00
A3R926	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315-0103-00
A3R927	315-0101-00			RES,FXD,FILM:100 OHM,5%,0.25W	80009	315-0101-00
A3R938	315-0331-00			RES,FXD,FILM:330 OHM,5%,0.25W	80009	315-0331-00
A3R939	315-0682-00			RES,FXD,FILM:6.8K OHM,5%,0.25W	80009	315-0682-00
A3R944	321-0380-00			RES,FXD,FILM:88.7K OHM,1%,0.125W,TC=T0	07716	CEAD88701F
A3R947	322-3421-00			RES,FXD,FILM:237K OHM,1%,0.2W,TC=T0	91637	CCF50-2F23702F
A3R950	321-0317-00			RES,FXD,FILM:19.6K OHM,1%,0.125W,TC=T0	07716	CEAD19601F
A3R951	322-3066-00			RES,FXD,FILM:47.5 OHM,1%,0.2W,TC=T0	09969	CCF502G47R50F
A3R953	322-3481-00			RES,FXD,FILM:1M OHM.1%,0.2W,TC=T0	80009	322-3481-00
A3R954	315-0334-00			RES,FXD,FILM:330K OHM,5%,0.25W	80009	315-0334-00
A3R956	315-0472-00			RES,FXD,FILM:4.7K OHM,5%,0.25W	80009	315-0472-00
A3R957	322-3318-00			RES,FXD,FILM:20K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 20K0
A3R958	322-3385-00			RES,FXD,FILM:100K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 100K
A3R959	322-3385-00			RES,FXD,FILM:100K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 100K
A3R960	322-3385-00			RES,FXD,FILM:100K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 100K
A3R963	322-3243-00			RES,FXD,FILM:3.32K OHM,1%,0.2W,TC=T0	91637	CCF50-1-G33200F
A3R964	322-3481-00			RES,FXD,FILM:1M OHM.1%,0.2W,TC=T0	80009	322-3481-00
A3R965	322-3385-00			RES,FXD,FILM:100K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 100K
A3R966	322-3354-00			RES,FXD,FILM:47.5K OHM,1%,0.2W,TC=T0	80009	322-3354-00
A3R975	322-3246-00			RES,FXD,FILM:3.57K OHM,1%,0.2W,TC=T0	80009	322-3246-00
A3R976	322-3085-00			RES,FXD,FILM:75 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 75E0
A3R977	301-0681-00			RES,FXD,FILM:680 OHM,5%,0.5W	01121	EB6815
A3R982	322-3066-00			RES,FXD,FILM:47.5 OHM,1%,0.2W,TC=T0	09969	CCF502G47R50F
A3R983	322-3097-00			RES,FXD,FILM:100 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 100E
A3R987	315-0682-00			RES,FXD,FILM:6.8K OHM,5%,0.25W	80009	315-0682-00
A3R988	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	80009	315-0223-00
A3R989	315-0392-00			RES,FXD,FILM:3.9K OHM,5%,0.25W	80009	315-0392-00
A3R990	322-3250-00			RES,FXD,FILM:3.92K OHM,1%,0.2W,TC=T0	91637	CCF50-2F39200F
A3R991	315-0104-00			RES,FXD,FILM:100K OHM,5%,0.25W	80009	315-0104-00
A3R992	315-0224-00			RES,FXD,FILM:220K OHM,5%,0.25W	80009	315-0224-00
A3R993	315-0103-00			RES,FXD,FILM:10K OHM,5%,0.25W	80009	315-0103-00
A3R994	315-0223-00			RES,FXD,FILM:22K OHM,5%,0.25W	80009	315-0223-00
A3R997	315-0153-00			RES,FXD,FILM:15K OHM,5%,0.25W	80009	315-0153-00
A3S404	260-2301-00			SWITCH,PUSH:SPST,25MA,15VAC	34361	B3F3152
A3S504	260-2301-00			SWITCH,PUSH:SPST,25MA,15VAC	34361	B3F3152
A3S604	260-2301-00			SWITCH,PUSH:SPST,25MA,15VAC	34361	B3F3152
A3S704	260-2301-00			SWITCH,PUSH:SPST,25MA,15VAC	34361	B3F3152
A3S804	260-2301-00			SWITCH,PUSH:SPST,25MA,15VAC	34361	B3F3152
A3U125	156-1150-00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR;NEGATIV E,-5.0V,100MA,4%;MC79L05ACP,TO-92	80009	156-1150-00
A3U164	156-1451-00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR;NEGATIV E,ADJUSTABLE,1.5A,4%;LM337T,TO-220	80009	156-1451-00
A3U172	156-1161-00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR;POSITIV E,ADJUSTABLE,1.5A,4%;LM317T,TO-220	04713	LM317T
A3U231	156-1191-00			IC,LINEAR:BIFET,OP-AMP;DUAL;TL072CN/LF353N, DIP08.3	80009	156-1191-00
A3U234	156-0941-00			IC,DIGITAL:CMOS,GATES;QUAD 2-INPUT NAND;74C 00,DIP14.3,TUBE,CERAMIC	27014	MM74C00 J OR N
A3U239	156-1225-00			IC,LINEAR:BIPOLAR,COMPARATOR;DUAL,OPEN COLL ECTOR,300NS;LM393N,DIP08.3	01295	LM393P

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A3U252	156-0048-00			IC,LINEAR:	80009	156-0048-00
A3U263	156-1225-00			IC,LINEAR:BIPOLAR,COMPARATOR;DUAL,OPEN COLLECTOR,300NS;LM393N,DIP08.3	01295	LM393P
A3U277	156-1850-00			IC,MISC:CMOS,ANALOG SWITCH;QUAD;DG211,DIP16.3	17856	SDG21107
A3U305	156-0259-00			IC,LINEAR:	80009	156-0259-00
A3U325	156-2493-00			IC,CONVERTER:	80009	156-2493-00
A3U331	156-0910-00			IC,DIGITAL:LSTTL,COUNTER;DUAL 4-BIT DECADE;74LS390,DIP16.3,TUBE	80009	156-0910-00
A3U334	156-0575-00			IC,DIGITAL:CMOS,GATE;TRIPLE 3-INPUT NOR;4025B,DIP14.3,TUBE	80009	156-0575-00
A3U395	156-1850-00			IC,MISC:CMOS,ANALOG SWITCH;QUAD;DG211,DIP16.3	17856	SDG21107
A3U407	156-1430-00			IC,DIGITAL:CMOS,MISC;4-DIGIT LED DISPLAY CONTROLLER;74C911,DIP28.6,TUBE	27014	MM74C911 N
A3U445	156-1225-00			IC,LINEAR:BIPOLAR,COMPARATOR;DUAL,OPEN COLLECTOR,300NS;LM393N,DIP08.3	01295	LM393P
A3U465	156-1225-00			IC,LINEAR:BIPOLAR,COMPARATOR;DUAL,OPEN COLLECTOR,300NS;LM393N,DIP08.3	01295	LM393P
A3U488	156-1149-00			IC,LINEAR:BIFET,OP-AMP;;LF351N,DIP08.3	27014	LF351N/GLEA134
A3U492	156-2460-00			IC,MISC:BIPOLAR,MODULATOR/DEMODULATOR;BALANCED;MC1496P,DIP14.3	04713	MC1496P
A3U495	156-1191-00			IC,LINEAR:BIFET,OP-AMP;DUAL;TL072CN/LF353N,DIP08.3	80009	156-1191-00
A3U522	160-3304-01			MICROCKT,DGTL:8052 MICROCONTROLLER W/8K ROM,PRGM (1730/1731 ONLY)	80009	160-3304-01
A3U522	160-4316-00			MICROCKT,DGTL:MICROPROCESSOR,EPROM,PRGM (1735 ONLY)	80009	160-4316-00
A3U522	160-4528-00			MICROCKT,DGTL:MICROPROCESSOR,EPROM,PRGM (1731 PM ONLY)	80009	160-4528-00
				MOUNTING PARTS		
	136-0757-00	672-0225-00	672-0225-04	SOCKET,DIP:	09922	DILB40P-108
	136-0757-00	672-1229-00	672-1229-04	SOCKET,DIP:	09922	DILB40P-108
	136-0757-00	672-1266-00	672-1266-05	SOCKET,DIP:	09922	DILB40P-108
				END MOUNTING PARTS		
A3U527	156-0913-00			IC,DIGITAL:LSTTL,FLIP FLOP;OCTAL D-TYPE, ENABLE;74LS377,DIP20.3,TUBE	80009	156-0913-00
A3U532	156-0913-00			IC,DIGITAL:LSTTL,FLIP FLOP;OCTAL D-TYPE, ENABLE;74LS377,DIP20.3,TUBE	80009	156-0913-00
A3U533	156-1221-00			IC,DIGITAL:LSTTL,FLIP FLOP;HEX D, POS EDGE TRIG, W/ENABLE;74LS378,DIP16.3,TUBE	80009	156-1221-00
A3U535	160-3662-00	672-1229-00	672-1229-01	IC,DIGITAL:STTL,PLD;PAL,16R4;16R4,DIP20.3,TUBE	80009	160-3662-00
A3U535	160-3662-01	672-1229-01		IC,DIGITAL:STTL,PLD;PAL,16R4;16R4,DIP20.3	80009	160-3662-01
A3U535	160-3662-00	672-1266-00	672-1266-01	IC,DIGITAL:STTL,PLD;PAL,16R4;16R4,DIP20.3,TUBE	80009	160-3662-00
A3U535	160-3662-01	672-1266-01		IC,DIGITAL:STTL,PLD;PAL,16R4;16R4,DIP20.3	80009	160-3662-01
A3U535	160-3662-00	672-0225-00	672-0225-01	IC,DIGITAL:STTL,PLD;PAL,16R4;16R4,DIP20.3,TUBE	80009	160-3662-00
A3U535	160-3662-01	672-0225-01		IC,DIGITAL:STTL,PLD;PAL,16R4;16R4,DIP20.3	80009	160-3662-01
				MOUNTING PARTS		
	136-0752-00			SKT,PL-IN ELEK:MICROCIRCUIT,20 DIP	09922	DILB20P-108
				END MOUNTING PARTS		
A3U541	156-2009-00			IC,DIGITAL:HCMOS,FLIP FLOP;DUAL D-TYPE;74HC74,DIP14.3,TUBE	80009	156-2009-00
A3U552	156-1191-00			IC,LINEAR:BIFET,OP-AMP;DUAL;TL072CN/LF353N,DIP08.3	80009	156-1191-00
A3U564	156-0048-00			IC,LINEAR:	80009	156-0048-00
A3U578	156-2460-00			IC,MISC:BIPOLAR,MODULATOR/DEMODULATOR;BALANCED;MC1496P,DIP14.3	04713	MC1496P

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A3U585	156-1850-00			IC,MISC:CMOS,ANALOG SWITCH;QUAD;DG211,DIP16 .3	17856	SDG21107
A3U644	156-0704-00			IC,MISC:CMOS,PLL;LOW SPEED;MC14046BCP,DIP16 .3	04713	MC14046CP
A3U655	156-1191-00			IC,LINEAR:BIFET,OP-AMP;DUAL;TL072CN/LF353N, DIP08.3	80009	156-1191-00
A3U690	156-0048-00			IC,LINEAR:	80009	156-0048-00
A3U725	156-2029-00			IC,MEMORY:NMOS,NVRAM;16 X 16, SERIAL DATA;X 2443,DIP8	60395	X2444P
				MOUNTING PARTS		
	136-0727-00			SKT,PL-IN ELEK:MICROCKT,8 CONTACT	09922	DILB8P-108
				END MOUNTING PARTS		
A3U726	156-1126-00			IC,LINEAR:BIPOLAR,COMPARATOR;OPEN COLLECTOR ,200NS;LM311N,DIP08.3	80009	156-1126-00
A3U727	156-0991-00			IC,LINEAR:BIPOLAR,VOLTAGE REGULATOR;POSITIV E,5.0V,100MA,5%;MC78L05ACP,TO-92	80009	156-0991-00
A3U731	156-0956-00			IC,DIGITAL:LSTTL,BUFFER/DRIVER;OCTAL NONINV , 3-STATE;74LS244,DIP20.3,TUBE	80009	156-0956-00
A3U735	160-3661-00			MICROCKT,DGTL:STTL,QUAD 16 INPUT REGISTERED AND-OR GATW ARRAY	80009	160-3661-00
				MOUNTING PARTS		
	136-0752-00			SKT,PL-IN ELEK:MICROCIRCUIT,20 DIP	09922	DILB20P-108
				END MOUNTING PARTS		
A3U741	156-0750-03			IC,DIGITAL:CMOS,MULTIVIBRATOR;DUAL MONOSTAB LE;74C221,DIP16.3,DUPLICATE OF 156-0750-02	27014	74C221N
A3U753	156-1225-00			IC,LINEAR:BIPOLAR,COMPARATOR;DUAL,OPEN COLL ECTOR,300NS;LM393N,DIP08.3	01295	LM393P
A3U786	156-1850-00			IC,MISC:CMOS,ANALOG SWITCH;QUAD;DG211,DIP16 .3	17856	SDG21107
A3U795	156-0048-00			IC,LINEAR:	80009	156-0048-00
A3U805	156-0941-00			IC,DIGITAL:CMOS,GATES;QUAD 2-INPUT NAND;74C 00,DIP14.3,TUBE,CERAMIC	27014	MM74C00 J OR N
A3U809	156-1373-00			IC,DIGITAL:LSTTL,BUFFER/DRIVER;QUAD, 3-STAT E;74LS125,DIP14.3,TUBE	80009	156-1373-00
A3U841	156-0941-00			IC,DIGITAL:CMOS,GATES;QUAD 2-INPUT NAND;74C 00,DIP14.3,TUBE,CERAMIC	27014	MM74C00 J OR N
A3U844	156-0750-03			IC,DIGITAL:CMOS,MULTIVIBRATOR;DUAL MONOSTAB LE;74C221,DIP16.3,DUPLICATE OF 156-0750-02	27014	74C221N
A3U884	156-1917-00			IC,DIGITAL:LSTTL,SHIFT REGISTER;8-BIT W/OUT PUT LATCH;74LS595,DIP16.3,TUBE	80009	156-1917-00
A3U892	156-1381-00			IC,LINEAR:BIPOLAR,TRANSISTOR ARRAY;THREE NP N,TWO PNP,INDEPENDENT;CA3096AE,DIP16.3	02735	CA3096AE-17
A3U947	156-1191-00			IC,LINEAR:BIFET,OP-AMP;DUAL;TL072CN/LF353N, DIP08.3	80009	156-1191-00
A3U978	156-0048-00			IC,LINEAR:	80009	156-0048-00
A3VR273	152-0243-00			DIODE,ZENER:,;15V,5%,0.4W;1N965B,DO-7 OR 35 ,TR	14433	Z5412
A3VR297	152-0175-00			DIODE,ZENER:,;5.6V,5%,0.4W;1N752A,DO-7 OR 3 5,TR	14552	TD3810976
A3VR497	152-0175-00			DIODE,ZENER:,;5.6V,5%,0.4W;1N752A,DO-7 OR 3 5,TR	14552	TD3810976
A3VR540	152-0688-00			DIODE,ZENER:,;2.4V,5%,0.4W;1N4370A,DO-7 OR 35	04713	1N4370A
A3VR769	152-0359-00			DIODE,ZENER:,;9V,500MW,5%,TEMP COMPENSATED; 1N935,DO-35	04713	SZ50850
A3VR877	152-0175-00			DIODE,ZENER:,;5.6V,5%,0.4W;1N752A,DO-7 OR 3 5,TR	14552	TD3810976
A3W99	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L	80009	131-0566-00
A3W257	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L	80009	131-0566-00

