

TEKTRONIX®

3.60

**MR 501
MONITOR**

INSTRUCTION MANUAL

Tektronix, Inc.
P.O. Box 500
Beaverton, Oregon 97005

Serial Number _____



WARRANTY

All TEKTRONIX instruments are warranted against defective materials and workmanship for one year. Any questions with respect to the warranty should be taken up with your TEKTRONIX Field Engineer or representative.

All requests for repair and replacement parts should be directed to the TEKTRONIX Field Office or representative in your area. This will assure you the fastest possible service. Please include the instrument Type Number or Part Number and Serial Number with all requests for parts or service.

Specifications and price change privileges reserved.

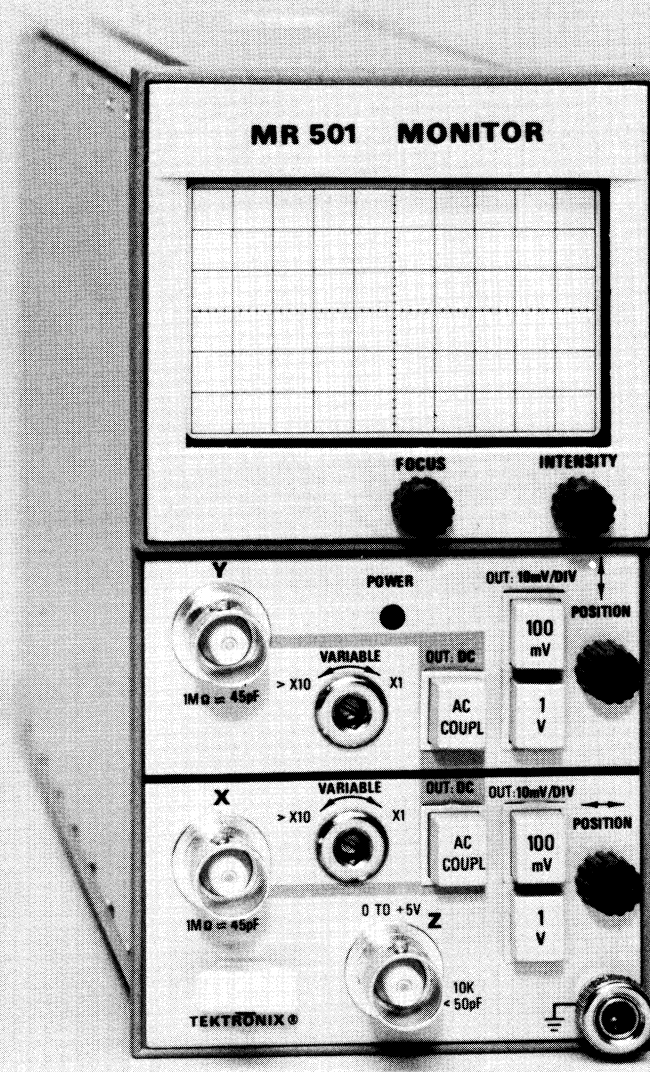
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OPERATING INSTRUCTIONS

INTRODUCTION

Description

The MR 501 Monitor is designed to operate in a TM 500 Series Power Module. It is a general-purpose X-Y display monitor. The MR 501 is well suited for general purpose, non-stored X-Y displays. In conjunction with an RG 501 it may be used as a monitor oscilloscope.

All display axis inputs (vertical, horizontal and intensity) are available at either the front-panel connectors, or by modification, at the TM 500 Series Power Module interface connector.

Total MR 501 power consumption is 14.5 watts.

Installation

The MR 501 is calibrated and ready to use as received. Referring to Fig. 1-1, install the Monitor and turn on the

Power Module. Check that the POWER indicator on the MR 501 front panel comes on.

Remove the monitor by pulling the release latch at the bottom of the front panel and slide the plug-in straight out of the Power Module.

CAUTION

Turn the Power Module off before inserting the plug-in; otherwise, damage may occur to the plug-in circuitry.

Refer to the Controls and Adjustments foldout page in Section 2 for front-panel controls, connectors and indicator descriptions.

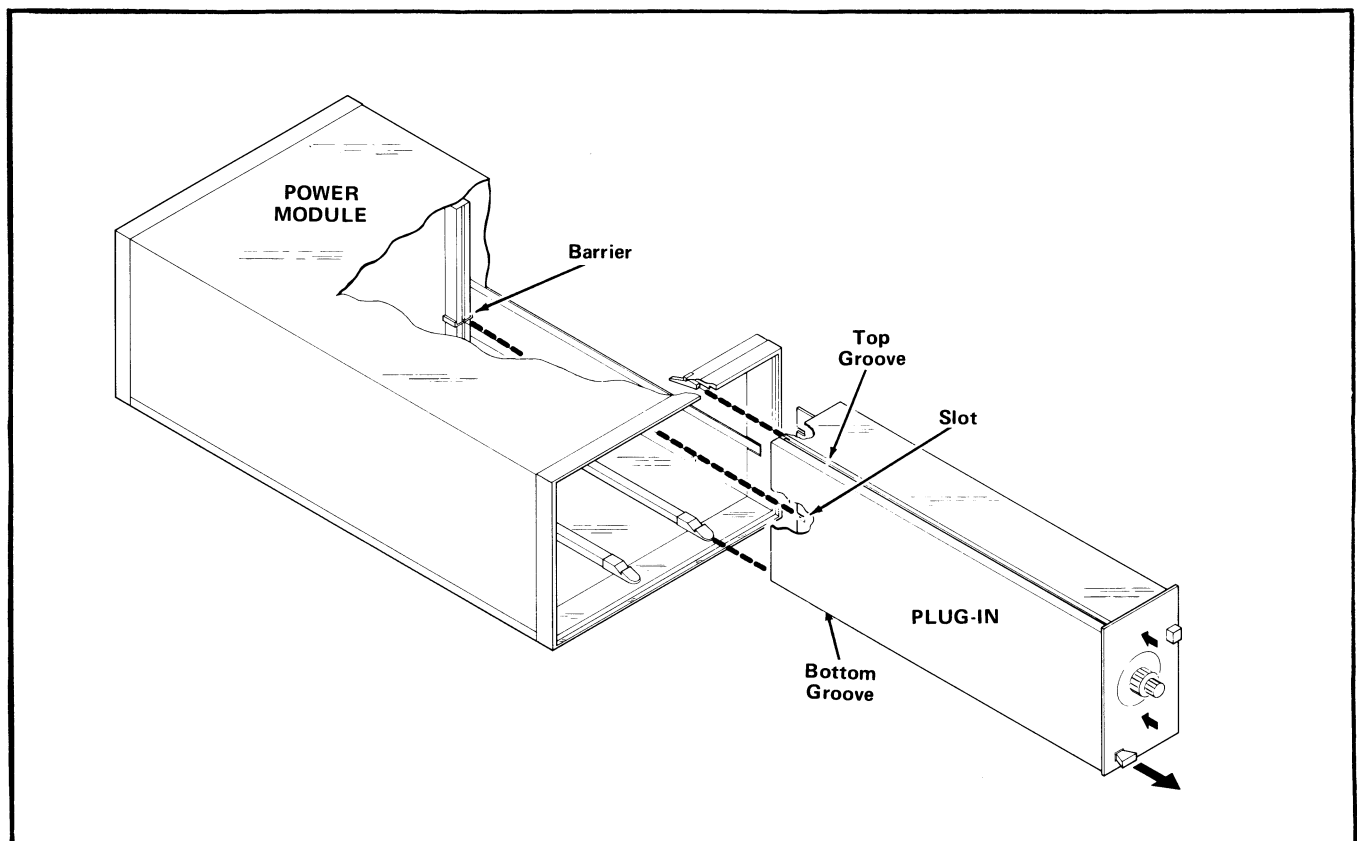


Fig. 1-1. Plug-in Installation and removal.

OPERATING CONSIDERATIONS

Applying Signals

When displaying DC voltage, use the largest deflection factor (1 V/Div) when first connecting the MR 501 to an unknown voltage source. If the deflection is too small to make the measurement, switch to a lower deflection factor.

While most connections to the MR 501 will be made using coaxial cables, probes offer another convenient method of connecting a signal to the input of the MR 501. Tektronix probes are shielded to prevent pickup of electrostatic interference. A 10X attenuator probe offers a high input impedance and allows the circuit under test to perform very close to normal operating conditions. The MR 501 is compatible with probes such as the Tektronix P6060 and P6052 Passive Probes.

NOTE

Probe compensation must be checked each time MR 501 deflection factor is changed.

Sometimes unshielded test leads can be used to connect the MR 501 to a signal source, particularly when a high-level, low-frequency signal is monitored at a low-impedance point. However, when any of these factors is missing, it becomes increasingly important to use shielded signal cables. In all cases, the signal transporting leads should be kept as short as practical. Be sure to establish a common ground connection between the device under test and the MR 501. The shield of a coaxial cable or ground strap of a signal probe provides an adequate common ground connection.

Input Coupling

The AC COUPL pushbutton switch allows a choice of input coupling. The type of display desired determines the coupling used.

DC coupling (button out) can be used for most applications. However, if the DC component of the signal is much larger than the AC component, AC coupling (button in) will probably provide a better display. DC coupling should be used to display an AC signal below about 3 hertz, since it will be attenuated in the AC position.

In the AC position, the DC component is blocked by a capacitor in the input circuit. The low-frequency response in the AC position is about 3 hertz (-3 dB point). Therefore, some low-frequency attenuation and phase shift can be expected near this frequency limit. Distortion will

also appear in square waves that have low-frequency components.

Optional Bandwidth Limiting

The bandwidth of the MR 501 X and Y amplifiers can be limited by connecting an appropriate capacitance value to the location shown in Fig. 1-2. Table 1-1 lists a few common capacitor values and the approximate bandwidth limit that results. The capacitor used for bandwidth limiting should be non-polarized and have a working DC voltage of at least 10 V.

TABLE 1-1

Bandwidth Limiting

Capacitor Value	Upper Bandwidth Limit (-3 dB)
.001 μ F	100 kHz
.01 μ F	10 kHz
.1 μ F	1 kHz
1 μ F	100 Hz

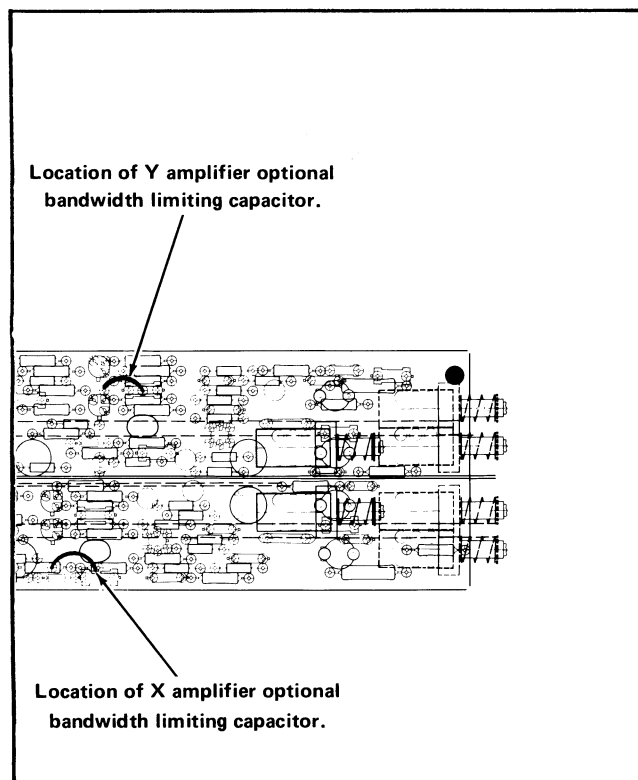


Fig. 1-2. Location of added optional bandwidth limiting Capacitors for the X and Y amplifiers.

Deflection Factor

The amount of trace deflection produced by a signal is determined by the signal amplitude, the attenuation factor (if any) of the probe, the setting of the Volts/Div pushbuttons, and the setting of the VARIABLE control. The deflection factors indicated by the Volts/Div push-

buttons are calibrated only when the VARIABLE control is rotated fully clockwise.

The range of the VARIABLE control is at least 10:1. It provides uncalibrated deflection factors covering the full range between the fixed settings of the Volts/Div pushbuttons. The control can be set to extend the deflection factor to at least 10 volts/division.

OPERATING MODES

X-Y

In the X-Y mode, apply the vertical signal to the Y input connector and the horizontal signal to the X input connector. The intensity modulation signal is applied to the Z input connector. Input signal requirements are given later in this section.

Refer to the RG 501 Ramp Generator Instruction Manual for more complete operating instructions.

Set the RG 501 triggering controls for an Auto Trig and Ext triggering. Use the signal being observed on the Y-axis to externally trigger the RG 501. Adjust the RG 501 Level control to obtain a stable display on the MR 501. Refer to the RG 501 Ramp Generator Instruction Manual for more complete operating instructions.

Y-T (Sweep Operation)

An RG 501 Ramp Generator can be used in conjunction with the MR 501 Monitor to make an oscilloscope. The signal to be observed is connected to the Y input connector. The RG 501 Ramp Out and Gate Out connectors are connected via short coaxial cables to the MR 501 X input and Z input connectors, respectively.

If a time-calibrated MR 501 Y-T display is desired, connect time-markers from a time mark generator to the MR 501 Y input connector. Use the RG 501 Ramp Amplitude control to achieve the correct time-calibration between the first and last graticule lines (10 divisions) on the MR 501.

REAR INTERFACE

Input/Output Assignment

The X and Y input and the Z input connector signals can be applied through the rear connector if the MR 501 is modified. The modification consists of:

1. Unsoldering the resistors going to the X and Y input connectors.
2. Connecting the center conductor of a coaxial cable to each resistor. Connect the shield to ground.
3. Connecting the unconnected end of the X input cable to pin 17B (center conductor) and 17A (ground). The Y input cable solders to pin 16A (center conductor) and 16B (ground).
4. Unsolder the coaxial cable from the Z input connector and solder it to pins 27A (center conductor) and 26A (ground).

Other Functions Available

Unassigned pins are available at the rear connector for routing signals to and from the MR 501 for specialized applications (see Rear Connector Pin Assignments in Section 2). One or more compartments of a multi-plug-in Power Module can be wired with barriers installed to provide specific functions between compartments. See Power Module instruction manual for additional information.

ELECTRICAL CHARACTERISTICS

Performance Conditions,

The electrical characteristics are valid only if the MR 501 has been calibrated at an ambient temperature be-

tween +20°C and +30°C and is operating at an ambient temperature between 0°C and +50°C unless otherwise noted.

TABLE 1-2
VERTICAL (Y) AND HORIZONTAL (X) AMPLIFIERS

Characteristics	Performance Requirements	Supplemental Information
Bandwidth	DC to at least 2 MHz	Upper frequency limit can be easily reduced to below 1 kHz
Input Sensitivity	10 mV/div to 10 V/div	10X variable and fixed attenuators are used
Attenuator		
Steps	10 mV/div, 100 mV/div and 1 V/div	
Accuracy	±3%	VARIABLE in X1 (full cw) position; gain correctly set at 10 mV/div.
Uncalibrated (Variable) Range	Continuously variable between calibrated steps. Extends maximum input sensitivity to at least 10 V/div	At least at 10:1 range
Low Frequency Linearity		0.1 division or less compression or expansion of a two division (at center screen) signal when positioned to the top and bottom of the graticule area
Input Coupling	AC or DC	
Input Impedance	1 MΩ paralleled by less than 50 pF	Input capacitance is not standardized between attenuator steps.
Maximum Safe Input Voltage	350 V (DC + peak AC)	
Phase Shift X-Y	Less than 1° from DC to 100 kHz	
Channel Isolation	≥70 dB at 2 MHz	

TABLE 1-3
Z-AXIS AMPLIFIER

Characteristics	Performance Requirements	Supplemental Information
External Input Voltage	+5 V turns CRT beam on from off condition	Actual voltage required depends on setting of INTENSITY control. Unblanking requirements are compatible with RG 501 Ramp Generator
Bandwidth	DC to greater than 200 kHz	
Input Impedance	10 kΩ paralleled by less than 50 pF	
Input Coupling	DC	

TABLE 1-4

DISPLAY

Characteristics	Performance Requirements	Supplemental Information
Standard CRT Type		T211-31-1
Graticule		
Type	Internal black line, nonilluminated	
Area	Six divisions vertical by 10 divisions horizontal. Each division equals 0.203 inch	
Phosphor	P31 standard	
Raster Distortion (Geometry)		0.2 division or less total bowing or tilt of a displayed vertical or horizontal line

TABLE 1-5

ENVIRONMENTAL

Characteristics	Performance Requirements	Supplemental Information
Temperature		
Operating	0°C to +50°C	
Storage	-40°C to +75°C	
Altitude		
Operating	To 15,000 feet	
Storage	To 50,000 feet	
Vibration		
Operating and Nonoperating	With the instrument complete and operating, vibration frequency swept from 10 to 50 to 10 Hz at 1 minute per sweep. Vibrate 15 minutes in each of the three major axis at 0.015 inch total displacement. Hold 3 minutes at any major resonance, or if none, at 50 Hz. Total time, 54 minutes.	
Shock		
Operating and Nonoperating	30 g's, 1/2 sine, 11 ms duration, 2 shocks in each direction along 3 major axes, for a total of 12 shocks.	

SERVICING INFORMATION

Contents

This section of the manual contains information necessary to service the MR 501. Adjustment procedures are provided on foldout pages with supporting illustrations that show internal adjustment locations and describe front-panel control functions. Also included is the electrical parts list, and an illustration on the Component Location foldout page that shows the physical location of components on the etched circuit board. Schematic diagrams are located near the circuit board illustration to further facilitate the location of components. Rear connector pin assignments are listed in Table 2-1.

