

**TEKTRONIX®**

**212**

**OSCILLOSCOPE**

**SERVICE**

**INSTRUCTION MANUAL**

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

Serial Number \_\_\_\_\_

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# INTRODUCTION

The 212 Oscilloscope is a dual-channel portable oscilloscope using all solid state and integrated circuitry (except the CRT). The small size of the 212 makes it an extremely portable oscilloscope for on-location maintenance in many fields of application.

The 500 kilohertz vertical system provides vertical deflection factors from one millivolt (at a reduced bandwidth) to 50 volts/division at the tip of either of the two integral high-impedance probes. Both single-trace and dual-trace modes of operation are offered. Single-trace displays are achieved by turning off either vertical channel with its position control. In the dual-trace mode, the instrument automatically chops or alternates, depending upon the sweep rate. The trigger circuits provide stable triggering over the full bandwidth capabilities of the vertical system.

The horizontal deflection system provides calibrated sweep rates from 500 milliseconds to five microseconds/division. It also provides uncalibrated sweep rates, via a variable sweep magnifier, to at least five times the indicated sweep rate for a maximum of at least one microsecond/division. In addition, X-Y operation is provided. Channel 1 supplies the horizontal (X) deflection, with a range from less than one millivolt to 50 volts/division (at a reduced bandwidth of 50 kilohertz), and Channel 2 the vertical (Y) deflection. The resultant CRT display is presented on a 6 X 10 division graticule (each division equals 0.203 inch).

The 212 is operated either from AC line voltage or from internal rechargeable batteries. The internal batteries are recharged from the AC power line by the integral battery charger.

This instrument will meet the following electrical characteristics after complete instrument calibration. These characteristics apply over an ambient temperature of  $-15^{\circ}\text{C}$  to  $+55^{\circ}\text{C}$  ( $+5^{\circ}\text{F}$  to  $+131^{\circ}\text{F}$ ), except as otherwise indicated. Warmup time for given accuracies is five minutes.

## VERTICAL DEFLECTION SYSTEM

### DEFLECTION FACTOR:

Calibrated Range: One millivolt to 50 volt/division. 15 steps in 1-2-5 sequence.

Accuracy: Within 5% with VOLTS/DIV VAR control in CAL position and gain correctly set at 5 mV/div.

Uncalibrated (variable) Range: Continuously variable between calibrated settings. Extends maximum deflection factor to at least 125 volts/division.

### BANDWIDTH (with six-division reference):

10 mV/DIV to 50 V/DIV: DC to at least 500 kilohertz.

5 mV/DIV: DC to at least 400 kilohertz.

2 mV/DIV: DC to at least 200 kilohertz.

1 mV/DIV: DC to at least 100 kilohertz.

Lower Bandwidth Limit, AC (capacitively) Coupled: about 2 hertz at all deflection factors.

### INPUT RESISTANCE:

Approximately one megohm.

### INPUT CAPACITANCE:

1 mV/DIV to 50 mV/DIV: Approximately 160 picofarads.

100 mV/DIV to 50 V/DIV: Approximately 140 picofarads.

### MAXIMUM USABLE INPUT VOLTAGE:

50 V/DIV to .1 V/DIV: 600 volts (DC + peak AC). 600 volts peak-to-peak AC (five megahertz or less).

50 mV/DIV to 1 mV/DIV: 600 volts (DC + peak AC). AC not over 2 kilohertz or risetime not less than 100 nanoseconds.

### CHOPPED MODE:

From 500 ms/DIV to 2 ms/DIV of time base at approximately 50 kilohertz.

### ALTERNATE MODE:

From 1 ms/DIV to 5  $\mu\text{s}$ /DIV of time base.

### INPUT IMPEDANCE MATCHING:

Matched to within approximately 10%.

**GAIN ACCURACY BETWEEN CHANNELS:**

Within 5% with both VOLTS/DIV VAR controls in CAL position and gain correctly set at 5 mV/DIV.

**TRIGGERING**

**TRIGGER SENSITIVITY:**

Internal:

COMP: 0.2 division from DC to 500 kilohertz.

CH 2: 0.2 division from 2 hertz to 500 kilohertz.

External:

1.0 volt from DC to 500 kilohertz.

**PRESET TRIGGER LEVEL:**

Triggered at preset level on positive slope of triggering signal. Sensitivity same as stated above.

**DISPLAY JITTER:**

0.5 microsecond or less at 500 kilohertz.

**EXTERNAL TRIGGER:**

Input Resistance: Approximately one megohm.

Input Capacitance: Approximately 30 picofarads.

Maximum Usable Input Voltage: 8 volts (DC + peak AC) 16 volts peak-to-peak AC (one megahertz or less).

**HORIZONTAL DEFLECTION SYSTEM**

**SWEEP RATE:**

Calibrated Range: 500 milliseconds to five microseconds/division. 16 steps in 1-2-5 sequence.

Accuracy (over center eight divisions): Within 5% with HORIZ MAG control in CAL position and timing correctly set at 1 ms/DIV (disregard first 0.5 microsecond of total sweep length).

Linearity (any two division portion within center eight divisions): Within 5% (disregard first 10% of total sweep length).

Variable Magnifier: Continuously variable between calibrated settings. Extends maximum sweep rate to at least 1.0 microsecond/division.

**CH 1 HORIZONTAL INPUT:**

Calibrated Deflection Factor: 1 millivolt to 50 volts/division.

Variable: At least five times (using HORIZ MAG).

Accuracy: Within 10% (with HORIZ MAG control in CAL position).

X-Y Phasing: Less than 3° at five kilohertz.

Maximum Input Voltage: 600 volts (DC + peak AC); 600 volts (peak-to-peak AC).

**DISPLAY**

**GRATICULE:**

Type: Internal black line, non-illuminated.

Area: Six divisions vertical by 10 divisions horizontal. Each division equals 0.203 inch.

**PHOSPHOR:**

P31 Standard.

**ISOLATION**

PROBE COMMON TO 212 CASE EXTERIOR: (When battery operated with AC power plug secured in the insulated cover.) Maximum safe potential between probe common (floating circuit ground) and 212 case exterior not to exceed 500 V RMS sinusoidal, or 700 V (DC + peak AC).

PROBE COMMON TO AC LINE: Maximum safe potential between probe common (floating circuit ground) and the AC power line is not to exceed 250 V RMS sinusoidal minus the AC power line RMS voltage. (i.e., when the AC power line RMS voltage is 117 V, the maximum allowable potential on the probe common is 250 - 117 = 133 V RMS.)



## AC OPERATION

**CAUTION**

*Due to the capacitive line input circuit, sudden voltage changes may cause damaging input current transients. Avoid operating this instrument from square-wave inverter supplies, or other sources that produce large voltage transients.*

LINE VOLTAGE RANGE: 110 to 126 volts, AC. Batteries can not be charged during AC operation. Instrument can be operated between 104 and 110 volts with resulting slow discharge of internal batteries.

LINE FREQUENCY: 58 to 62 hertz.

**NOTE**

*Refer to Option and Corrective Maintenance information for other line voltages and frequencies.*

MAXIMUM POWER CONSUMPTION: Three watts or less at 126 volts, 60 hertz.

## INTERNAL BATTERY OPERATION

BATTERIES: 10 rechargeable A nickel-cadmium cells.

CHARGE TIME (from AC line): 16 hours for full charge (instrument off during charge cycle).

POWER (BATTERY) INDICATOR: When extinguished, indicates less than 10 minutes of scope operating life left in the batteries.

BATTERY EXCESSIVE DISCHARGE PROTECTION: Instrument operation automatically interrupted when battery charge drops to 10 volts  $\pm 0.5$  volt.

TYPICAL OPERATING TIME (at maximum trace intensity after full charge cycle at  $+20^{\circ}\text{C}$  to  $+30^{\circ}\text{C}$ ): Three to five hours. Longest operating time provided at lower trace intensity.

TYPICAL CHARGE CAPACITY (reference to charge/discharge at  $+20^{\circ}\text{C}$  to  $+30^{\circ}\text{C}$ ):

CHARGE TEMPERATURE	OPERATING TEMPERATURE		
	$-15^{\circ}\text{C}$ ( $+5^{\circ}\text{F}$ )	$+20^{\circ}\text{C}$ to $+30^{\circ}\text{C}$ ( $+68^{\circ}\text{F}$ to $+86^{\circ}\text{F}$ )	$+55^{\circ}\text{C}$ ( $+131^{\circ}\text{F}$ )
$0^{\circ}\text{C}$ ( $+32^{\circ}\text{F}$ )	40%	60%	50%
$+20^{\circ}\text{C}$ to $+30^{\circ}\text{C}$ ( $+68^{\circ}\text{F}$ to $+86^{\circ}\text{F}$ )	65%	100%	85%
$40^{\circ}\text{C}$ ( $+104^{\circ}\text{F}$ )	40%	65%	55%

## GENERAL

## ENVIRONMENT:

Temperature:

Operating from Batteries,  $-15^{\circ}\text{C}$  to  $+55^{\circ}\text{C}$  ( $+5^{\circ}\text{F}$  to  $+131^{\circ}\text{F}$ ).

Charging or operating from AC line,  $0^{\circ}\text{C}$  to  $+40^{\circ}\text{C}$  ( $+32^{\circ}\text{F}$  to  $+104^{\circ}\text{F}$ ).

Storage,  $-40^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$  ( $-40^{\circ}\text{F}$  to  $+140^{\circ}\text{F}$ ).

Altitude:

Operating, to 25,000 feet (maximum operating temperature decreased by  $1^{\circ}\text{C}$  per 1,000 feet above 15,000 feet).

Non-operating, to 50,000 feet.

Humidity (operating and non-operating): 5 cycles (120 hours) to 95% relative humidity referenced to MIL-E-16400F.

Shock (operating and non-operating): Tested with two shocks at 150 g, one-half sine, two millisecond duration each direction along three major axes.

WEIGHT (without accessories):

3.4 pounds (1.5 kilograms)

DIMENSIONS (measured at maximum points):

Height: 3.0 inches (7.6 centimeters).

Width: 5.25 inches (13.2 centimeters).

Depth: 8.9 inches (22.6 centimeters).



# FUNCTIONS OF CONTROLS AND CONNECTORS

The controls and connectors necessary for operation of the 212 are located on the right side of the instrument. (See Fig. 2-1.) The POWER (BATTERY) indicator is on the front panel. A brief description of each control and connector is given here.

**VOLTS/DIV**—selects vertical deflection factor (vertical VARIABLE control must be in CAL position for indicated deflection.)

**INPUT COUPLING**—selects the method used to couple the channel input signal to the vertical amplifier system.

**AC**—the DC component of input signal is blocked.

**GND**—vertical amplifier input circuit is grounded. The applied input signal is connected to ground through a one megohm resistor to provide a pre-charge path for the AC input coupling capacitor.

**DC**—all components of the input signal are passed to the vertical amplifier system input.

**STEP ATTEN BALANCE**—a screwdriver adjustment to balance the vertical amplifier system for minimum trace shift when switching deflection factors.

**Vertical POSITION**—controls the vertical position of the appropriate trace. OFF detent turns the channel off.

**VOLTS/DIV VARIABLE**—provides a continuously variable deflection factor between the calibrated settings of the VOLTS/DIV switch for the appropriate vertical channel.

**VERTICAL GAIN**—screwdriver adjustment to set the gain of the vertical amplifier system.

**AUTO PRESET**—screwdriver adjustment to set the AUTO PRESET trigger point for automatic trigger operation.

**Trigger SOURCE**—selects the source of the trigger signal.

**COMP**—the sweep is triggered from a sample of the vertical deflection signal after the vertical switching.

**CH 2**—the sweep is triggered from a sample of the vertical deflection signal before the vertical switching and only from CH 2.

**EXT**—the sweep is triggered from the signal applied to the EXT TRIG banana jack.

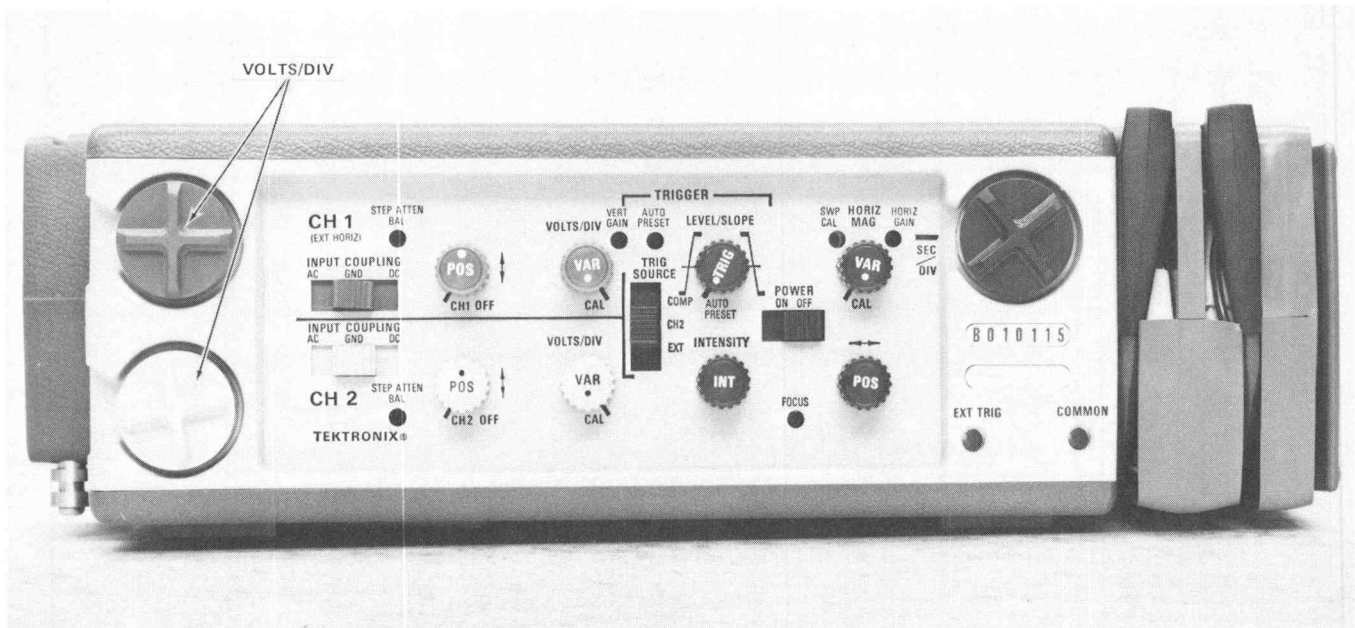


Fig. 2-1. Side Panel controls and connectors.

## Controls & Connectors—212

**LEVEL/SLOPE**—selects the amplitude point and the slope of the trigger signal on which the sweep is triggered. When the indicator dot is to the left of center, the sweep is triggered on the positive-going slope of the trigger signal; to the right of center, on the negative-going slope. When the LEVEL/SLOPE control is set to the AUTO PRESET detent, the sweep is automatically triggered at a preset level on the positive-going slope.

**INTENSITY**—controls brightness of CRT display.

**SWP CAL**—screwdriver adjustment to provide calibrated sweep timing.

**POWER**—controls power to the instrument. Does not interrupt charging current to the internal batteries when the instrument is connected to an AC line voltage.

**FOCUS**—screwdriver adjustment to obtain a well-defined display.

**HORIZONTAL MAGNIFIER**—provides continuously variable sweep magnification to a maximum of approximately five times the sweep rate indicated by the SEC/DIV switch.