Component No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Name & Description	Mfr. Code	Mfr. Part No.
A3W786	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L	80009	131-0566-00
A3W886	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L	80009	131-0566-00
A3W921	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L	80009	131-0566-00
A3W922	131-0566-00			BUS,CONDUCTOR:DUMMY RES,0.094 OD X 0.225 L	80009	131-0566-00
A3Y709	158-0300-00			XTAL UNIT,QTZ:12 MHZ,0.05%,SERIES RESONANT	80009	158-0300-00
A3A1	671-1796-00			CIRCUIT BD ASSY:GRATICULE LIGHT,388-9768-XX WIRED	80009	671-1796-00
A3A1DS100	150-0168-00			LAMP,INCAND:14V,0.08A,WEDGE BASE,T1.75 FOR SOCKET MOUNT	80009	150-0168-00
				MOUNTING PARTS		
	136-1119-00			SOCKET,LPHLDR:PCB,LAMPHOLDER;FEMALE,STR,SINGLE,0.404 H X 0.218 TAIL,TIN,T-1.75 WEDGE BASE;,,	80009	136-1119-00
				END MOUNTING PARTS		
A3A1DS200	150-0168-00			LAMP,INCAND:14V,0.08A,WEDGE BASE,T1.75 FOR SOCKET MOUNT	80009	150-0168-00
				MOUNTING PARTS		
	136-1119-00			SOCKET,LPHLDR:PCB,LAMPHOLDER;FEMALE,STR,SINGLE,0.404 H X 0.218 TAIL,TIN,T-1.75 WEDGE BASE;,,	80009	136-1119-00
				END MOUNTING PARTS		
A3A1DS300	150-0168-00			LAMP,INCAND:14V,0.08A,WEDGE BASE,T1.75 FOR SOCKET MOUNT	80009	150-0168-00
				MOUNTING PARTS		
	136-1119-00			SOCKET,LPHLDR:PCB,LAMPHOLDER;FEMALE,STR,SINGLE,0.404 H X 0.218 TAIL,TIN,T-1.75 WEDGE BASE;,,	80009	136-1119-00
				END MOUNTING PARTS		
A3A1J100	131-4530-00			CONN,HDR::PCB,;MALE,STR,1 X 3,0.1 CTR,0.230 MLG X 0.120 TAIL,30 GOLD,BD RETENTION;,,	80009	131-4530-00
A3A1P100	131-0993-00			CONN,BOX:SHUNT/SHORTING,;FEMALE,STR,1 X 2,0.1 CTR,0.385 H,30 GOLD,BLACK,JUMPER;	22526	65474-006
A3A1P200	131-1806-00			CONN,HDR::PCB,;MALE,RTANG,1 X 31,0.15 CTR,0.230 MLG X 0.120 TAIL,30 GOLD;,,	22526	65595-131
A3A1P800	131-1806-00			CONN,HDR::PCB,;MALE,RTANG,1 X 31,0.15 CTR,0.230 MLG X 0.120 TAIL,30 GOLD;,,	22526	65595-131
J1	131-0106-02			CONN,RF JACK:	80009	131-0106-02
J2	131-0106-02			CONN,RF JACK:	80009	131-0106-02
J3	196-3146-00			FLEX STRIP:SINGLE JUMPER,1.0 L	15912	FSN-LA
J4	131-0106-02			CONN,RF JACK:	80009	131-0106-02
J5	131-0106-02			CONN,RF JACK:	80009	131-0106-02
J6	196-3146-00			FLEX STRIP:SINGLE JUMPER,1.0 L	15912	FSN-LA
J7	131-0106-02			CONN,RF JACK:	80009	131-0106-02
J8	131-0106-02			CONN,RF JACK:	80009	131-0106-02
J9	196-3146-00			FLEX STRIP:SINGLE JUMPER,1.0 L	15912	FSN-LA
J14	131-0106-02			CONN,RF JACK:	80009	131-0106-02
V1	154-0903-00			ELECTRON TUBE:CRT NTSC,FINISHED,T1710-3.30 (1730 ONLY)	80009	154-0903-00
V1	154-0904-02			ELECTRON TUBE:CRT PAL,FINISHED T1710-3.31 (1731 ONLY)	80009	154-0904-02
V1	154-0916-01			ELECTRON TUBE:CRTDUAL STD,FINISHED,T1710-3.35 (1735 ONLY)	80009	154-0916-01
V1	154-0903-16			ELECTRON TUBE:CRT,T1710-4-3.30 (1730 OPTION 74 ONLY)	80009	154-0903-16
V1	154-0904-16			ELECTRON TUBE:CRT,T1710-4-3.31 (1731 OPTION 74 ONLY)	80009	154-0904-16
V1	154-0916-16			ELECTRON TUBE:CRT,T1710-4-3.35 (1735 OPTION 74 ONLY)	80009	154-0916-16

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.

Both overline and parenthesis indicate a low asserting state.

Example: $\overline{\text{ID,CONTROL}}$ 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:

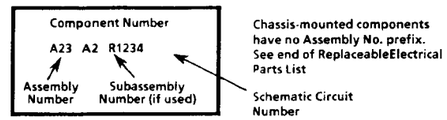
Capacitors:
Values one or greater are in picofarads (pF).
Values less than one are in microfarads (μF).
Resistors = Ohms (Ω).

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.

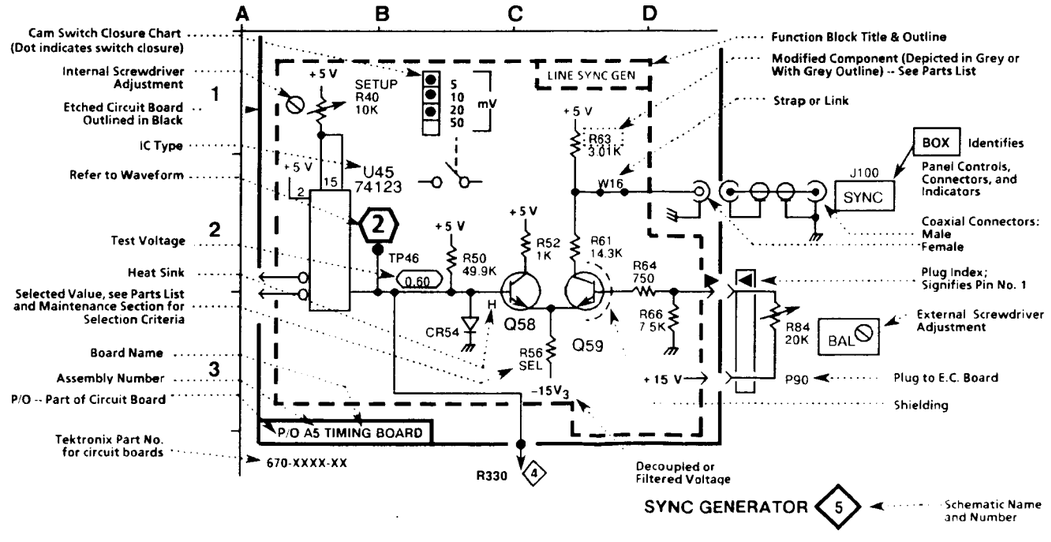
The Replaceable Electrical Parts List is arranged by assembly number in numerical sequence; the components are listed by component number. Example:



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 may only appear opposite the first diagram; the lookup table will list the diagram number of other diagrams that the other circuitry appears on.



Waveform Conditions

Waveforms appearing with the schematic diagrams were taken with a color bar signal input to Channel A input and with the front panel setup shown in Table 9-1, unless otherwise noted. Source of the signals used for these waveform photos is a Tektronix 1410–Series Television Signal Generator.

Table 9–1. Front Panel Selections for Waveform Photographs.

Control	Setting
FILTER	FLAT
REF	INT
INPUT	CH–A
GAIN	off
DC REST	OFF
MAG	off
SWEEP	2-LINE
FIELD	FLD 1
LINE SELECT	off

Schematic 1

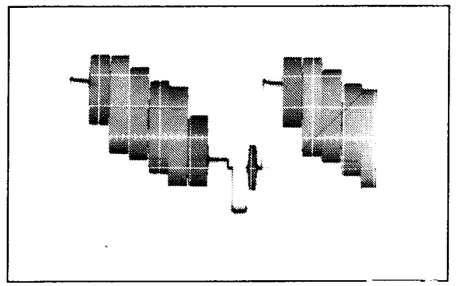


Fig. 1. Vertical ampl = 1 V: Horizontal time 100 μs.

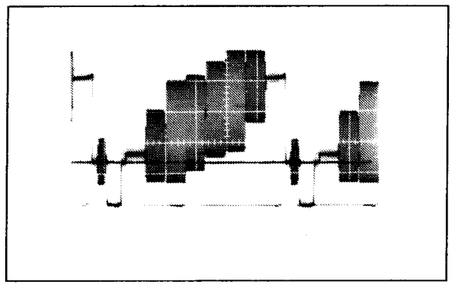


Fig. 2. Vertical ampl = 1 V: Horizontal time 100 μs.

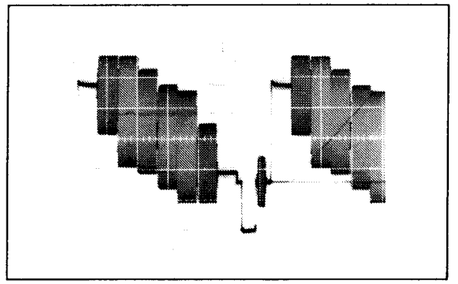


Fig. 3. Vertical ampl = 0.55 V: Horizontal time 100 μs.

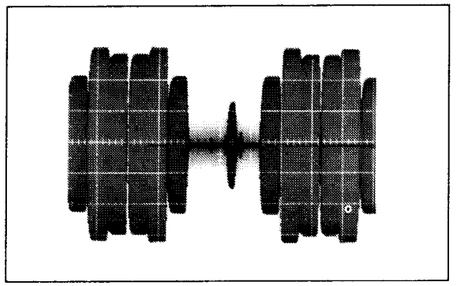


Fig. 4a. Chroma Filter: Vertical ampl = 0.03 V: Horizontal time 100 μs.

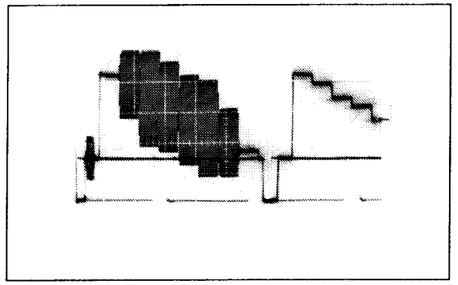


Fig. 4b. Flat & LPass Filters: Vertical ampl = 0.5 V: Horizontal time 100 μs.

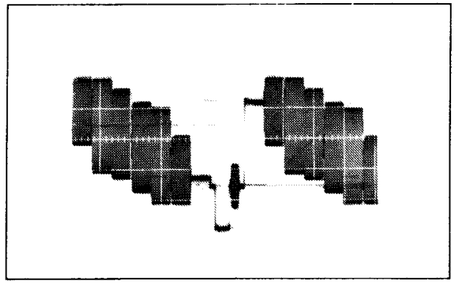


Fig. 5. Vertical ampl = 1 V: Horizontal time 100 μs.