Mechanical parts are listed at the rear of this section with an exploded view of the instrument. A list of standard accessories and a carton assembly drawing are on the back of the exploded view foldout page.

Maintenance

General system maintenance procedures are provided in the Power Module instruction manual, i.e., preventive maintenance, troubleshooting aids, parts removal and replacement procedures, parts ordering information, etc.

CRT Replacement. The following procedure outlines the removal and replacement of the cathode-ray tube. Refer to Fig. 2-1.

WARNING

Use care when handling a CRT. Protective clothing and safety glasses should be worn. Avoid striking it on any object which might cause it to crack or implode. When storing a CRT, place it in a protective carton or set it face down in a protected location on a smooth surface with a soft mat under the faceplate to protect it from scratches.

A. REMOVAL

1. Remove the bezel assembly, which is held in place with two flat head screws, and the FOCUS and INTENSITY control knobs. To remove the two knobs, loosen the set screw and pull off. The bezel assembly now pulls out.

NOTE

The red and black wires entering the CRT shield are connected to the trace-rotation coil around the CRT. They must be disconnected before removing the CRT.

2. Remove the CRT base socket and disconnect the trace-rotation wires from the circuit board.

3. With one hand on the CRT faceplate, push on the CRT base until the CRT is part way out of the MR 501. Pull the CRT out of the instrument from the front.

B. REPLACEMENT

1. Insert the CRT into the CRT shield through the front of the instrument.

2. Install bezel assembly with its two flat-head screws.

3. Push CRT tight against bezel assembly.

NOTE

If CRT support ring has come out of CRT shield, place over rear of CRT and position inside CRT shield between CRT and CRT shield, see Fig. 2-1.

4. Place the CRT base socket onto the CRT base pins. Connect the trace-rotation wires to mating pins on the circuit board.

5. Install the FOCUS and INTENSITY control knobs.

6. Replacing the CRT will require partial instrument readjustment. Refer to the Adjustments foldout pages.

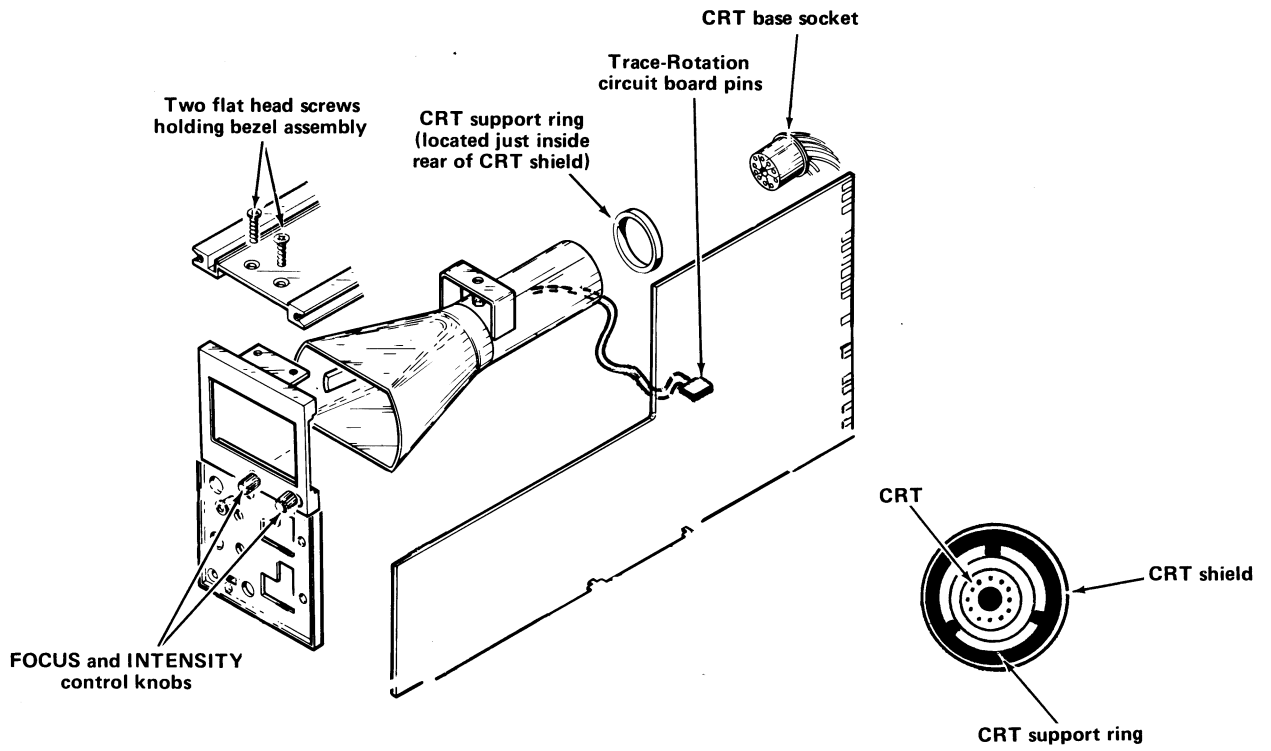


Fig. 2-1. Replacing the cathode-ray tube.

DIAGRAMS, PARTS LISTS, AND ILLUSTRATIONS

Symbols and Reference Designators

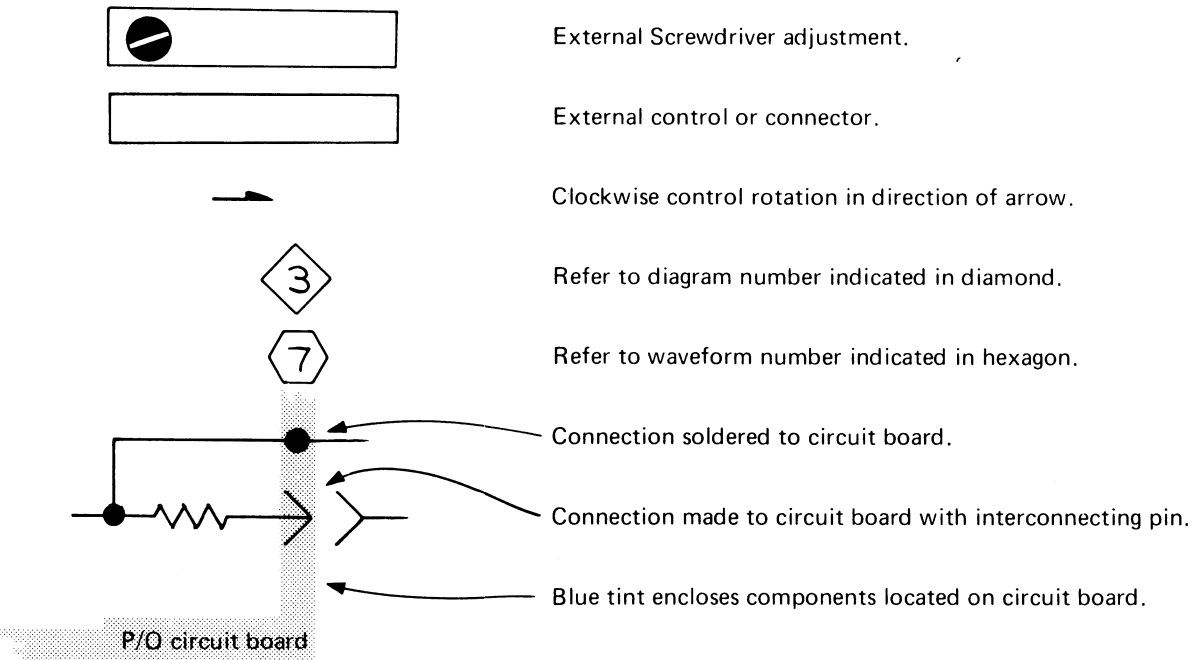
Electrical components shown on the diagrams are in the following units unless noted otherwise:

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

Symbols used on the diagrams are based on ANSI Y32.2 – 1970.

Logic symbology is based on MIL-STD-806B in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

The following special symbols are used on the diagrams:



REPLACEABLE ELECTRICAL PARTS

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

SPECIAL NOTES AND SYMBOLS

X000 Part first added at this serial number
00X Part removed after this serial number

ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

ABBREVIATIONS

ACTR	ACTUATOR	PLSTC	PLASTIC
ASSY	ASSEMBLY	QTZ	QUARTZ
CAP	CAPACITOR	RECP	RECEPTACLE
CER	CERAMIC	RES	RESISTOR
CKT	CIRCUIT	RF	RADIO FREQUENCY
COMP	COMPOSITION	SEL	SELECTED
CONN	CONNECTOR	SEMICOND	SEMICONDUCTOR
ELCTLT	ELECTROLYTIC	SENS	SENSITIVE
ELEC	ELECTRICAL	VAR	VARIABLE
INCAND	INCANDESCENT	WW	WIREWOUND
LED	LIGHT EMITTING DIODE	XFMR	TRANSFORMER
NONWIR	NON WIREWOUND	XTAL	CRYSTAL

CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
00853	SANGAMO ELECTRIC CO., S. CAROLINA DIV.	P. O. BOX 128	PICKENS, SC 29671
01002	GENERAL ELECTRIC CO., INDUSTRIAL AND POWER CAPACITOR PRODUCTS DEPT.	JOHN ST. 1201 2ND ST. SOUTH	HUDSON FALLS, NY 12839 MILWAUKEE, WI 53204
01121	ALLEN-BRADLEY CO.		
03508	GENERAL ELECTRIC CO., SEMI-CONDUCTOR PRODUCTS DEPT.	ELECTRONICS PARK	SYRACUSE, NY 13201
04713	MOTOROLA, INC., SEMICONDUCTOR PRODUCTS DIV.	5005 E. MCDOWELL RD.	PHOENIX, AZ 85036
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS ST. 12515 CHADRON AVE.	MOUNTAIN VIEW, CA 94042 HAWTHORNE, CA 90250
07910	TELEDYNE SEMICONDUCTOR		
22229	SOLITRON DEVICES, INC., DIODES, INTEGRATED CIRCUITS AND CMOS	8808 BALBOA AVE. 3560 MADISON AVE.	SAN DIEGO, CA 92123 INDIANAPOLIS, IN 46227 NORTH ADAMS, MA 01247
24931	SPECIALTY CONNECTOR CO., INC.		
56289	SPRAGUE ELECTRIC CO.		
71400	BUSSMAN MFG., DIVISION OF MCGRAW- EDISON CO.	2536 W. UNIVERSITY ST. 4433 RAVENSWOOD AVE.	ST. LOUIS, MO 63107 CHICAGO, IL 60640
71744	CHICAGO MINIATURE LAMP WORKS		
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
73138	BECKMAN INSTRUMENTS, INC., HELIPOT DIV.	2500 HARBOR BLVD.	FULLERTON, CA 92634
74970	JOHNSON, E. F., CO.	299 10TH AVE. S. W.	WASECA, MN 56093
75042	TRW ELECTRONIC COMPONENTS, IRC FIXED RESISTORS, PHILADELPHIA DIVISION	401 N. BROAD ST. P. O. BOX 500	PHILADELPHIA, PA 19108 BEAVERTON, OR 97077
80009	TEKTRONIX, INC.		

Replaceable Electrical Parts—MR 501

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
A1	670-2980-00		CKT BOARD ASSY:MAIN	80009	670-2980-00
A2	670-3229-00		CKT BOARD ASSY:PROTECTION	80009	670-3229-00
C10	283-0008-00		CAP. ,FXD,CER DI:1UF,500V	72982	8151N501651104M
C12	281-0153-00		CAP. ,VAR,AIR DI:1.7-10PF,250V	74970	187-0106-005
C14	281-0564-00		CAP. ,FXD,CER DI:24PF,5%,500V	72982	301-000C0G0240J
C16	283-0598-00		CAP. ,FXD,MICA D:253PF,5%,300V	00853	D153E2530J0
C20	281-0153-00		CAP. ,VAR,AIR DI:1.7-10PF,250V	74970	187-0106-005
C22	281-0564-00		CAP. ,FXD,CER DI:24PF,5%,500V	72982	301-000C0G0240J
C24	283-0051-00		CAP. ,FXD,CER DI:0.0033UF,5%,100V	72982	8131N145COG332J
C26	281-0511-00		CAP. ,FXD,CER DI:22PF,+/-2.2PF,500V	72982	301-000C0G0220K
C28	283-0003-00		CAP. ,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
C32	283-0078-00		CAP. ,FXD,CER DI:0.001UF,20%,500V	56289	20C114A8
C44	281-0638-00		CAP. ,FXD,CER DI:240PF,5%,500V	72982	301-000Z5D0241J
C48	290-0522-00		CAP. ,FXD,ELCTLT:1UF,20%,50V	56289	196D105X0050HA1
C64	281-0589-00		CAP. ,FXD,CER DI:170PF,5%,500V	72982	301-057Z5D0171J
C92	281-0603-00		CAP. ,FXD,CER DI:39PF,5%,500V	72982	308-000C0G0390J
C100	283-0008-00		CAP. ,FXD,CER DI:1UF,500V	72982	8151N501651104M
C112	281-0153-00		CAP. ,VAR,AIR DI:1.7-10PF,250V	74970	187-0106-005
C114	281-0564-00		CAP. ,FXD,CER DI:24PF,5%,500V	72982	301-000C0G0240J
C116	283-0598-00		CAP. ,FXD,MICA D:253PF,5%,300V	00853	D153E2530J0
C120	281-0153-00		CAP. ,VAR,AIR DI:1.7-10PF,250V	74970	187-0106-005
C122	281-0564-00		CAP. ,FXD,CER DI:24PF,5%,500V	72982	301-000C0G0240J
C124	283-0051-00		CAP. ,FXD,CER DI:0.0033UF,5%,100V	72982	8131N145COG332J
C126	281-0511-00		CAP. ,FXD,CER DI:22PF,+/-2.2PF,500V	72982	301-000C0G0220K
C128	283-0003-00		CAP. ,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
C132	283-0078-00		CAP. ,FXD,CER DI:0.001UF,20%,500V	56289	20C114A8
C144	281-0638-00		CAP. ,FXD,CER DI:240PF,5%,500V	72982	301-000Z5D0241J
C164	281-0646-00		CAP. ,FXD,CER DI:88PF,5%,500V	72982	308-000T2H880J
C170	290-0525-00		CAP. ,FXD,ELCTLT:4.7UF,20%,50V	56289	196D475X0050KA1
C192	281-0519-00		CAP. ,FXD,CER DI:47PF,+/-4.7PF,500V	72982	308-000C0G0470K
C224	283-0003-00		CAP. ,FXD,CER DI:0.01UF,+80-20%,150V	72982	855-547E103Z
C226	281-0529-00		CAP. ,FXD,CER DI:1.5PF,0.25PF,500V	72982	301-000C0K0159C
C234	285-0622-00		CAP. ,FXD,PLSTC:0.1UF,20%,100V	01002	64F24AB104
C236	285-0622-00		CAP. ,FXD,PLSTC:0.1UF,20%,100V	01002	64F24AB104
C245	283-0057-00		CAP. ,FXD,CER DI:0.1UF,+80-20%,200V	56289	274C10
C248	290-0164-00		CAP. ,FXD,ELCTLT:1UF,+50-10%,150V	56289	30D105F150BA4
C250	281-0638-00		CAP. ,FXD,CER DI:240PF,5%,500V	72982	301-000Z5D0241J
C252	283-0279-00		CAP. ,FXD,CER DI:0.01UF,20%,3000V	72982	878521Y5S102M
C254	283-0343-00		CAP. ,FXD,CER DI:0.01UF,20%,2000V	72982	3848-019E103M
C265	290-0522-00		CAP. ,FXD,ELCTLT:1UF,20%,50V	56289	196D105X0050HA1
C280	283-0279-00		CAP. ,FXD,CER DI:0.001UF,20%,3000V	72982	878Y5S102M
C294	283-0010-00		CAP. ,FXD,CER DI:0.05UF,+100-20%,50V	56289	273C20
C296	290-0522-00		CAP. ,FXD,ELCTLT:1UF,20%,50V	56289	196D105X0050HA1
C300	283-0010-00		CAP. ,FXD,CER DI:0.05UF,+100-20%,50V	56289	273C20
C302	290-0410-00		CAP. ,FXD,ELCTLT:15UF,+50-10%,100V	56289	30D156F1000DD4
C304	285-0629-00		CAP. ,FXD,PLSTC:0.047UF,20%,100V	01002	64F19AB473
C310	290-0410-00		CAP. ,FXD,ELCTLT:15UF,+50-10%,100V	56289	30D156F1000DD4
C311	290-0164-00		CAP. ,FXD,ELCTLT:1UF,+50-10%,150V	56289	30D105F150BA4
C315	283-0267-00		CAP. ,FXD,CER DI:0.01UF,20%,500V	72982	841-541C103M
C316	283-0267-00		CAP. ,FXD,CER DI:0.01UF,20%,500V	72982	841-541C103M
C318	283-0267-00		CAP. ,FXD,CER DI:0.01UF,20%,500V	72982	841-541C103M
C320	283-0267-00		CAP. ,FXD,CER DI:0.01UF,20%,500V	72982	841-541C103M