**HORIZONTAL GAIN**—screwdriver adjustment to set the basic gain of the horizontal amplifier system.

**Horizontal POSITION**—controls the horizontal position of the trace.

**SEC/DIV**—selects horizontal sweep rate (HORIZ MAG must be in CAL position for indicated sweep rate). X-Y position allows for X-Y operation; CH 2 supplies the vertical deflection and CH 1 the horizontal deflection.

**EXT TRIG**—banana jack for input of an external trigger signal.

**COMMON**—banana jack to establish common ground between the 212 and the external signal source or equipment under test.

### **WARNING**

*COMMON and probe ground straps are electrically connected. Therefore, an elevated reference applied to any is present on each - as indicated by the yellow warning bands under the probe retractable hook tips.*

**POWER (BATTERY) Indicator**—red light to indicate when the instrument is on. When light extinguishes, less than 10 minutes of operating life remain.



# PREVENTIVE MAINTENANCE

Preventive maintenance, when performed on a regular basis, can prevent instrument breakdown and may improve the reliability of this instrument. The severity of environment to which the 212 is subjected will determine the frequency of maintenance. A convenient time to perform preventive maintenance is preceding recalibration of the instrument.

## Disassembly

To gain access to the interior of the instrument, unwind both the probe cords and the power cord from the rear of the instrument. Remove the five screws in the bottom cover of the instrument. See Fig. 3-1. Gently separate the bottom cover from the instrument and lay aside. The Power Supply circuit board with the batteries can be lifted up and pivoted out of the way. Most of the internal workings of the instrument are now accessible.

If it is necessary to have access to the front of the Input circuit board, remove the knobs from all of the external control shafts. Remove the four screws securing the side panel to the Input circuit board and remove the instrument side panel.

## Cleaning

The 212 should be cleaned as often as operating conditions require. Accumulation of dirt in the instrument can cause component breakdown.

The high impact plastic covers provide protection against dust in the interior of the instrument. Loose dust accumulated on these covers can be removed with a soft cloth or small brush. The brush is also useful for dislodging dirt on and around the side-panel controls. Dirt which remains can be removed with a soft cloth dampened in a mild detergent and water solution. Abrasive cleaners should not be used.

It should be only occasionally necessary to clean the interior. The best way to clean the interior is to blow off the accumulated dust with dry, low-velocity air. A soft-bristle brush or a cotton-tipped applicator is useful for cleaning in narrow spaces or for cleaning more delicate circuit components.

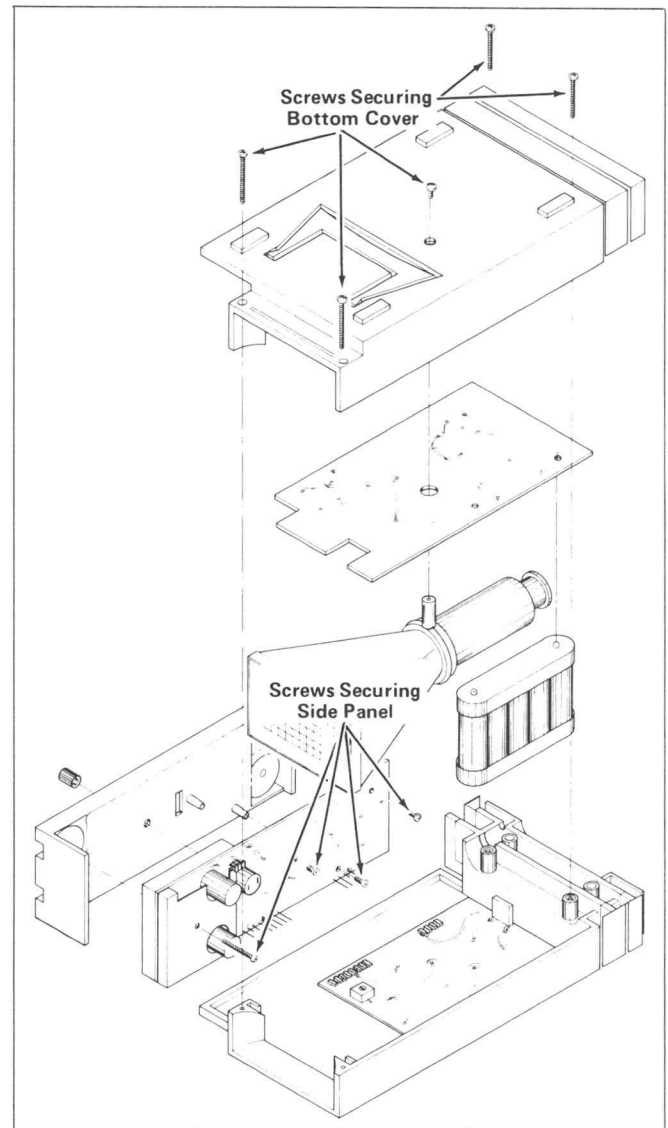


Fig. 3-1. Location of screws securing bottom cover and side panel.

### CAUTION

*Avoid the use of chemical cleaning agents which might damage the plastics used in this instrument. Avoid chemicals which contain hydrochloric acid, sodium hydroxide, or sulfuric acid.*

## Visual Inspection

The 212 should be inspected occasionally for such defects as broken connections, improperly seated transis-

## Preventive Maintenance—212

tors, damaged circuit boards, and heat-damaged parts. The corrective procedure for most visible defects is apparent; however, particular care must be taken if heat-damaged components are found. Overheating usually indicates other trouble in the instrument; therefore, it is important that the cause of the overheating be corrected to prevent recurrence of the damage.

### Semiconductor Checks

Periodically checking the semiconductors in the 212 is not recommended. The best check of semiconductor performance is actual operation in the instrument. If it is desired to check the performance of a semiconductor out of the instrument, a dynamic checker such as a TEKTRONIX Type 576 Transistor Curve Tracer is recommended. Lead configurations of the semiconductors used in the 212 are shown in Fig. 5-2.

An extracting tool should be used to remove the 14- and 16-pin flat integrated circuits to prevent damage to the pins. If an extracting tool is not available when removing one of these integrated circuits, pull slowly and evenly on both ends of the device. Try to avoid having one end of the integrated circuit disengage from the socket before the other, as the pins may be damaged. When replacing semiconductors, key the semiconductor's index with that of its socket. Failure to do so can result in damaged components.

### Recalibration

To assure accurate measurements, check the calibration of this instrument after each 1000 hours of operation or every six months if used infrequently. In addition, replacement of components may necessitate recalibration of the affected circuits. The calibration procedure can also be helpful in localizing certain troubles in the instrument. In some cases, minor troubles may be revealed or corrected by recalibration.

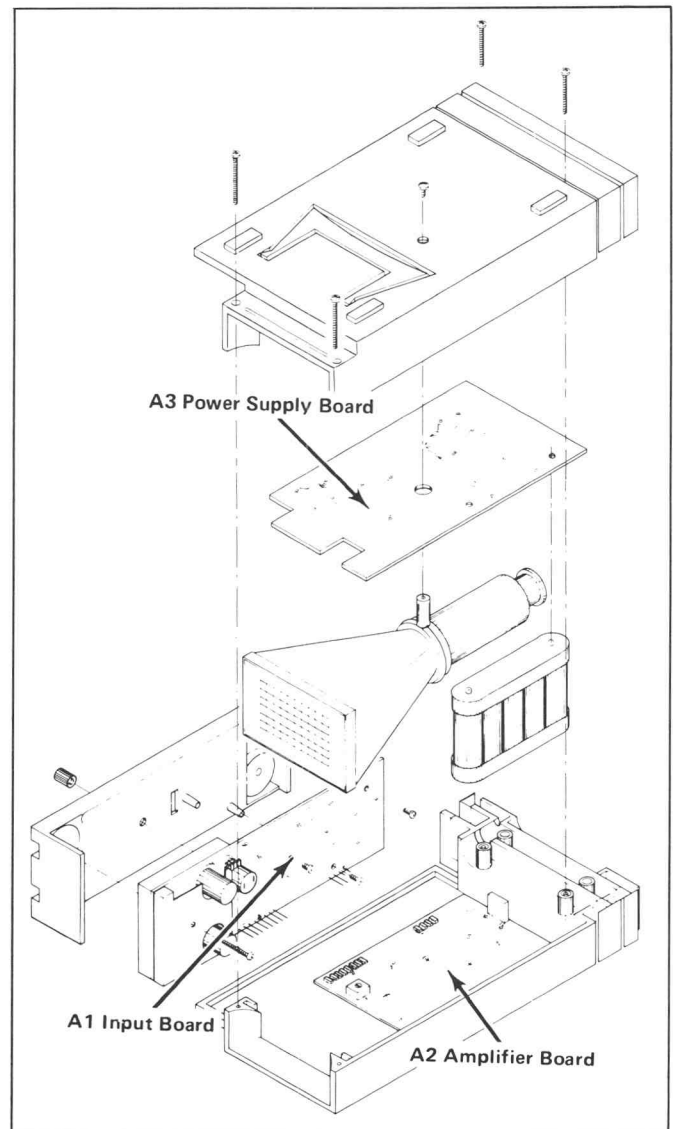


Fig. 3-2. Location of circuit boards within the 212.

# CALIBRATION

## General

To assure instrument accuracy, check the calibration of the 212 every 1000 hours of operation, or every six months if used infrequently. Before complete calibration, thoroughly clean and inspect this instrument as outlined in the Preventive Maintenance section.

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

To aid in locating a step in this procedure, an index is given prior to the complete procedure. Completion of each step in the Calibration procedure ensures that this instrument meets the electrical specifications given in the Introduction of this manual. Where possible, instrument performance is checked before an adjustment is made. For best overall instrument performance, make each adjustment to the exact setting even if the CHECK—step is within the allowable tolerances.

## TEST EQUIPMENT REQUIRED

The following test equipment and accessories, or their equivalent, are required for complete calibration of the 212. Given specifications for the test equipment are the minimum necessary for accurate calibration. Therefore, the specifications of any test equipment must either meet or exceed those listed below. All test equipment is assumed to be correctly calibrated and operating within the listed specifications. Detailed operating instructions for the test units are not given in this procedure. Refer to the instruction manual for the test equipment if more information is needed.

### Special Calibration Fixtures

Special TEKTRONIX Calibration fixtures are used in this procedure only where they facilitate instrument calibration. These special calibration fixtures are available from Tektronix, Inc. Order by part number through your local TEKTRONIX Field Office or representative.

TABLE 4-1

TEST EQUIPMENT			
Description	Minimum Specifications	Usage	Example
1. Time-Mark Generator	Marker outputs, 5 microseconds to 0.1 second; marker accuracy, within 0.1%.	Horizontal timing check and adjustment.	a. TEKTRONIX 2901 Time-Mark Generator.  b. TEKTRONIX 184 Time-Mark Generator.
2. Standard Amplitude Calibrator	Amplitude accuracy, 0.25%; signal amplitude, 5 millivolts to 100 volts; output signal one-kilohertz square wave.	Vertical and horizontal amplifier gain checks and adjustments.	a. TEKTRONIX calibration fixture Part Number 067-0502-01.
3. Square-Wave Generator	Frequency, one kilohertz; risetime, 100 nanoseconds or less; output amplitude, 0.4 volt to 40 volts.	Vertical amplifier compensation checks and adjustments.	a. TEKTRONIX Type 106 Square-Wave Generator.
4. Low-Frequency Constant-Amplitude Signal Generator	Frequency, one kilohertz to 500 kilohertz; output amplitude, at least 200 millivolts.	Vertical Amplifier bandwidth check. Trigger operation checks.	a. General Radio 1310-B Oscillator.
5. DC Voltmeter	Range, zero to 1000 volts; accuracy, within 3%; input impedance, 20,000 $\Omega$ /volt.	Power supply output level checks. Vertical and horizontal centering adjustment. CRT grid bias adjustment.	a. Triplet Model 630-NA.  b. Simpson Model 262.

TABLE 4-1 (cont)

Description	Minimum Specifications	Usage	Example
6. Cable	Impedance, 50 ohms; type, RG-58/U; length, 42 inches; connectors, BNC.	External trigger operation check. Horizontal gain check and adjustment.	a. TEKTRONIX Part Number 012-0057-01.
7. Adapter	Connectors, BNC female and dual banana plug.	External trigger checks.	a. TEKTRONIX Part Number 103-0090-00.
8. Adapter	Connectors, GR874 and BNC female.	Vertical Amplifier compensation checks and adjustment.	a. TEKTRONIX Part Number 017-0063-00.
9. Termination	Impedance, 50 ohms; accuracy, 2%; connectors, BNC.	Vertical amplifier compensation checks and adjustment.	a. TEKTRONIX Part Number 011-0049-01.
10. Attenuator	Ratio, 10X; connectors, BNC; impedance, 50 ohms.	Vertical amplifier bandwidth check.	a. TEKTRONIX Part Number 011-0059-01.
11. Adapter	Connectors, probe tip to BNC.	Used throughout procedure for signal interconnection.	a. TEKTRONIX Part Number 013-0084-01.
12. T-Connector	Connectors, BNC.	External trigger operation checks.	a. TEKTRONIX Part Number 103-0030-00.
13. Screwdriver	Three-inch shaft, 3/32 inch bit.	Used throughout procedure to adjust variable resistors.	a. Xcelite R-3323.
14. Low-Capacitance Screwdriver	1 1/2-inch shaft.	Used to adjust variable capacitors.	a. TEKTRONIX Part Number 003-0000-00.

## INDEX TO CALIBRATION PROCEDURE

### Power Supply and Display

1. Check Power Supply DC Levels
2. Adjust CRT Grid Bias (internal adjustment of R273)
3. Adjust FOCUS (external side panel adjustment of R398)
4. Adjust Trace Rotation (internal adjustment of R141)

### Vertical System Adjustment

5. Adjust Vertical DC Centering (internal adjustment of R101)
6. Adjust CH 1 STEP ATTENUATION BALANCE (external side panel adjustment of R415)
7. Adjust CH 2 STEP ATTENUATION BALANCE (external side panel adjustment of R315)

8. Adjust VERTICAL GAIN (external side panel adjustment of R470)

9. Check CH 2 VARIABLE VOLTS/DIV Range

10. Check CH 2 VOLTS/DIV Accuracy

11. Check CH 1 VOLTS/DIV Accuracy and VARIABLE VOLTS/DIV Range

12. Adjust CH 1 VOLTS/DIV Switch Compensation (internal side panel adjustment of C407, C408, C409)

13. Adjust CH 2 VOLTS/DIV Switch Compensation (internal side panel adjustment of C307, C308, C309)

14. Check CH 2 Vertical Amplifier Bandwidth



15. Check CH 1 Vertical Amplifier Bandwidth

### Trigger Circuit Adjustment

16. Adjust AUTO PRESET (external side panel adjustment of R375)

17. Check Trigger Circuit Operation

### Horizontal System Adjustment

18. Adjust Horizontal Centering (internal adjustment of R366)

19. Adjust HORIZontal GAIN (external side panel adjustment of R475)

20. Adjust SWEEP CALibration (external side panel adjustment of R370)

21. Check HORIZ MAG Range

22. Check SEC/DIV Accuracy

### PRELIMINARY PROCEDURE

This instrument should be adjusted at an ambient temperature of +25°C (± 5°C) for best overall accuracy.

1. Remove the instrument covers as described in the Disassembly Instructions in the Preventive Maintenance section.

2. Connect the instrument to a 117 VAC 60 Hz line source. If the batteries are not fully charged, leave the 212 connected to the line with the power switch turned off for a period of approximately one hour before continuing with calibration.

3. Set the instrument controls as given under Preliminary Control Settings. Allow at least five minutes of warmup before proceeding.