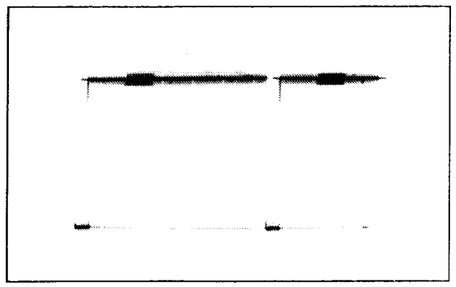
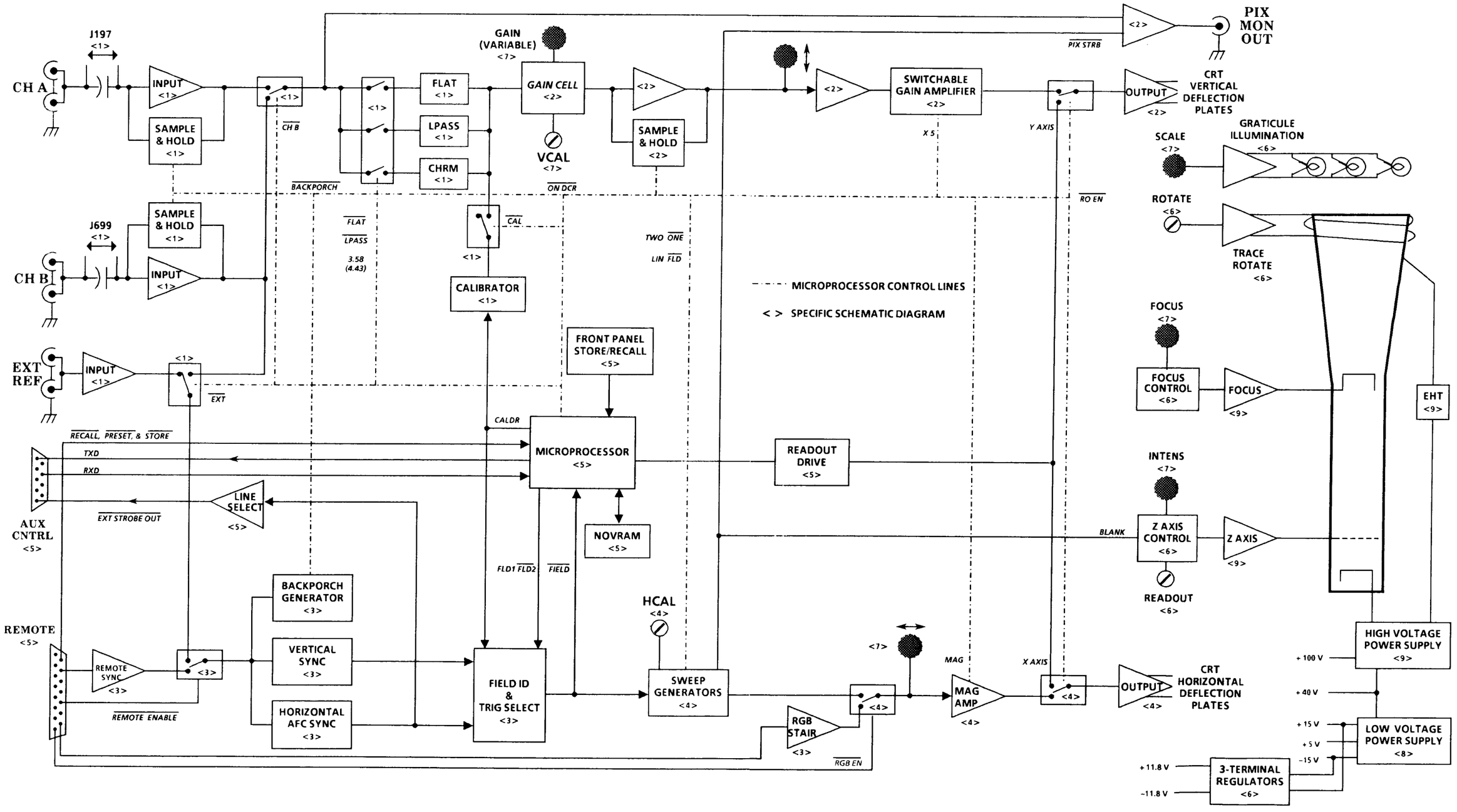
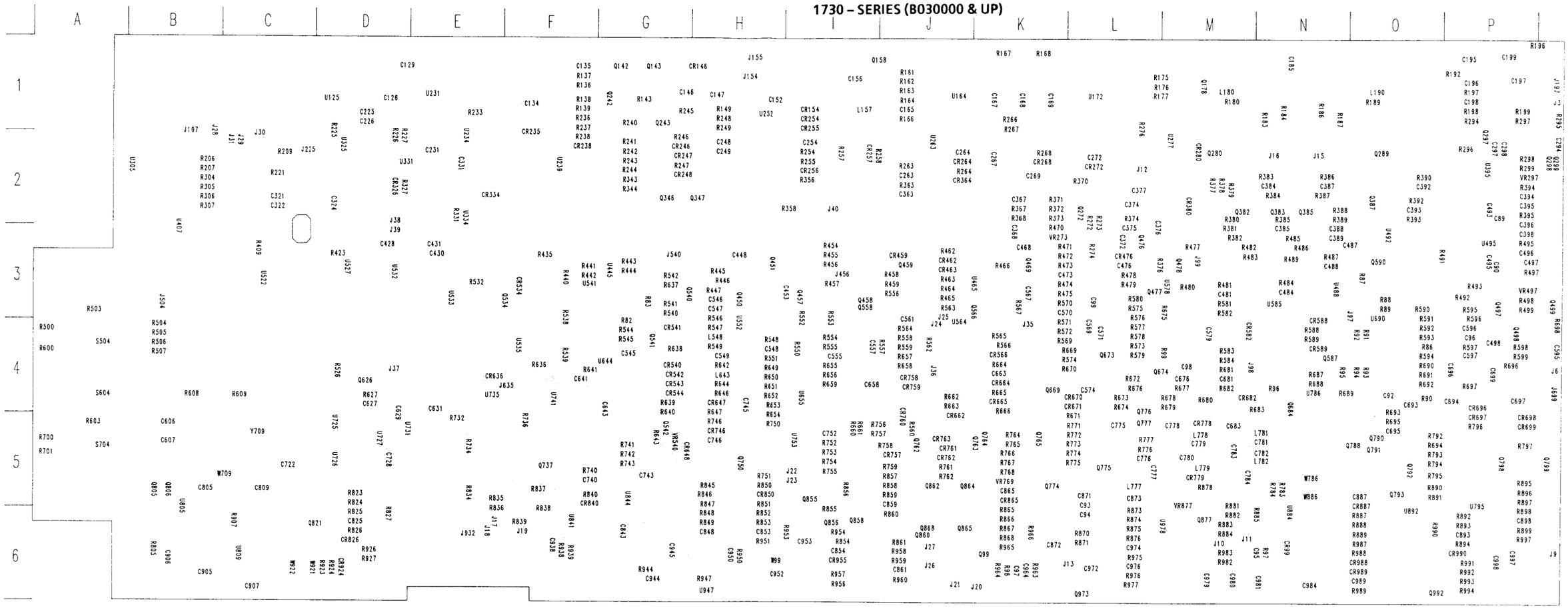


Fig. 6. Vertical ampl = 5 V: Horizontal time 100 μs.



BLOCK DIAGRAM

A3 MAIN BOARD



Static Sensitive Devices
See Maintenance Section

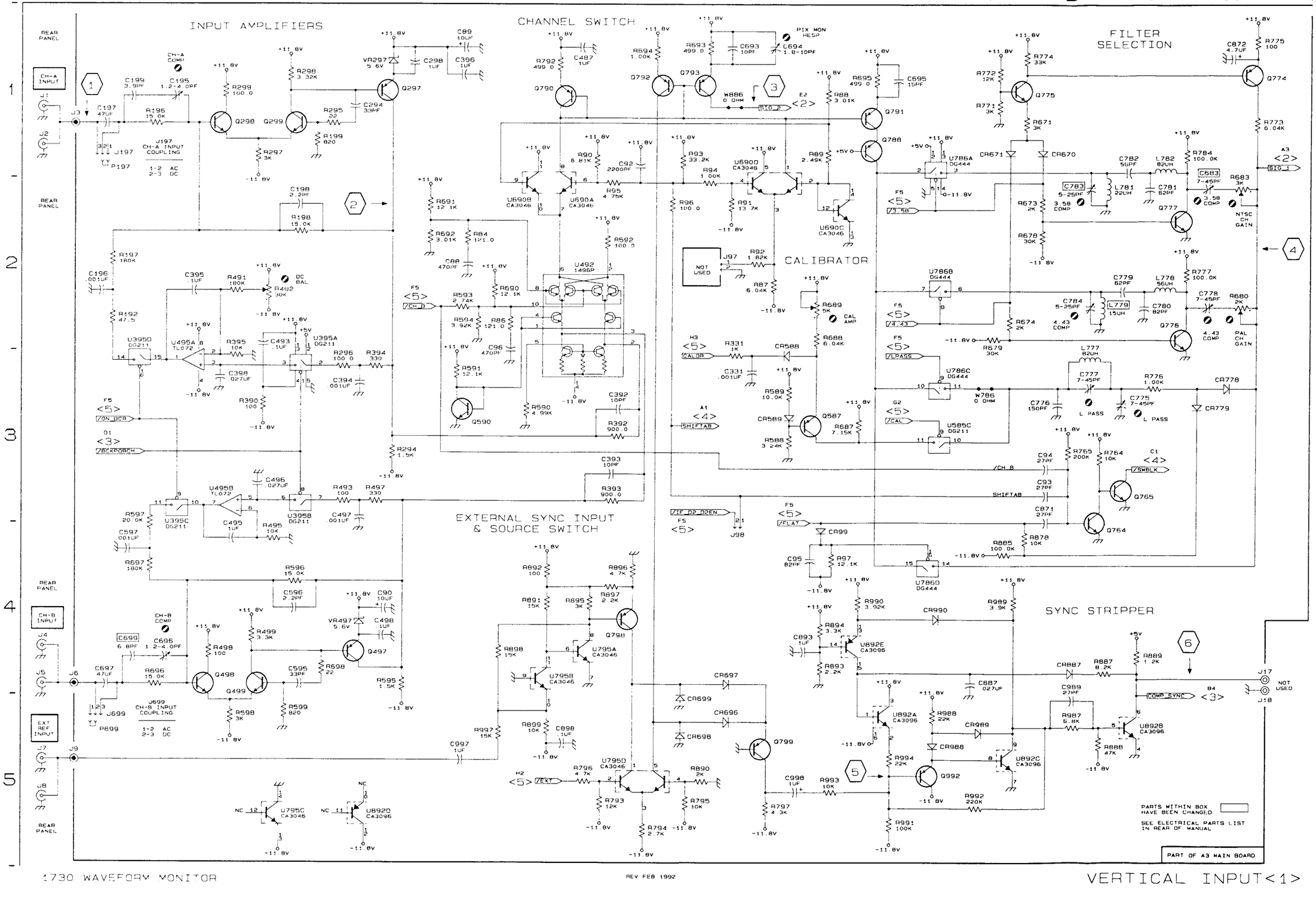
A3 Main Board

SCHEMATIC DIAGRAM <1> LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location
C88	C2	C495	B4	C871	G3	J1	A1	Q297	C1	R88	E1	R390	B3	R671	G1	R774	G1	R895	D4	U690A	D1
C89	C1	C496	B3	C872	H1	J2	A1	Q298	B1	R86	D2	R392	D3	R673	G2	R775	H1	R896	D4	U690B	D1
C90	C4	C497	C3	C887	F4	J3	A1	Q299	B1	R87	E2	R393	D3	R674	G2	R776	G3	R897	D4	U690C	F2
C92	D1	C498	C4	C893	E4	J5	A4	Q497	C4	R89	E1	R394	C3	R678	G2	R777	H2	R898	C4	U690D	E1
C93	G3	C595	B4	C898	D5	J6	A4	Q498	B4	R90	D1	R395	B3	R679	F2	R784	H1	R899	D5	U786A	F1
C94	G3	C596	B4	C989	G5	J7	A5	Q499	B4	R91	E2	R491	B2	R680	H2	R792	D1	R987	G5	U786B	F2
C95	E4	C597	A4	C997	C5	J8	A5	Q587	E3	R92	E2	R492	B2	R683	H2	R793	D5	R988	F5	U786C	F3
C96	D2	C683	H2	C998	E5	J9	A5	Q590	C3	R93	E1	R493	B3	R687	F3	R794	D5	R989	G4	U786D	F4
C195	A1	C693	E1			J17	H4	Q764	G3	R94	E2	R495	B4	R688	E2	R795	E5	R990	F4	U795A	D4
C196	A2	C694	E1	CR99	E4	J18	H4	Q765	G3	R95	D2	R497	C3	R689	E2	R793	D5	R991	F5	U795B	D4
C197	A1	C695	F1	CR588	E3	J97	E2	Q774	H1	R96	E2	R498	B4	R690	C2	R794	D5	R992	F5	U795C	B5
C198	B2	C696	A4	CR589	E3	J98	E4	Q775	G1	R97	F4	R499	B4	R691	C2	R795	E5	R993	E5	U795D	D5
C199	A1	C697	A4	CR670	G1	J197	A1	Q776	H2	R192	A2	R588	E3	R692	C2	R796	D5	R994	F5	U892A	F5
C294	C1	C699	A4	CR671	G1	J699	A5	Q777	H2	R196	A1	R589	E3	R693	E1	R797	E5	R997	C5	U892B	G5
C298	C1	C775	G3	CR696	E5			Q788	F1	R197	A2	R590	D3	R694	D1	R878	G4			U892C	G5
C331	E3	C776	G3	CR697	E4	L777	G3	Q790	D1	R198	B2	R591	C3	R695	F1	R885	G4	U395A	B3	U892D	C5
C392	D3	C777	G3	CR698	E5	L778	H2	Q791	F1	R199	B1	R592	D2	R696	A4	R887	G4	U395B	B3	U892E	F4
C393	D3	C778	H2	CR699	E5	L779	G2	Q792	D1	R294	C3	R593	C2	R697	A4	R888	G5	U395C	A3		
C394	C3	C779	G2	CR778	H3	L781	G2	Q793	E1	R295	B1	R594	C2	R698	B4	R889	G4	U395D	A3	VR297	C1
C395	B2	C780	G2	CR779	H3	L782	H1	Q798	D4	R296	B3	R595	C4	R764	G3	R890	E5	U492	D2	VR497	C4
C396	C1	C781	G2	CR887	G4			Q799	E5	R297	B1	R596	B4	R765	G3	R891	D4	U495A	B3		
C398	B3	C782	G1	CR988	F5	P197	A1	Q992	F5	R298	B1	R597	A3	R771	G1	R892	D4	U495B	B3	W786	F3
C487	D1	C783	G2	CR989	F5	P699	A5			R299	B1	R598	B5	R772	G1	R893	E4	U585A *	F2	W886	E1
C493	B2	C784	G2	CR990	F4			R84	C2	R331	E3	R599	B5	R773	H1	R894	E4	U585C	F3		

* SEE PARTS LIST FOR SERIAL NUMBER RANGES.


INPUT AMPLIFIERS
CHANNEL SWITCH
FILTER SELECTION
CALIBRATOR
EXTERNAL SYNC INPUT & SOURCE SWITCH
SYNC STRIPPER
VERTICAL INPUT
CH-A INPUT
CH-B INPUT
EXT REF INPUT
REAR PANEL
PARTS WITHIN BOX HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL
PART OF A3 MAIN BOARD

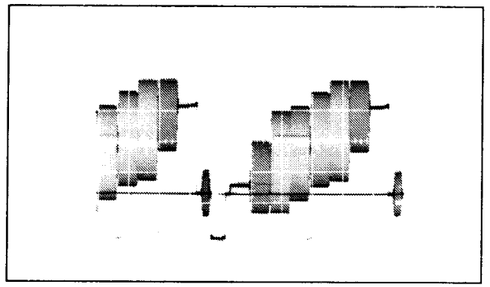


Fig. 1. Vertical ampl = 1 V: Horizontal time 100 μs.

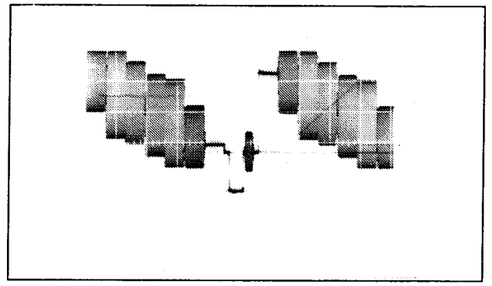


Fig. 2. Vertical ampl = 1 V: Horizontal time 100 μs DC level +3V.