Replaceable Electrical Parts—MR 501

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
C322	283-0267-00			CAP., FXD, CER DI:0.01UF, 20%, 500V	72982	841-541C103M
C324	283-0267-00			CAP., FXD, CER DI:0.01UF, 20%, 500V	72982	841-541C103M
C326	283-0013-00			CAP., FXD, CER DI:0.01UF, 100V	56289	33C29A7
C330	283-0013-00			CAP., FXD, CER DI:0.01UF, +100-0%, 1000V	56289	33C29A7
C332	283-0013-00			CAP., FXD, CER DI:0.01UF, +100-0%, 1000V	56289	33C29A7
C335	283-0013-00			CAP., FXD, CER DI:0.01UF, +100-0%, 1000V	56289	33C29A7
C400	290-0525-00			CAP., FXD, ELCTLT:4.7UF, 20%, 50V	56289	196D475X0050KA1
C404	281-0550-00			CAP., FXD, CER DI:120PF, 10%, 500V	72982	301-000X5P0121K
C434	290-0512-00			CAP., FXD, ELCTLT:22UF, 20%, 15V	56289	196D226X0015KA1
C436	290-0525-00			CAP., FXD, ELCTLT:4.7UF, 20%, 50V	56289	196D475X0050KA1
C438	290-0525-00			CAP., FXD, ELCTLT:4.7UF, 20%, 50V	56289	196D475X0050KA1
C450	290-0525-00			CAP., FXD, ELCTLT:4.7UF, 20%, 50V	56289	196D475X0050KA1
C454	281-0638-00			CAP., FXD, CER DI:240PF, 5%, 500V	72982	301-000Z5D0241J
CR30	152-0246-00			SEMICOND DEVICE:SILICON, 400PIV, 200MA	07910	CD12676
CR40	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
CR80	152-0061-00			SEMICOND DEVICE:SILICON, 175V, 100MA	80009	152-0061-00
CR90	152-0061-00			SEMICOND DEVICE:SILICON, 175V, 100MA	80009	152-0061-00
CR130	152-0246-00			SEMICOND DEVICE:SILICON, 400PIV, 200MA	07910	CD12676
CR140	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
CR180	152-0061-00			SEMICOND DEVICE:SILICON, 175V, 100MA	80009	152-0061-00
CR190	152-0061-00			SEMICOND DEVICE:SILICON, 175V, 100MA	80009	152-0061-00
CR204	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
CR210	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
CR219	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
CR245	152-0107-00	B010100	B039999	SEMICOND DEVICE:SILICON, 375V, 400MA	80009	152-0107-00
CR245	152-0107-03	B040000		SEMICOND DEVICE:SILICON, 175V, 400MA, SEL	80009	152-0107-03
CR247	152-0107-00	B010100	B039999	SEMICOND DEVICE:SILICON, 375V, 400MA	80009	152-0107-00
CR247	152-0107-03	B040000		SEMICOND DEVICE:SILICON, 175V, 400MA, SEL	80009	152-0107-03
CR248	152-0107-00	B010100	B039999	SEMICOND DEVICE:SILICON, 375V, 400MA	80009	152-0107-00
CR248	152-0107-03	B040000		SEMICOND DEVICE:SILICON, 175V, 400MA, SEL	80009	152-0107-03
CR254	152-0107-00	B010100	B039999	SEMICOND DEVICE:SILICON, 375V, 400MA	80009	152-0107-00
CR254	152-0107-03	B040000		SEMICOND DEVICE:SILICON, 175V, 400MA, SEL	80009	152-0107-03
CR256	152-0107-00	B010100	B039999	SEMICOND DEVICE:SILICON, 375V, 400MA	80009	152-0107-00
CR256	152-0107-03	B040000		SEMICOND DEVICE:SILICON, 175V, 400MA, SEL	80009	152-0107-03
CR290	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
CR291	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
CR310	152-0107-00	B010100	B039999	SEMICOND DEVICE:SILICON, 375V, 400MA	80009	152-0107-00
CR310	152-0107-03	B040000		SEMICOND DEVICE:SILICON, 175V, 400MA, SEL	80009	152-0107-03
CR315	152-0107-00	B010100	B039999	SEMICOND DEVICE:SILICON, 375V, 400MA	80009	152-0107-00
CR315	152-0107-03	B040000		SEMICOND DEVICE:SILICON, 175V, 400MA, SEL	80009	152-0107-03
CR316	152-0107-00	B010100	B039999	SEMICOND DEVICE:SILICON, 375V, 400MA	80009	152-0107-00
CR316	152-0107-03	B040000		SEMICOND DEVICE:SILICON, 175V, 400MA, SEL	80009	152-0107-03
CR318	152-0107-00	B010100	B039999	SEMICOND DEVICE:SILICON, 375V, 400MA	80009	152-0107-00
CR318	152-0107-03	B040000		SEMICOND DEVICE:SILICON, 175V, 400MA, SEL	80009	152-0107-03
CR320	152-0107-00	B010100	B039999	SEMICOND DEVICE:SILICON, 375V, 400MA	80009	152-0107-00
CR320	152-0107-03	B040000		SEMICOND DEVICE:SILICON, 175V, 400MA, SEL	80009	152-0107-03
CR322	152-0107-00	B010100	B039999	SEMICOND DEVICE:SILICON, 375V, 400MA	80009	152-0107-00
CR322	152-0107-03	B040000		SEMICOND DEVICE:SILICON, 175V, 400MA, SEL	80009	152-0107-03
CR324	152-0107-00	B010100	B039999	SEMICOND DEVICE:SILICON, 375V, 400MA	80009	152-0107-00
CR324	152-0107-03	B040000		SEMICOND DEVICE:SILICON, 175V, 400MA, SEL	80009	152-0107-03
CR460	152-0141-02			SEMICOND DEVICE:SILICON, 30V, 150MA	07910	1N4152
DS430	150-0109-00			LAMP, INCAND:18V, 26MA	71744	CM7220

Replaceable Electrical Parts—MR 501

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
F310	159-0025-00		FUSE, CARTRIDGE:0.5A, 3AG, FAST-BLOW	71400	AGC1-2
J10	131-0955-00		CONNECTOR, RCPT, :BNC, FEMALE	24931	28JR200-1
J100	131-0955-00		CONNECTOR, RCPT, :BNC, FEMALE	24931	28JR200-1
J200	131-0955-00		CONNECTOR, RCPT, :BNC, FEMALE	24931	28JR200-1
Q30A,B	151-1054-00		TRANSISTOR:SILICON,JFE,N-CHANNEL,DUAL	22229	FD1644
Q40	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q50	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q60	151-0342-00		TRANSISTOR:SILICON,PNP	07263	2N4249
Q70	151-0342-00		TRANSISTOR:SILICON,PNP	07263	2N4249
Q80	151-0347-00		TRANSISTOR:SILICON,NPN	80009	151-0347-00
Q90	151-0347-00		TRANSISTOR:SILICON,NPN	80009	151-0347-00
Q130A,B	151-1054-00		TRANSISTOR:SILICON,JFE,N-CHANNEL,DUAL	22229	FD1644
Q140	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q150	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q160	151-0342-00		TRANSISTOR:SILICON,PNP	07263	2N4249
Q170	151-0342-00		TRANSISTOR:SILICON,PNP	07263	2N4249
Q180	151-0347-00		TRANSISTOR:SILICON,NPN	80009	151-0347-00
Q190	151-0347-00		TRANSISTOR:SILICON,NPN	80009	151-0347-00
Q200	151-0341-00		TRANSISTOR:SILICON,NPN	07263	2N3565
Q220	151-0342-00		TRANSISTOR:SILICON,PNP	07263	2N4249
Q225	151-0347-00		TRANSISTOR:SILICON,NPN	80009	151-0347-00
Q230	151-0350-00		TRANSISTOR:SILICON,PNP	07263	2N5401
Q290	151-0254-00		TRANSISTOR:SILICON,NPN	03508	2N5308
Q298	151-0301-00		TRANSISTOR:SILICON,PNP	04713	2N2907A
Q300	151-0358-00		TRANSISTOR:SILICON,NPN,SEL FROM D44R4	03508	D44R211
Q310	151-0506-00		TRANSISTOR:SILICON,CONTROLLED RECTIFIER	03508	C106B2
Q404	151-0342-00		TRANSISTOR:SILICON,PNP	07263	2N4249
Q410	151-0190-00		TRANSISTOR:SILICON,NPN	04713	2N3904
Q430	151-0302-00		TRANSISTOR:SILICON,NPN	04713	2N2222A
Q454	151-0341-00		TRANSISTOR:SILICON,NPN	07263	2N3565
Q460	151-0342-00		TRANSISTOR:SILICON,PNP	07263	2N4249
R10	316-0471-00		RES.,FXD,COMP:470 OHM,10%,0.25W	01121	CB4711
R14	322-0621-01		RES.,FXD,FILM:900K OHM,0.5%,0.25W	75042	CEAT0-9003D
R16	321-1389-01		RES.,FXD,FILM:111K OHM,0.5%,0.125W	75042	CEAT0-1113D
R22	322-0624-01		RES.,FXD,FILM:990K OHM,0.5%,0.25W	75042	CEAT0-9903D
R24	321-1289-01		RES.,FXD,FILM:10.1K OHM,0.5%,0.125W	75042	CEAT0-1012D
R26	321-0481-01		RES.,FXD,FILM:1M OHM,0.5%,0.125W	75042	CEAT0-1004D
R28	316-0104-00		RES.,FXD,COMP:100K OHM,10%,0.25W	01121	CB1041
R29	316-0222-00		RES.,FXD,COMP:2.2K OHM,10%,0.25W	01121	CB2221
R30	315-0203-00		RES.,FXD,COMP:20K OHM,5%,0.25W	01121	CB2035
R32	315-0203-00		RES.,FXD,COMP:20K OHM,5%,0.25W	01121	CB2035
R33	316-0101-00		RES.,FXD,COMP:100 OHM,10%,0.25W	01121	CB1011
R34	316-0103-00		RES.,FXD,COMP:10K OHM,10%,0.25W	01121	CB1031
R35	311-1558-00		RES.,VAR, NONWIR:20K OHM,20%,0.50W	73138	91A-20001M
R40	321-0175-00		RES.,FXD,FILM:649 OHM,1%,0.125W	75042	CEAT0-6490F
R42	321-0269-00		RES.,FXD,FILM:6.19K OHM,1%,0.125W	75042	CEAT0-6191F
R44	321-0080-00		RES.,FXD,FILM:66.5 OHM,1%,0.125W	75042	CEAT0-66R50F
R46	315-0622-00		RES.,FXD,COMP:6.2K OHM,5%,0.25W	01121	CB6225
R48	311-1298-00		RES.,VAR, NONWIR:10K OHM,20%,0.50W	01121	W7909
R50	321-0173-00		RES.,FXD,FILM:619 OHM,1%,0.125W	75042	CEAT0-6190F
R52	321-0269-00		RES.,FXD,FILM:6.19K OHM,1%,0.125W	75042	CEAT0-6191F

Replaceable Electrical Parts—MR 501

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
R55	311-0091-00		RES.,VAR, NONWIR:1K OHM,10%,0.50W	01121	W3083E
R60	321-0225-00		RES.,FXD,FILM:2.15K OHM,1%,0.125W	75042	CEATO-2151F
R62	321-0237-00		RES.,FXD,FILM:2.87K OHM,1%,0.125W	75042	CEATO-2871F
R64	321-0155-00		RES.,FXD,FILM:402 OHM,1%,0.125W	75042	CEATO-4020F
R70	321-0225-00		RES.,FXD,FILM:2.15K OHM,1%,0.125W	75042	CEATO-2151F
R71	321-0151-00		RES.,FXD,FILM:365 OHM,1%,0.125W	75042	CEATO-3650F
R72	321-0237-00		RES.,FXD,FILM:2.87K OHM,1%,0.125W	75042	CEATO-2871F
R80	303-0622-00		RES.,FXD,COMP:6.2K OHM,5%,1W	01121	GB6225
R82	322-0229-00		RES.,FXD,FILM:2.37K OHM,1%,0.25W	75042	CEBTO-2371F
R84	315-0112-00		RES.,FXD,COMP:1.1K OHM,5%,0.25W	01121	CB1125
R86	321-0202-00		RES.,FXD,FILM:1.24K OHM,1%,0.125W	75042	CEATO-1241F
R90	303-0622-00		RES.,FXD,COMP:6.2K OHM,5%,1W	01121	GB6225
R92	322-0229-00		RES.,FXD,FILM:2.37K OHM,1%,0.25W	75042	CEBTO-2371F
R95	311-1563-00		RES.,VAR, NONWIR:1K OHM,20%,0.50W	73138	91A-10000M
R100	316-0471-00		RES.,FXD,COMP:470 OHM,10%,0.25W	01121	CB4711
R114	322-0621-01		RES.,FXD,FILM:900K OHM,0.5%,0.25W	75042	CEBTO-9003D
R116	321-1389-01		RES.,FXD,FILM:111K OHM,0.5%,0.125W	75042	CEATO-1113D
R122	322-0624-01		RES.,FXD,FILM:990K OHM,0.5%,0.25W	75042	CEBTO-9903D
R124	321-1289-01		RES.,FXD,FILM:10.1K OHM,0.5%,0.125W	75042	CEATO-1012D
R126	321-0481-01		RES.,FXD,FILM:1M OHM,0.5%,0.125W	75042	CEATO-1004D
R128	316-0104-00		RES.,FXD,COMP:100K OHM,10%,0.25W	01121	CB1041
R129	316-0222-00		RES.,FXD,COMP:2.2K OHM,10%,0.25W	01121	CB2221
R130	315-0203-00		RES.,FXD,COMP:20K OHM,5%,0.25W	01121	CB2035
R132	315-0203-00		RES.,FXD,COMP:20K OHM,5%,0.25W	01121	CB2035
R133	316-0101-00		RES.,FXD,COMP:100 OHM,10%,0.25W	01121	CB1011
R134	316-0103-00		RES.,FXD,COMP:10K OHM,10%,0.25W	01121	CB1031
R135	311-1558-00		RES.,VAR, NONWIR:20K OHM,20%,0.50W	73138	91A-20001M
R140	321-0175-00		RES.,FXD,FILM:649 OHM,1%,0.125W	75042	CEATO-6490F
R142	321-0269-00		RES.,FXD,FILM:6.19K OHM,1%,0.125W	75042	CEATO-6191F
R144	321-0080-00		RES.,FXD,FILM:66.5 OHM,1%,0.125W	75042	CEATO-66R50F
R146	315-0622-00		RES.,FXD,COMP:6.2K OHM,5%,0.25W	01121	CB6225
R148	311-1298-00		RES.,VAR, NONWIR:10K OHM,20%,0.50W	01121	W7909
R150	321-0173-00		RES.,FXD,FILM:619 OHM,1%,0.125W	75042	CECTO-6190F
R152	321-0269-00		RES.,FXD,FILM:6.19K OHM,1%,0.125W	75042	CEATO-6191F
R155	311-0091-00		RES.,VAR, NONWIR:1K OHM,10%,0.50W	01121	W3083E
R160	321-0225-00		RES.,FXD,FILM:2.15K OHM,1%,0.125W	75042	CEATO-2151F
R162	321-0237-00		RES.,FXD,FILM:2.87K OHM,1%,0.125W	75042	CEATO-2871F
R164	321-0175-00		RES.,FXD,FILM:649 OHM,1%,0.125W	75042	CEATO-6490F
R170	321-0225-00		RES.,FXD,FILM:2.15K OHM,1%,0.125W	75042	CEATO-2151F
R171	321-0151-00		RES.,FXD,FILM:365 OHM,1%,0.125W	75042	CEATO-3650F
R172	321-0237-00		RES.,FXD,FILM:2.87K OHM,1%,0.125W	75042	CEATO-2871F
R180	303-0622-00		RES.,FXD,COMP:6.2K OHM,5%,1W	01121	GB6225
R182	322-0229-00		RES.,FXD,FILM:2.37K OHM,1%,0.25W	75042	CEBTO-2371F
R184	315-0112-00		RES.,FXD,COMP:1.1K OHM,5%,0.25W	01121	CB1125
R186	321-0202-00		RES.,FXD,FILM:1.24K OHM,1%,0.125W	75042	CEATO-1241F
R190	303-0622-00		RES.,FXD,COMP:6.2K OHM,5%,1W	01121	GB6225
R192	322-0229-00		RES.,FXD,FILM:2.37K OHM,1%,0.25W	75042	CEBTO-2371F
R195	311-1563-00		RES.,VAR, NONWIR:1K OHM,20%,0.50W	73138	91A-10000M
R200	321-0289-00		RES.,FXD,FILM:10K OHM,1%,0.125W	75042	CEATO-1002F
R202	321-0343-00		RES.,FXD,FILM:36.5K OHM,1%,0.125W	75042	CEATO-3652F
R204	315-0362-00		RES.,FXD,COMP:3.6K OHM,5%,0.25W	01121	CB3625
R206	321-0302-00		RES.,FXD,FILM:13.7K OHM,1%,0.125W	75042	CEATO-1372F
R207	315-0362-00		RES.,FXD,COMP:3.6K OHM,5%,0.25W	01121	CB3625