### NOTE

*Titles for external controls of this instrument are fully capitalized in this procedure (e.g., INTENSITY). Internal adjustments are initial capitalized only (e.g., Grid Bias).*

### PRELIMINARY CONTROL SETTINGS

Preset the instrument controls to the settings given below when starting a calibration procedure.

#### Channel 1 Controls

VOLTS/DIV	5 m
VOLTS/DIV VAR	CAL
POS	Midrange
INPUT COUPLING	GND

#### Channel 2 Controls

VOLTS/DIV	5 m
VOLTS/DIV VAR	CAL
POS	OFF
INPUT COUPLING	GND

#### Trigger Controls

SOURCE	COMP
LEVEL/SOURCE	AUTO PRESET

#### Sweep Controls

SEC/DIV	1 m
HORIZ MAG	CAL
POS	Midrange

#### Display Controls

POWER	ON
INTENSITY	Fully Counterclockwise

## CALIBRATION PROCEDURE POWER SUPPLY and DISPLAY

Equipment Required	
1. DC Voltmeter	2. Three-inch Screwdriver

### Control Setting

Preset instrument controls to the settings given under Preliminary Control Settings.

### 1. Check Power Supply DC Levels

*NOTE*

*If the instrument has been operating satisfactorily prior to recalibration, proceed with step 2.*

a. Using the DC voltmeter, measure the DC level of the power supplies given in Table 4-2. Observe proper meter polarity. See Fig. 4-1 for test point locations.

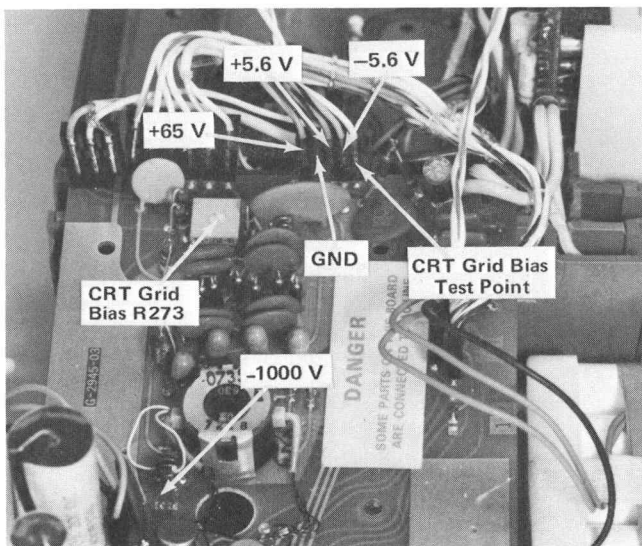
**TABLE 4-2**

**Power Supply Accuracy**

Supply	Measurement
-5.6 volt	-5.6 volts $\pm 0.4$ volt
+5.6 volt	+5.6 volts $\pm 0.4$ volt
+65 volt	+65 volts $\pm 4$ volts
-1000 volt	-960 volts $\pm 40$ volts (due to meter loading)

### 2. Adjust CRT Grid Bias

a. Connect the DC voltmeter between pin 5 and pin 2 of plug P3 (negative meter lead to pin 2) on the Power Supply Board. See Fig. 4-1.



**Fig. 4-1.** Location of power supply test points and CRT Grid Bias adjustment.

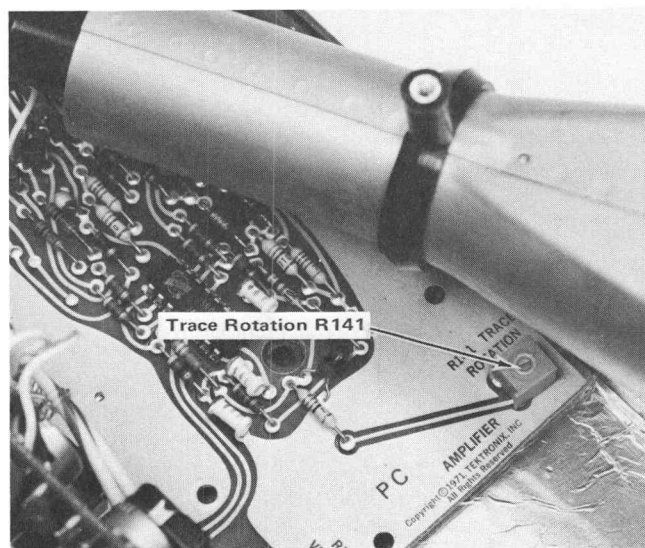
- b. Turn the INTENSITY control fully clockwise.
- c. CHECK—Meter reading of +1.9 volts.
- d. ADJUST—CRT Grid Bias, R273 (see Fig. 4-1) for a meter reading of +1.9 volts.
- e. Disconnect all test equipment. Turn the INTENSITY control fully counterclockwise.

### 3. Adjust FOCUS

- a. Turn CH 2 POS midrange and CH 1 POS to the OFF detent.
- b. Set the SEC/DIV switch to X-Y and adjust the INTENSITY control for a nominal display intensity.
- c. ADJUST—FOCUS, R398 (located on the 212 side panel) for a well-defined dot.

### 4. Adjust Trace Rotation

- a. Set the SEC/DIV switch to 1 m.
- b. CHECK—Free-running sweep is parallel with a horizontal graticule line.
- c. ADJUST—Trace Rotation, R141 (see Fig. 4-2) so the trace is parallel with the center horizontal graticule line.



**Fig. 4-2.** Location of Trace Rotation adjustment.

## VERTICAL SYSTEM ADJUSTMENT

### Equipment Required

- |  |  |
|--|--|
| <ol style="list-style-type: none"> <li>1. Standard Amplitude Calibrator</li> <li>2. Square-Wave Generator</li> <li>3. Low Frequency Constant Amplitude Signal Generator</li> <li>4. DC Voltmeter</li> <li>5. GR-to-BNC Female Adapter</li> </ol> | <ol style="list-style-type: none"> <li>6. Probe Tip-to-BNC Adapter</li> <li>7. 50-Ohm BNC Termination</li> <li>8. 10X 50-Ohm Attenuator</li> <li>9. Three-inch Screwdriver</li> <li>10. Low-Capacitance Screwdriver</li> </ol> |
|--|--|

### Control Settings

Preset instrument controls to the settings given under Preliminary Control Settings, except as follows:

INTENSITY	Visible Display
INPUT COUPLING	DC
(both)	

### 5. Adjust Vertical DC Centering

- a. Connect the DC voltmeter between pin 11 of U105 (positive meter lead to pin 11) and ground (see Fig. 4-3).
- b. Adjust CH 1 Vertical POS control for a 0 volt meter reading.
- c. CHECK—Trace should be within approximately 0.4 division of graticule center.
- d. ADJUST—Vertical Centering, R101 (see Fig. 4-3) to position the trace to the center horizontal graticule line.
- e. Disconnect all test equipment.

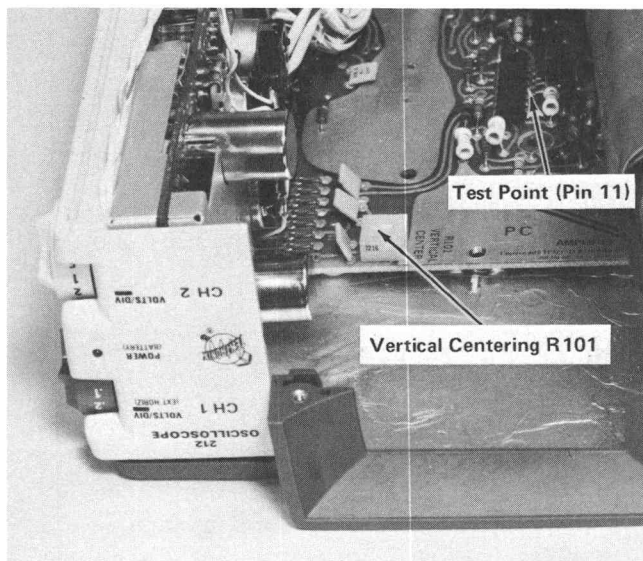


Fig. 4-3. Location of Vertical Centering adjustment and test point.

### 6. Adjust CH 1 STEP ATTENUATOR BALANCE

- a. Rotate the CH 1 VOLTS/DIV switch from 50 m to 1 m.
- b. CHECK—The CRT display for 0.1 division or less of trace shift between adjacent switch positions when rotating the VOLTS/DIV switch from 50 m to 1 m.
- c. ADJUST—CH 1 STEP ATTEN BAL, R415 (located on the side panel) for minimum trace shift when rotating the CH 1 VOLTS/DIV switch from 50 m to 1 m.

### 7. Adjust CH 2 STEP ATTENUATOR BALANCE

- a. Turn the CH 1 POS control to the OFF detent and the CH 2 POS control to midrange.
- b. Rotate the CH 2 VOLTS/DIV switch from 50 m to 1 m.
- c. CHECK—The CRT display for 0.1 division or less of trace shift between adjacent switch positions when rotating the VOLTS/DIV switch from 50 m to 1 m.
- d. ADJUST—CH 2 STEP ATTEN BAL, R315 (located on the side panel) for minimum trace shift rotating the CH 2 VOLTS/DIV switch from 50 m to 1 m.

### 8. Adjust VERTICAL GAIN

- a. Set the CH 2 VOLTS/DIV switch to 5 m.
- b. Connect the CH 2 probe tip to the output of the Standard Amplitude Calibrator via a probe tip-to-BNC adapter.
- c. Set the Standard Amplitude Calibrator for a 20 millivolts output signal.
- d. CHECK—The CRT display for four divisions of deflection within 0.2 division.
- e. ADJUST—VERT GAIN, R470 (located on the side panel) for exactly four divisions of deflection.

**9. Check CH 2 VARIABLE VOLTS/DIV Range**

a. Rotate the CH 2 VOLTS/DIV VAR control fully clockwise.

b. CHECK—The CRT display for 1.6 divisions or less of deflection. 1.6 divisions of deflection indicates a VARIABLE VOLTS/DIV range of at least 2.5:1.

c. Set the VARIABLE VOLTS/DIV control to CAL.

**10. Check CH 2 VOLTS/DIV Accuracy**

a. CHECK—Using the CH 2 VOLTS/DIV switch and Standard Amplitude Calibrator settings given in Table 4-3, check that the deflection factor accuracy for CH 2 is within 5% at each position.

**TABLE 4-3**  
Vertical Deflection Accuracy

VOLTS/DIV Switch Setting	Standard Amplitude Calibrator Output	Vertical Deflection in Divisions	Maximum Error For $\pm 5\%$ Accuracy
1 m	5 millivolts	5	$\pm 0.25$ division
2 m	10 millivolts	5	$\pm 0.25$ division
5 m	20 millivolts	4	Previously set in step 8.
10 m	50 millivolts	5	$\pm 0.25$ division
20 m	0.1 volt	5	$\pm 0.25$ division
50 m	0.2 volt	4	$\pm 0.2$ division
.1	0.5 volt	5	$\pm 0.25$ division
.2	1 volt	5	$\pm 0.25$ division
.5	2 volts	4	$\pm 0.2$ division
1	5 volts	5	$\pm 0.25$ division
2	10 volts	5	$\pm 0.25$ division
5	20 volts	4	$\pm 0.2$ division
10	50 volts	5	$\pm 0.25$ division
20	100 volts	5	$\pm 0.25$ division
50	100 volts	2	$\pm 0.1$ division

b. Disconnect the CH 2 probe tip from the Standard Amplitude Calibrator.

**11. Check CH 1 VOLTS/DIV Accuracy and VARIABLE VOLTS/DIV Range**

a. Turn CH 2 POS to the OFF detent and the CH 1 POS to midrange.

b. Connect the CH 1 probe tip to the output of the Standard Amplitude Calibrator via a probe tip-to-BNC adapter.

c. CHECK—Using the CH 1 VOLTS/DIV switch and Standard Amplitude Calibrator settings given in Table 4-3, that the deflection factor accuracy of CH 1 at each position is within 5%.

d. Set the Standard Amplitude Calibrator for a 20 millivolts output signal.

e. Set the CH 1 VOLTS/DIV switch to 5 m.

f. Rotate the CH 1 VARIABLE VOLTS/DIV control fully clockwise.

g. CHECK—The CRT display for 1.6 divisions or less of deflection. 1.6 divisions of deflection indicates a VARIABLE VOLTS/DIV range of at least 2.5:1.

h. Set the VARIABLE VOLTS/DIV control to CAL.

**12. Adjust CH 1 VOLTS/DIV Switch Compensation**

a. Set the CH 1 VOLTS/DIV switch to 0.1 V.

b. Connect the CH 1 probe tip to the high amplitude output of the Type 106 Square-Wave generator via a GR-to-BNC female adapter, a 50-ohm BNC termination, and a probe tip-to-BNC adapter.

c. Adjust the Square-Wave generator for a four-division display of a one kilohertz square wave.

d. Adjust the Triggering controls for a stable display.

e. CHECK—The CRT display for flat-top waveform with no more than +0.2 division, -0.1 division, or a total of 0.2 division of aberration.

**NOTE**

*If C307, C308, C309, C407, C408, or C409 require adjustment, it will be necessary to remove the instrument side panel from the Input Board. Refer to the Disassembly Instructions for removal procedure.*



f. ADJUST—C407 (see Fig. 4-4) for no more than +0.2 division, -0.1 division, or a total of 0.2 division of aberration. (Use a low-capacitance screwdriver.)

g. Set the CH 1 VOLTS/DIV switch to 1 and adjust the Square-Wave generator for a four-division display.

h. CHECK—The CRT display for flat-top waveform with no more than +0.2 division, -0.1 division, or a total of 0.2 division of aberration.

i. ADJUST—C408 (see Fig. 4-4) for no more than +0.2 division, -0.1 division, or a total of 0.2 division of aberration.

j. Set the VOLTS/DIV switch to 10, remove the 50-ohm BNC termination from the test setup, and adjust the Square-Wave generator for a four-division display.

k. CHECK—The CRT display for a flat-top waveform with no more than +0.2 division, -0.1 division, or a total of 0.2 division of aberration.

l. ADJUST—C409 (see Fig. 4-4) for no more than +0.2 division, -0.1 division, or a total of 0.2 division of aberration.

m. Disconnect CH 1 probe tip from the test setup.

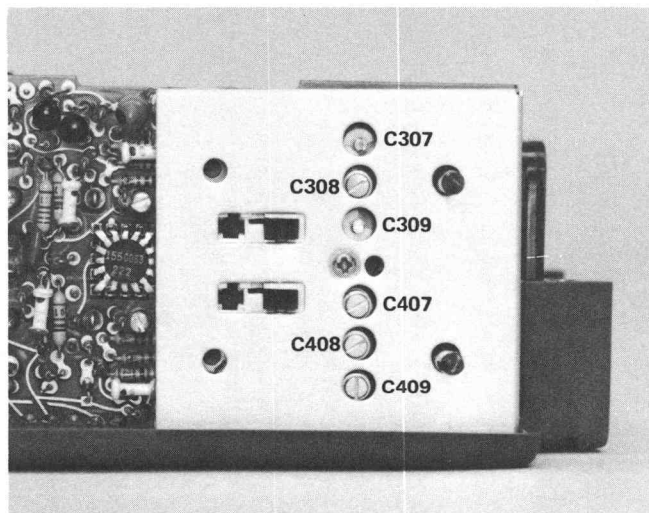


Fig. 4-4. Location of attenuator compensation capacitors.