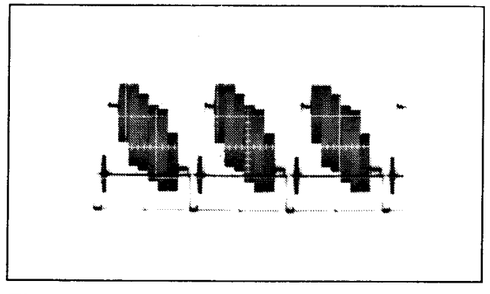
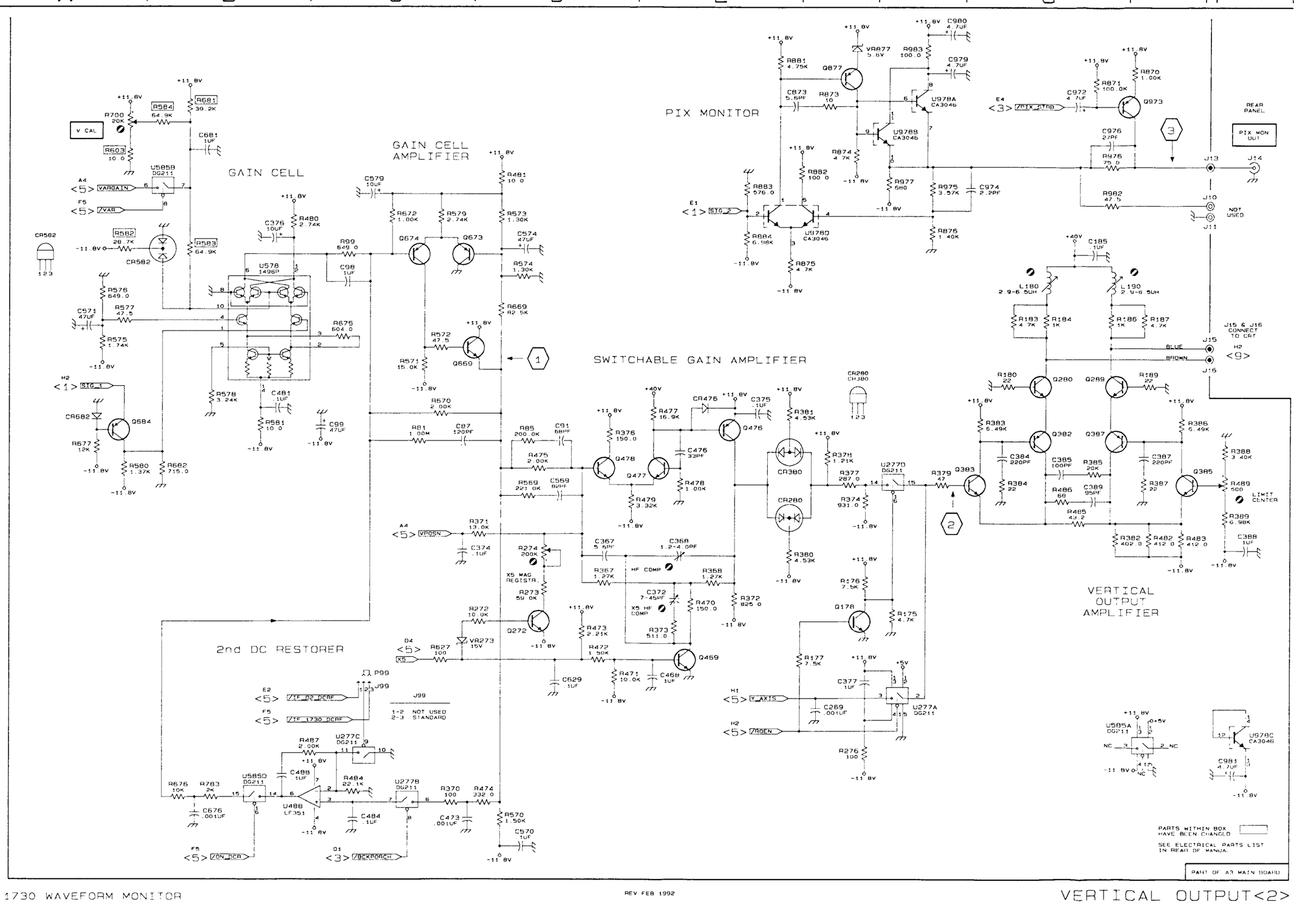


Fig. 3. Vertical ampl = 2 V: Horizontal time 200 μs.

SCHEMATIC DIAGRAM <2> LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location
C87	C3	J15	H2	R374	F3	R627	C4
C91	D3	J16	H2	R376	D3	R669	D2
C98	C2	J99	C4	R377	F3	R670	C3
C99	C3			R378	F3	R672	C2
C185	G2	L180	G2	R379	F3	R675	C2
C269	F4	L190	G2	R380	E4	R676	B5
C367	D4			R381	E3	R677	A3
C368	E4	P99	C4	R382	G3	R681	B1
C372	E4			R383	G3	R682	B3
C374	C4	Q178	F4	R384	G3	R700	A1
C375	E3	Q272	D4	R385	G3	R783	B5
C376	B2	Q280	G3	R386	H3	R870	H1
C377	F4	Q289	G3	R387	H3	R871	G1
C384	G3	Q382	G3	R388	H3	R873	F1
C385	G3	Q383	G3	R389	H3	R874	F1
C387	H3	Q385	H3	R470	E4	R875	E2
C388	H4	Q387	G3	R471	D4	R876	F2
C389	G3	Q469	E4	R472	D4	R881	E1
C468	E4	Q476	E3	R473	D4	R882	E1
C473	C5	Q477	E3	R474	D5	R883	E1
C476	E3	Q478	D3	R475	D3	R884	E2
C481	B3	Q669	C2	R477	E3	R975	F1
C484	C5	Q673	C2	R478	E3	R976	G1
C488	B5	Q674	C2	R479	D3	R977	F1
C569	D3	Q684	A3	R480	B2	R982	G2
C570	D5	Q877	F1	R481	D1	R983	F1
C571	A2	Q973	G1	R482	H3		
C574	D2			R483	H3	U277A	F4
C579	C2	R81	C3	R484	C5	U277B	C5
C629	D4	R85	D3	R485	G3	U277C	C5
C676	B5	R99	C2	R486	G3	U277D	F3
C681	B1	R175	F4	R487	B5	U488	B5
C873	E1	R176	F4	R489	H3	U578	B2
C972	G1	R177	E4	R569	D3	U585B	B1
C974	G2	R180	G3	R570	D5	U585D	B5
C976	G1	R183	G2	R571	C2	U978A	F1
C979	F1	R184	G2	R572	C2	U978B	F1
C980	F1	R186	G2	R573	D2	U978C	H5
C981	H5	R187	H2	R574	D2	U978D	E2
		R189	H3	R575	A2		
CR280	E3	R272	C4	R576	A2	VR273	C4
CR380	E3	R273	D4	R577	A2	VR877	F1
CR476	E3	R274	D4	R578	B3		
CR582	B2	R276	F5	R579	C2		
CR682	A3	R367	D4	R580	A3		
		R368	E4	R581	B3		
J10	H2	R370	C5	R582	A2		
J11	H2	R371	C3	R583	B2		
J13	H1	R372	E4	R584	B1		
J14	H1	R373	E4	R603	A1		


GAIN CELL
GAIN CELL AMPLIFIER
PIX MONITOR
SWITCHABLE GAIN AMPLIFIER
2nd DC RESTORER
VERTICAL OUTPUT AMPLIFIER
V CAL
VARGAIN
VVAR
VPOSN
PIX MON OUT
REAR PANEL
NOT USED
J15 & J16 CONNECT TO CRT
BLUE
BROWN
HF COMP
X5 MAG REGISTR
X5 HF COMP
V_AXIS
VBGEN
VIF_DC_OCAP
VIF_1730_OCAP
VON_OCA
VBLKPORCH
J99
1-2 NOT USED
2-3 STANDARD
PARTS WITHIN BOX HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL
PART OF A3 MAIN BOARD

SCHEMATIC DIAGRAM <3> LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Circuit Number	Schematic Diagram Location
C97	C2
C545	B2
C643	B3
C743	F1
C745	C2
C746	C2
C843	B2
C848	B1
C853	E5
C854	G1
C906	H3
C907	G3
C938	C5
C944	A3
C945	E5
C950	E5
C952	F2
C953	F1
C964	C1
CR636	F5
CR647	C2
CR648	C3
CR826	H2
CR850	F5
CR955	F1
J12	D1
J19	E1
J20	C1
J21	C1
J22	H1
J23	H1
J635	C4
P635	C4
Q99	C1
Q737	B1
Q805	H3
Q806	G3
Q821	G2
Q855	G1
Q856	G1
R98	C1
R435	H3
R538	G3
R539	G3
R636	B2
R647	C2
R734	C3
R736	D3
R741	C2
R742	B3
R743	B3
R751	E5
R755	G2
R805	G3
R834	C3
R835	C5
R836	C5
R837	A1
R838	B1
R839	C5
R840	B2
R845	F5
R846	F5
R847	C2
R848	C2
R849	B1
R850	E5
R851	F5
R852	E5
R853	E5
R854	G1
R855	G1
R856	G1
R907	G3
R923	G2
R924	G2
R926	G2
R938	E1
R939	F1
R944	A3
R947	E5
R950	C2
R951	E5
R953	F1
R954	G1
R956	F1
R957	F1
R963	B1
R964	C2
U535	F3
U644	B2
U735	D4
U753B	F5
U841A	C4
U841B	C5
U841C	F1
U841D	D2
U844A	B1
U844B	A3
U947A	E5
U947B	C2
W921	G2
W99	F1

HORIZONTAL SYNC GENERATOR

RGB AMPLIFIER

FIELD ID & TRIGGER SELECT

VERTICAL SYNC GENERATOR

J19 NOT USED

J22 NOT USED

J23

J20

J12

J21

J635 REMOTE SYNC POLARITY

1-2 POSITIVE
2-3 NEGATIVE

P635 J635

U644 4046

U844A 74C221

U844B 74C221

U841A 74C00

U841B 74C00

U841C 74C00

U841D 74C00

U9478 TL072

U535 160-3662-01

U735

U7538 LM393

Q737

Q99

Q856

Q855

Q821

Q806

Q805

CR955

CR826

CR647

CR648

CR636

CR850

PARTS WITHIN BOX HAVE BEEN CHANGED

SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL

PART OF A3 MAIN BOARD

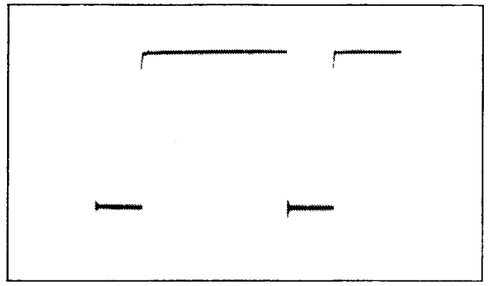


Fig. 1. Vertical ampl = 5 V: Horizontal time 100 μs.

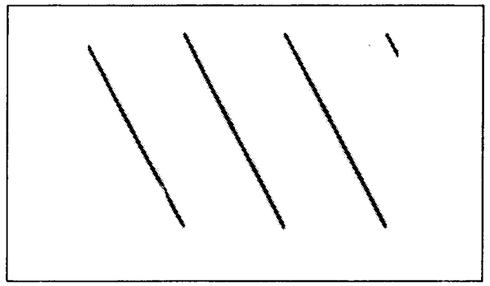


Fig. 3b. Vertical ampl = 6 V: Horizontal time 0.1 s 2-Field sweep.

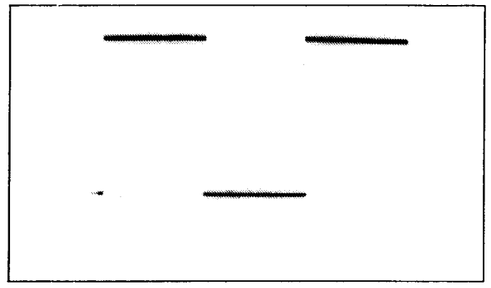


Fig. 2. Vertical ampl = 5 V: Horizontal time 50 ms DC level +3V.

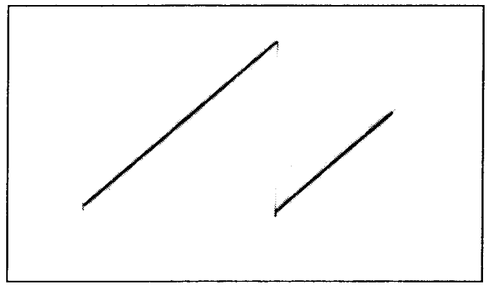


Fig. 4. Vertical ampl = 55 V: Horizontal time 200 μs.

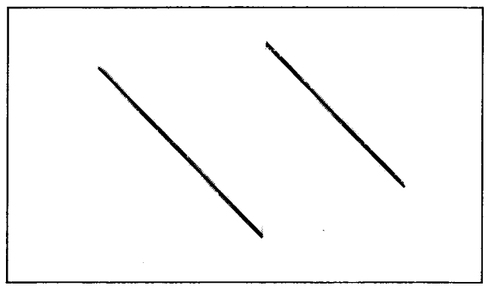


Fig. 3a. Vertical ampl = 6 V: Horizontal time 200 μs.

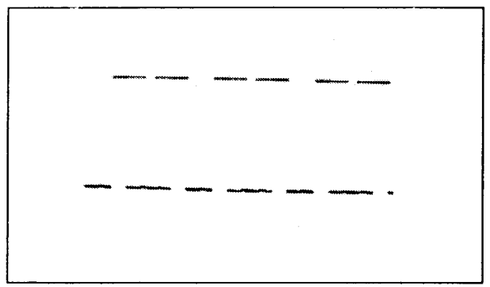


Fig. 5. Vertical ampl = 3.5 V: Horizontal time 100 ms Line Select ON.

SCHEMATIC DIAGRAM <4> LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location
C134	F4	P456	E4	R560	A1	U234B	C5
C431	C2	P540	C5	R562	E1	U234C	G1
C448	E3			R563	F2	U334A	B4
C453	E2	Q450	E4	R564	F2	U334B	C3
C546	D2	Q451	E2	R565	F1	U334C	B2
C547	D2	Q457	E5	R566	F1	U445A	A3
C548	D2	Q458	E3	R567	F2	U445B	A2
C549	D4	Q459	E5	R600	D2	U465A	G1
C555	F5	Q534	B5	R637	C4	U465B	G1
C557	F2	Q540	C5	R638	D5	U541A	B2
C561	F5	Q541	D4	R639	D5	U541B	B4
C567	F2	Q542	D4	R640	D5	U552A	E3
C641	C2	Q558	F5	R641	C2	U552B	E2
C658	C1	Q566	F1	R642	D4	U564A	F5
C663	F2	Q750	D3	R643	D4	U564B	F4
C740	C3	Q762	F3	R644	D4	U564C	F2
C752	C1	Q763	G4	R646	D2	U564D	F2
C859	H4	Q858	G4	R649	D3	U655A	F5
C861	G3	Q860	H4	R650	D3	U655B	C1
C865	H2	Q862	G4	R651	C3	U741A	C2
		Q864	H4	R652	D4	U741B	B3
CR326	C2	Q865	H3	R653	D2	U753A	D3
CR334	D2	Q868	G3	R654	D3		
CR459	E5			R655	F5	VR540	D4
CR462	F5	R82	A3	R656	F5	VR769	G2
CR463	E3	R83	A2	R657	E1		
CR534	E5	R327	C2	R658	C1		
CR540	D5	R440	B5	R659	C1		
CR541	C5	R441	B3	R660	F3		
CR542	D5	R442	B2	R661	F3		
CR543	D4	R443	A3	R662	F3		
CR544	D4	R444	A2	R663	A1		
CR566	F1	R445	E3	R664	F1		
CR662	F5	R446	E2	R665	F4		
CR664	F2	R447	E3	R666	F3		
CR665	F4	R454	E3	R740	C3		
CR746	C3	R455	E2	R746	D3		
CR757	G3	R456	E4	R750	D3		
CR758	B1	R457	E4	R752	C1		
CR759	B1	R458	E5	R753	C1		
CR760	B1	R459	E4	R754	B1		
CR761	G3	R462	E3	R756	F3		
CR762	G3	R463	F4	R757	F3		
CR763	A1	R464	E5	R758	G4		
CR865	G3	R465	F2	R759	G4		
CR924	C3	R466	G1	R761	G4		
		R532	A5	R762	H4		
J24	D1	R540	C5	R766	G3		
J25	D1	R541	C4	R767	F4		
J26	H3	R542	C5	R768	G4		
J27	H3	R544	A3	R857	H4		
J28	H1	R545	A2	R858	G4		
J29	H1	R546	D2	R859	H4		
J30	H1	R547	C2	R860	H4		
J31	H1	R548	D2	R861	G3		
J35	H2	R549	D2	R865	G2		
J36	D1	R550	E2	R866	G3		
J37	D1	R551	D2	R867	H3		
J38	B3	R552	E3	R868	H2		
J39	B3	R553	F3	R958	H3		
J40	D5	R554	E3	R959	G3		
J456	E4	R555	F3	R960	G3		
J540	C5	R556	E3	R965	H3		
		R557	F2	R966	G3		
L548	C2	R558	E2				
L643	C4	R559	E2	U234A	A4		