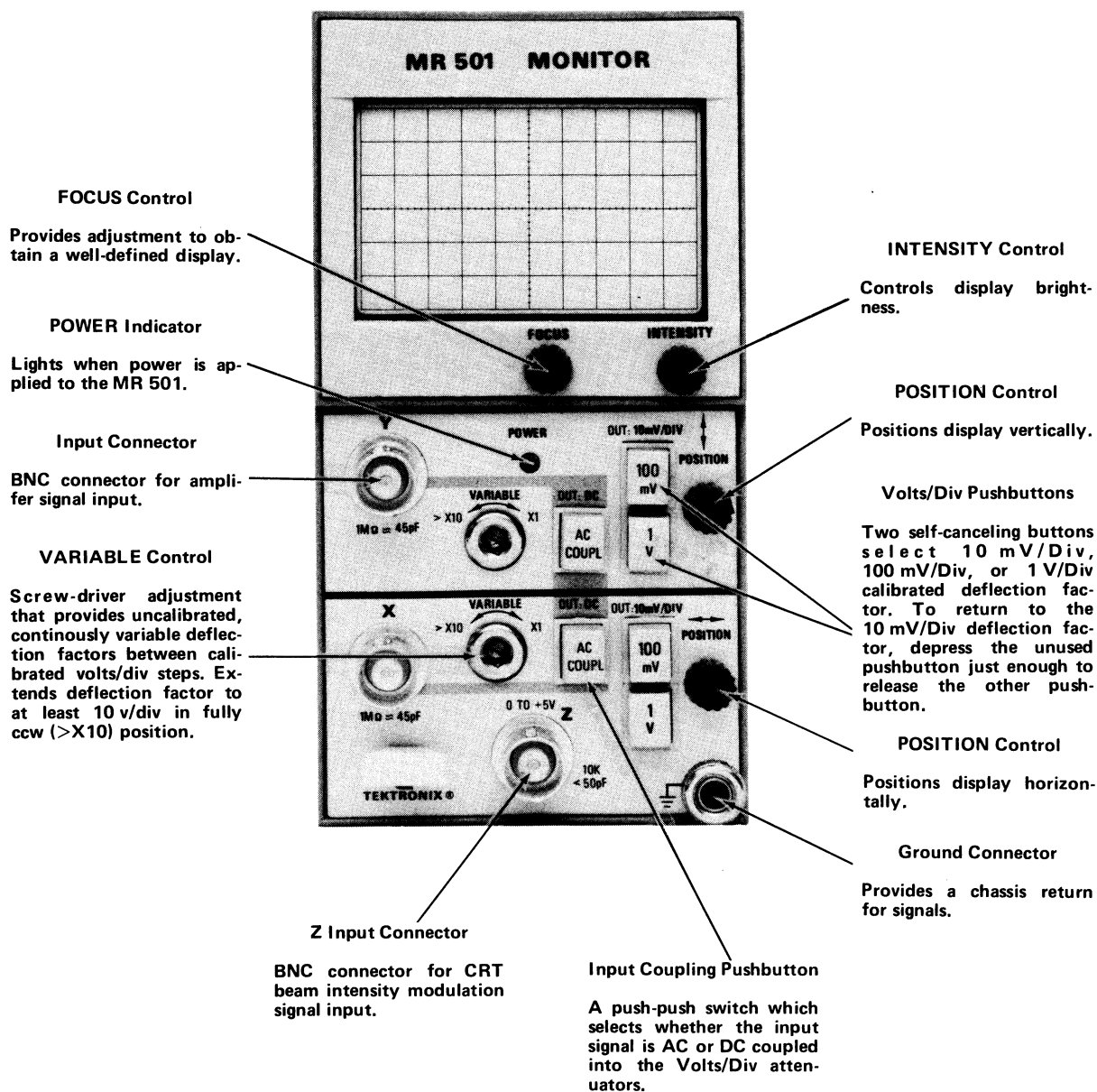
Replaceable Electrical Parts—MR 501

Ckt No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Name & Description	Mfr Code	Mfr Part Number
R210	315-0473-00		RES.,FXD,COMP:47K OHM,5%,0.25W	01121	CB4735
R215	311-1298-00		RES.,VAR,NONWIR:10K OHM,20%,0.50W	01121	W7909
R218	321-0260-00		RES.,FXD,FILM:4.99K OHM,1%,0.125W	75042	CEAT0-4991F
R219	321-0298-00		RES.,FXD,FILM:12.4K OHM,1%,0.125W	75042	CEAT0-1242F
R222	315-0184-00		RES.,FXD,COMP:180K OHM,5%,0.25W	01121	CB1845
R224	316-0472-00		RES.,FXD,COMP:4.7K OHM,10%,0.25W	01121	CB4721
R225	316-0101-00		RES.,FXD,COMP:100 OHM,10%,0.25W	01121	CB1011
R226	321-0344-00		RES.,FXD,FILM:37.4K OHM,1%,0.125W	75042	CEAT0-3742F
R230	316-0683-00		RES.,FXD,COMP:68K OHM,10%,0.25W	01121	CB6831
R232	316-0682-00		RES.,FXD,COMP:6.8K OHM,10%,0.25W	01121	CB6821
R234	315-0182-00		RES.,FXD,COMP:1.8K OHM,5%,0.25W	01121	CB1825
R236	316-0471-00		RES.,FXD,COMP:470 OHM,10%,0.25W	01121	CB4711
R245	311-1554-00		RES.,VAR,NONWIR:200K OHM,20%,0.50W	73138	91A-20002M
R246	316-0222-00		RES.,FXD,COMP:2.2K OHM,10%,0.25W	01121	CB2221
R250	316-0334-00		RES.,FXD,COMP:330K OHM,10%,0.25W	01121	CB3341
R256	316-0106-00		RES.,FXD,COMP:10M OHM,10%,0.25W	01121	CB1061
R260	311-1558-00		RES.,VAR,NONWIR:20K OHM,20%,0.50W	73138	91A-20001M
R262	316-0822-00		RES.,FXD,COMP:8.2K OHM,10%,0.25W	01121	CB8221
R265	321-0354-00		RES.,FXD,FILM:47.5K OHM,1%,0.125W	75042	CEAT0-4752F
R266	321-0377-00		RES.,FXD,FILM:82.5K OHM,1%,0.125W	75042	CEAT0-8252F
R270	311-1312-00		RES.,VAR,NONWIR:5M OHM,20%,1W	01121	10M156A
R272	321-0481-00		RES.,FXD,FILM:1M OHM,1%,0.125W	75042	CEAT0-1004F
R274	321-0481-00		RES.,FXD,FILM:1M OHM,1%,0.125W	75042	CEAT0-1004F
R276	321-0481-00		RES.,FXD,FILM:1M OHM,1%,0.125W	75042	CEAT0-1004F
R278	321-0481-00		RES.,FXD,FILM:1M OHM,1%,0.125W	75042	CEAT0-1004F
R280	321-0481-00		RES.,FXD,FILM:1M OHM,1%,0.125W	75042	CEAT0-1004F
R290	321-0645-00		RES.,FXD,FILM:100K OHM,0.5%,0.125W	75042	CEAT2100KD
R292	316-0102-00		RES.,FXD,COMP:1K OHM,10%,0.25W	01121	CB1021
R294	316-0103-00		RES.,FXD,COMP:10K OHM,10%,0.25W	01121	CB1031
R295	316-0103-00		RES.,FXD,COMP:10K OHM,10%,0.25W	01121	CB1031
R296	316-0101-00		RES.,FXD,COMP:100 OHM,10%,0.25W	01121	CB1011
R298	316-0682-00		RES.,FXD,COMP:6.8K OHM,10%,0.25W	01121	CB6821
R299	316-0472-00		RES.,FXD,COMP:4.7K OHM,10%,0.25W	01121	CB4721
R300	316-0101-00		RES.,FXD,COMP:100 OHM,10%,0.25W	01121	CB1011
R302	316-0100-00		RES.,FXD,COMP:10 OHM,10%,0.25W	01121	CB1001
R304	316-0103-00		RES.,FXD,COMP:10K OHM,10%,0.25W	01121	CB1031
R310	315-0220-00		RES.,FXD,COMP:22 OHM,5%,0.25W	01121	CB2205
R311	315-0472-00		RES.,FXD,COMP:4.7K OHM,5%,0.25W	01121	CB4725
R312	315-0561-00		RES.,FXD,COMP:560 OHM,5%,0.25W	01121	CB5615
R326	316-0822-00		RES.,FXD,COMP:8.2K OHM,10%,0.25W	01121	CB8221
R335	315-0203-00		RES.,FXD,COMP:20K OHM,5%,0.25W	01121	CB2035
R337	316-0100-00		RES.,FXD,COMP:10 OHM,10%,0.25W	01121	CB1001
R339	316-0100-00		RES.,FXD,COMP:10 OHM,10%,0.25W	01121	CB1001
R400	315-0200-00		RES.,FXD,COMP:20 OHM,5%,0.25W	01121	CB2005
R404	316-0103-00		RES.,FXD,COMP:10K OHM,10%,0.25W	01121	CB1031
R406	316-0102-00		RES.,FXD,COMP:1K OHM,10%,0.25W	01121	CB1021
R408	315-0621-00		RES.,FXD,COMP:620 OHM,5%,0.25W	01121	CB6215
R410	316-0332-00		RES.,FXD,COMP:3.3K OHM,10%,0.25W	01121	CB3321
R413	321-0252-00		RES.,FXD,FILM:4.12K OHM,1%,0.125W	75042	CEAT0-4121F
R415	311-1564-00		RES.,VAR,NONWIR:500 OHM,20%,0.50W	73138	91A-500ROM
R417	321-0222-00		RES.,FXD,FILM:2K OHM,1%,0.125W	75042	CEAT0-2001F
R430	321-0266-00		RES.,FXD,FILM:5.76K OHM,1%,0.125W	75042	CEAT0-5761F
R431	316-0391-00		RES.,FXD,COMP:390 OHM,10%,0.25W	01121	CB3911

Replaceable Electrical Parts—MR 501

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R432	321-0248-00			RES.,FXD,FILM:3.74K OHM,1%,0.125W	75042	CEATO-3741F
R434	315-0751-00			RES.,FXD,COMP:750 OHM,5%,0.25W	01121	CB7515
R436	316-0100-00			RES.,FXD,COMP:10 OHM,10%,0.25W	01121	CB1001
R438	316-0100-00			RES.,FXD,COMP:10 OHM,10%,0.25W	01121	CB1001
R450	315-0200-00			RES.,FXD,COMP:20 OHM,5%,0.25W	01121	CB2005
R454	316-0103-00			RES.,FXD,COMP:10K OHM,10%,0.25W	01121	CB1031
R456	316-0102-00			RES.,FXD,COMP:1K OHM,10%,0.25W	01121	CB1021
R458	315-0621-00			RES.,FXD,COMP:620 OHM,5%,0.25W	01121	CB6215
R460	315-0622-00			RES.,FXD,COMP:6.2K OHM,5%,0.25W	01121	CB6225
R465	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	75042	CEATO-1002F
R467	321-0289-00			RES.,FXD,FILM:10K OHM,1%,0.125W	75042	CEATO-1002F
S10	260-1445-00			SWITCH,PUSH:AC/DC	80009	260-1445-00
S20A,B	260-1365-00			SWITCH,PUSH:100MV/1V	80009	260-1365-00
S100	260-1445-00			SWITCH,PUSH:AC/DC	80009	260-1445-00
S120A,B	260-1365-00			SWITCH,PUSH:100MV/1V	80009	260-1365-00
T300	120-0863-00			XFMR,POWER:HV	80009	120-0863-00
V260	154-0703-00			ELECTRON TUBE:CRT	80009	154-0703-00
VR48	152-0149-00			SEMICOND DEVICE:ZENER,0.4W,5%,10V	04713	1N961B
VR310	152-0357-00			SEMICOND DEVICE:ZENER,0.4W,5%,82V	04713	1N983B
VR410	152-0280-00			SEMICOND DEVICE:ZENER,0.4W,6.2V,5%	04713	1N753A

CONTROLS AND CONNECTORS



CONTROLS, CONNECTORS & REAR CONNECTOR PIN ASSIGNMENTS

REAR CONNECTOR PIN ASSIGNMENT

Table 2-1
FRONT VIEW

Pin No.	Left (A)	Right (B)
28	Not Used	Not Used
27	*Z Input	Not Used
26	*Z Input Common	Not Used
18-26	Not Used	Not Used
17	*X Input Common	*X Input
16	*Y Input	*Y Input Common
15	Not Used	Not Used
14	Not Used	Not Used
13	25 VAC Winding	25 VAC Winding
12	+33.5 V Filtered DC	+33.5 V Filtered DC
11	Base of Series Pass Transistor	Collector of Series Pass Transistor
10	Emitter of Series Pass Transistor	Transformer Shield
9	+33.5 V Common	+33.5 V Common
8	-33.5 V Filtered DC	-33.5 V Filtered DC
7	Emitter of Series Pass Transistor	Collector of Series Pass Transistor
6	Base of Series Transistor	Not used
5	17.5 VAC Winding	17.5 VAC Winding
3 and 4	+11.5 V Common	+11.5 V Common
2	+11.5 V Filtered DC	+11.5 V Filtered DC
1	25 VAC Winding	25 VAC Winding

*Instrument not supplied with these connections. If modification is done instrument front-panel connectors are no longer connected.

ADJUSTMENTS

Adjustment is generally required after a repair has been made, or after long time intervals in which normal aging of components may affect instrument accuracy.

Before complete calibration, thoroughly clean and inspect this instrument as outlined in the service section of the Power Module manual. The Power Module manual also contains information for general maintenance of this instrument, including preventive maintenance, component identification and replacement, etc.

Services Available

Tektronix, Inc. provides complete instrument repair and calibration at local Field Service Centers and at the Factory Service Center. Contact your local Tektronix Field Office or representative for further information.

WARNING

Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Disconnect power before cleaning the instrument or replacing parts.

Equipment Required

1. TM 500-Series Power Module.
2. DC voltmeter having an accuracy within $\pm 0.1\%$ and a measurement range from about -980 volts to $+70$ volts. For example, a DM 501 Digital Multimeter (operates in a TM 500-Series Power Module), or any DC voltmeter may be used.
3. Plug-In Extension. Tektronix Calibration Fixture 067-0645-01.

4. Amplitude Calibrator. Must have output amplitudes of 50 mV, 100 mV, 500 mV, 1 V, 5 V and 10 V all within 1% into 1 M Ω .

Preliminary Procedure

NOTE

The performance of this instrument can be checked at any temperature within the 0°C to +50°C range. Make any adjustment of a temperature of +25°C, $\pm 5^\circ$ C.

- a. Check that the correct nominal line selector block (110 VAC or 220 VAC) has been installed on the line selector pins and that the regulating range selected includes the input line voltage, see Installation section of Power Module manual.
- b. Remove the MR 501 side covers and connect the Monitor to the Power Module using the plug-in extension.
- c. Connect the Power Module to the line voltage source and apply power to the MR 501.
- d. Set the following controls:

INTENSITY*	Fully ccw
FOCUS	Midrange
Y VARIABLE	Fully cw
X VARIABLE	Fully cw
Input Coupling	DC
Volts/Div	10 mV
↕ & ↔ POSITION	Midrange

*If it is not possible to extinguish the CRT spot, see Bias Adjustment on Performance Checkout foldout.

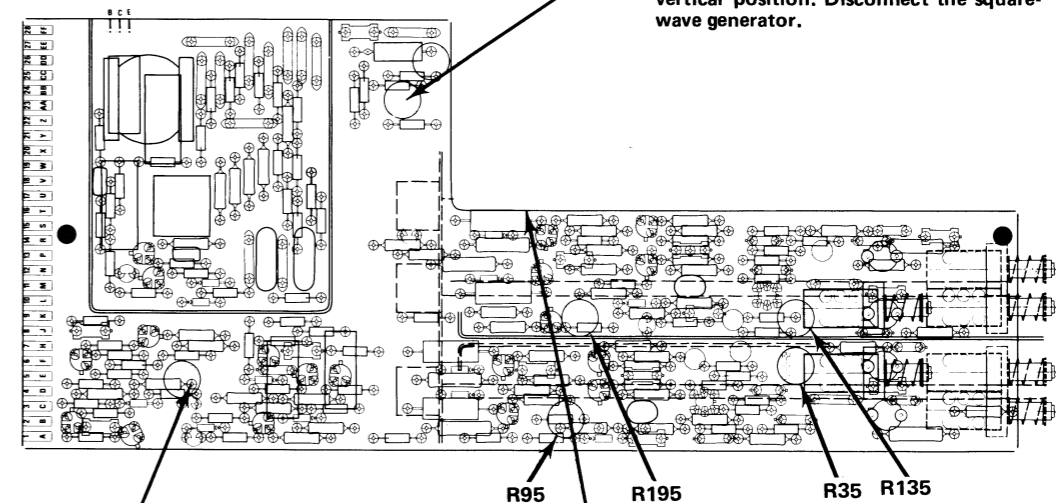
1. Power Supply Voltage Checks

Connect the precision DC voltmeter between each voltage test point and ground. Check that each supply is within the tolerance listed below.

Supply	Tolerance
+20 V	+19.9 V to +20.1 V
-20 V	-19.6 V to -20.4 V
-10 V	-9 V to -11 V
+7.1 V	+6.9 V to +7.5 V
70 V	+65 V to +75 V
-980 V	-960 V to -1000 V

4. Adjust Rotation R260

Connect the output of an amplitude calibrator to the X input connector. Set the calibrator amplitude to 50 mV. Set the MR 501 volts/div pushbuttons for a deflection factor of 10 mV. Adjust R260, so both CRT spots are the same vertical distance from any horizontal graticule line, i.e., they are level. It may be necessary to make a compromise adjustment so trace will be level at any vertical position. Disconnect the square-wave generator.



3. Adjust X and Y Amplifier Balance and Gain Y (R35 & R95) respectively; X (R135 & R195) respectively.

NOTE

This procedure must be accomplished once for each amplifier.

Turn the MR 501 INTENSITY control cw until a spot on the CRT is seen. Position the spot to the center line of the graticule. Using a small screwdriver, rotate the VARIABLE control from its fully cw position to its fully ccw position and note the CRT spot shifting. Adjusting R35 (R135), Bal until the CRT spot does not shift as the VARIABLE is rotated. Set VARIABLE control to its fully cw position before proceeding.

Connect the output of an amplitude calibrator through a coaxial cable to the input connector of the amplifier being adjusted. Set the calibrator amplitude switch to 50 mV when doing Y amplifier and to 100 mV when doing X amplifier. Set the MR 501 volts/div pushbuttons for a deflection factor of 10 mV. Adjust R95 (R195), Gain for exactly five major divisions for Y amplifier and ten major divisions for X amplifier between the CRT spots. Check the other two deflection factors, they should be within 3%. Disconnect the calibrator.