### 13. Adjust CH 2 VOLTS/DIV Switch Compensation

a. Turn CH 1 POS control to the OFF detent and turn CH 2 POS control to midrange.

b. Set the CH 2 VOLTS/DIV switch to 0.1 V/div.

c. Connect the CH 2 probe tip to the high amplitude output of the Type 106 Square-Wave generator via a GR-to-BNC female adapter, a 50-ohm BNC termination, and a probe tip-to-BNC adapter.

d. Adjust the Square-Wave generator for a four-division display of a one-kilohertz square wave.

e. CHECK—The CRT display for flat-top waveform with no more than +0.2 division, -0.1 division, or a total of 0.2 division of aberration.

f. ADJUST—C307 (see Fig. 4-4) for no more than +0.2 division, -0.1 division, or a total of 0.2 division of aberration.

g. Set the CH 2 VOLTS/DIV switch to 1 and adjust the Square-Wave generator for a four-division display.

h. CHECK—The CRT display for a flat-top waveform with no more than +0.2 division, -0.1 division, or a total of 0.2 division of aberration.

i. ADJUST—C308 (see Fig. 4-4) for no more than +0.2 division, -0.1 division, or a total of 0.2 division of aberration.

j. Set the CH 2 VOLTS/DIV switch to 10, remove the 50-ohm BNC termination from the test setup, and adjust the Square-Wave generator for a four-division display.

k. CHECK—The CRT display for a flat-top waveform with no more than +0.2 division, -0.1 division, or a total of 0.2 division of aberration.

l. ADJUST—C309 (see Fig. 4-4) for no more than +0.2 division, -0.1 division, or a total of 0.2 division of aberration.

m. Disconnect all test equipment, and re-install the instrument side panel.

#### 14. Check CH 2 Vertical Amplifier Bandwidth

- a. Set the CH 2 VOLTS/DIV switch to 1 m.
- b. Connect the CH 2 probe tip to the output of the Low Frequency Constant-Amplitude signal generator via a 50-ohm BNC 10X attenuator and a probe tip-to-BNC adapter.
- c. Adjust the signal generator for a six-division display for a one-kilohertz signal.
- d. Without adjusting the output amplitude, increase the output frequency until the display is reduced in amplitude to 4.2 divisions.
- e. CHECK—The signal generator output must be at least 100 kilohertz.
- f. Set the VOLTS/DIV switch to 2 m and adjust the signal generator for a six-division display of a one-kilohertz signal.
- g. Without adjusting the output amplitude, increase the output frequency until the display is reduced in amplitude to 4.2 divisions.
- h. CHECK—The signal generator output must be at least 200 kilohertz.
- i. Set the VOLTS/DIV switch to 5 m and adjust the signal generator for a six-division display of a one-kilohertz signal.

j. Without adjusting the output amplitude, increase the output frequency until the display is reduced in amplitude to 4.2 divisions.

k. CHECK—The signal generator output frequency must be at least 400 kilohertz.

l. Set the VOLTS/DIV switch to 10 m and adjust the signal generator for a six-division display of a one-kilohertz signal.

m. Without adjusting the output amplitude, increase the output frequency until the display is reduced in amplitude to 4.2 divisions.

n. CHECK—The signal generator output frequency must be at least 500 kilohertz.

o. Remove CH 2 probe tip from the test setup.

#### 15. Check CH 1 Vertical Amplifier Bandwidth

- a. Connect CH 1 probe tip to the test setup.
- b. Turn CH 2 POS to the OFF detent and CH 1 POS to midrange.
- c. Set the CH 1 VOLTS/DIV switch to 1 m.
- d. Repeat steps 14-c through 14-n.

## TRIGGER CIRCUIT ADJUSTMENT

### Equipment Required

- |                                   |                               |
|-----------------------------------|-------------------------------|
| 1. Low Frequency Signal Generator | 4. BNC to Banana Plug Adapter |
| 2. 42-inch 50-Ohm BNC Cable       | 5. Three-inch Screwdriver     |
| 3. BNC-T Connector                | 6. Probe tip-to-BNC Adapter   |

### Control Settings

Preset instrument controls to the settings given under Preliminary Control Settings except as follows:

INTENSITY	Visible Display
SEC/DIV	.1 m
CH 1 INPUT COUPLING	DC
CH 1 POS	OFF
CH 2 POS	Midrange
Trigger SOURCE	CH 2

### 16. Adjust AUTO PRESET

a. Connect the CH 2 probe tip to the output of the Low Frequency signal generator via a BNC-T connector and a probe tip-to-BNC adapter.

b. Adjust the signal generator for a 0.2 division display of a five-kilohertz signal.

c. CHECK—For a stable display.

d. ADJUST—AUTO PRESET, R375 (located on the side panel) for a stable display.

### 17. Check Trigger Circuit Operation

a. Set the CH 2 VOLTS/DIV switch to 1 V.

b. Adjust the signal generator for a one-division display of a 500 kilohertz signal.

c. Set the CH 2 VOLTS/DIV switch to 5 V.

d. CHECK—A stable display can be obtained by adjusting the LEVEL/SLOPE control to trigger on both the positive-going and negative-going slopes of the displayed waveform.

e. Return the LEVEL/SLOPE control to the AUTO PRESET detent.

f. Set the Trigger SOURCE switch to COMP.

g. CHECK—A stable display can be obtained by adjusting the LEVEL/SLOPE control to trigger on both the positive-going and negative-going slopes of the displayed waveform.

h. Set the Trigger SOURCE switch to EXT and the LEVEL/SLOPE control to the AUTO PRESET detent.

i. Connect the unused output of the BNC-T connector to the 212 EXT TRIG input via a 42-inch BNC cable and a BNC-to-banana plug adapter.

j. CHECK—A stable display can be obtained by adjusting the LEVEL/SLOPE control to trigger on both the positive-going and negative-going slopes of the displayed waveform.

## HORIZONTAL SYSTEM ADJUSTMENT

### Equipment Required

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. Standard Amplitude Calibrator</li> <li>2. Time-Mark Generator</li> <li>3. DC Voltmeter</li> <li>4. 42-inch 50-ohm BNC Cable</li> </ol> | <ol style="list-style-type: none"> <li>5. BNC-to-Banana Plug Adapter</li> <li>6. Probe Tip-to-BNC Adapter</li> <li>7. Three-inch Screwdriver</li> </ol> |
|--|---|

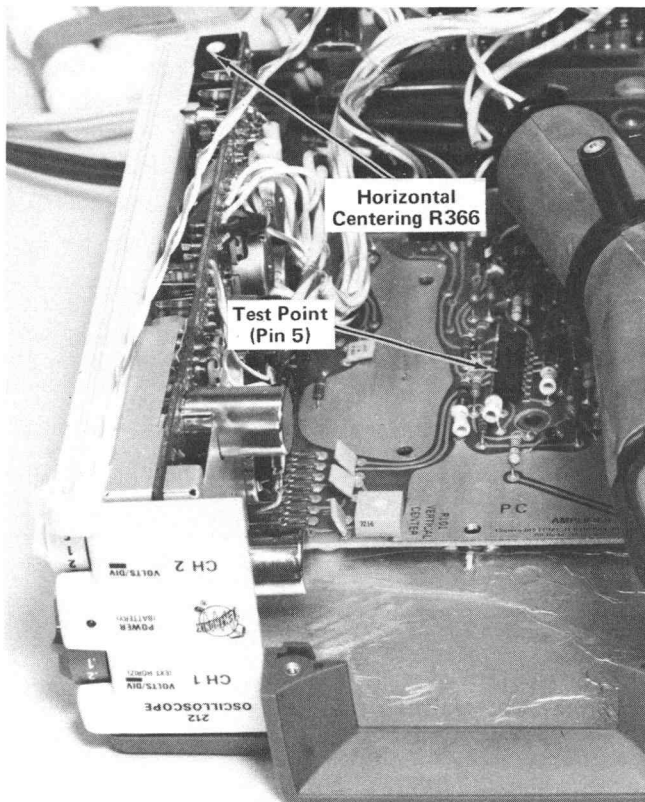
### Control Settings

Preset instrument controls to the settings given under Preliminary Control Settings except as follows:

INTENSITY	Visible Display
SEC/DIV	X-Y
CH 2 POS	Midrange

### 18. Adjust Horizontal Centering

- a. Align dot to graticule center using HORIZ POS and CH 2 VERT POS control.
- b. Connect the DC voltmeter between pin 5 of U105 (positive meter lead to pin 5) and ground. (See Fig. 4-5 for test point and adjustment location.)



1376-9

Fig. 4-5. Location of Horizontal Centering adjustment and test point.

- c. CHECK—For a reading of 0 volts,  $\pm 0.2$  volt.

- d. ADJUST—Horizontal Centering, R366 for a meter reading of 0 volts  $\pm 0.1$  V.

### 19. Adjust HORIZONTAL GAIN

- a. Connect the CH 1 probe tip to the output of the Standard Amplitude Calibrator via a probe tip-to-BNC adapter.
- b. Set the Standard Amplitude Calibrator for a 20 millivolts output.
- c. Set CH 1 INPUT COUPLING switch to DC.
- d. CHECK—The CRT display for two dots separated horizontally by four divisions,  $\pm 0.2$  division.
- e. ADJUST—Horiz Gain, R475 (located on the side panel) for four divisions of deflection between dots.
- f. Disconnect all test equipment.

### 20. Adjust SWEEP CALibration

- a. Connect the CH 1 probe tip to the output of the Time-Mark generator via a probe tip-to-BNC adapter.
- b. Set the SEC/DIV switch to 1 m and the Time-Mark generator for 1 millisecond markers.
- c. Set CH 2 POS to the OFF detent.
- d. Adjust the CH 1 VOLTS/DIV switch for a display approximately three divisions in amplitude.

e. CHECK—The CRT display for one time mark per division. With the second time mark aligned with the second vertical graticule line, the tenth time mark should align with the tenth vertical graticule line within 0.4 division.

f. ADJUST—SWEEP CAL, R370 (located on the side panel) for exactly eight divisions of deflection between the second and tenth time marks.

### 21. Check Horizontal Magnification Range

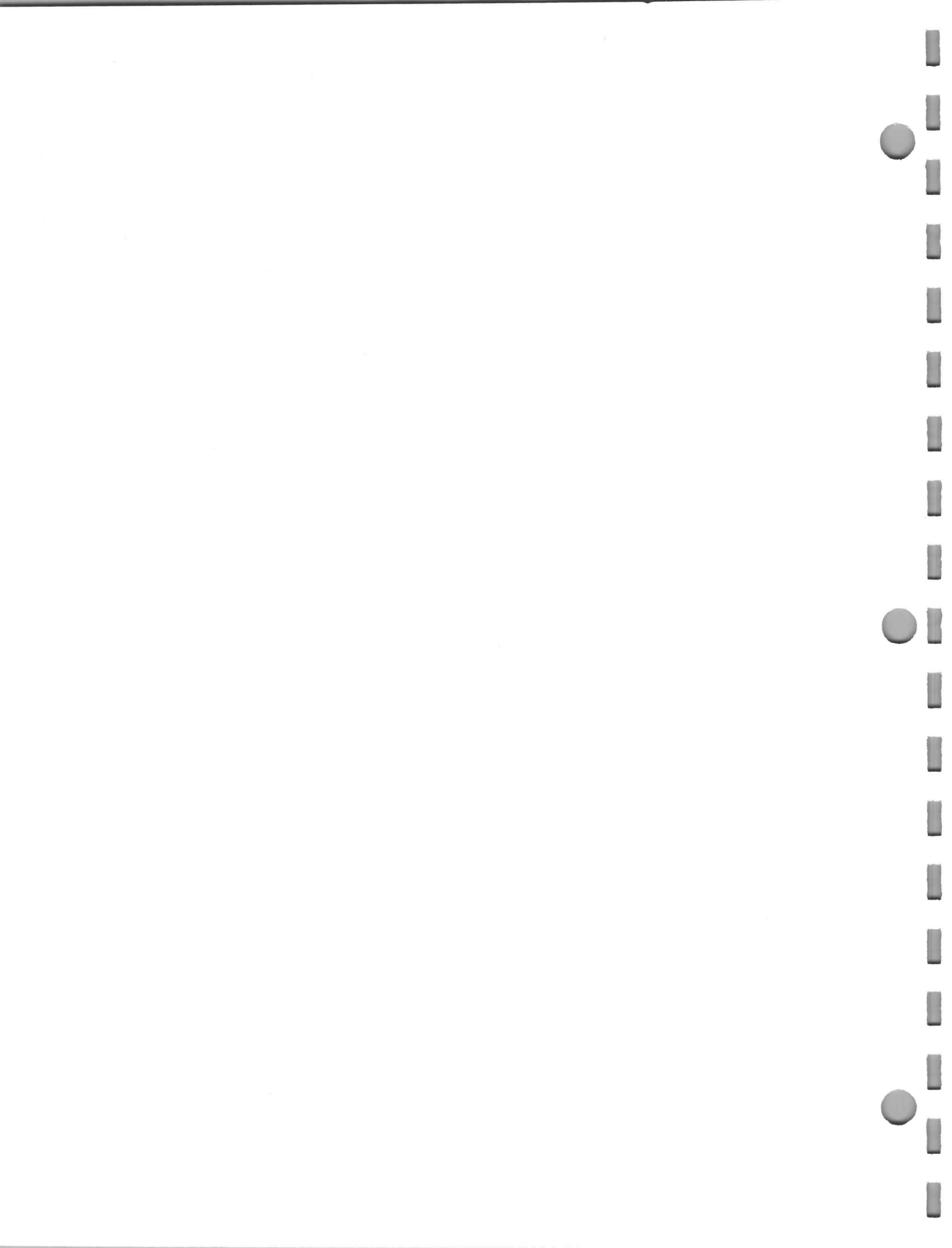
a. Rotate the HORIZ MAG control fully clockwise.

b. CHECK—The CRT display for at least five divisions between adjacent time marks. Five-division spacing indicates a HORIZ MAG control range of at least 5:1.

c. Return the HORIZ MAG control to the CAL detent.

### 22. Check SEC/DIV Accuracy

a. CHECK—Apply the appropriate time marks and check each position of the SEC/DIV switch for proper timing over the center eight division portion of each sweep, within 0.4 division.





# TROUBLESHOOTING AIDS

## TROUBLESHOOTING AIDS

Complete circuit diagrams are given in the rear of this manual. The component number and electrical value of each component in this instrument are shown on the diagrams along with important voltages. The portions of the circuit mounted on circuit boards are enclosed with blue lines.

Figure 3-2 shows the location of the circuit boards within the instrument along with the assembly (A) numbers. The assembly numbers are also used on the diagrams to aid in locating the boards. Pictures of the circuit boards are shown in the Diagrams section, on the back of the page opposite the circuit diagram, to aid cross-referencing between the diagrams and the circuit board pictures. Each electrical component on the boards is identified by its circuit number as well as the interconnecting wires and/or connectors.

## Component Color Coding

The resistors used in this instrument are either composition resistors or precision resistors. The resistance values are color-coded on the components with EIA color-code (some precision resistors may have the value printed on the body). The color-code is read starting with the stripe nearest the end of the resistor. Composition resistors have four stripes which consist of two significant figures, a multiplier, and a tolerance value (see Fig. 5-1). Precision resistors have five stripes consisting of three significant figures, a multiplier, and a tolerance value.

The capacitance values of common disc capacitors and small tubular electrolytics are marked in microfarads on the side of the component body. The molded electrolytic capacitors are color-coded in picofarads (see Fig. 5-1).

The cathode end of each glass-encased diode is indicated by a stripe, a series of stripes, or a dot.