SWEEP GENERATOR

HORIZONTAL OUTPUT AMPLIFIER

MAGNIFIER & POSITION AMPLIFIER

R560 NOT INSTALLED

Q534 NOT INSTALLED

J540 90/100 Hz TRIGGER ENABLE
1-2 90/100 Hz
2-3 1LINE/1FLD (NORM)

J456 RGB/YRGB
1-2 RGB
2-3 YRGB

J38 NOT USED

J40 NOT USED

J24 NOT USED

J29 NOT USED

J35 NOT USED

J26 & J27 CONNECT TO CRT

PARTS WITHIN HOX HAVE BEEN CHANGED

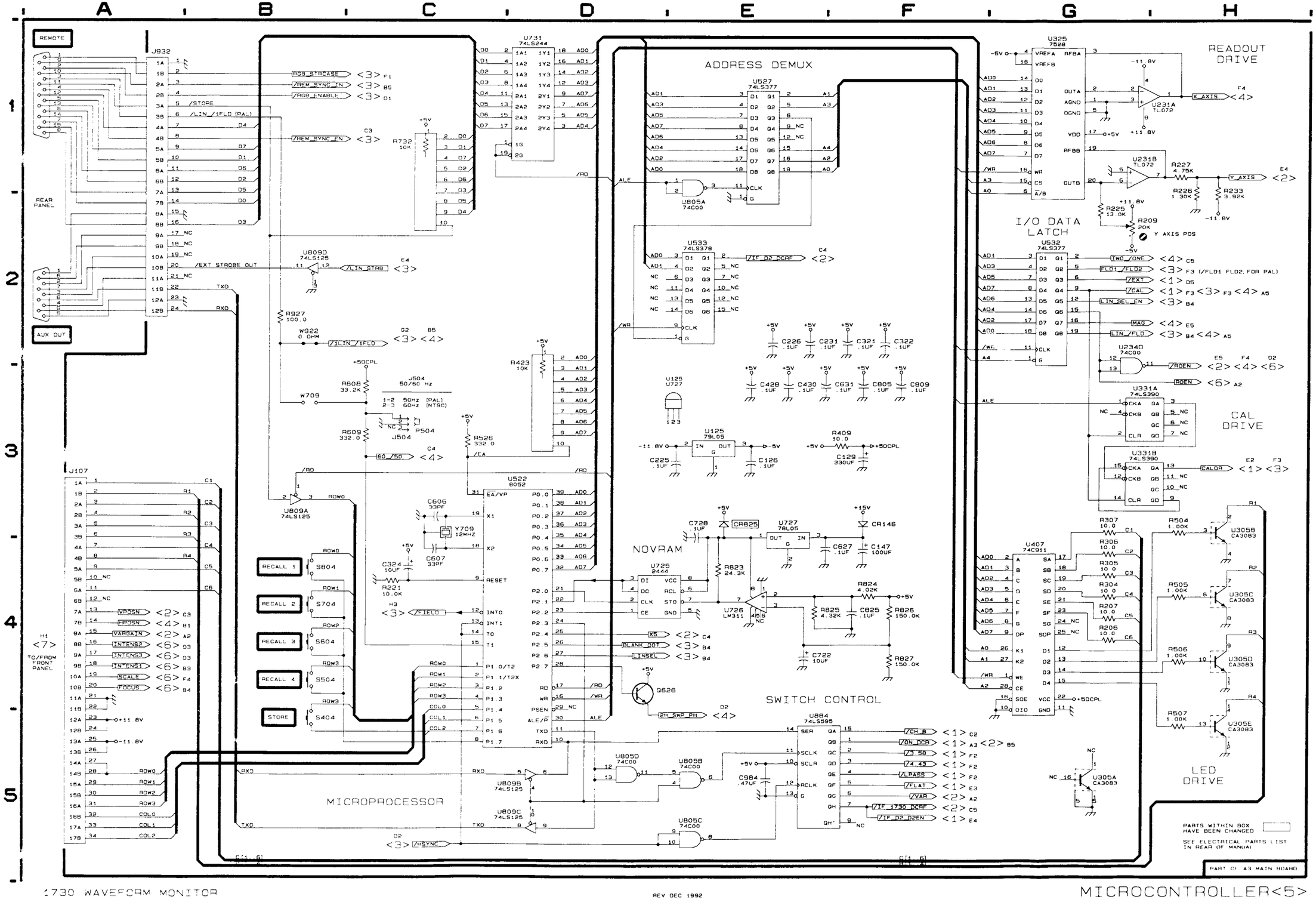
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL

PART OF A3 MAIN BOARD

SCHEMATIC DIAGRAM <5> LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location
C126	E3	R609	C3
C129	F3	R732	C1
C147	F4	R823	E3
C225	E3	R824	F4
C226	E2	R825	E4
C231	E2	R826	F4
C321	F2	R827	F4
C322	F2	R927	B2
C324	C4		
C428	E3	S404	B5
C430	E3	S504	B4
C606	C3	S604	B4
C607	C4	S704	B4
C627	E4	S804	B4
C631	E3		
C722	E4	U125	E3
C728	E4	U231A	G1
C805	F3	U231B	G1
C809	F3	U234D	G2
C825	F4	U305A	G5
C984	E5	U305B	H3
		U305C	H4
CR146	F3	U305D	H4
		U305E	H5
J107	A3	U325	G1
J504	C3	U331A	G3
J932	A1	U331B	G3
		U407	G4
P504	C3	U522	C3
		U527	E1
Q626	D4	U532	G2
		U533	E2
R206	G4	U725	D4
R207	G4	U726	E4
R209	G2	U727	E3
R221	C4	U731	D1
R225	G2	U805A	E1
R226	H1	U805B	E5
R227	H1	U805C	E5
R233	H1	U805D	D5
R304	G4	U809A	B3
R305	G4	U809B	D5
R306	G3	U809C	D5
R307	G3	U809D	B2
R409	F3	U884	E5
R423	D2		
R504	H3	W709	B3
R505	H4	W922	B2
R506	H4		
R507	H5	Y709	C3
R526	C3		
R608	C3		



1730 WAVEFORM MONITOR

REV DEC 1992

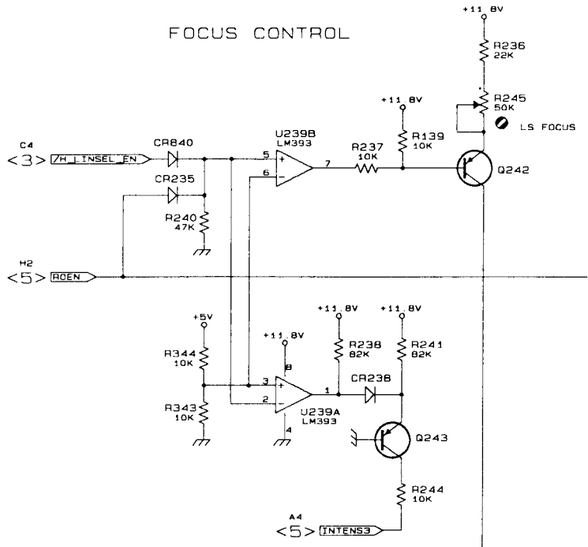
MICROCONTROLLER<5>

SCHEMATIC DIAGRAM <6> LOOK-UP CHART

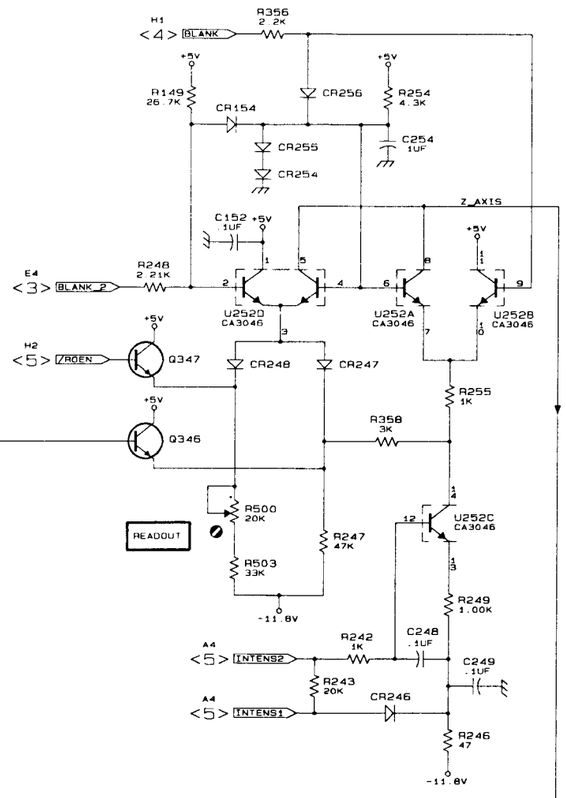
The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location
C135	G2	R136	G2
C146	A4	R137	G2
C152	D2	R138	C4
C156	G3	R139	C2
C165	F4	R143	H2
C167	F5	R149	D1
C168	D5	R161	F3
C169	D5	R162	F3
C248	E3	R163	F3
C249	E3	R164	F3
C254	E1	R166	F4
C263	G4	R167	E5
C264	E5	R168	D5
C267	F5	R236	C2
C272	D5	R237	B2
C363	G3	R238	B3
		R240	B2
CR154	D1	R241	C3
CR235	B2	R242	E3
CR238	B3	R243	E3
CR246	E3	R244	C3
CR247	E2	R245	C2
CR248	D2	R246	E3
CR254	D2	R247	E3
CR255	D1	R248	D2
CR256	E1	R249	E3
CR257	G4	R254	E1
CR264	F5	R255	E2
CR268	D5	R257	G3
CR272	D4	R258	F4
CR364	F5	R263	F4
CR840	B2	R264	F5
		R266	E4
DS100	H4	R267	D5
DS200	H4	R268	D5
DS300	H4	R343	B3
		R344	B3
J100	H3	R356	D1
J154	A4	R358	E2
J155	A5	R363	F4
J225	H2	R500	D3
		R503	D3
L157	G3	R701	G2
P100	H3	U164	E5
P200	G3	U172	D5
P800	G4	U239A	B3
		U239B	B2
Q142	H2	U252A	E2
Q143	H2	U252B	E2
Q158	G4	U252C	E3
Q242	C2	U252D	D2
Q243	B3	U263A	F3
Q346	D2	U263B	F4
Q347	D2		