2. +20 Volt Adjustment R415

Connect the precision DC voltmeter between the +20 V test point and ground. Adjust R415, +20 V ADJ for a voltmeter reading of exactly +20 volts.

NOTE

The adjustments on the Adjustments foldout page should be accomplished before proceeding with the performance checks and adjustments.

Equipment Required

1. TM 500-Series Power Module.
2. DC voltmeter having an accuracy within $\pm 0.1\%$ and a measurement range from about -980 volts to -20 volts. For example, a DM 501 Digital Multimeter (operates in a TM 500-Series Power Module), or any DC voltmeter may be used.
3. Plug-In Extension. Tektronix Calibration Fixture 067-0645-01.
4. Variable Auto Transformer. Must be capable of supplying sufficient wattage (depends on what plug-in modules are installed) over a range of 90 to 132 VAC or 180 to 264 VAC. Auto transformer must also have an AC voltmeter to indicate output voltage.
5. Square-Wave Generator. Known output amplitude within 1% into $10\text{ k}\Omega$ (3 to 5 volts desirable) with a risetime of $2\ \mu\text{s}$ or less. For example, The RG501 Gate Out or any square-wave generator meeting the listed requirements.
6. Amplitude Calibrator. Must have output amplitudes of 500 mV, 1 V, 5 V and 10 V at a repetition rate of about 1 kHz.

7. Ramp Generator. Must have a sweep length of $500\ \mu\text{s}$, a +3 V unblanking gate and sweep triggering ability. For example a RG501 Ramp Generator (operates in a TM 500-Series Power Module) or any ramp generator meeting the listed requirements.

8. Test Oscilloscope. Must have a minimum bandpass of 1 MHz and a deflection factor of 100 mV/div with a 10X probe. For example a 5103N/D10 Oscilloscope with 5B10N Time Base/Ampl and a 5A23N Amplifier plug-ins and a P6006 Probe, or any oscilloscope - 10X probe that will meet the listed requirements may be used.

9. 50 ohm Termination. Connectors, BNC; accuracy, within 1%.

10. Leveled Sine-Wave Generator. Must have output frequencies of 50 kHz, 350 kHz and 2 MHz and an output amplitude of at least 5 V peak-to-peak.

11. Dual Input Coupler. Connectors, one female BNC to two male BNC. Tektronix Calibration Fixture 067-0525-00.

Preliminary Procedure

NOTE

The performance of this instrument can be checked at any temperature within the 0°C to $+50^\circ\text{C}$ range. Make any adjustment of a temperature of $+25^\circ\text{C}$, $\pm 5^\circ\text{C}$.

PERFORMANCE CHECKS AND ADJUSTMENTS

2. Check Z Axis Amplifier Gain and Risetime

Connect the test oscilloscope via a 10X probe to the Z axis amplifier output test point. Set the oscilloscope time/div control to 1 ms, input coupling to DC and the volts/div control to 100 mV.

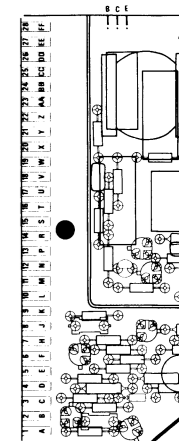
Note the DC level of the Z axis amplifier; it should be between 2 and 6 volts. Rotate the MR 501 INTENSITY control until the Z axis amplifier DC level just starts to shift upward.

Set the test oscilloscope volts/div control to 5. Connect the known output of the square-wave generator through a coaxial cable and a 50 ohm termination to the MR 501 Z input connector.

Measure the test oscilloscope waveform amplitude, it should be within 8 to 11 volts over the known output of the square-wave generator.

Set the test oscilloscope time/div switch to $1\ \mu\text{s}$ and magnify the sweep.

Measure the risetime of the test oscilloscope waveform, it should not be more than $1.75\ \mu\text{s}$.



Z-Axis Amplifier Test Point

1. Power Supply Regulation Checks

Connect a precision DC voltmeter between ground and the -20 V test point. Note actual power supply voltage. Vary the auto transformer output voltage from the lower through the upper line voltage regulating range (see Power Module manual). Output power supply voltage must remain within 1% of voltage noted above as line voltage is varied.

Repeat test for -980 V test point. Set auto transformer to nominal voltage when check is complete.

a. Check that the correct nominal line selector block (110 VAC or 220 VAC) has been installed on the line selector pins and that the regulating range selected includes the input line voltage, see Installation section of Power Module manual.

b. Connect Power Module to the variable auto transformer and the auto transformer to the line voltage source.

c. Remove the MR 501 side covers and connect the Monitor to the Power Module, using the plug-in extension.

d. Apply power to the MR 501 by setting the auto transformer to the nominal line voltage that the power module line selector is set to.

e. Set the following controls:

INTENSITY	Fully ccw
FOCUS	Midrange
Y VARIABLE	Fully cw
X VARIABLE	Fully cw
Input Coupling	DC
Volts/Div	10 mV
↑ & ↔ POSITION	Midrange

WARNING

Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Disconnect power before cleaning the instrument or replacing parts.

PERFORMANCE CHECKS AND ADJUSTMENTS

a. Check that the correct nominal line selector block (110 VAC or 220 VAC) has been installed on the line selector pins and that the regulating range selected includes the input line voltage, see Installation section of Power Module manual.

b. Connect Power Module to the variable auto transformer and the auto transformer to the line voltage source.

c. Remove the MR 501 side covers and connect the Monitor to the Power Module, using the plug-in extension.

d. Apply power to the MR 501 by setting the auto transformer to the nominal line voltage that the power module line selector is set to.

e. Set the following controls:

INTENSITY	Fully ccw
FOCUS	Midrange
Y VARIABLE	Fully cw
X VARIABLE	Fully cw
Input Coupling	DC
Volts/Div	10 mV
↑ & ↔ POSITION	Midrange

WARNING

Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Disconnect power before cleaning the instrument or replacing parts.

2. Check Z Axis Amplifier Gain and Risetime

Connect the test oscilloscope via a 10X probe to the Z axis amplifier output test point. Set the oscilloscope time/div control to 1 ms, input coupling to DC and the volts/div control to 100 mV.

Note the DC level of the Z axis amplifier; it should be between 2 and 6 volts. Rotate the MR 501 INTENSITY control until the Z axis amplifier DC level just starts to shift upward.

Set the test oscilloscope volts/div control to 5. Connect the known output of the square-wave generator through a coaxial cable and a 50 ohm termination to the MR 501 Z input connector.

Measure the test oscilloscope waveform amplitude, it should be within 8 to 11 volts over the known output of the square-wave generator.

Set the test oscilloscope time/div switch to 1 μs and magnify the sweep.

Measure the risetime of the test oscilloscope waveform, it should not be more than 1.75 μs.

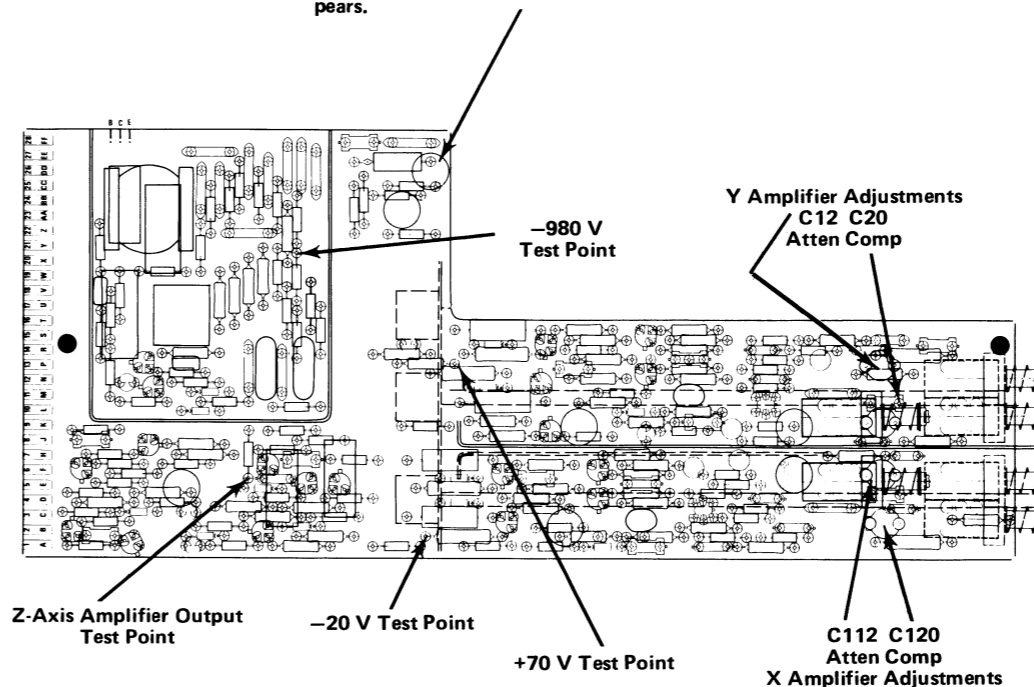
1. Power Supply Regulation Checks

Connect a precision DC voltmeter between ground and the -20 V test point. Note actual power supply voltage. Vary the auto transformer output voltage from the lower through the upper line voltage regulating range (see Power Module manual). Output power supply voltage must remain within 1% of voltage noted above as line voltage is varied.

Repeat test for -980 V test point. Set auto transformer to nominal line voltage when check is complete.

3. Bias Adjustment R245

With the INTENSITY control set fully ccw and no test equipment connected to the MR 501, adjust R245, Bias until a spot appears on the MR 501 CRT. Finely focus the CRT spot, then position it to the center of the CRT. Adjust R245 until the CRT spot just disappears.



4. Check or Adjust X and Y Amplifier Attenuator Compensation and Check Bandpass

Y - C12 and C20; X - C112 and C120.

NOTE

This procedure must be accomplished once for each amplifier.

Turn the MR 501 INTENSITY control cw until a spot on the CRT is seen. Connect the amplitude calibrator, through a coaxial cable, to the input connector of the amplifier being adjusted. Use 500 mV for Y amplifier adjustment; 1 V for X amplifier adjustment.

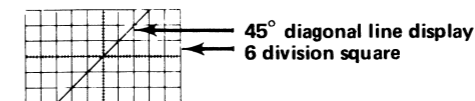
Connect a ramp generator to the MR 501 and obtain a triggered sweep display. NOTE: Connect the ramp signal to the amplifier not being adjusted.

Set the MR 501 volts/div pushbuttons for a deflection factor of 100 mV. Check and adjust, if necessary, C12 (C112), Atten Comp for a flat top on the displayed square wave. Push in the MR 501 1 V pushbutton. Apply the amplitude calibrator signal to the amplifier under adjustment. Use a 5 V signal when doing the Y amplifier and a 10 V signal when doing the X amplifier. Check and adjust, if necessary, C20 (C120) Atten Comp for a flat top on the square wave. Disconnect the amplitude calibrator and ramp generator.

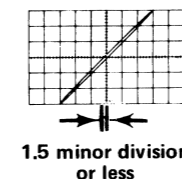
Connect the output of the leveled sine-wave generator through a coaxial cable and a 50 ohm termination to the input connector of the amplifier being adjusted. Set the output frequency of the generator to 50 kHz. Adjust the sine-wave generator output amplitude control until the spots on the MR 501 CRT are exactly 6 major divisions apart for the Y amplifier and 10 major divisions apart for the X amplifier. Change the generator frequency to 2 MHz and check that the two CRT spots are at least 4.2 major divisions apart for the Y amplifier and 7.0 major divisions apart for the X amplifier. Check the other two deflection factors for the same requirements. Disconnect the sine-wave generator.

5. Check Phasing

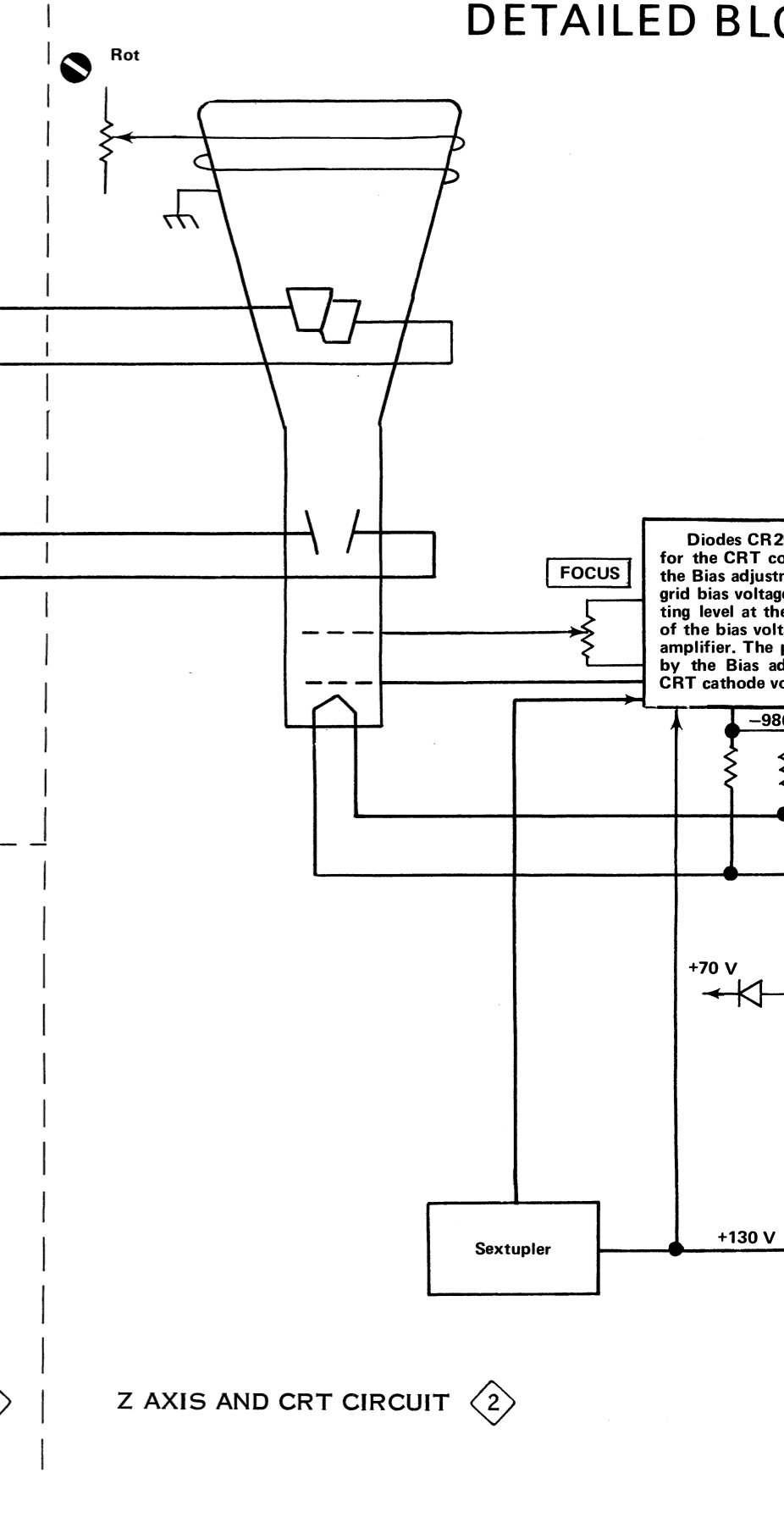
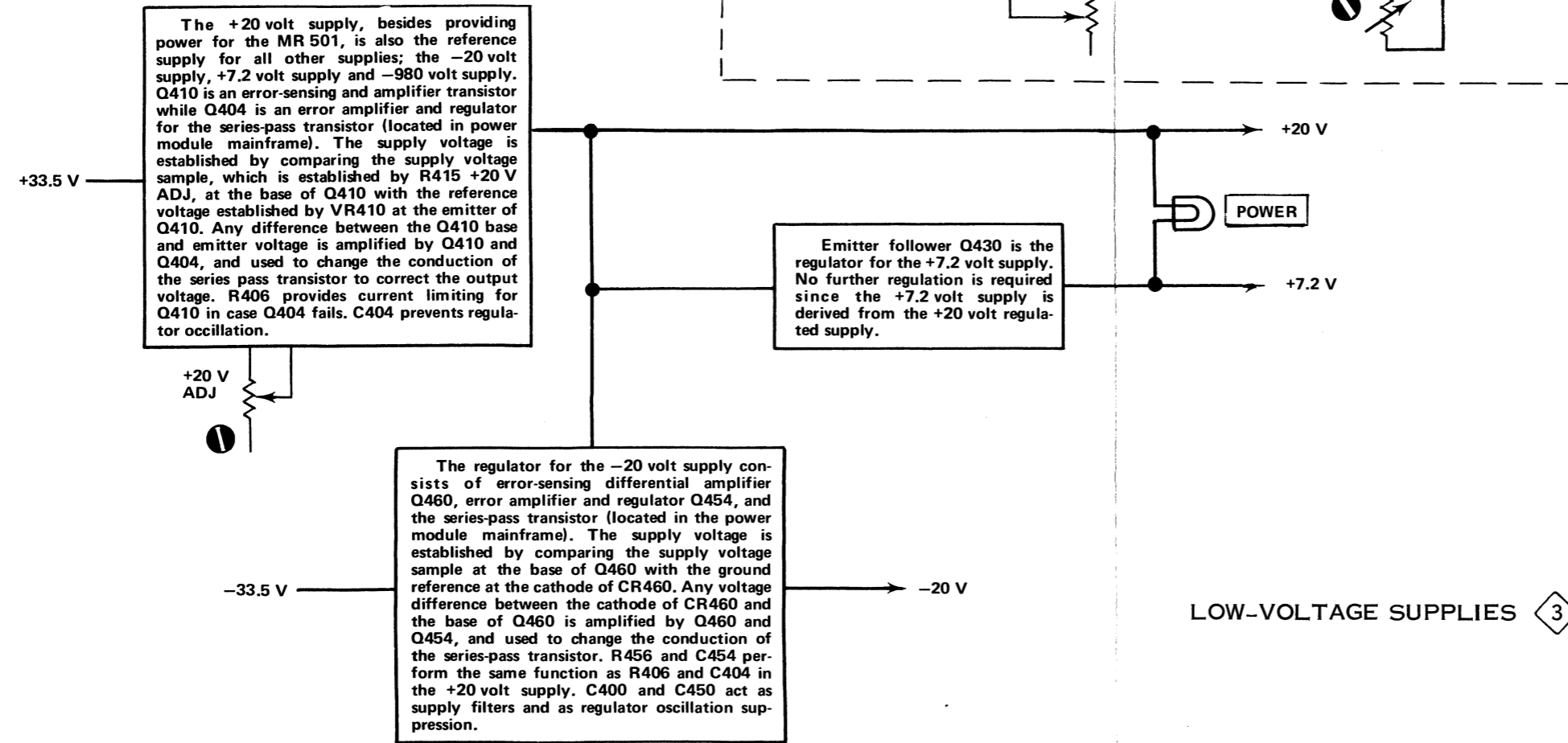
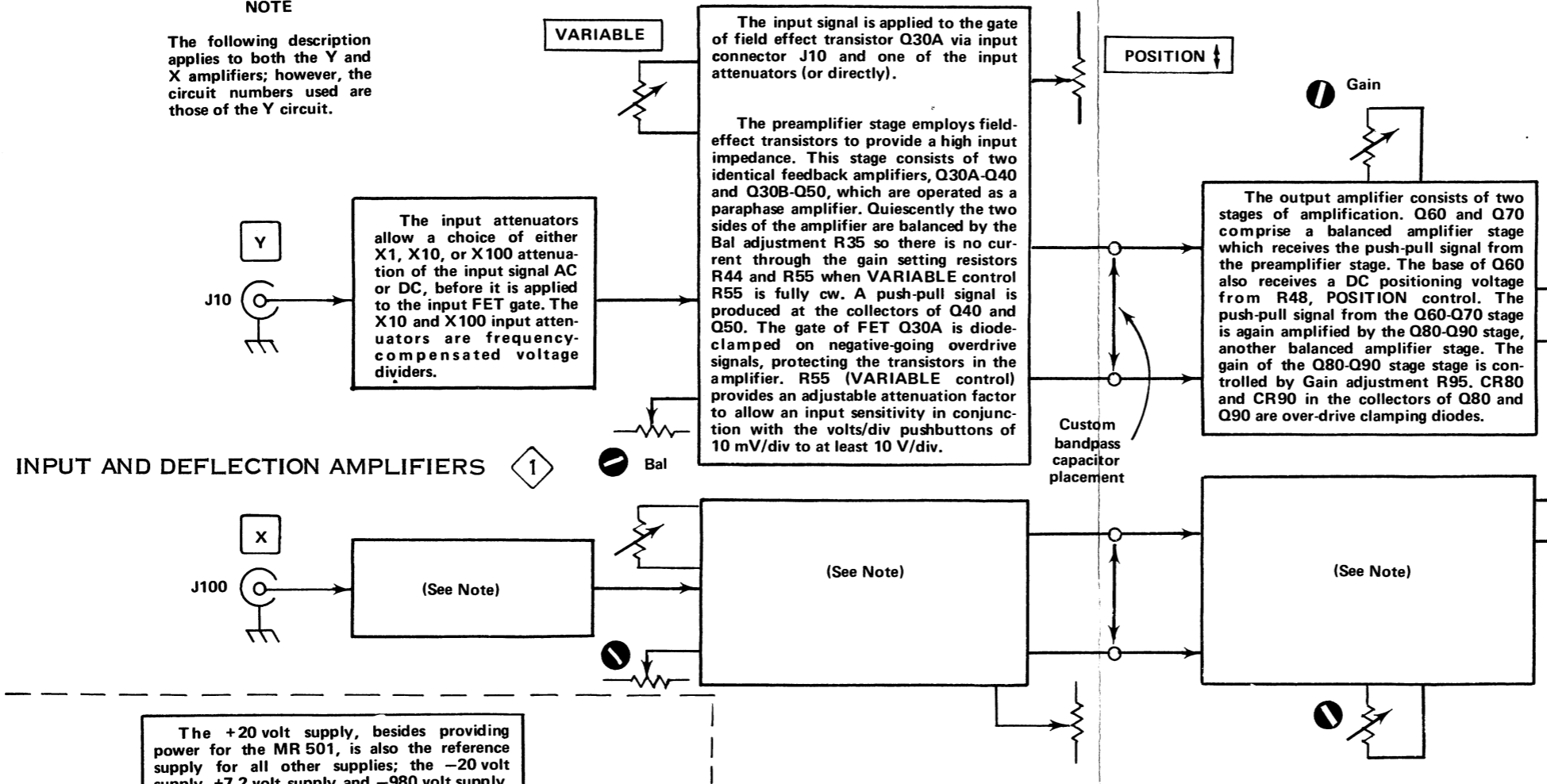
Set the MR 501 X and Y amplifier volts/div pushbuttons for a deflection factor of 10 mV. Connect the output of the leveled sine-wave generator through a coaxial cable, 50 ohm termination and a dual input coupler to the X and Y input connectors. Set the output frequency of the generator to 50 kHz. Adjust the sine-wave generator output amplitude control for a 45° diagonal line across a 6 division square.