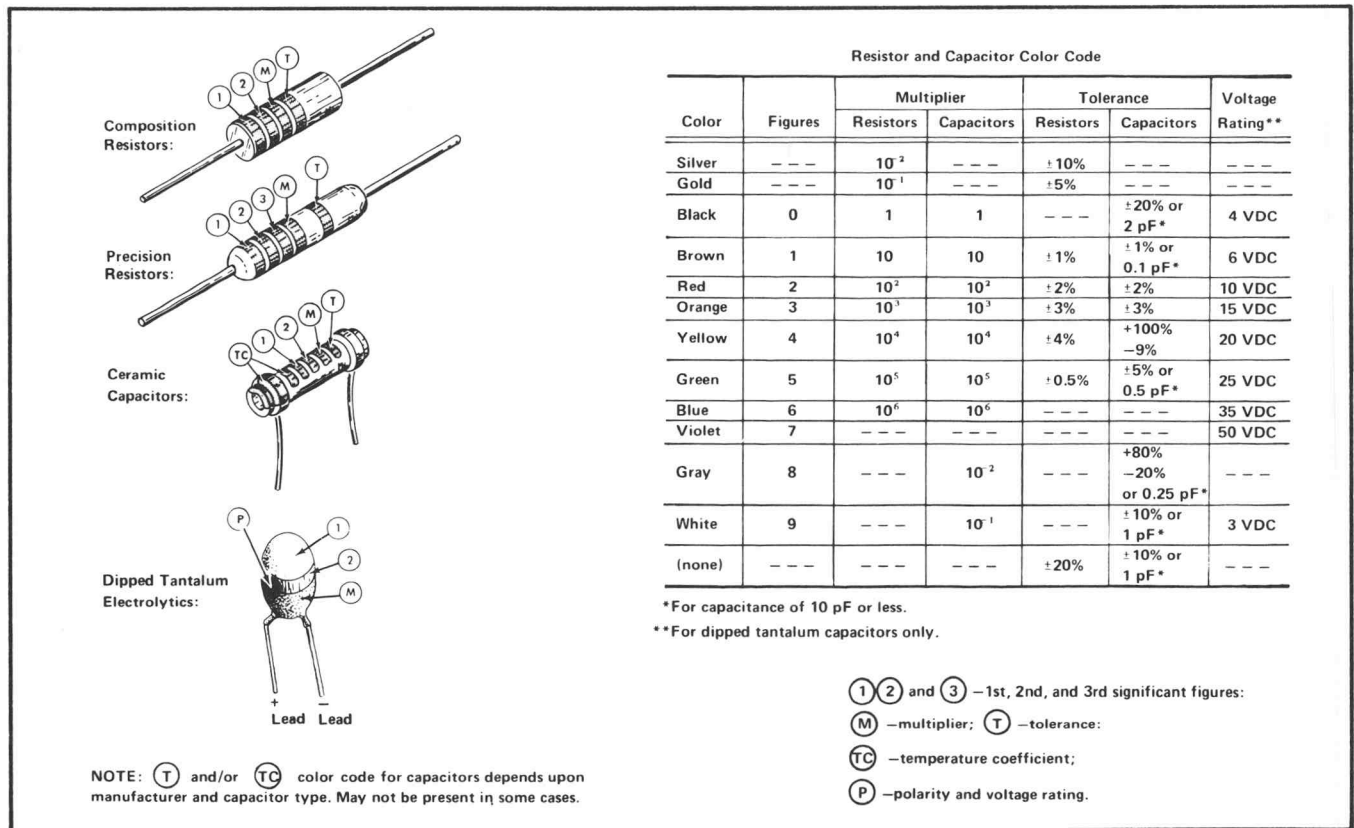


Fig. 5-1. Color code for resistors, ceramic capacitors, and dipped tantalum electrolytic capacitors.

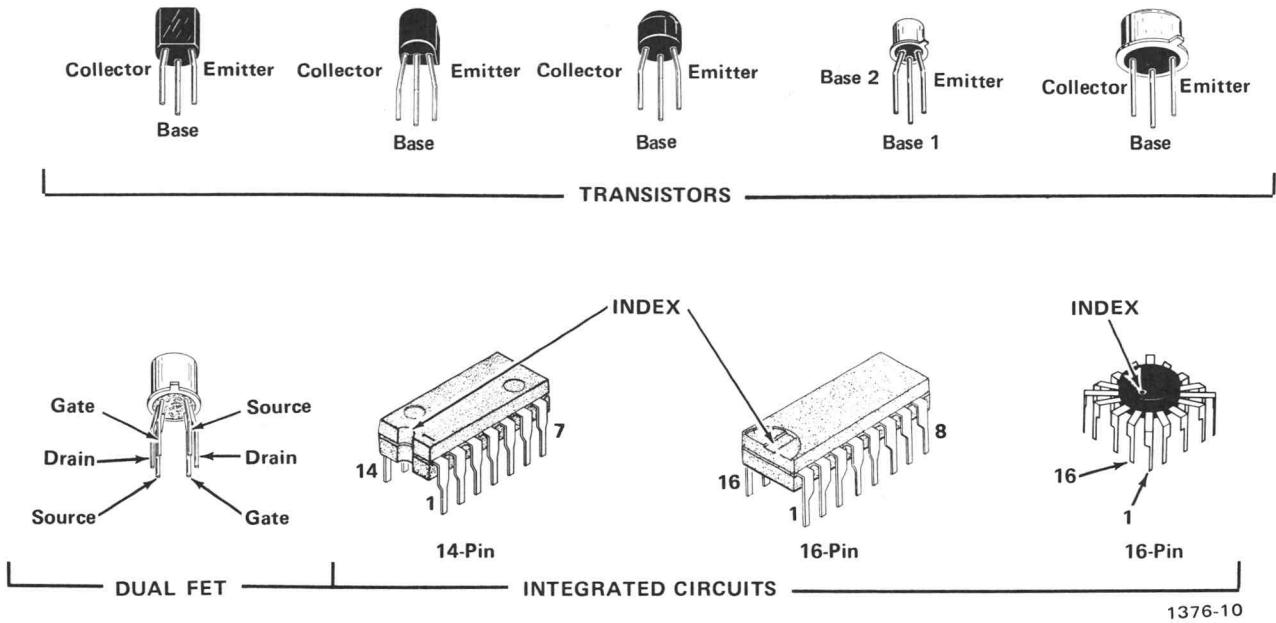


Fig. 5-2. Lead configuration of semiconductors used in this instrument.

### Semiconductor Lead Configuration

Figure 5-2 shows the lead configurations of the semiconductors used in this instrument.

### Troubleshooting Equipment

The majority of troubleshooting to be done on the 212 can be accomplished with a 20,000 ohms/volt VOM such as

a Triplet Model 630-NA or a Simpson Model 262. Use a dynamic transistor tester such as a TEKTRONIX Type 576 Transistor-Curve Tracer to check the semiconductor devices used in the 212. To check waveform(s) in this instrument, use a test oscilloscope with a DC to 500 kilohertz frequency response and one millivolt to 50 volts/division deflection factor.

# CIRCUIT DESCRIPTION

The following circuit description begins with a discussion of the instrument using the block diagram located in the Diagrams section at the rear of this manual. Then each circuit is described in detail, using detailed diagrams where necessary to show the interconnections between the stages in each major circuit and the relationship of the side-panel controls to the individual stages. In addition to the block diagram, complete schematics are given in the Diagrams section.

## Block Diagram

Signals to be displayed on the CRT are applied to the tips of the signal probes. The signals are then amplified by the appropriate channel Input Amplifier circuit, consisting of a two-section source-follower stage and two feedback amplifiers. The Input Amplifier circuits also contain the vertical deflection, position (with channel on-OFF), input coupling, variable attenuation, and balance controls.

The Trigger Generator circuit initiates the sweep signal produced by the Sweep Generator. The input signal to the Trigger Generator can be selected internally either from the capacitively coupled CH 2 Input Amplifier signal, or from the directly coupled COMPOSITE signal of the Feedback Amplifier. The Trigger Generator input signal can also be selected from the external signal applied to the EXT TRIG jack. The Trigger Generator circuit contains coupling and source controls in addition to a combination level/slope control.

The Sweep Generator circuit produces a linear sawtooth output signal when initiated by the Trigger Generator circuit. The slope of the sawtooth signal is controlled by

the SEC/DIV switch. The Sweep Generator circuit also produces an unblanking gate signal coincident with the sawtooth waveform. This gate signal unblanks the CRT to permit display presentation.

The output of U370 is amplified by the Horizontal Amplifier circuit to produce the correct horizontal deflection for the CRT for all positions of the SEC/DIV switch. The Horizontal Amplifier contains a variable magnifier to increase the sweep rate up to at least a maximum of five times in any position of the SEC/DIV switch.

The Power Supply and CRT circuits provide all the voltages necessary for operation of this instrument.

## Circuit Operation

In the following description of the electrical operation and relationship of the circuits in the 212, circuitry commonly used by TEKTRONIX is only briefly explained. If more information is desired on the commonly used circuits, refer to the following textbooks:

Phillip Cutler, "Semiconductor Circuit Analysis", McGraw-Hill, New York, 1964.

Lloyd P. Hunter (Ed.), "Handbook of Semiconductor Electronics", second edition, McGraw-Hill, New York, 1962.

Jacob Millman and Herbert Taub, "Pulse, Digital, and Switching Waveforms", McGraw-Hill, New York, 1965.

### Vertical Input Amplifiers

Input signals for vertical deflection of the CRT of the 212 are applied to the tips of the attached probes. Each Input Amplifier provides control of input coupling, variable attenuation, vertical deflection factor, balance, and vertical position (with channel on-OFF) for the appropriate channel. Figure 6-1 shows a detailed block diagram of the Vertical Input Amplifier circuit. A schematic of this circuit is shown on diagram 1.

Input signals applied to the tips of the probes are connected to the appropriate Attenuation Stage through the INPUT COUPLING switches (S305 and S405). The deflection factor in each channel is determined by the VOLTS/DIV switch (S310 or S410). In all positions of the VOLTS/DIV switches below .1 V/DIV, the correct deflection factor is achieved by changing the gain of Feedback Amplifiers U320-A and U320-B. In switch

positions .1 V/DIV and up, precision attenuators are used (in addition to changing the gain of U320-A and U320-B) to achieve the correct deflection factors. When the VOLTS/DIV VAR control is rotated, the signal is attenuated across R320 or R420. This offers variable (uncalibrated) deflection factors between the calibrated settings of the VOLTS/DIV switch. The STEP ATTEN BALANCE adjustments (R315 and R417) control the trace shift when switching between deflection factors.

The 212 can be operated single trace by turning either vertical POSITION control to the OFF detent; this disables that channel in the last feedback stage of the Input Amplifier through the operation of the Vertical Mode Multivibrator U440. The CH 2 trigger signal is present regardless of the CH 2 POS control setting. In the dual-trace mode, the instrument will automatically chop or alternate, depending upon the sweep rate.

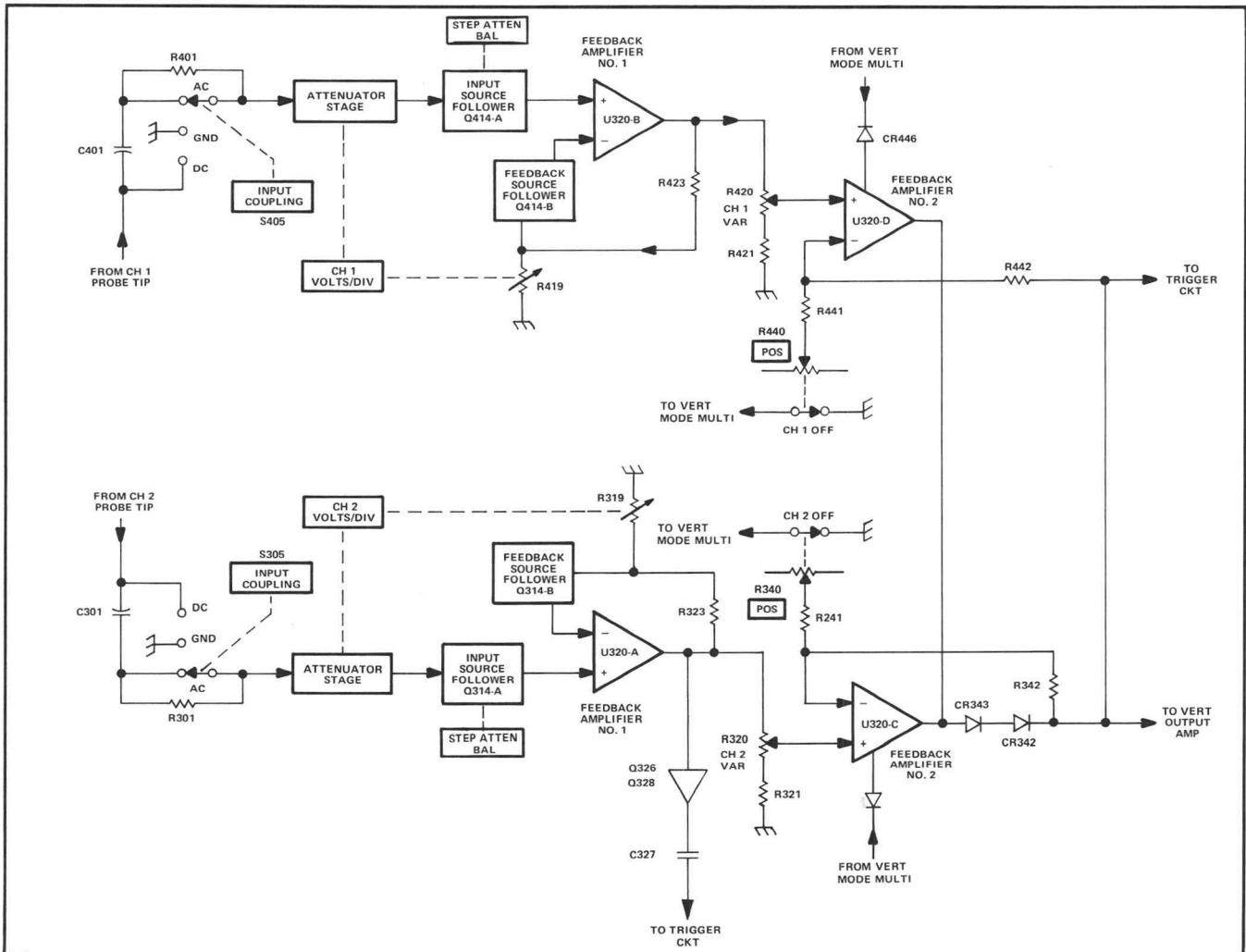


Fig. 6-1. Vertical input amplifiers detailed block diagram.

## Vertical and Horizontal Output Amplifiers

The Vertical and Horizontal Output Amplifiers provide the final amplification for the deflection signals. Figure 6-2 shows a detailed block diagram of these Output Amplifiers. A schematic of these circuits is on diagram 2.

Both amplifiers contain the same basic circuitry. The single-ended input signals are applied to paraphase

amplifiers, U105-A and U105-B, to convert the signal into push-pull output signals. The Vertical Paraphase Amplifier stage contains the VERT GAIN adjustment (R470) that sets the over-all gain of the vertical system, and a Vertical Centering adjustment (R101) to set DC centering. The Horizontal Paraphase Amplifier stage contains the HORIZ GAIN adjustment (R475), the HORIZ MAG control (R476), and the Horizontal POSition control (R480). The output signals from the Paraphase Amplifiers receive final amplification in the common base Output Amplifier stages.