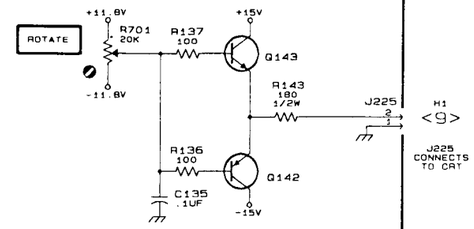
FOCUS CONTROL



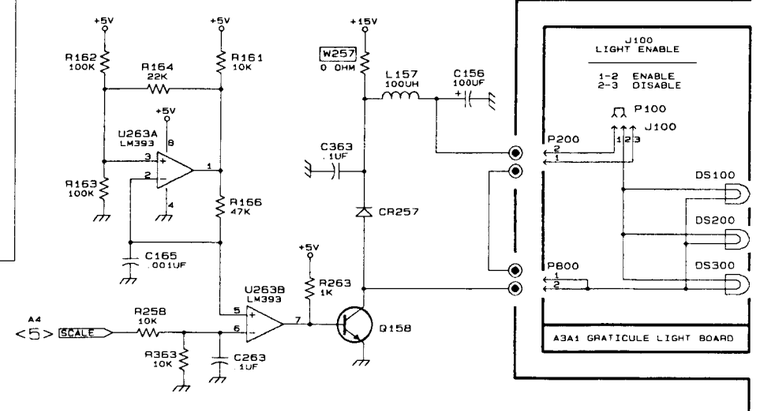
Z AXIS CONTROL



TRACE ROTATION



GRATICULE ILLUMINATION



J154

1	1	NC
2	2	FOCUS_I
3	3	Z_AXIS
4	4	NC
5	5	+100V
6	6	+40V
7	7	+15V
8	8	+5V
9	9	
10	10	-15V

H3 <8> TO/FROM A1 POWER SUPPLY

A4 <5> FOCUS — R138 68K

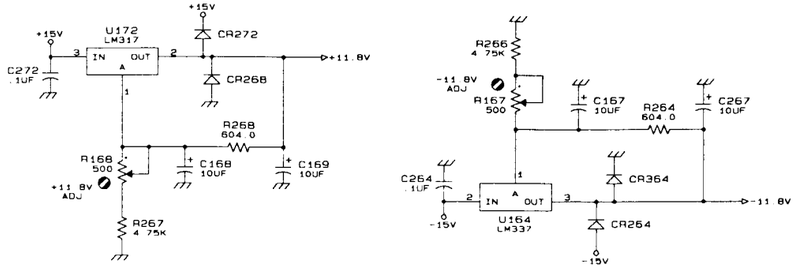
+5V — C146 10UF

J155

1	1	NC
2	2	+100V
3	3	+40V
4	4	+15V
5	5	+5V
6	6	
7	7	-15V
8	8	
9	9	-11.8V
10	10	+11.8V

NOT USED

± 11.8V REGULATORS



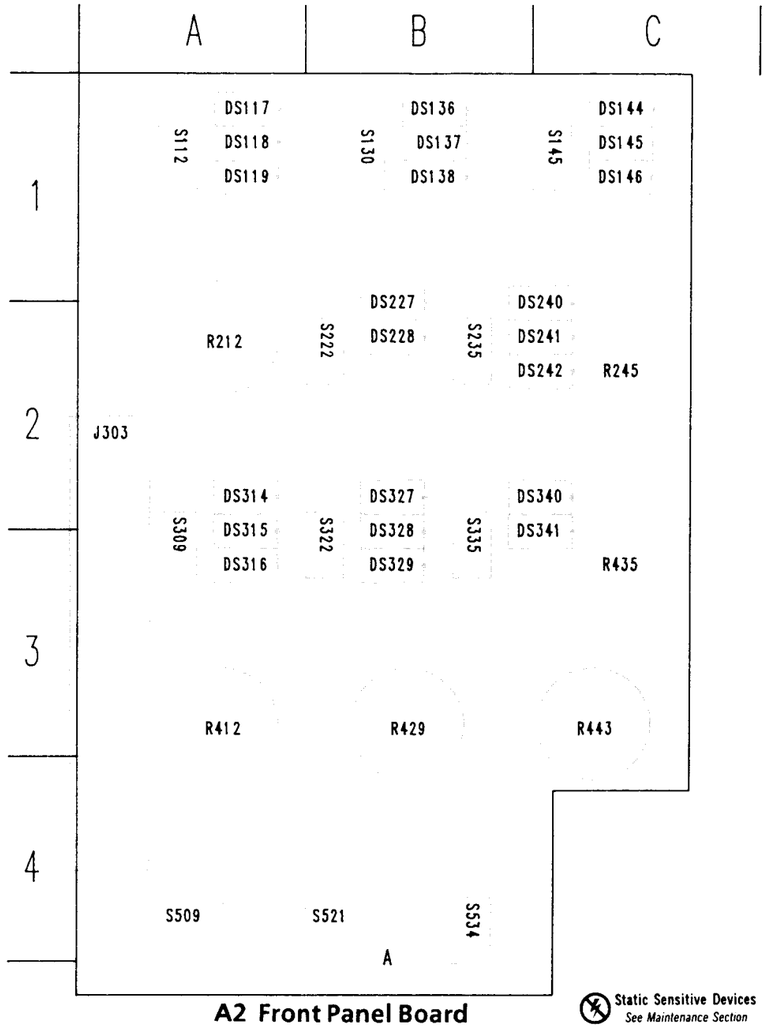
NOTE

LM337 1-ADJ 2-IN 3-OUT — LM317 1-ADJ 2-OUT 3-IN

PARTS WITHIN BOX HAVE BEEN CHANGED

SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL

PART OF A3 MAIN BOARD



A2 Front Panel Board

Static Sensitive Devices
See Maintenance Section

SCHEMATIC DIAGRAM <7> LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location
DS117	C1	P107	H1
DS118	C2		
DS119	C2	R212	F2
DS136	C1	R245	F1
DS137	C2	R345	F2
DS138	C2	R412	F3
DS144	D1	R429	F3
DS145	D2	R443	F2
DS227	C3		
DS228	C3	S112	F3
DS240	C3	S130	F3
DS241	C3	S145	F3
DS242	C4	S222	F4
DS314	C4	S235	F4
DS315	C5	S309	F4
DS316	C5	S322	F4
DS327	C4	S335	F4
DS328	C5	S509	F5
DS329	C5	S521	F5
DS340	D4	S534	F5
DS341	D5		

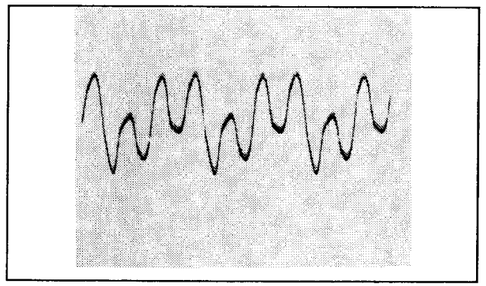


Fig. 1. Vertical ampl = 17 V: Horizontal time 50 ms.

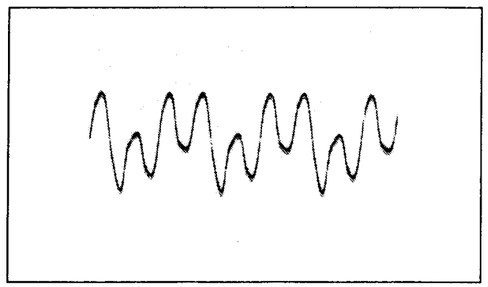


Fig. 2. Vertical ampl = 15 V: Horizontal time 50 ms.

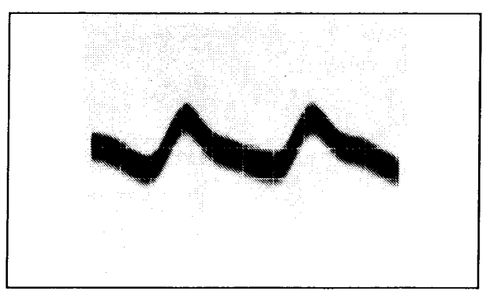
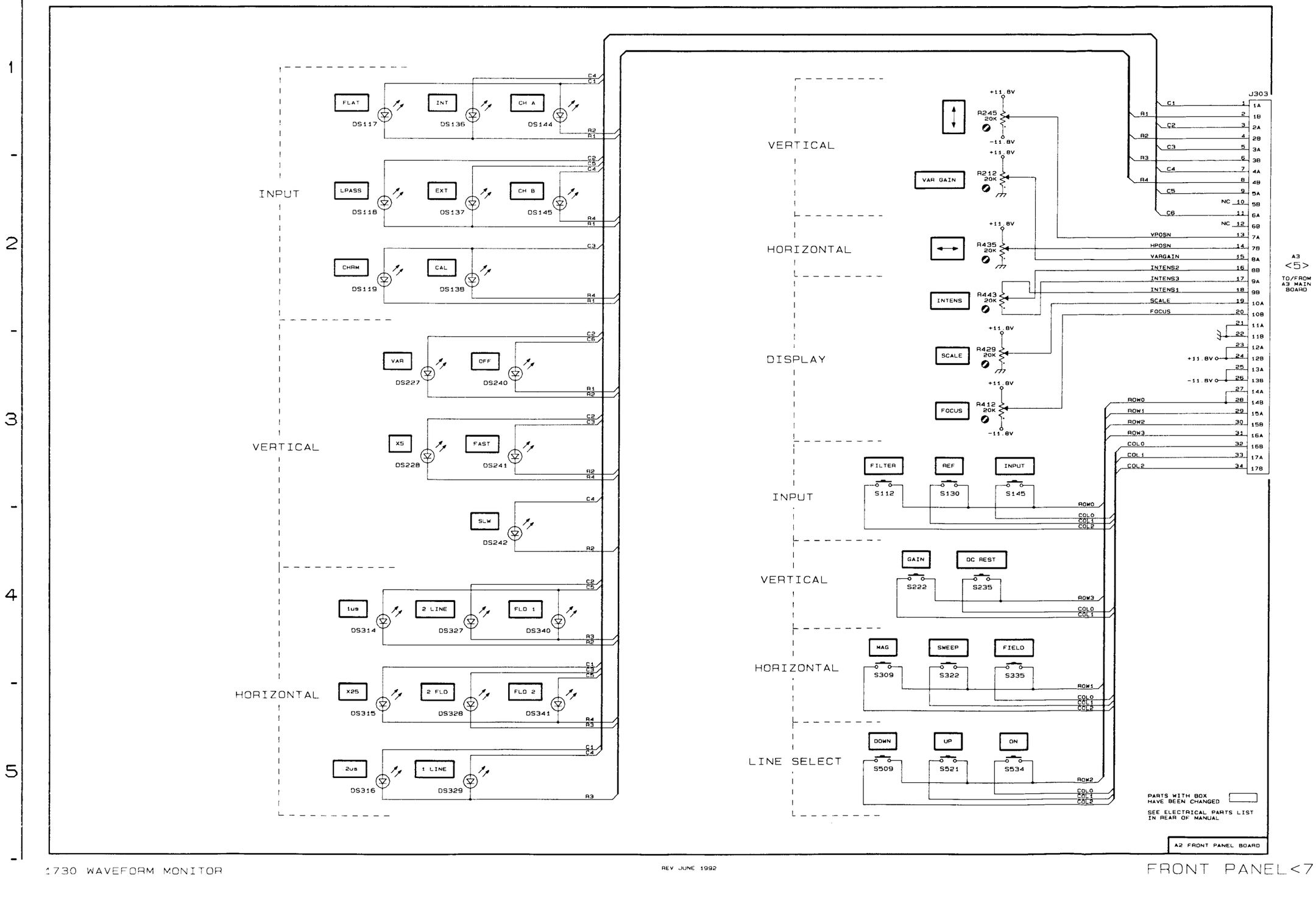
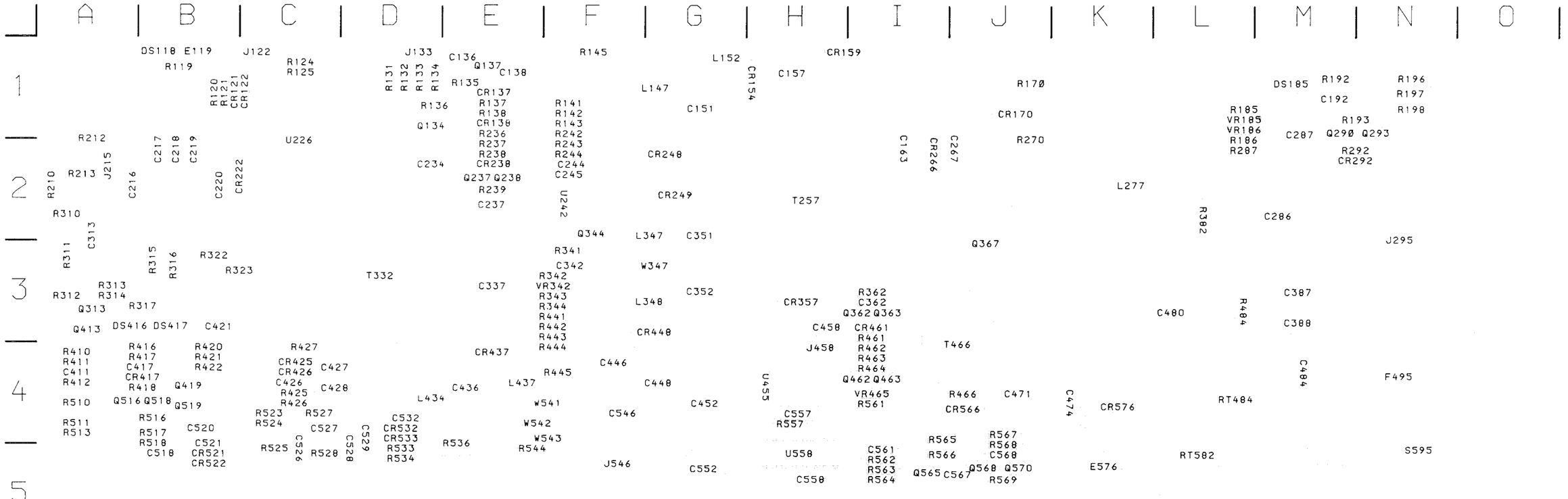


Fig. 3. Vertical ampl = 0.12 V: Horizontal time 50 ms.


INPUT
FLAT
DS117
INT
DS136
CH A
DS144
LPASS
DS118
EXT
DS137
CH B
DS145
CHRM
DS119
CAL
DS138
VERTICAL
VAR
DS227
OFF
DS240
X5
DS228
FAST
DS241
SLW
DS242
HORIZONTAL
1us
DS314
2 LINE
DS327
FLD 1
DS340
X25
DS315
2 FLD
DS328
FLD 2
DS341
2us
DS316
1 LINE
DS329
VERTICAL
HORIZONTAL
DISPLAY
VAR GAIN
R245 20K
R212 20K
R435 20K
INTENS
R443 20K
SCALE
R429 20K
FOCUS
R412 20K
+11.8V
-11.8V
J303
VPOSN
HPOSN
VARGAIN
INTENS2
INTENS3
INTENS1
SCALE
FOCUS
NC
+11.8V
-11.8V
ROW0
ROW1
ROW2
ROW3
COL0
COL1
COL2
A3 <5>
TO/FROM A3 MAIN BOARD
INPUT
FILTER
S112
REF
S130
INPUT
S145
VERTICAL
GAIN
S222
DC REST
S235
HORIZONTAL
MAG
S309
SWEEP
S322
FIELD
S335
LINE SELECT
DOWN
S509
UP
S521
ON
S534
PARTS WITH BOX HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL
A2 FRONT PANEL BOARD

1730 – SERIES (B030000 & UP)



A1 Power Supply Board

Static Sensitive Devices
See Maintenance Section

SCHEMATIC DIAGRAM <8> LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location
C136	G2	C458	D2	CR266	E2	J546	H3	Q462	C3	R292	B2	R484	C1	T257	E2
C151	F2	C471	D3	CR292	C2			Q463	C3	R341	E5	R544	G2	T466	D3
C157	F2	C474	C1	CR357	E2	L147	F2	Q565	C4	R342	E5	R557	B3		
C163	D1	C480	C1	CR448	E3	L152	F2	Q568	B4	R343	F5	R561	C3	U242B	F5
C192	D1	C487	B1	CR461	C3	L177	D2	Q570	B4	R344	F5	R562	B4	U455	E4
C267	D2	C552	F3	CR566	D3	L277	D1			R362	C2	R563	B4	U558	B3
C286	C1	C557	B3	CR576	C1	L347	F3	R135	G2	R382	C1	R564	C4		
C287	C2	C558	B3			L348	F2	R170	D2	R441	E5	R565	B4	VR185	B2
C342	E5	C561	B4	DS185	D1			R185	B2	R442	F5	R566	C4	VR186	B2
C351	F3	C567	B4			P458	D2	R186	B2	R443	F5	R567	C5	VR342	F5
C352	F3	C568	B5	E576	B1			R192	D1	R444	F5	R568	B5	VR465	C3
C362	C2					Q290	B2	R193	B2	R445	G5	R569	B4		
C387	C1	CR154	E2	F495	A1	Q293	B2	R196	D1	R461	D2	RT484	B1	W347	F3
C388	C1	CR159	E1			Q344	E5	R197	B2	R462	D2	RT582	B1	W476	B1
C446	F2	CR170	D2	J145	H1	Q362	D2	R198	B2	R463	C2			W541	G3
C448	F3	CR248	E2	J295	A1	Q363	C2	R270	D3	R464	C2	S595	B1	W542	G2
C452	F2	CR249	E3	J458	D2	Q367	D2	R287	C2	R466	D2			W543	G3

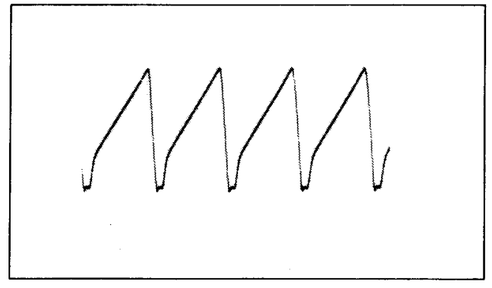


Fig. 1. Vertical ampl = 0.8 V: Horizontal time 200 μs.