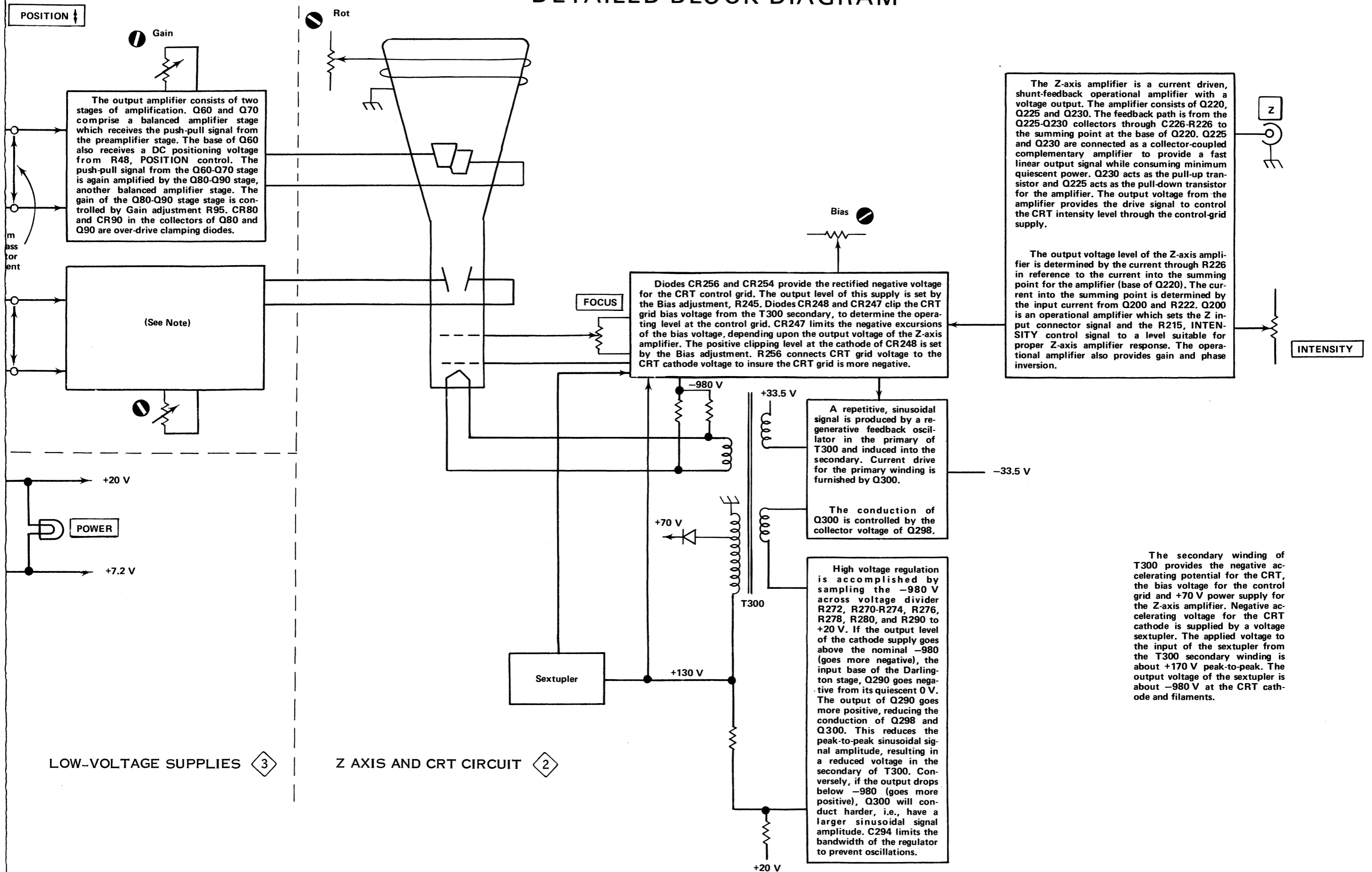
Change the generator frequency to 350 kHz. The center of the 45° diagonal line must not show more than 1.5 minor divisions of separation. Disconnect the sine-wave generator.



NOTE
The following description applies to both the Y and X amplifiers; however, the circuit numbers used are those of the Y circuit.



DETAILED BLOCK DIAGRAM

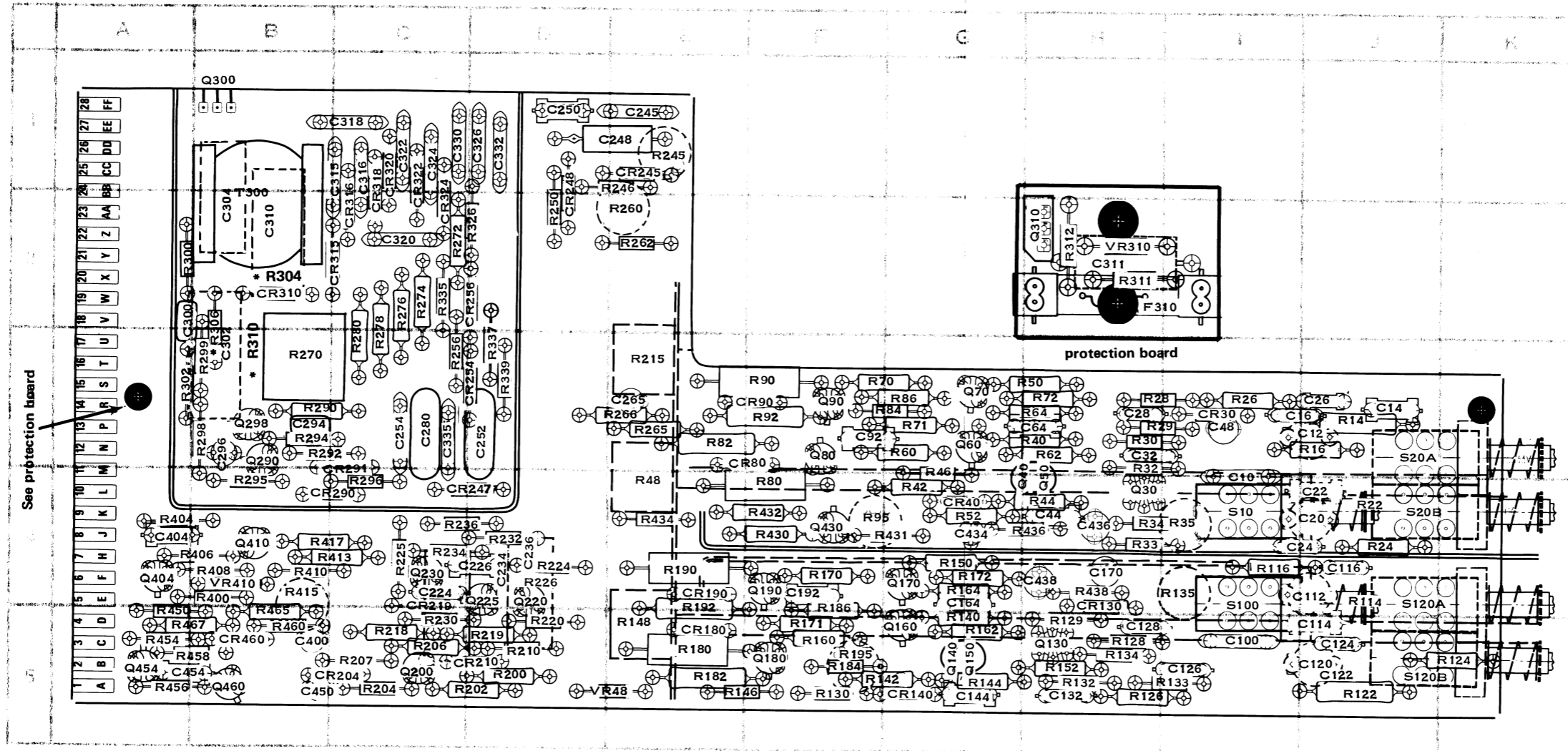


LOW-VOLTAGE SUPPLIES 3

Z AXIS AND CRT CIRCUIT 2

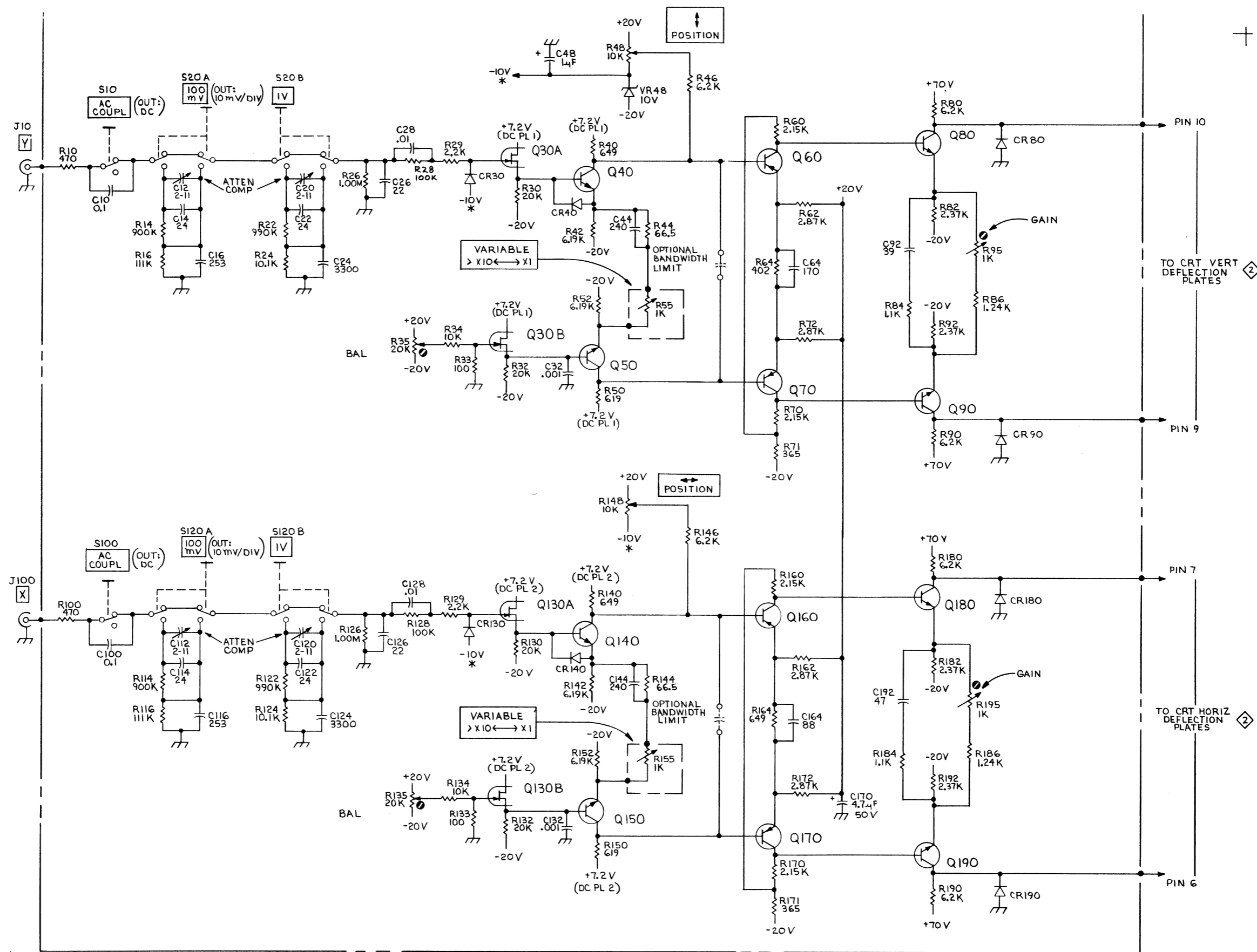
The secondary winding of T300 provides the negative accelerating potential for the CRT, the bias voltage for the control grid and +70 V power supply for the Z-axis amplifier. Negative accelerating voltage for the CRT cathode is supplied by a voltage sextupler. The applied voltage to the input of the sextupler from the T300 secondary winding is about +170 V peak-to-peak. The output voltage of the sextupler is about -980 V at the CRT cathode and filaments.