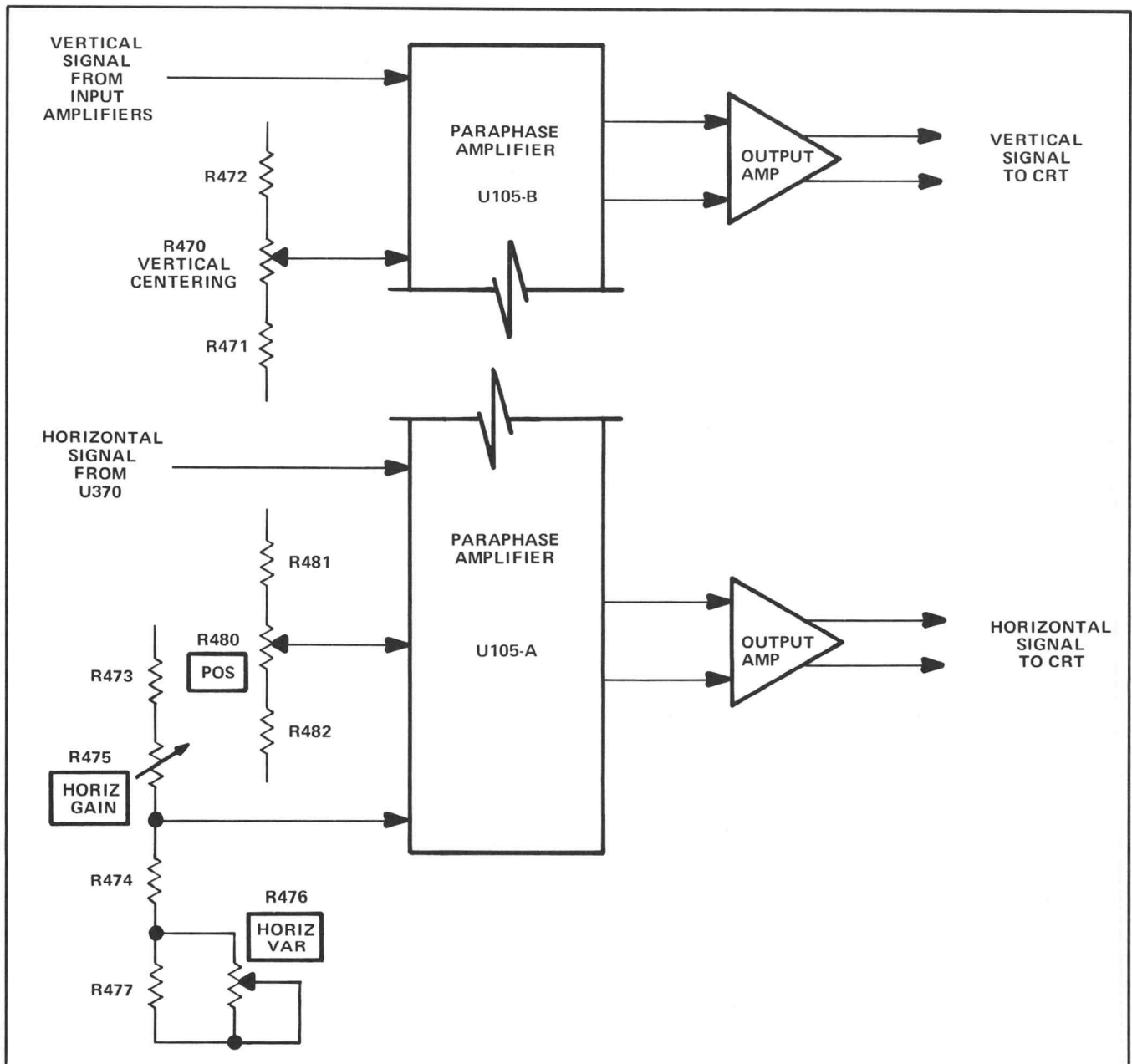


Fig. 6-2. Vertical and Horizontal output amplifiers detailed block diagram.

Trigger/Sweep Generator

Integrated circuit U370 is a combination Trigger/Sweep Generator. The Trigger portion derives trigger signals internally, either from the capacitively coupled CH 2 Vertical Input Amplifier, or from the directly coupled COMPOSITE signal from the input of the Vertical Output Amplifier. The Trigger portion can also select signals from an external signal applied to the EXT TRIG banana jack. Controls are provided in this circuit to select trigger level, slope, and source. Figure 6-3 shows a detailed block diagram of the Trigger/Sweep Generator circuit. A schematic of this circuit is on diagram 2.

The Sweep Generator portion of U370 serves a multiple purpose. In all positions of the SEC/DIV switch except X-Y, the Sweep Generator is an integrator, which generates a linear sawtooth voltage waveform. The slope of the sawtooth voltage is controlled by the setting of the SEC/DIV switch. U370 also produces an unblanking gate signal coincident with the sawtooth waveform. This gate signal is amplified by Unblanking Amplifier Q134 and applied to the CRT to unblank the CRT during sweep presentation. In addition, the Sweep Generator supplies the clock pulses to the Vertical Mode Multivibrator for alternate switching between channels. In the X-Y position, the Sweep Generator section becomes a feedback amplifier to amplify the signal applied to the probe tip of CH 1.

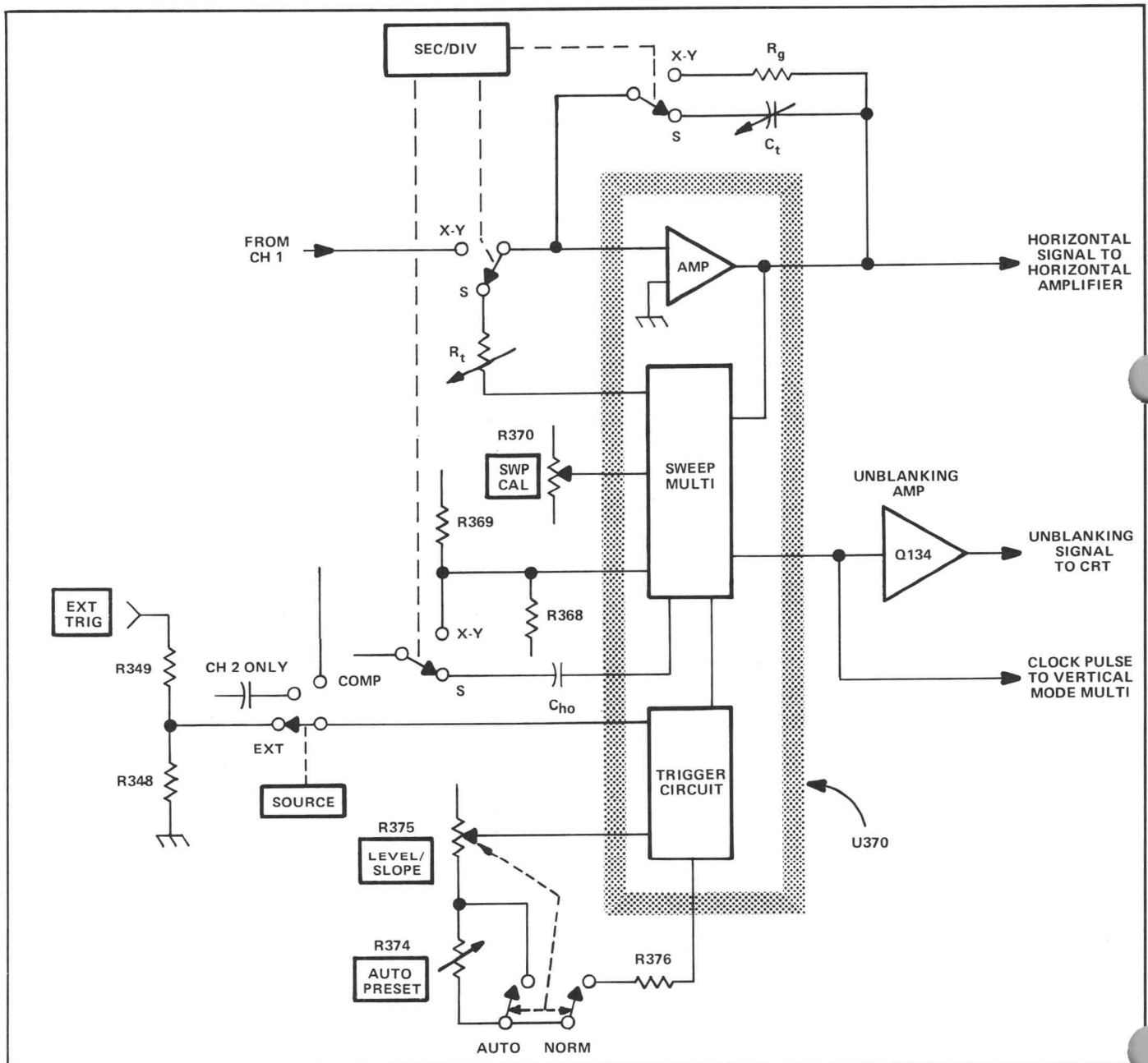


Fig. 6-3. Trigger/Sweep Generator detailed block diagram.



## Power Supply

The Power Supply provides the power necessary to operate this instrument or, if the instrument is turned off, to recharge the batteries. Figure 6-4 shows a detailed block diagram of this circuit. A schematic of this circuit is shown on diagram 4.

When the instrument is connected to a power line the AC power is capacitively coupled to the Power Rectifier. The rectified DC is used to either run the instrument or recharge the internal batteries. The batteries act as a large filter capacitor for the Input Rectifier in the AC line mode of

operation. When the instrument is not connected to a power line, operating power is provided by the batteries. The POWER (BATTERY) indicator, light emitting diode DS310, is illuminated when the 212 is operating from line voltage or adequately charged batteries. When about 10 minutes of operating time remains, the battery charge drops to a point where DS310 will extinguish. The Discharge Protection circuit (Q231, Q235) prevents the Converter Multivibrator (Q242, Q249) from functioning, and thereby over-discharging the batteries, when the charge level of the batteries falls below approximately 10 volts. The Converter Multivibrator changes DC into AC, which is applied across T250 and then rectified into the appropriate DC voltages in the Rectifier circuit.

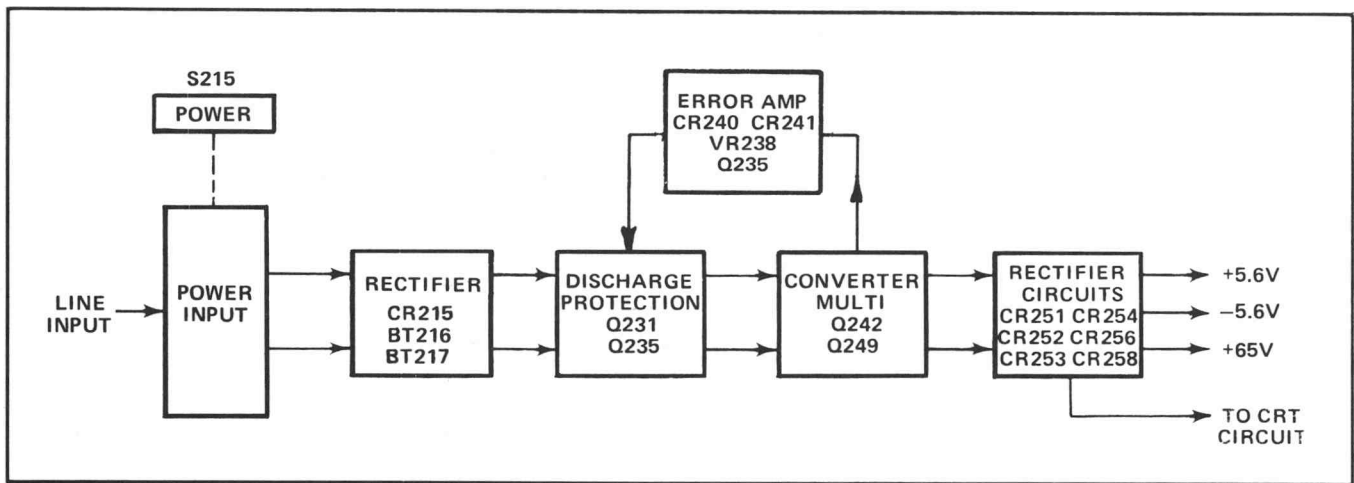


Fig. 6-4. Power Supply detailed block diagram.

**CRT Circuit**

The CRT circuit provides the high voltage and control circuits necessary for operation of the cathode-ray tube (CRT). Figure 6-5 shows a detailed block diagram of the CRT circuit. A schematic of this circuit is given on diagram 3.

Rectifiers CR261 through CR268 provide the negative accelerating potential for the CRT. Voltage output is

approximately  $-1000$  volts at the CRT cathode. Filament voltage for the CRT is provided by a separate winding of the power transformer. Display intensity and focus are controlled by R395 and R398 respectively. The Trace Rotation adjustment controls the current through L300 and affects both the vertical and horizontal alignment of the CRT beam.

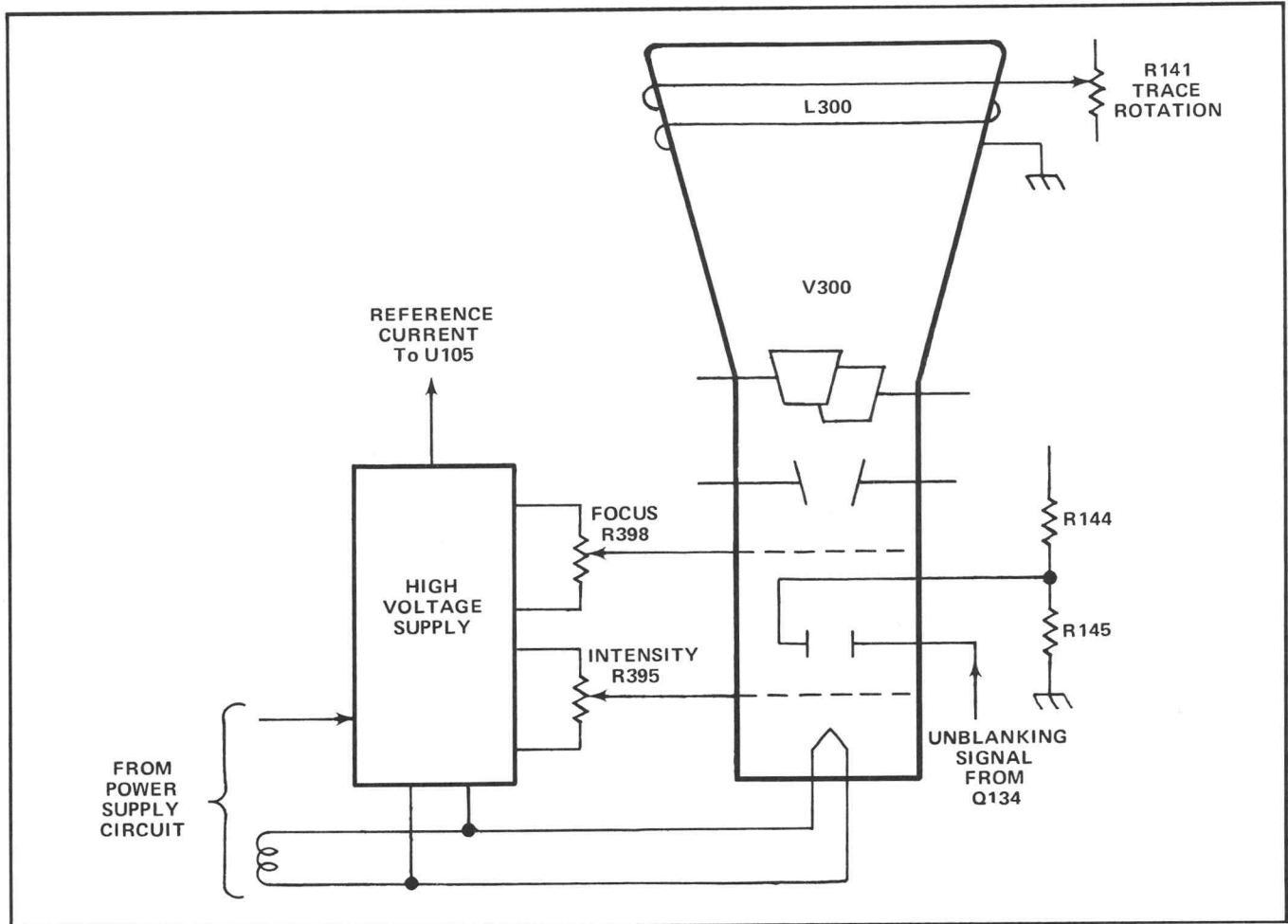


Fig. 6-5. CRT Circuit detailed block diagram.