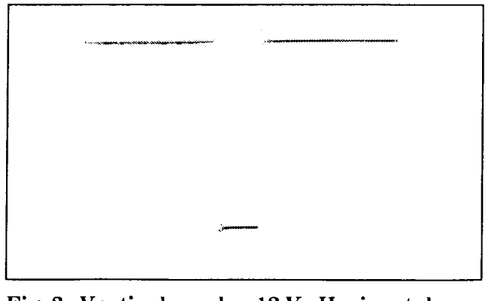
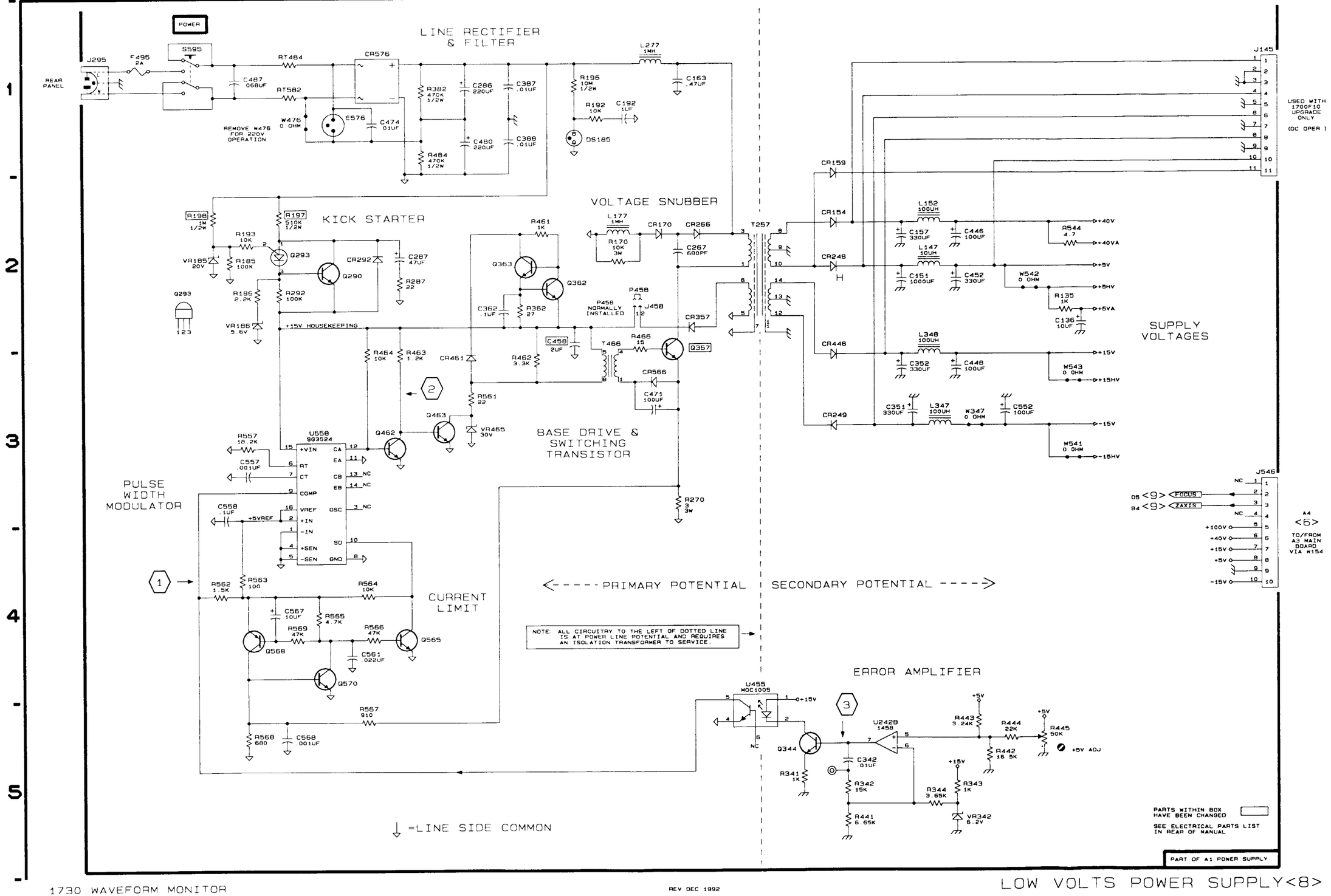


Fig. 2. Vertical ampl = 12 V: Horizontal time 200 μs + X10 Magnified.


LINE RECTIFIER & FILTER
POWER
S595
J295
F495 2A
REAR PANEL
RT484
RT582
CR576
C487 .068UF
W476 0 OHM
REMOVE W476 FOR 220V OPERATION
E576
C474 .01UF
R382 470K 1/2W
R484 470K 1/2W
C286 220UF
C480 220UF
C387 .01UF
C388 .01UF
L277 1MH
R196 10M 1/2W
R192 10K
C192 .1UF
C163 .47UF
DS185
KICK STARTER
R198 1M 1/2W
R197 510K 1/2W
R193 10K
VR185 20V
R185 100K
Q293
CR292
Q290
C287 47UF
R287 22
R186 2.2K
R292 100K
VR186 5.6V
+15V HOUSEKEEPING
VOLTAGE SNUBBER
L177 1MH
R170 10K 3W
CR170
CR266
C267 680PF
T257
R461 1K
Q363
Q362
C362 .1UF
R362 27
P458 NORMALLY INSTALLED
P458
J458
CR357
C458 2UF
T466
R466 15
Q367
CR461
R462 3.3K
R464 10K
R463 1.2K
CR566
C471 100UF
R561 22
Q463
Q462
VR465 30V
BASE DRIVE & SWITCHING TRANSISTOR
R270 3 3W
U556 SG3524
+VIN
RT
CT
COMP
VREF
+IN
-IN
+SEN
-SEN
CA
EA
CB
EB
OSC
SD
GND
NC
R557 18.2K
C557 .001UF
C558 .1UF
+5VREF
PULSE WIDTH MODULATOR
R562 1.5K
R563 100
R564 10K
C567 10UF
R565 4.7K
R569 47K
R566 47K
Q568
Q565
C561 .022UF
Q570
R567 910
R568 680
C568 .001UF
CURRENT LIMIT
<---- PRIMARY POTENTIAL
SECONDARY POTENTIAL ---->
NOTE: ALL CIRCUITRY TO THE LEFT OF DOTTED LINE IS AT POWER LINE POTENTIAL AND REQUIRES AN ISOLATION TRANSFORMER TO SERVICE.
=LINE SIDE COMMON
CR159
CR154
CR248
CR448
CR249
L152 100UH
C157 330UF
C446 100UF
L147 10UH
C151 1000UF
C452 330UF
L348 100UH
C352 330UF
C448 100UF
C351 330UF
L347 100UH
W347 0 OHM
C552 100UF
R544 4.7
W542 0 OHM
R135 1K
C136 10UF
W543 0 OHM
W541 0 OHM
+40V
+40VA
+5V
+5HV
+5VA
+15V
+15HV
-15V
-15HV
SUPPLY VOLTAGES
J145
USED WITH 1700F10 UPGRADE ONLY (DC OPER)
J545
A4 <6>
TO/FROM A3 MAIN BOARD VIA W154
05 <9> FOCUS
84 <9> ZAXIS
+100V
+40V
+15V
+5V
-15V
ERROR AMPLIFIER
U455 MOC1005
U2428 1458
Q344
R341 1K
C342 .01UF
R342 15K
R441 6.65K
R443 3.24K
R444 22K
R445 50K
+5V ADJ
R442 16.5K
R344 3.65K
R343 1K
VR342 6.2V
PARTS WITHIN BOX HAVE BEEN CHANGED
SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL
PART OF A1 POWER SUPPLY

SCHEMATIC DIAGRAM <9> LOOK-UP CHART

The schematic diagram has an alpha-numeric grid to assist in locating parts within that diagram. The etched circuit boards follow a numbering sequence starting with the lowest number at the upper left corner, as pictured in this manual.

Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location	Circuit Number	Schematic Diagram Location
C138	A2	E119	E2	R314	E5
C216	D3			R315	D3
C217	D3	L434	B2	R316	D3
C218	D3	L437	D1	R317	E5
C219	E2			R322	E2
C220	E2	P320	H1	R323	D2
C234	B2			R410	D5
C237	B3	Q134	B2	R411	B4
C244	B1	Q137	A2	R412	C4
C245	B1	Q237	A2	R416	D4
C313	F4	Q238	B2	R417	C5
C337	B2	Q313	E5	R418	C4
C411	C4	Q413	E5	R420	D4
C417	C4	Q419	D4	R421	D4
C421	D4	Q516	C4	R422	D4
C426	D2	Q518	D4	R425	D2
C427	C2	Q519	D4	R426	F3
C428	D2			R427	C2
C436	D1	R119	D3	R510	B4
C518	C4	R120	E2	R511	B4
C520	C4	R121	E3	R513	E5
C521	C4	R124	F3	R516	C4
C526	F2	R125	E3	R517	C4
C527	F3	R131	F3	R518	C5
C528	F2	R132	F2	R523	F1
C529	D2	R133	F2	R524	F2
C532	C2	R134	F2	R525	F2
C546	D1	R136	B3	R527	F3
		R137	A2	R528	F2
CR121	E2	R138	A2	R533	D2
CR122	E2	R141	A2	R534	D2
CR137	A2	R142	B1	R536	D2
CR138	A2	R143	C2		
CR222	D3	R210	E4	T332	B2
CR238	B2	R212	E3		
CR417	C4	R213	F4	U226	D1
CR425	D2	R236	A2	U242A	B2
CR426	D2	R237	A2		
CR437	C1	R238	B2		
CR521	D4	R239	A3		
CR522	D5	R242	B1		
CR532	C2	R243	C2		
CR533	D2	R244	B1		
		R310	E4		
DS118	E3	R311	E4		
DS416	E4	R312	E4		
DS417	E4	R313	E5		

HV OSC & ERROR AMP

SUPPLY VOLTAGES

GRID DRIVE

Z AXIS AMPLIFIER

FOCUS AMPLIFIER

V1

P320 IS PART OF CRT

TRACE ROTATION

WIRE COLOR CODES

WHITE/BLK/RED 12 — HORIZONTAL DEFLECTION — RED 6 — H3 <4>

WHITE/GREEN 5 — GREEN 9

VERTICAL DEFLECTION — BLUE 11 — H2 <2>

BROWN 10

ASTIG

FOCUS

1st ANODE

CATHODE

J133: WHITE/BLUE, WHITE/GRAY, WHITE/BROWN, WHITE/RED

J122: WHITE/BLACK, BROWN

J215: BROWN/RED

PIN NUMBERS ON TUBE SOCKET

V1 TUBE SOCKET VISUAL AID

1-N Filament H
9-0 Filament TEF
9-2 Cathode TEF
9-0.2 Gnds
9-1 GRID TEF
D-4 6-N BLUE VERT PLATE
1-2 Focus TEF
D3 1-N BROWN VERT PLATE
9-5 Vert Shield TEF
D-2 5-N GREEN HORIZ PLATE
2-N RED-1 HORZ
9-8 1st ANODE
9-6 ASTIG

NOTE WIRES FROM PIN 1(9-1) H AND PIN 5(9-5) ARE TIED TOGETHER ON THE POWER SUPPLY BOARD

PARTS WITHIN BOX HAVE BEEN CHANGED

SEE ELECTRICAL PARTS LIST IN REAR OF MANUAL

PART OF A1 POWER SUPPLY

REPLACEABLE MECHANICAL PARTS LIST

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc., field office or representative.

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

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

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

ITEM NAME

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

FIGURE AND INDEX NUMBERS

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

INDENTATION SYSTEM

This Mechanical Parts List is indented to indicate item relationships. Following is an example of the indentation system used in the description column.

```
1  2  3  4  5          Name & Description
Assembly and/or Component
Mounting parts for Assembly and/or Component
*MOUNTING PARTS*/*END MOUNTING PARTS*
    Detail Part of Assembly and/or Component
    Mounting parts for Detail Part
    *MOUNTING PARTS*/*END MOUNTING
    PARTS*
        Parts of Detail Part
        Mounting parts for Parts of Detail Part
        *MOUNTING PARTS*/*END MOUNTING
        PARTS*
```

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.

Mounting parts must be purchased separately, unless otherwise specified.

CHASSIS PARTS

Chassis-mounted parts and cable assemblies may be found at the end of the Electrical Parts List.

ABBREVIATIONS

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

CROSS INDEX - MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip Code
00779	AMP INC	2800 FULLING MILL PO BOX 3608	HARRISBURG PA 17105
06383	PANDUIT CORP	17301 RIDGELAND	TINLEY PARK IL 07094-2917
07416	NELSON NAME PLATE CO	3191 CASITAS	LOS ANGELES CA 90039-2410
0KB01	STAUFFER SUPPLY	810 SE SHERMAN	PORTLAND OR 97214
12327	FREEWAY CORP	9301 ALLEN DR	CLEVELAND OH 44125-4632
15912	THOMAS AND BETTS CORP ELECTRONICS GROUP	4371 VLY BLVD	LOS ANGELES CA 90032-3632
18677	SCANBE MFG CO DIV OF ZERO CORP	3445 FLETCHER AVE	EL MONTE CA 91731
34785	DEK INC	3480 SWENSON AVE	ST CHARLES IL 60174-3450
54492	CINCH CO THE	6126 MONTECITO BLVD P O BOX 167	SANTA ROSA CA 95402-3429
71468	ITT CANNON DIV OF ITT CORP	666 E DYER RD	SANTA ANA CA 92702
73743	FISCHER SPECIAL MFG CO	111 INDUSTRIAL RD	COLD SPRING KY 41076-9749
75915	LITTELFUSE INC SUB TRACOR INC	800 E NORTHWEST HWY	DES PLAINES IL 60016-3049
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
80126	PACIFIC ELECTRICORD CO	747 W REDONDO BEACH PO BOX 10	GARDENA CA 90247-4203
83385	MICRODOT MFG INC GREER-CENTRAL DIV	3221 W BIG BEAVER RD	TROY MI 48098
83486	ELCO INDUSTRIES INC	1101 SAMUELSON RD	ROCKFORD IL 61101
TK0435	LEWIS SCREW CO	4300 S RACINE AVE	CHICAGO IL 60609-3320
TK1373	PATELEC-CEM (ITALY)	10156 TORINO	VAICENTALLO 62/45S ITALY
TK1543	CAMCAR/TEXTRON	600 18TH AVE	ROCKFORD IL 61108-5181