PARTS LOCATION GRID



*See Parts List for serial number ranges.

CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC	CKT NO	GRID LOC							
C10	I-4	C114	J-5	C245	E-1	C320	C-2	CR30	I-3	CR291	C-4	Q130	H-5	Q430	F-4	R40	H-3	R86	G-3	R140	G-5	R186	F-5	R226	D-4	R276	C-2	R318	C-1	R450	A-5					
C12	J-3	C116	J-4	C248	D-1	C322	C-1	CR40	G-4	CR310	B-2	Q140	G-5	Q454	A-5	R42	G-4	R90	F-3	R142	G-5	R190	E-4	R230	C-5	R278	C-2	R326	D-2	R454	A-5					
C14	J-3	C120	J-5	C250	D-1	C324	C-1	CR80	F-3	CR315	C-2	Q150	G-5	Q460	B-5	R44	H-4	R92	F-3	R144	G-5	R192	E-5	R232	D-4	R280	C-2	R335	C-2	R456	A-5					
C16	J-3	C122	J-5	C252	D-3	C326	D-1	CR90	F-3	CR316	C-1	Q160	G-5			R46	G-4	R95	F-4	R146	E-5	R195	F-5	R234	C-4	R290	B-3	R337	D-3	R458	A-5					
C20	J-4	C124	J-5	C254	C-3	C330	C-1	CR130	H-4	CR320	C-1	Q170	G-4	R14	J-3	R48	E-4	R114	J-4	R148	E-5	R200	D-5	R236	C-4	R292	B-3	R339	D-3	R460	B-5					
C22	J-4	C126	I-5	C265	E-3	C332	D-1	CR140	G-5	CR322	C-1	Q180	F-5	R16	J-3	R50	H-3	R116	I-4	R150	G-4	R202	D-5	R245	E-1	R294	B-3	R400	B-4	R465	B-5					
C24	J-4	C128	H-5	C280	C-3	C335	C-3	CR180	E-5	CR324	C-1	Q190	F-4	R22	J-4	R52	G-4	R122	J-5	R152	H-5	R204	C-5	R246	E-1	R295	B-4	R404	A-4	R467	A-5					
C26	J-3	C132	H-5	C294	B-3	C400	B-5	CR190	E-4	CR460	B-5	Q200	C-5	R24	J-4	R60	G-3	R124	K-5	R160	F-5	R206	C-5	R250	D-2	R296	C-4	R406	B-4	S10	I-4					
C28	H-3	C144	G-5	C296	B-3	C404	A-4	CR204	C-5			Q220	D-4	R26	I-3	R62	H-3	R126	H-5	R162	G-5	R207	C-5	R256	C-3	R298	B-3	R408	B-4	S20A	J-3					
C32	H-3	C164	G-4	C300	A-2	C434	G-4	CR210	D-5	F310	H-2	Q225	D-4	R28	H-3	R64	H-3	R128	H-5	R164	G-4	R210	D-5	R260	E-2	R299	B-3	R410	B-4	S20B	J-4					
C44	H-4	C170	H-4	C302	B-3	C436	H-4	CR219	C-5			Q230	C-4	R29	H-3	R70	F-3	R129	H-5	R170	F-4	R215	E-3	R262	E-2	R300	A-2	R413	B-4	S100	I-4					
C48	I-3	C192	F-4	C304	B-2	C438	H-4	CR245	E-1	Q30	H-4	Q290	B-4	R30	H-3	R71	G-3	R130	F-5	R171	F-5	R218	C-5	R265	E-3	R302	A-3	R415	B-4	S120A	J-4					
C64	H-3	C224	C-4	C310	B-2	C450	B-5	CR247	C-4	Q40	H-4	Q298	B-3	R32	H-3	R72	H-3	R132	H-5	R172	G-4	R219	D-5	R266	E-3	R304	B-2	R417	B-4	S120B	J-5					
C92	F-3	C226	D-4	C315	C-1	C454	A-5	CR254	D-3	Q50	H-4	Q300	B-1	R33	H-4	R80	F-4	R133	I-5	R180	E-5	R220	D-5	R270	B-3	R306	B-3	R430	F-4	T300	B-2					
C100	I-5	C234	D-4	C316	C-1			CR256	D-2	Q60	G-3	Q404	A-4	R34	H-4	R82	E-3	R134	H-5	R182	E-5	R224	D-4	R272	C-2	R310	B-3	R431	G-4							
C311	H-2	C236	D-4	C318	C-1			CR290	C-4	Q70	G-3	Q410	B-4	R35	I-4	R84	F-3	R135	I-4	R184	F-5	R225	C-4	R274	C-2	R311	H-2	R432	F-4	VR48	E-5					
C112	J-4									Q80	F-3																					R434	E-4	VR310	H-2	
										Q90	F-3																						R436	H-4	VR410	B-4
																																	R438	H-4		



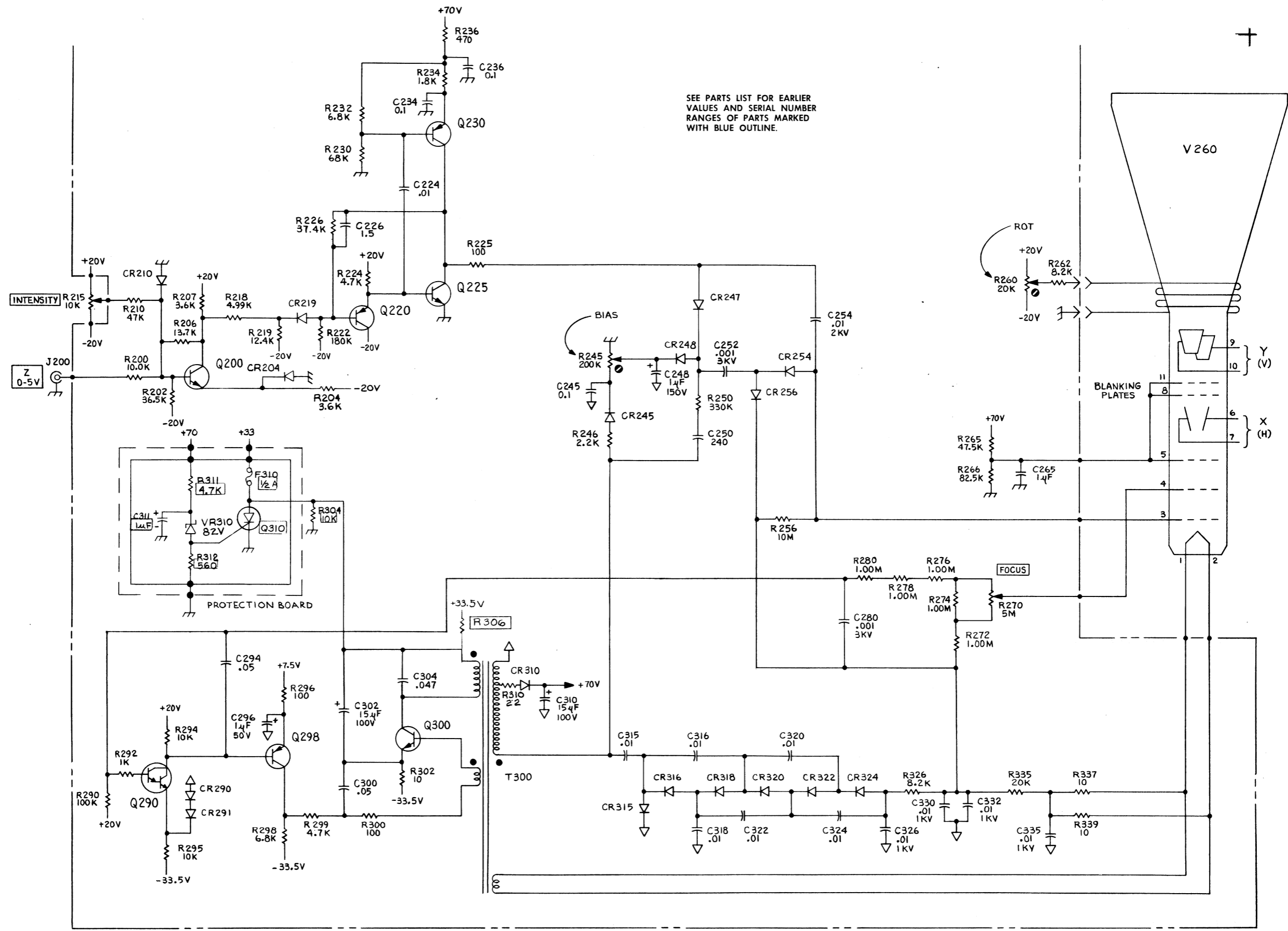
MR 501

(A)

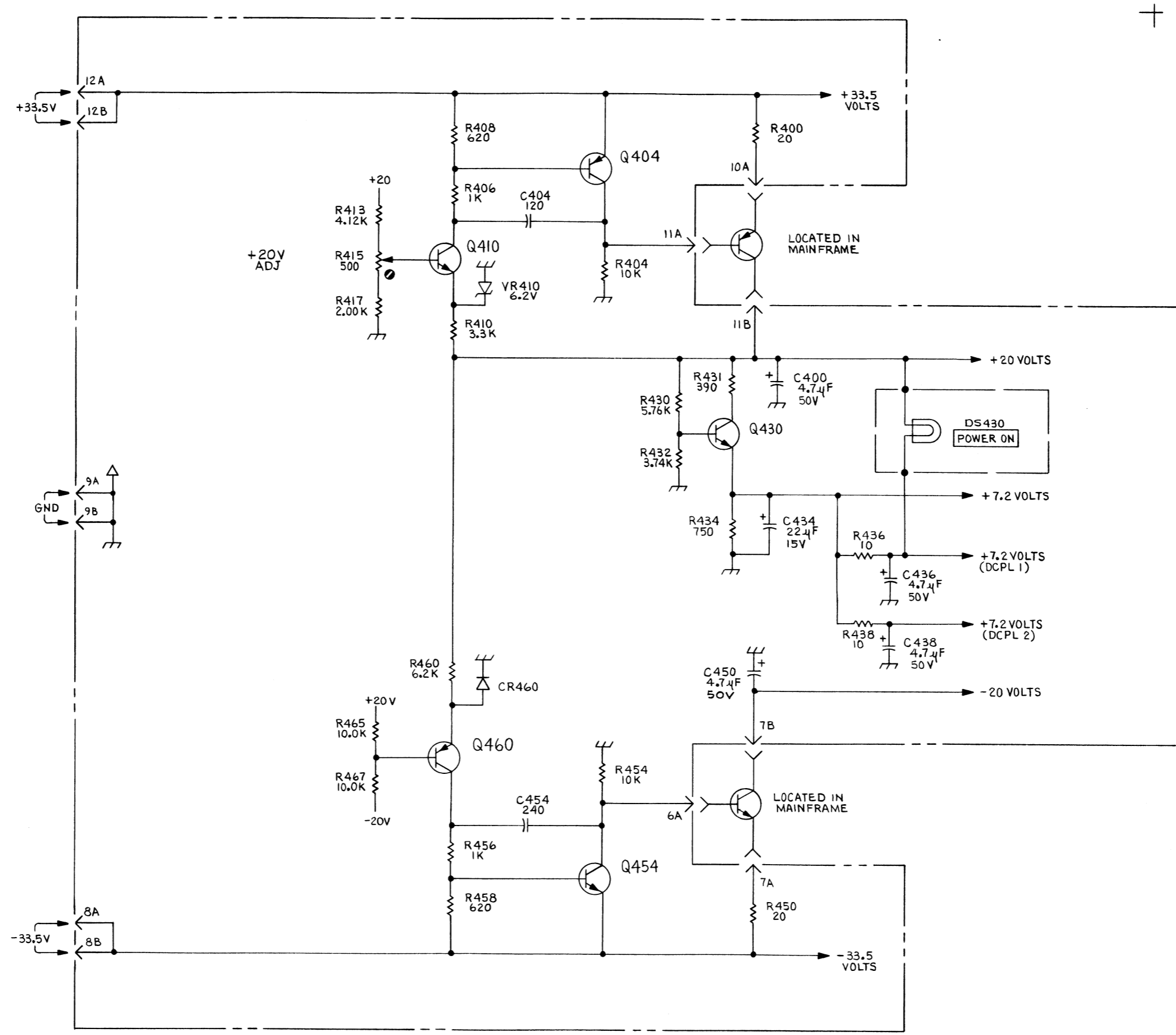
INPUT AND DEFLECTION AMPLIFIERS

CJH 0473

INPUT AND DEFLECTION AMPLIFIERS



SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS MARKED WITH BLUE OUTLINE.



REPLACEABLE MECHANICAL PARTS

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

SPECIAL NOTES AND SYMBOLS

X000 Part first added at this serial number
 00X Part removed after this serial number

FIGURE AND INDEX NUMBERS

Items in this section are referenced by figure and index numbers to the illustrations.

INDENTATION SYSTEM

This mechanical parts list is indented to indicate item relationships. Following is an example of the indentation system used in the description column.

```

1 2 3 4 5           Name & Description
Assembly and/or Component
Attaching parts for Assembly and/or Component
    ---*---
Detail Part of Assembly and/or Component
Attaching parts for Detail Part
    ---*---
Parts of Detail Part
Attaching parts for Parts of Detail Part
    ---*---
    
```

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation. The separation symbol ---*--- indicates the end of attaching parts.

Attaching parts must be purchased separately, unless otherwise specified.

ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

ABBREVIATIONS

"	INCH	ELCTRN	ELECTRON	IN	INCH	SE	SINGLE END
#	NUMBER SIZE	ELEC	ELECTRICAL	INCAND	INCANDESCENT	SECT	SECTION
ACTR	ACTUATOR	ELCTLT	ELECTROLYTIC	INSUL	INSULATOR	SEMICON	SEMICONDUCTOR
ADPTR	ADAPTER	ELEM	ELEMENT	INTL	INTERNAL	SHLD	SHIELD
ALIGN	ALIGNMENT	EPL	ELECTRICAL PARTS LIST	LPHLDR	LAMPHOLDER	SHLDR	SHOULDERED
AL	ALUMINUM	EQPT	EQUIPMENT	MACH	MACHINE	SKT	SOCKET
ASSEM	ASSEMBLED	EXT	EXTERNAL	MECH	MECHANICAL	SL	SLIDE
ASSY	ASSEMBLY	FIL	FILLISTER HEAD	MTG	MOUNTING	SLFLKG	SELF-LOCKING
ATTEN	ATTENUATOR	FLEX	FLEXIBLE	NIP	NIPPLE	SLVG	SLEEVING
AWG	AMERICAN WIRE GAGE	FLH	FLAT HEAD	NON WIRE	NOT WIRE WOUND	SPR	SPRING
BD	BOARD	FLTR	FILTER	OD	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	HLCP	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	IDNT	IDENTIFICATION	SCOPE	OSCILLOSCOPE	XFMR	TRANSFORMER
DWR	DRAWER	IMPLR	IMPELLER	SCR	SCREW	XSTR	TRANSISTOR

CROSS INDEX MFR. CODE NUMBER TO MANUFACTURER

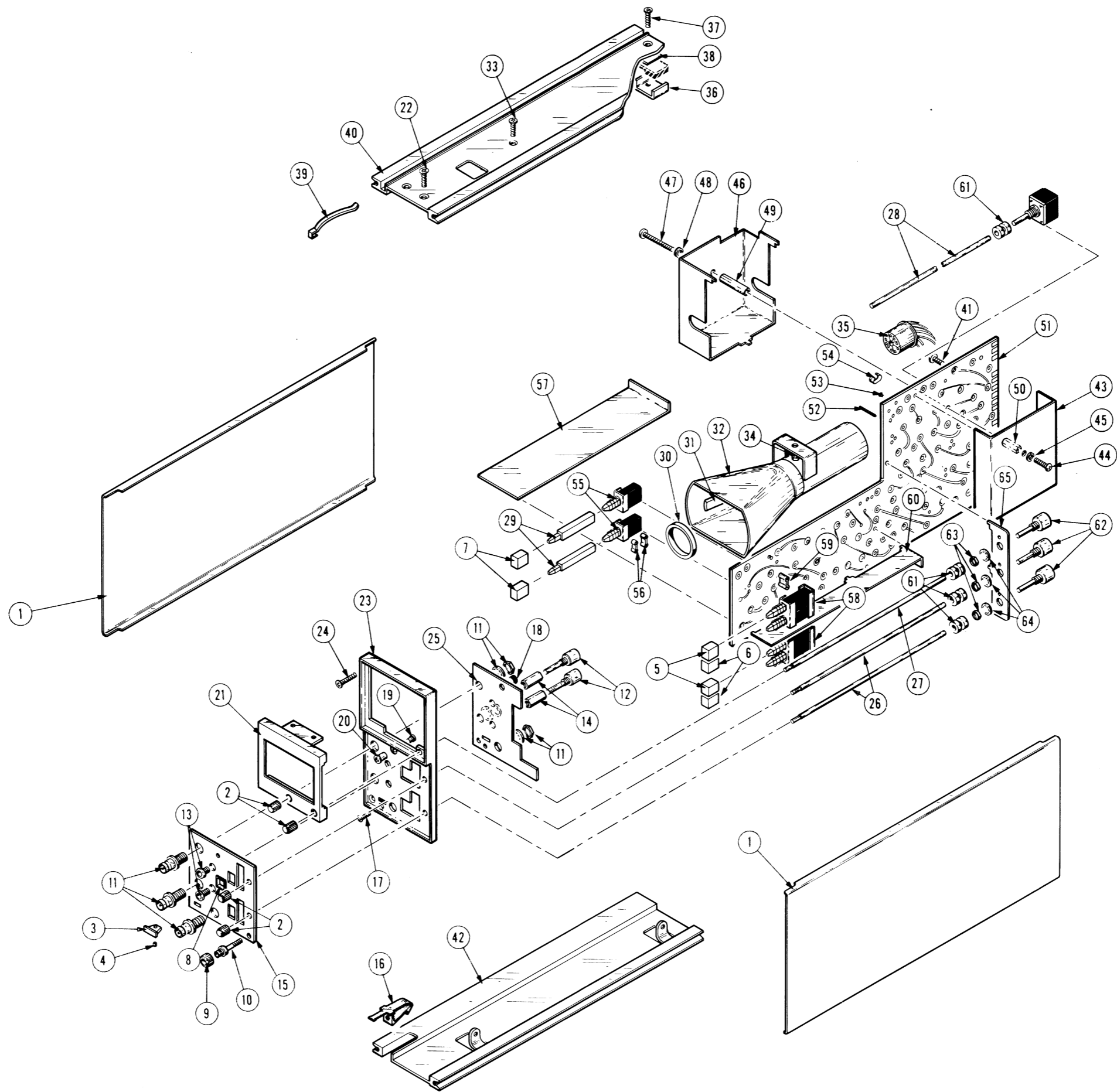
MFR.CODE	MANUFACTURER	ADDRESS	CITY,STATE,ZIP
00779	AMP, INC.	P. O. BOX 3608	HARRISBURG, PA 17105
08261	SPECTRA-STRIP CORP.	7100 LAMPSON AVE.	GARDEN GROVE, CA 92642
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
24931	SPECIALTY CONNECTOR CO., INC.	3560 MADISON AVE.	INDIANAPOLIS, IN 46227
45722	USM CORP., PARKER-KALON FASTENER DIV.	1 PEEKAY DRIVE	CLIFTON, NJ 07014
71159	BRISTOL SOCKET SCREW, DIV. OF AMERICAN CHAIN AND CABLE CO., INC.	40 BRISTOL ST.	WATERBURY, CT 06720
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
74445	HOLO-KROME CO.	31 BROOK ST. WEST	HARTFORD, CT 06110
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120
79807	WROUGHT WASHER MFG. CO.	2100 S. O BAY ST.	MILWAUKEE, WI 53207
80009	TEKTRONIX, INC.	P. O. BOX 500	BEAVERTON, OR 97077
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153