# CORRECTIVE MAINTENANCE

## Obtaining Replacement Parts

**Standard Parts.** All electrical and mechanical part replacements for the 212 can be obtained through your local TEKTRONIX Field Office or representative. However, many of the standard electronic components can be obtained locally in less time than is required to order them from Tektronix, Inc. Before purchasing or ordering replacement parts, check the parts list for value, tolerance, rating, and description.

### NOTE

*When selecting replacement parts, it is important to remember that the physical size and shape of a component may affect its performance in the instrument. All replacement parts should be direct replacements unless it is known that a different component will not adversely affect the instruments performance.*

**Special Parts.** In addition to the standard electronic components, some special components are used in the 212. These components are manufactured or selected by Tektronix, Inc., to meet specific performance requirements, or are manufactured for Tektronix, Inc. in accordance with our specifications. Most of the mechanical parts used in this instrument have been manufactured by Tektronix, Inc. Order all special parts directly from your local TEKTRONIX Field Office or representative.

**Ordering Parts.** When ordering replacement parts from Tektronix, Inc., include the following information:

1. Instrument type.
2. Instrument serial number.
3. A description of the part (if electrical, include circuit number).
4. TEKTRONIX Part Number.

## Component Replacement

### WARNING

*Disconnect the instrument from any power source before replacing components.*

**Circuit Board Replacement.** If a circuit board is damaged beyond repair, the entire assembly including all soldered-on components can be replaced. Part numbers are given in the Mechanical Parts List for the completely wired board.

## Semiconductor Replacement

Semiconductors should not be replaced unless actually defective. If removed from their sockets during routine maintenance, return them to their original sockets. Unnecessary replacement of semiconductors may affect the calibration of the instrument. When semiconductors are replaced, check the operation of that part of the instrument which may be affected.

Replacement semiconductors should be of the original type or a direct replacement. Figure 5-2 shows the lead configurations of the semiconductors used in this instrument. Some plastic case transistors have lead configurations which do not agree with those shown here. If a replacement transistor is made by a manufacturer other than that of the original, check the replacement manufacturer's basing diagram for correct basing. All transistor sockets in the 212 are wired for the basing used for metal-cased transistors.

When re-inserting an integrated circuit, key the socket's index with that of the integrated circuit's. Failure to do so can result in damaged components.

## Power Supply Capacitors

When operating the instrument on power lines other than 115 VAC 60 Hz, it is necessary to change the electrical value of four capacitors (C204, C215, C210, and C212) in the instruments power input circuitry must be changed. Refer to Table 7-1 for the correct values of capacitance for three of the more commonly used line voltage/line frequency combinations.

### NOTE

*Power line for this instrument must be sinusoidal.*

**TABLE 7-1**  
**Power Supply Capacitors**

Power Line	Capacitor Values		
	C210	C212	C204 & C215
110 to 126 VAC 58 to 62 Hz	1.7 $\mu$ f, $\pm$ 10% 200 V DC TEKTRONIX Part No. 285-0924-00	3.3 $\mu$ f, $\pm$ 10%, 200 V DC TEKTRONIX Part No. 285-0925-00	No change
90 to 110 VAC 48 to 52 Hz (Option 2)	2 $\mu$ f, $\pm$ 10%, 200 V DC TEKTRONIX Part No. 285-0934-00	4.0 $\mu$ f, $\pm$ 10%, 200 V DC TEKTRONIX Part No. 285-0935-00	No change
220 to 250 VAC 48 to 52 Hz (Option 1)	1 $\mu$ f, $\pm$ 10%, 400 V DC TEKTRONIX Part No. 285-0932-00	2.0 $\mu$ f, $\pm$ 10%, 400 V DC TEKTRONIX Part No. 285-0933-00	.001 $\mu$ f, 3 k V DC TEKTRONIX Part No. 283-0279-00

If the instrument is to be operated on some line voltage/line frequency combination other than one of the above three examples, refer to Figs. 7-1 and 7-2 to select the correct values of capacitance for C210 and C212. For example, if the instrument is to be operated on a 60 hertz line that will vary in voltage from 210 VAC to 230 VAC, refer to Fig. 7-2. Trace across the graph on the line representing 210 VAC to the point where that line crosses the first curve. This point represents the minimum values of capacitance that can be used for correct operation. Now trace across the graph on the line representing 230 VAC to the point where that line crosses the second curve. This point represents the maximum values of capacitance that can be used for correct operation. Read off the numbers directly under these points at the bottom of the graph to find the value of capacitance required for C210. Read off the numbers directly above these points for the value of capacitance required for C212. Thus, C210 can be a value between 0.75  $\mu$ f and 0.92  $\mu$ f and C212 can be a value between 1.54  $\mu$ f and 1.87  $\mu$ f. The voltage ratings of these capacitors should be at least 1.414 times the RMS value of the applied line voltage.

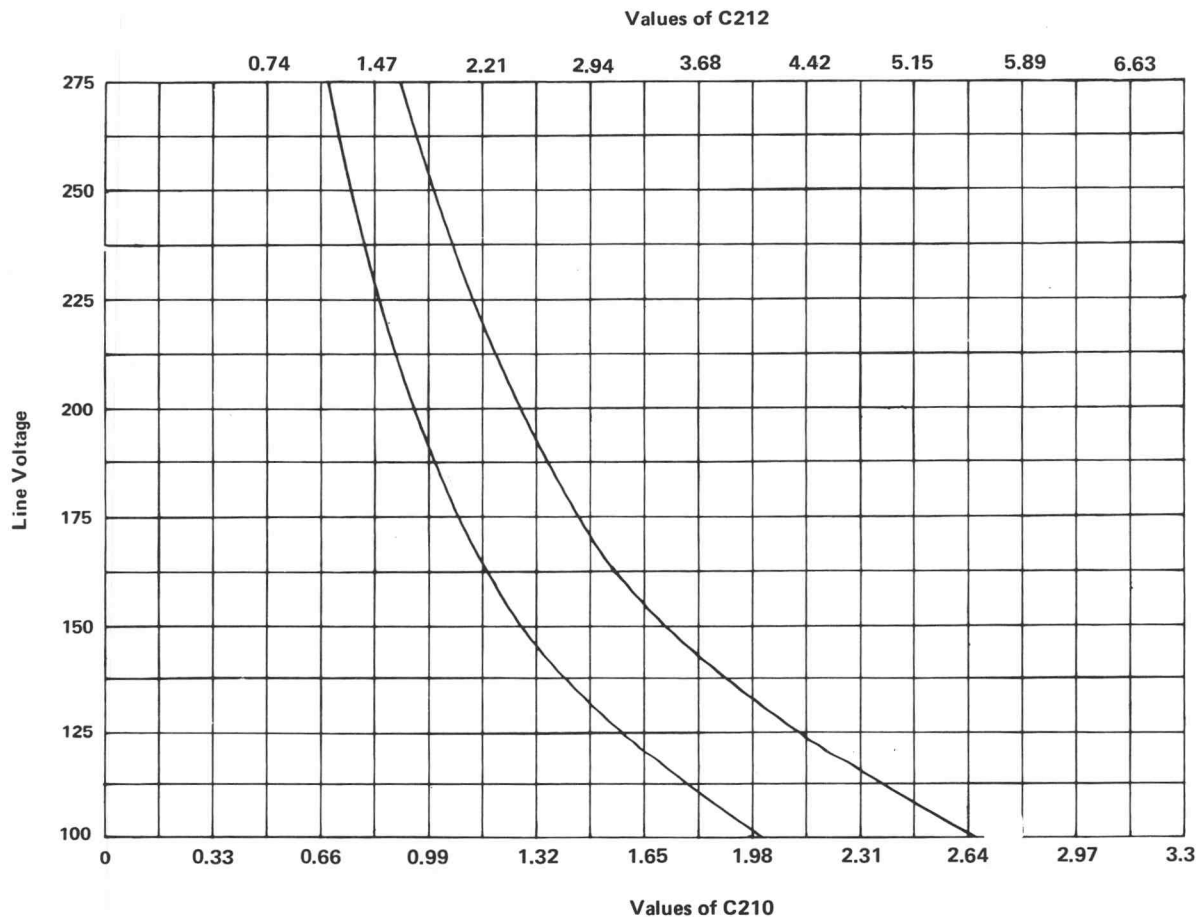


Fig. 7-1. Selecting C210 and C212 capacitance values for 48 to 52 Hz operation.

When replacing C210 and C212, be certain the foam pad is under the replacement capacitor.

**Rotary Switches.** Individual parts of the VOLTS/DIV and SEC/DIV rotary switches are replaceable. Refer to the Parts List for the applicable part numbers for replacement parts.

**REPACKAGING FOR SHIPMENT**

If the Tektronix instrument is to be shipped to a Tektronix Service Center for service or repair, attach a tag showing: owner (with address) and the name of an individual at your firm that can be contacted, complete instrument serial number and a description of the service required.

Save and re-use the package in which your instrument was shipped. If the original packaging is unfit for use or not available, repackage the instrument as follows:

1. Obtain a carton of corrugated cardboard having inside dimensions of no less than six inches more than the instrument dimensions; this will allow for cushioning. Refer to the following table for carton test strength requirements.

2. Surround the instrument with polyethylene sheeting to protect the finish of the instrument.
3. Cushion the instrument on all sides by tightly packing dunnage or urethane foam between carton and instrument, allowing three inches on all sides.
4. Seal carton with shipping tape or industrial stapler.

**SHIPPING CARTON TEST STRENGTH**

Gross Weight (lb)	Carton Test Strength (lb)
0-10	200
10-30	275
30-120	375
120-140	500
140-160	600

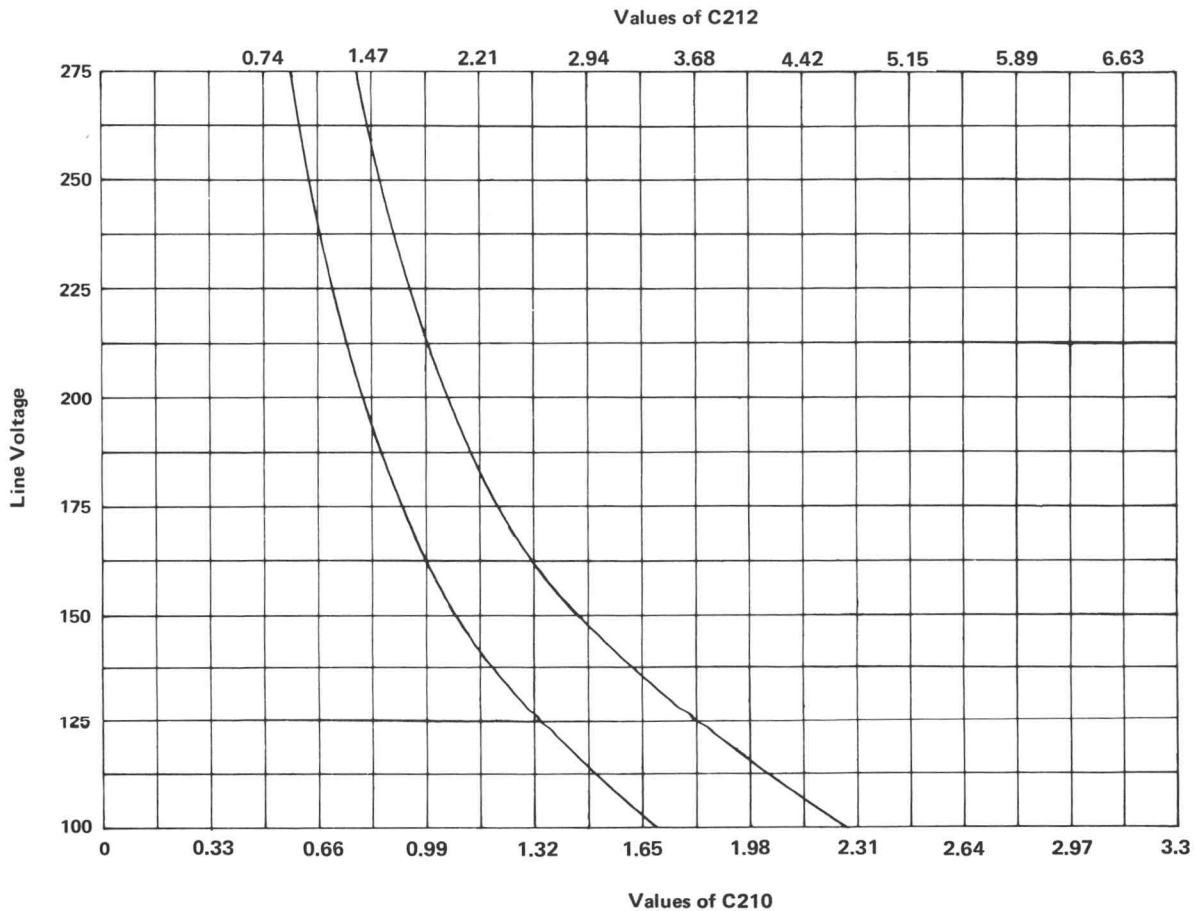
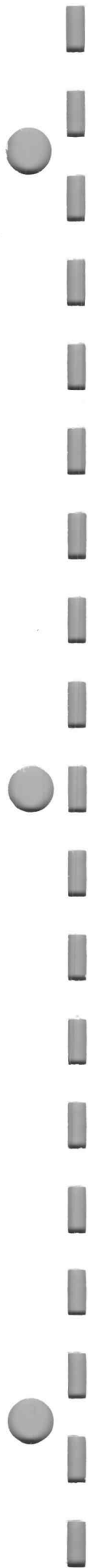


Fig. 7-2. Selecting C210 and C212 capacitance values for 58 to 62 Hz operation.





# OPTION INFORMATION

Your instrument may be equipped with one or more options. This section describes those options or directs the reader to where the option is documented.

## OPTION 1

Option 1 equips the 212 for operation from a 220 to 250 V ac 48 to 52 Hz power line source. Option 1 parts values that differ from the standard 212 are listed here. A power cord cable assembly, for adapting to appropriate power plugs, is included with Option 1 instruments. Refer to the Corrective Maintenance and Diagrams sections of this manual for additional information concerning Option 1.

### ELECTRICAL PARTS LIST DIFFERENCES FOR OPTION 1

A3	670-2405-21*	POWER SUPPLY Circuit Board Assembly (Option 1)
C204	283-0279-00	0.001 UF, 20%, 3 KV
C210	285-0932-00	1.0 UF, 10%, 400V
C212	285-0933-00	2.0 UF, 10%, 400V
C215	283-0279-00	0.001 UF, 20%, 3 KV

### ADDITIONAL STANDARD ACCESSORIES FOR OPTION 1

161-0077-01	CABLE ASSEMBLY, POWER (Adapts to users plug type)
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\*In some Option 1 instruments, the suffix number on the board may not be marked —21.