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
1-1	426-2102-00			1	FRAME,CRT:BEZEL	80009	426-2102-00
					MOUNTING PARTS		
-2	211-0690-02			2	SCREW,MACHINE:6-32 X 0.875,PNH,SST	TK1543	B20-70430
					END MOUNTING PARTS		
-3	366-0616-00			5	PUSH BUTTON:0.585 X 0.3 X 0.150	80009	366-0616-00
-4	333-3304-00			1	PANEL,FRONT:	80009	333-3304-00
					(1730/1731 ONLY)		
	333-3483-00			1	PANEL,FRONT:	80009	333-3483-00
					(1735 ONLY)		
-5	378-0258-00			1	FLTR,CONTRASTIN:GRAY,POLYCARBONATE	80009	378-0258-00
-6	348-0660-00			4	CUSHION,CRT:POLYURETHANE	80009	348-0660-00
-7	333-3300-00			1	PANEL,FRONT:	80009	333-3300-00
					(1730 ONLY)		
	333-3301-00			1	PANEL,FRONT:	80009	333-3301-00
					(1731/1731 PM ONLY)		
	333-3439-00			1	PANEL,FRONT:	80009	333-3439-00
					(1735 ONLY)		
					MOUNTING PARTS		
-8	211-0721-00			2	SCREW,MACHINE:6-32 X 0.375,PNH,STL	83486	ORDER BY DESCR
					END MOUNTING PARTS		
-9	366-1701-01			6	KNOB:GY,0.127 ID X 0.392 OD X 0.4 H	80009	366-1701-01
-10	----- -----			1	CIRCUIT BD ASSY:FRONT PNL		
					(SEE A2 REPL)		
					MOUNTING PARTS		
-11	211-0721-00			4	SCREW,MACHINE:6-32 X 0.375,PNH,STL	83486	ORDER BY DESCR
					END MOUNTING PARTS		
-12	366-0616-00			11	PUSH BUTTON:0.585 X 0.3 X 0.150	80009	366-0616-00
-13	426-2101-01			1	FRAME SECT,CAB.:FRONT	80009	426-2101-01
					MOUNTING PARTS		
-14	211-0721-00			3	SCREW,MACHINE:6-32 X 0.375,PNH,STL	83486	ORDER BY DESCR
-15	210-0405-00			2	NUT,PLAIN,HEX:2-56 X 0.188,BRS CD PL	73743	12157-50
-16	211-0100-00			2	SCREW,MACHINE:2-56 X 0.750,PNH,STL	83385	ORDER BY DESCR
					END MOUNTING PARTS		
-17	----- -----			1	CIRCUIT BD ASSY:MAIN		
					(SEE A3 REPL)		
					MOUNTING PARTS		
-18	211-0721-00			8	SCREW,MACHINE:6-32 X 0.375,PNH,STL	83486	ORDER BY DESCR
					END MOUNTING PARTS		
-19	196-3146-00			1	FLEX STRIP:SINGLE JUMPER,1.0 L	15912	FSN-LA
-20	337-3321-00			1	SHIELD,ELEC:CKT BD 1730	80009	337-3321-00
-21	----- -----			1	CIRCUIT BD ASSY:POWER		
					(SEE A1 REPL)		
					MOUNTING PARTS		
-22	211-0721-00			7	SCREW,MACHINE:6-32 X 0.375,PNH,STL	83486	ORDER BY DESCR
-23	210-0586-00			2	NUT,PL,ASSEM WA:4-40 X 0.25,STL CD PL	78189	211-041800-00
-24	211-0016-00			2	SCREW,MACHINE:4-40 X 0.625,PNH,STL	TK0435	ORDER BY DESCR
					END MOUNTING PARTS		
-25	131-3573-00			1	CONN,PLUG,ELEC:MALE,W/LOCKING ADAPTER	80126	B-0779
-26	337-3257-00			1	SHIELD,CKT BD:LV PWR SUPPLY	80009	337-3257-00
-27	175-9872-01			1	CA ASSY,SP,ELEC:2,18 AWG,2.5 L,0-N	80009	175-9872-01
-28	333-3305-02			1	PANEL,REAR:	80009	333-3305-02
					MOUNTING PARTS		
-29	211-0721-00			3	SCREW,MACHINE:6-32 X 0.375,PNH,STL	83486	ORDER BY DESCR
					END MOUNTING PARTS		
-30	----- -----			7	CONN,RCPT,ELEC:BNC,FEMALE		
					(SEE J1,J2,J4,J5,J7,J8,J14 REPL)		
-31	174-0335-00	B030000	B041472	1	LEAD,ELECTRICAL:22 AWG,8.75 L,9-N	80009	174-0335-00
	174-0335-01	B041473		1	LEAD,ELECTRICAL:22 AWG,9.75 L,9-N	80009	174-0335-01
-32	210-0255-00			1	TERMINAL,LUG:0.391 ID,LOCKING,BRS CD PL	12327	ORDER BY DESCR
-33	174-0123-00	B030000	B041682	1	CA ASSY,SP,ELEC:24,26 AWG,20.0 L,RIBBON	15912	TO BE ASSIGNED
	174-0123-01	B041683		1	CA ASSY,SP,ELEC:24,26 AWG,21.0 L,RIBBON	80009	174-0123-01
					(1730 ONLY)		
	174-0123-00	B030000	B034617	1	CA ASSY,SP,ELEC:24,26 AWG,20.0 L,RIBBON	15912	TO BE ASSIGNED
	174-0123-01	B034618		1	CA ASSY,SP,ELEC:24,26 AWG,21.0 L,RIBBON	80009	174-0123-01
					(1731 ONLY)		
	174-0123-00	B030000	B030951	1	CA ASSY,SP,ELEC:24,26 AWG,20.0 L,RIBBON	15912	TO BE ASSIGNED
	174-0123-01	B030952		1	CA ASSY,SP,ELEC:24,26 AWG,21.0 L,RIBBON	80009	174-0123-01
					(1735 ONLY)		

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
1-					*MOUNTING PARTS*		
-34					*END MOUNTING PARTS*		
	131-0890-00	B030000	B040125	4	SCREW LOCK:4-40 X 0.312 L HEX HD,STLCD PL	71468	D 20418-2
	214-3903-01	B040126		4	SCREW,JACK:4-40 X 0.312 EXT THD,4-40 INT TH D,0.188 HEX,STEEL,CAD PLATE (1730/1731 ONLY)	80009	214-3903-01
	131-0890-00	B030000	B030875	4	SCREW LOCK:4-40 X 0.312 L HEX HD,STLCD PL	71468	D 20418-2
	214-3903-01	B030876		4	SCREW,JACK:4-40 X 0.312 EXT THD,4-40 INT TH D,0.188 HEX,STEEL,CAD PLATE (1735 ONLY)	80009	214-3903-01
-35	200-2519-00			1	CAP,CRT SOCKET:NATURAL LEXAN	80009	200-2519-00
-36	426-2096-00			1	MOUNT,RESILIENT:CRT REAR	80009	426-2096-00
					MOUNTING PARTS		
-37	210-0457-00			2	NUT,PL,ASSEM WA:6-32 X 0.312,STL CD PL	78189	511-061800-00
					END MOUNTING PARTS		
-38	136-0895-01	B010100	B040999	1	SOCKET,CRT ASSY:	80009	136-0895-01
	136-0895-02	B041000		1	SKT,CRT ASSY: (1730 ONLY)	80009	136-0895-02
	136-0895-01	B010100	B034018	1	SOCKET,CRT ASSY:	80009	136-0895-01
	136-0895-02	B034019		1	SKT,CRT ASSY: (1731 ONLY)	80009	136-0895-02
	136-0895-01	B010100	B030857	1	SOCKET,CRT ASSY:	80009	136-0895-01
	136-0895-02	B030858		1	SKT,CRT ASSY: (1735 ONLY)	80009	136-0895-02
-39	346-0120-00			1	STRAP,TIEDOWN,E:5.5 L MIN,PLASTIC,WHITE	06383	SST1.5M
-40	337-3487-00			1	SHIELD,ELEC:CRT,STL	80009	337-3487-00
-41	334-1379-00			1	MARKER,IDENT:MKD HI VACUUM	07416	ORDER BY DESCR
-42	386-4443-00			1	SUPPORT,SHIELD:CRT,FRONT,PLASTIC	80009	386-4443-00
-43	351-0688-00			1	GUIDE,CKT BOARD:NYLON,12.0 L	18677	11633-5
-44	348-0171-00			1	GROMMET,PLASTIC:BLACK,U-SHAPED,0.276 ID	80009	348-0171-00
-45	343-0916-00			1	CLAMP,LOOP:0.5 ID,NYLON	34785	029-500
-46	426-2103-04			1	FRAME,CHASSIS:SAFETY CONTROLLED	80009	426-2103-04
-47	211-0720-01			2	SCREW,MACHINE:6-32 X 0.50,PNH,STL,TORX T-15 WITH SLOT	0KB01	211-0720-01
-48	211-0721-00			1	SCREW,MACHINE:6-32 X 0.375,PNH,STL	83486	ORDER BY DESCR
					STANDARD ACCESSORIES		
-49	131-0459-00	B030000	B040168	1	CONN,DSUB: (1730 ONLY)	54492	DA-15P
	131-0459-00	B030000	B033663	1	CONN,DSUB: (1731 ONLY)	54492	DA-15P
	131-0459-00	B030000	B030773	1	CONN,DSUB: (1735 ONLY)	54492	DA-15P
-50	159-0021-00			1	FUSE,CARTRIDGE:3AG,2A,250V,FAST BLOW	75915	312 002
-51	200-1666-00	B030000	B040168	1	SHLD,ELEC CONN:15 CONTACT,TYPE HD SIZE 2 (1730 ONLY)	00779	206471-1
	200-1666-00	B030000	B033663	1	SHLD,ELEC CONN:15 CONTACT,TYPE HD SIZE 2 (1731 ONLY)	00779	206471-1
	200-1666-00	B030000	B030773	1	SHLD,ELEC CONN:15 CONTACT,TYPE HD SIZE 2	00779	206471-1
	070-7948-00			1	MANUAL,TECH:INSTR,1730 WAVEFORM MONITOR (1735 ONLY)	80009	070-7948-00
	150-0168-00			3	LAMP,INCAND:14V,0.08A,WEDGE BASE,T1.75 FOR SOCKET MOUNT	80009	150-0168-00
-52	161-0216-00			1	CABLE ASSY,PWR,:3,18 AWG,2.5M L,BLACK (STANDARD ONLY)	80126	C7120-25M-BL
					OPTIONAL ACCESSORIES		
-53	161-0215-00			1	CABLE ASSY,PWR,:3,0.75MU,2.5MM L,GREY (EUROPEAN OPTION A1 ONLY)	80009	161-0215-00
-54	161-0066-10			1	CABLE ASSY,PWR,:THREE 0.75MM SQ,250V,2.5 METERS LONG,UNITED KINGDOM (UNITED KINGDOM OPTION A2 ONLY)	TK1373	24230
-55	161-0066-11			1	CABLE ASSY,PWR,:3,0.75MM,240V,96.0 L (AUSTRALIAN OPTION A3 ONLY)	80009	161-0066-11
	016-0475-00			1	VIEWING HOOD:	80009	016-0475-00
	200-3897-01			1	COVER,FRONT:1700F02,HOT STAMPED	80009	200-3897-01
	----- -----			1	CAMERA,SCOPE:C5C (OPTION 02 ONLY)		

Fig. & Index No.	Tektronix Part No.	Serial/Assembly No. Effective	Dscont	Qty	12345 Name & Description	Mfr. Code	Mfr. Part No.
1-	----- -----			1	CAMERA,SCOPE:C7 (OPTION 03 ONLY)		
	----- -----			1	PLAIN CASE:1700F00		
	----- -----			1	PTD CASE ASSY:1700F02		
	----- -----			1	RACK ADAPTER:1700F05		
	----- -----			1	FILLER PANEL:1700F06		
	----- -----			1	DRAWER,UTILITY:1700F07		

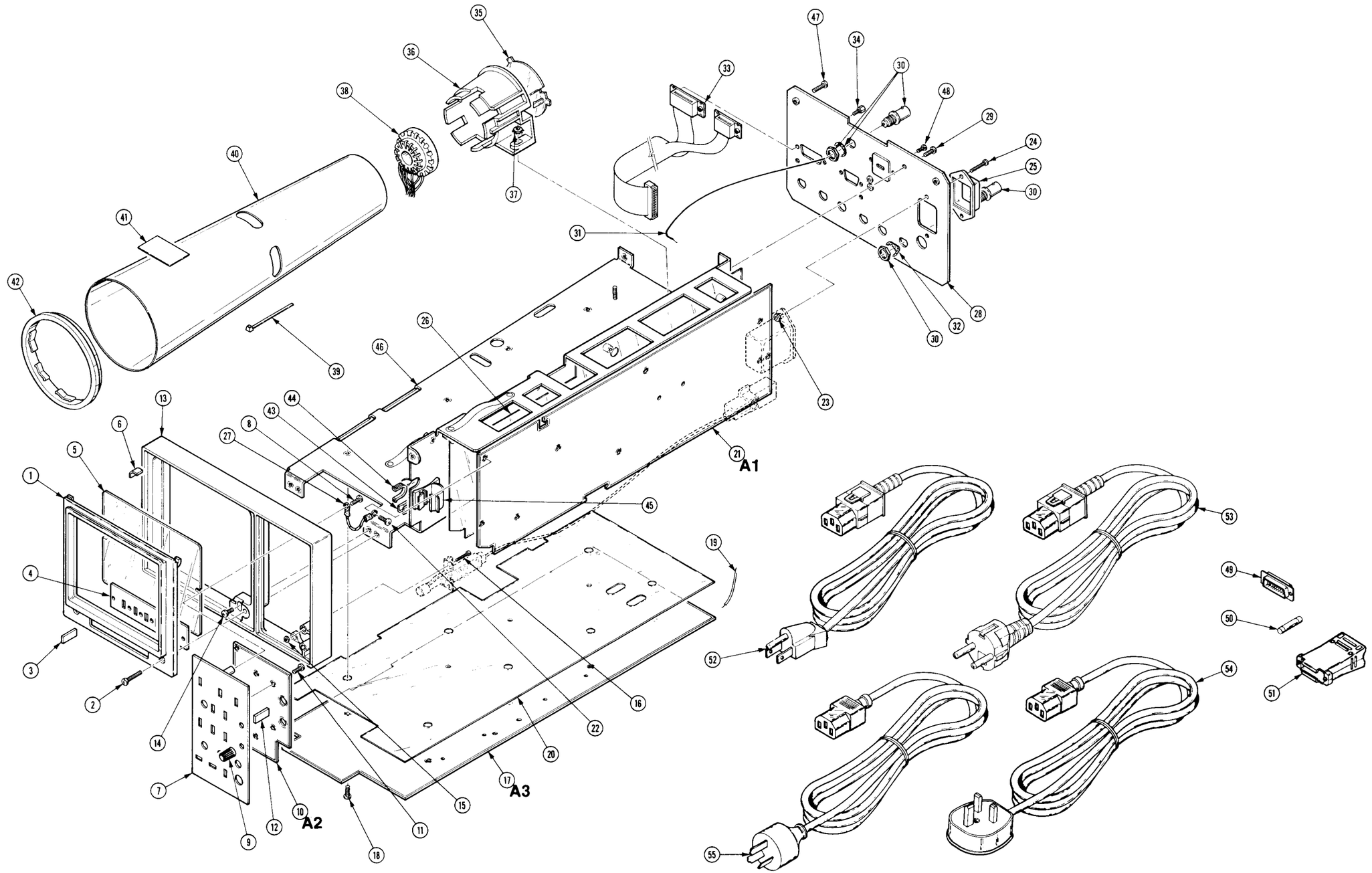


FIG 1 EXPLODED VIEW