Replaceable Mechanical Parts—MR 501

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscnt	Qty	Name & Description					Mfr Code	Mfr Part Number
					1	2	3	4	5		
1-1	337-1399-00			2	SHLD,ELECTRICAL:SIDE					80009	337-1399-00
-2	366-1173-03			4	KNOB:CHARCOAL WITH SETSCREW					80009	366-1173-03
	213-0239-00			1	. SETSCREW:3-48 X 0.062 INCH,HEX SOC STL					71159	OBD
-3	366-1422-01			1	KNOB:LATCH					80009	366-1422-01
-4	214-1840-00			1	PIN,KNOB SECRG:					80009	214-1840-00
-5	366-1257-54			2	PUSH BUTTON:--100MV					80009	366-1257-54
-6	366-1257-55			2	PUSH BUTTON:--1V					80009	366-1257-55
-7	366-1257-27			2	PUSH BUTTON:--AC COUPL					80009	366-1257-27
-8	426-0681-00			6	FR,PUSH BUTTON:GRAY PLASTIC					80009	426-0681-00
-9	220-0633-00			1	NUT,PLAIN,KNURL:0.25-28 X 0.25" LONG,BRS					80009	220-0633-00
-10	355-0170-00			1	STUD,SHOULDERED:6-32 X 0.40 INCH LONG					80009	355-0170-00
-11	131-0955-00			3	CONNECTOR,RCPT,:BNC,FEMALE					24931	28JR200-1
-12	- - - - -			2	RES,VAR,NONWIRE:(SEE R55/R155 EPL) (ATTACHING PARTS)						
-13	358-0054-00			2	BSHG,MACH THD:0.406 INCH LONG,BRS					80009	358-0054-00
-14	210-0471-00			2	NUT,SLEEVE:HEX.,0.312 X 0.594 INCH LONG - - - * - - -					80009	210-0471-00
-15	333-1766-00			1	PANEL,FRONT:					80009	333-1766-00
-16	214-1513-01			1	LCH,PLUG-IN RET: (ATTACHING PARTS)					80009	214-1513-01
-17	213-0254-00			1	SCR,TPG,THD CTG:2-56X0.25"100 DEG,FLH STL - - - * - - -					45722	OBD
-18	200-0935-00			1	BASE,LAMPHOLDER:0.29 OD X 0.19" L,BK PLSTC					80009	200-0935-00
-19	378-0602-00			1	LENS,LIGHT:GREEN					80009	378-0602-00
-20	352-0157-00			1	LAMPHOLDER:WHITE PLASTIC					80009	352-0157-00
-21	200-1555-00			1	BEZEL:CRT (ATTACHING PARTS)					80009	200-1555-00
-22	211-0101-00			2	SCREW,MACHINE:4-40 X 0.25" 100 DEG,FLH STL - - - * - - -					83385	OBD
-23	386-2641-00			1	SUBPANEL,FRONT:PLASTIC (ATTACHING PARTS)					80009	386-2641-00
-24	213-0229-00			3	SCR,TPG,THD FOR:6-20X0.375 100 DEG,FLH STL - - - * - - -					83385	OBD
-25	337-1841-00			1	SHLD,ELECTRICAL:FRONT SUBPANEL					80009	337-1841-00
-26	384-1215-00			2	EXTENSION SHAFT:6.2 INCHES LONG					80009	384-1215-00
-27	384-1216-00			1	EXTENSION SHAFT:6.375 INCHES LONG					80009	384-1216-00
-28	384-1217-00			1	EXTENSION SHAFT:8.45 INCHES LONG					80009	384-1217-00
-29	384-1099-00			2	EXTENSION SHAFT:PUSH BUTTON,1.54 INCH LONG					80009	384-1099-00
-30	354-0423-00			1	RING,SPRT,CRT:RUBBER					80009	354-0423-00
-31	348-0279-00			1	PAD,CUSHIONING:3.50" LONG (CUT TO FIT)					80009	348-0102-00
-32	337-1458-03			1	SHLD,ELECTRICAL:CRT (ATTACHING PARTS)					80009	337-1458-03
-33	211-0101-00			1	SCREW,MACHINE:4-40 X 0.25" 100 DEG,FLH STL					83385	OBD
-34	210-0586-00			1	NUT,PLAIN,EXT W:4-40 X 0.25 INCH,STL - - - * - - -					78189	OBD
-35	136-0560-00			1	SKT,ELCTR N TUBE:ASSY CRT					80009	136-0560-00
	- - - - -			-	SKT,ELECTRON TUBE ASSEMBLY INCLUDES:						
	136-0453-00			1	SKT,ELCTR N TUBE:CRT					80009	136-0453-00
	131-1109-00			10	CONNECTOR TERM:					00779	42869-6
-36	343-0403-00			1	CLAMP,RIM,CLENC:TRANSISTOR (ATTACHING PARTS)					80009	343-0403-00
-37	211-0114-00			1	SCREW,MACHINE:4-40 X 0.438 INCH,FLH STL					83385	OBD
-38	342-0082-00			1	INSULATOR,PLATE:0.52"SQ,0.015"THK,ALUMINA - - - * - - -					80009	342-0082-00
-39	214-1061-00			1	SPRING,GROUND:FLAT					80009	214-1061-00
-40	426-1022-00			1	FRAME,SECT,TOP: (ATTACHING PARTS)					80009	426-1022-00
-41	213-0146-00			1	SCR,TPG,THD FOR:6-20 X 0.313 INCH,PNH STL - - - * - - -					83385	OBD
-42	426-1047-00			1	FR SECT,BOTTOM: (ATTACHING PARTS)					80009	426-1047-00
	213-0146-00			1	SCR,TPG,THD FOR:6-20 X 0.313 INCH,PNH STL - - - * - - -					83385	OBD

Replaceable Mechanical Parts—MR 501

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5					Name & Description	Mfr Code	Mfr Part Number
1-43	337-1839-00		1					SHLD,ELECTRICAL:HIGH VOLTAGE,RIGHT (ATTACHING PARTS)	80009	337-1839-00	
-44	211-0008-00		1					SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD	
-45	210-0994-00		1					WASHER,FLAT:0.125 ID X 0.25" OD,STL - - - * - - -	83385	OBD	
-46	337-1842-00		1					SHLD,ELECTRICAL:HIGH VOLTAGE,LEFT (ATTACHING PARTS)	80009	337-1842-00	
-47	211-0144-00		1					SCREW,MACHINE:4-40 X 1.312 INCH,PNH STL	83385	OBD	
-48	210-0994-00		1					WASHER,FLAT:0.125 ID X 0.25" OD,STL	83385	OBD	
-49	361-0581-00		1					SPACER,SLEEVE:1.044 INCHES LONG	80009	361-0581-00	
-50	129-0419-00		1					POST,ELEC-MECH:HEX.,0.588 INCH LONG - - - * - - -	80009	129-0419-00	
-51	- - - - -		1					CKT BOARD ASSY:--MAIN(SEE EPL FOR PN) - CKT BOARD ASSY INCLUDES:			
-52	131-0608-00		2					. CONTACT,ELEC:0.365 INCH LONG	22526	47357	
-53	136-0252-04		12					. CONTACT,ELEC:0.188 INCH LONG	22526	75060	
-54	214-0973-00		2					HEAT SINK,ELEC:0.28 X 0.18 OVAL X 0.187"H	80009	214-0973-00	
-55	260-1445-00		2					. SWITCH,PUSH:	80009	260-1445-00	
-56	361-0385-00		2					. SPACER,PB SW:0.164 INCH LONG	80009	361-0385-00	
-57	337-1838-00		1					SHLD,ELECTRICAL:1.687 X 6.125 INCHES	80009	337-1838-00	
-58	260-1365-00		2					. SWITCH,PUSH:	80009	260-1365-00	
-59	361-0384-00		2					. SPACER,PB SW:0.133 INCH LONG	80009	361-0384-00	
-60	337-1837-00		1					SHLD,ELECTRICAL:0.562 X 6.125 INCHES	80009	337-1837-00	
-61	376-0051-01		4					. CPLG,SHAFT,FLEX:FOR 0.125 INCH - COUPLING,SHAFT,FLEXABLE INCLUDES: 2 . . RING,COUPLING: 2 . . CPLG,SHAFT,FLEX:PLASTIC 4 . . SETSCREW:4-40 X 0.125 INCH,HEX SOC STL	80009	376-0051-01	
-62	- - - - -		3					RES,VAR,NONWIR:(SEE R35 EPL FOR PN) (ATTACHING PARTS)			
-63	210-0583-00		3					NUT,PLAIN,HEX:0.250-32 X 0.312",BRS	73743	2X20319-402	
-64	210-0940-00		3					. WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL	79807	OBD	
-65	337-1840-00		1					SHLD,ELECTRICAL:0.562 X 2.937 INCH LONG - - - * - - -	80009	337-1840-00	
- - - - -			1					CKT BOARD ASSY:(SEE A2 EPL) (ATTACHING PARTS)			
	213-0206-00		1					SCR,TPG,THD FOR:6-32 X 1.25 INCH,PNH STL	80009	213-0206-00	
	166-0038-00		1					SPACER,SLEEVE:0.181ID X 0.250OD X 0.750" L - - - * - - -	80009	166-0038-00	
- - - - -			-					. CKT BOARD ASSY INCLUDES:			
	344-0154-00		2					. CLIP,ELECTRICAL:FOR 0.25 INCH DIA FUSE	80009	344-0154-00	
	175-0826-00		FT					WIRE,ELECTRICAL:3 WIRE RIBBON	08261	TEK-175-0826-00	



MANUAL CHANGE INFORMATION

At Tektronix, we continually strive to keep up with latest electronic developments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on following pages.

A single change may affect several sections. Since the change information sheets are carried in the manual until all changes are permanently entered, some duplication may occur. If no such change pages appear following this page, your manual is correct as printed.

SERVICE NOTE

Because of the universal parts procurement problem, some electrical parts in your instrument may be different from those described in the Replaceable Electrical Parts List. The parts used will in no way alter or compromise the performance or reliability of this instrument. They are installed when necessary to ensure prompt delivery to the customer. Order replacement parts from the Replaceable Electrical Parts List.

CALIBRATION TEST EQUIPMENT REPLACEMENT

Calibration Test Equipment Chart

This chart compares TM 500 product performance to that of older Tektronix equipment. Only those characteristics where significant specification differences occur, are listed. In some cases the new instrument may not be a total functional replacement. Additional support instrumentation may be needed or a change in calibration procedure may be necessary.

Comparison of Main Characteristics

DM 501 replaces 7D13		
PG 501 replaces 107	PG 501 - Risetime less than 3.5 ns into 50 Ω .	107 - Risetime less than 3.0 ns into 50 Ω .
108	PG 501 - 5 V output pulse; 3.5 ns Risetime.	108 - 10 V output pulse; 1 ns Risetime.
111	PG 501 - Risetime less than 3.5 ns; 8 ns Pretrigger pulse delay.	111 - Risetime 0.5 ns; 30 to 250 ns Pretrigger Pulse delay.
114	PG 501 - ± 5 V output.	114 - ± 10 V output. Short proof output.
115	PG 501 - Does not have Paired, Burst, Gated, or Delayed pulse mode; ± 5 V dc Offset. Has ± 5 V output.	115 - Paired, Burst, Gated, and Delayed pulse mode; ± 10 V output. Short-proof output.
PG 502 replaces 107		
108	PG 502 - 5 V output	108 - 10 V output.
111	PG 502 - Risetime less than 1 ns; 10 ns Pretrigger pulse delay.	111 - Risetime 0.5 ns; 30 to 250 ns Pretrigger pulse delay.
114	PG 502 - ± 5 V output	114 - ± 10 V output. Short proof output.
115	PG 502 - Does not have Paired, Burst, Gated, Delayed & Undelayed pulse mode; Has ± 5 V output.	115 - Paired, Burst, Gated, Delayed & Undelayed pulse mode; ± 10 V output. Short-proof output.
2101	PG 502 - Does not have Paired or Delayed pulse. Has ± 5 V output.	2101 - Paired and Delayed pulse; 10 V output.
PG 506 replaces 106		
067-0502-01	PG 506 - Positive-going trigger output signal at least 1 V; High Amplitude output, 60 V. PG 506 - Does not have chopped feature.	106 - Positive and Negative-going trigger output signal, 50 ns and 1 V; High Amplitude output, 100 V. 0502-01 - Comparator output can be alternately chopped to a reference voltage.
SG 503 replaces 190, 190A, 190B, 191, 067-0532-01		
	SG 503 - Amplitude range 5 mV to 5.5 V p-p. SG 503 - Frequency range 250 kHz to 250 MHz. SG 503 - Frequency range 250 kHz to 250 MHz.	190B - Amplitude range 40 mV to 10 V p-p. 191 - Frequency range 350 kHz to 100 MHz. 0532-01 - Frequency range 65 MHz to 500 MHz.
TG 501 replaces 180, 180A		
	TG 501 - Marker outputs, 5 sec to 1 ns. Sinewave available at 5, 2, and 1 ns. Trigger output - slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	180A - Marker outputs, 5 sec to 1 μ s. Sinewave available at 20, 10, and 2 ns. Trigger pulses 1, 10, 100 Hz; 1, 10, and 100 kHz. Multiple time-marks can be generated simultaneously.
181	TG 501 - Marker outputs, 5 sec to 1 ns. Sinewave available at 5, 2, and 1 ns.	181 - Marker outputs, 1, 10, 100, 1000, and 10,000 μ s, plus 10 ns sinewave.
184	TG 501 - Marker outputs, 5 sec to 1 ns. Sinewave available at 5, 2, and 1 ns. Trigger output - slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	184 - Marker outputs, 5 sec to 2 ns. Sinewave available at 50, 20, 10, 5, and 2 ns. Separate trigger pulses of 1 and .1 sec; 10, 1, and .1 ms; 10 and 1 μ s. Marker amplifier provides positive or negative time marks of 25 V min. Marker intervals of 1 and .1 sec; 10, 1, and .1 ms; 10 and 1 μ s.
2901	TG 501 - Marker outputs, 5 sec to 1 ns. Sinewave available at 5, 2, and 1 ns. Trigger output - slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	2901 - Marker outputs, 5 sec to 0.1 μ s. Sinewave available to 50, 10, and 5 ns. Separate trigger pulses, from 5 sec to 0.1 μ s. Multiple time-marks can be generated simultaneously.

NOTE: All TM 500 generator outputs are short-proof. All TM 500 plug-in instruments require TM 500-Series Power Module.



MANUAL CHANGE INFORMATION

PRODUCT MR 501
070-1581-00

CHANGE REFERENCE C2/376
DATE 3-15-76

CHANGE:	DESCRIPTION
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TEXT CORRECTION

On the center panel of the PERFORMANCE CHECKS & ADJUSTMENTS pullout, right column, under the "2. Check Z Axis Amplifier Gain and Risetime" heading.

CHANGE the third paragraph to read:

Set the test oscilloscope volts/div control to 2. Connect a 1-volt output from the square-wave generator through a coaxial cable and a 50-ohm termination to the MR 501 Z input connector.

CHANGE the fourth paragraph to read:

Measure the test oscilloscope waveform amplitude, it should be within 7.5 to 12.5 volts. This represents a ten-times multiplication (+25%) of the 1-volt output of the square-wave generator.