## OPTION 2

Option 2 equips the 212 for operation from a 90 to 110 V ac 48 to 52 Hz power line source. Option 2 parts values that differ from the standard 212 are listed here. Refer to the Corrective Maintenance and Diagrams sections of this manual for additional information concerning Option 2.

### ELECTRICAL PARTS LIST DIFFERENCES FOR OPTION 2

A3	670-2405-31**	POWER SUPPLY Circuit Board Assembly (Option 2)
C210	285-0934-00	2.2 UF, 10%, 200V
C212	285-0935-00	4.4 UF, 10%, 200V

\*\*In some Option 2 instruments, the suffix number on the board may not be marked —31.



# PARTS LISTS, DIAGRAMS AND CIRCUIT BOARD 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 ( $\mu$ F).  
Resistors = Ohms ( $\Omega$ )

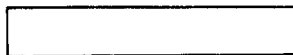
Symbols used on the diagrams are based on USA Standard Y32.2-1967.

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:



External Screwdriver adjustment.



External control or connector.



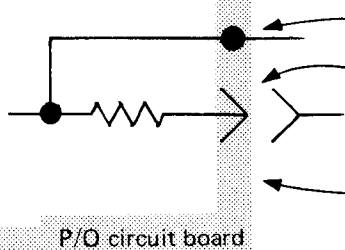
Clockwise control rotation in direction of arrow.



Refer to diagram number indicated in diamond.



Refer to waveform number indicated in hexagon.



Connection soldered to circuit board.

Connection made to circuit board with interconnecting pin.

Blue tint encloses components located on circuit board.

The following prefix letters are used as reference designators to identify components or assemblies on the diagrams.

A	Assembly, separable or repairable (circuit board, etc.)	LR	Inductor/resistor combination
AT	Attenuator, fixed or variable	M	Meter
B	Motor	Q	Transistor or silicon-controlled rectifier
BT	Battery	P	Connector, movable portion
C	Capacitor, fixed or variable	R	Resistor, fixed or variable
CR	Diode, signal or rectifier	RT	Thermistor
DL	Delay line	S	Switch
DS	Indicating device (lamp)	T	Transformer
F	Fuse	TP	Test point
FL	Filter	U	Assembly, inseparable or non-repairable (integrated circuit, etc.)
H	Heat dissipating device (heat sink, heat radiator, etc.)	V	Electron tube
HR	Heater	VR	Voltage regulator (zener diode, etc.)
J	Connector, stationary portion	Y	Crystal
K	Relay		
L	Inductor, fixed or variable		



# 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
01121	ALLEN-BRADLEY COMPANY	1201 2ND STREET SOUTH	MILWAUKEE, WI 53204
01295	TEXAS INSTRUMENTS, INC., SEMICONDUCTOR GROUP	P O BOX 5012, 13500 N CENTRAL EXPRESSWAY	DALLAS, TX 75222
02735	RCA CORPORATION, SOLID STATE DIVISION	ROUTE 202	SOMERVILLE, NY 08876
03508	GENERAL ELECTRIC COMPANY, SEMI-CONDUCTOR PRODUCTS DEPARTMENT	ELECTRONICS PARK	SYRACUSE, NY 13201
03888	KDI PYROFILM CORPORATION	60 S JEFFERSON ROAD	WHIPPANY, NJ 07981
04099	CAPCO, INC.	FORESIGHT INDUSTRIAL PARK, PO BOX 2164	GRAND JUNCTION, CO 81501
04713	MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.	5005 E MCDOWELL RD, PO BOX 20923	PHOENIX, AZ 85036
07263	FAIRCHILD SEMICONDUCTOR, A DIV. OF FAIRCHILD CAMERA AND INSTRUMENT CORP.	464 ELLIS STREET	MOUNTAIN VIEW, CA 94042
11237	CTS KEENE, INC.	3230 RIVERSIDE AVE.	PASO ROBLES, CA 93446
14433	ITT SEMICONDUCTORS	3301 ELECTRONICS WAY P O BOX 3049	WEST PALM BEACH, FL 33402
14752	ELECTRO CUBE INC.	1710 S. DEL MAR AVE.	SAN GABRIEL, CA 91776
27014	NATIONAL SEMICONDUCTOR CORP.	2900 SEMICONDUCTOR DR.	SANTA CLARA, CA 95051
32997	BOURNS, INC., TRIMPOT PRODUCTS DIV.	1200 COLUMBIA AVE.	RIVERSIDE, CA 92507
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247
71450	CTS CORP.	905 N. WEST BLVD	ELKHART, IN 46514
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
73138	BECKMAN INSTRUMENTS, INC., HELIPOT DIV.	2500 HARBOR BLVD.	FULLERTON, CA 92634
75915	LITTELFUSE, INC.	800 E. NORTHWEST HWY	DES PLAINES, IL 60016
76493	BELL INDUSTRIES, INC., MILLER, J. W., DIV.	19070 REYES AVE., P O BOX 5825	COMPTON, CA 90224
79727	C-W INDUSTRIES	550 DAVISVILLE RD., P O BOX 96	WARMINISTER, PA 18974
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
80031	ELECTRA-MIDLAND CORP., MEPCO DIV.	22 COLUMBIA ROAD	MORRISTOWN, NJ 07960
84411	TRW ELECTRONIC COMPONENTS, TRW CAPACITORS	112 W. FIRST ST.	OGALLALA, NE 69153
90201	MALLORY CAPACITOR CO., DIV. OF P. R. MALLORY AND CO., INC.	3029 E. WASHINGTON STREET P. O. BOX 372	INDIANAPOLIS, IN 46206
91637	DALE ELECTRONICS, INC.	P. O. BOX 609	COLUMBUS, NE 68601



Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
A1	670-2353-00	B010100	B056848	CKT BOARD ASSY: INPUT	80009	670-2353-00
A1	670-2353-02	B056849	B079999	CKT BOARD ASSY: INPUT	80009	670-2353-02
A1	670-2353-04	B080000	B089999	CKT BOARD ASSY: INPUT	80009	670-2353-04
A1	670-2353-06	B090000		CKT BOARD ASSY: INPUT	80009	670-2353-06
A2	670-1505-01			CKT BOARD ASSY:AMPLIFIER	80009	670-1505-01
A3	670-2405-00	B010100	B039999	CKT BOARD ASSY:POWER SUPPLY	80009	670-2405-00
A3	670-2405-11	B040000		CKT BOARD ASSY:POWER SUPPLY	80009	670-2405-11
A3	670-2405-21			CKT BOARD ASSY:POWER SUPPLY (OPTION 1 ONLY)	80009	670-2405-21
A3	670-2405-31			CKT BOARD ASSY:POWER SUPPLY (OPTION 2 ONLY)	80009	670-2405-31
BT216}	146-0031-00	B010100	B056119	BATTERY ASSY:2 SETS OF 5	80009	146-0031-00
BT217}	146-0031-00	B010100	B056119	BATTERY ASSY:2 SETS OF 5 (BT216, BT217 SEE MPL FOR SUB-PARTS.)	80009	146-0031-00
BT216}	146-0033-00	B056120		BATTERY ASSY:2 SETS OF 5	80009	146-0033-00
BT217}	146-0033-00	B056120		BATTERY ASSY:2 SETS OF 5 (BT216, BT217 SEE MPL FOR SUB-PARTS.)	80009	146-0033-00
C101	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C103	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C104	281-0591-00	B010100	B057908	CAP., FXD, CER DI:5600PF, 20%, 200V	72982	393001Z5V0562Z
C104	283-0180-00	B057909		CAP., FXD, CER DI:5600PF, 20%, 200V	72982	8121N204 E 562M
C113	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C115	283-0111-00			CAP., FXD, CER DI:0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C125	290-0524-00			CAP., FXD, ELCTLT:4.7UF, 20%, 10V	90201	TDC475M010EL
C127	290-0524-00			CAP., FXD, ELCTLT:4.7UF, 20%, 10V	90201	TDC475M010EL
C129	290-0534-00			CAP., FXD, ELCTLT:1UF, 20%, 35V	56289	196D105X0035HA1
C145	290-0522-00			CAP., FXD, ELCTLT:1UF, 20%, 50V	56289	196D105X0050HA1
C150	281-0591-00	B010100	B057908	CAP., FXD, CER DI:5600PF, 20%, 200V	72982	393001Z5V0562Z
C150	283-0180-00	B057909		CAP., FXD, CER DI:5600PF, 20%, 200V	72982	8121N204 E 562M
C153	281-0591-00	B010100	B057908	CAP., FXD, CER DI:5600PF, 20%, 200V	72982	393001Z5V0562Z
C153	283-0180-00	B057909		CAP., FXD, CER DI:5600PF, 20%, 200V	72982	8121N204 E 562M
C204	283-0280-00	B010100	B039999	CAP., FXD, CER DI:2200PF, 10%, 2000V (NOMINAL VALUE, SELECTED FOR LINE VOLTAGE AND (FREQUENCY. SEE OPTION INFORMATION.)	56289	562CBA202EH222KA
C204	283-0263-00	B040000		CAP., FXD, CER DI:0.0022UF, 20%, 3000V (NOMINAL VALUE, SELECTED FOR LINE VOLTAGE AND (FREQUENCY. SEE OPTION INFORMATION.)	56289	33C319
C204	283-0279-00			CAP., FXD, CER DI:0.001UF, 20%, 3000V (OPTION 1 ONLY)	56289	55C153
C206	283-0057-00	B010100	B042499	CAP., FXD, CER DI:0.1UF, +80-20%, 200V	56289	274C10
C206	285-1065-00	B042500		CAP., FXD, PLSTC:0.01UF, 20%, 600V	14752	230B1F103
C207	283-0057-00	B010100	B042499	CAP., FXD, CER DI:0.1UF, +80-20%, 200V	56289	274C10
C207	285-1065-00	B042500		CAP., FXD, PLSTC:0.01UF, 20%, 600V	14752	230B1F103
C210	285-0924-00			CAP., FXD, PLSTC:1.7UF, 10%, 200V (NOMINAL VALUE, SELECTED FOR LINE VOLTAGE AND (FREQUENCY. SEE OPTION INFORMATION.)	04099	C703C175K
C210	285-0932-00			CAP., FXD, PLSTC:1UF, 10%, 400V (OPTION 1 ONLY)	14752	A-1478
C210	285-0934-00			CAP., FXD, PLSTC:2.2UF, 10%, 200V (OPTION 2 ONLY)	56289	430P238
C212	285-0925-00			CAP., FXD, PLSTC:3.3UF, 10%, 200V (NOMINAL VALUE, SELECTED FOR LINE VOLTAGE AND (FREQUENCY. SEE OPTION INFORMATION.)	84411	TEK121-33592
C212	285-0933-00			CAP., FXD, PLSTC:2UF, 10%, 400V (OPTION 1 ONLY)	14752	A-1480
C212	285-0935-00			CAP., FXD, PLSTC:4.4UF, 10%, 200V (OPTION 2 ONLY)	56289	430P179

Replaceable Electrical Parts—212

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Serial/Model No. Dscont	Name & Description	Mfr Code	Mfr Part Number
C215	283-0280-00	B010100	B039999	CAP., FXD, CER DI: 2.200PF, 10%, 2000V (NOMINAL VALUE, SELECTED FOR LINE VOLTAGE AND FREQUENCY. SEE OPTION INFORMATION.)	56289	562CBA202EH222KA
C215	283-0263-00	B040000		CAP., FXD, CER DI: 0.0022UF, 20%, 3000V (NOMINAL VALUE, SELECTED FOR LINE VOLTAGE AND FREQUENCY. SEE OPTION INFORMATION.)	56289	33C319
C215	283-0279-00			CAP., FXD, CER DI: 0.001UF, 20%, 3000V (OPTION 1 ONLY)	56289	55C153
C216	283-0068-00			CAP., FXD, CER DI: 0.01UF, +100-0%, 500V	56289	19C241
C236	283-0001-00			CAP., FXD, CER DI: 0.005UF, +100-0%, 500V	72982	831-559E502P
C238	290-0534-00			CAP., FXD, ELCTLT: 1UF, 20%, 35V	56289	196D105X0035HA1
C239	290-0283-00			CAP., FXD, ELCTLT: 0.47UF, 10%, 35V	56289	162D474X9035BC2
C241	283-0028-00			CAP., FXD, CER DI: 0.0022UF, 20%, 50V	56289	19C606
C247	290-0519-00			CAP., FXD, ELCTLT: 100UF, 20%, 20V	90201	TDC107M020WLD
C251	290-0535-01			CAP., FXD, ELCTLT: 33UF, 20%, 10V	56289	196D336X0010KA1
C253	290-0535-01			CAP., FXD, ELCTLT: 33UF, 20%, 10V	56289	196D336X0010KA1
C256	290-0517-00			CAP., FXD, ELCTLT: 6.8UF, 20%, 35V	56289	196D685X0035KA1
C257	283-0057-00			CAP., FXD, CER DI: 0.1UF, +80-20%, 200V	56289	274C10
C258	290-0517-00			CAP., FXD, ELCTLT: 6.8UF, 20%, 35V	56289	196D685X0035KA1
C260	283-0068-00			CAP., FXD, CER DI: 0.01UF, +100-0%, 500V	56289	19C241
C261	283-0177-00			CAP., FXD, CER DI: 1UF, +80-20%, 25V	56289	273C5
C262	283-0068-00			CAP., FXD, CER DI: 0.01UF, +100-0%, 500V	56289	19C241
C263	283-0068-00			CAP., FXD, CER DI: 0.01UF, +100-0%, 500V	56289	19C241
C264	283-0068-00			CAP., FXD, CER DI: 0.01UF, +100-0%, 500V	56289	19C241
C265	283-0068-00			CAP., FXD, CER DI: 0.01UF, +100-0%, 500V	56289	19C241
C266	283-0068-00			CAP., FXD, CER DI: 0.01UF, +100-0%, 500V	56289	19C241
C267	283-0068-00			CAP., FXD, CER DI: 0.01UF, +100-0%, 500V	56289	19C241
C268	283-0068-00			CAP., FXD, CER DI: 0.01UF, +100-0%, 500V	56289	19C241
C269	283-0001-00			CAP., FXD, CER DI: 0.005UF, +100-0%, 500V	72982	831-559E502P
C273	283-0105-00			CAP., FXD, CER DI: 0.01UF, +80-20%, 2000V	56289	41C316
C301	285-0697-06			CAP., FXD, PLSTC: 0.1UF, +5-15%, 600V	80009	285-0697-06
C306B	307-0307-00			NTWK, HYB CKT: (FURNISHED AS A UNIT WITH R306A-F)	80009	307-0307-00
C306D						
C306F						
C307	281-0178-00			CAP., VAR, PLSTC: 1-3.5PF, 500V	80031	2805D013R5BH02FO
C308	281-0178-00			CAP., VAR, PLSTC: 1-3.5PF, 500V	80031	2805D013R5BH02FO
C309	281-0178-00			CAP., VAR, PLSTC: 1-3.5PF, 500V	80031	2805D013R5BH02FO
C313	283-0000-00			CAP., FXD, CER DI: 0.001UF, +100-0%, 500V	72982	831-516E102P
C321	283-0168-00			CAP., FXD, CER DI: 12PF, 5%, 100V	72982	8101B121C0G0120J
C323	281-0613-00	B010100	B010167	CAP., FXD, CER DI: 10PF, +/-1PF, 200V	72982	374001C0G100F
C323	281-0645-00	B010168	B053776	CAP., FXD, CER DI: 8.2PF, +/-0.25PF, 500V	72982	374018C0H0829C
C323	281-0645-00	B053777		CAP., FXD, CER DI: 8.2PF, +/-0.25PF, 500V	72982	374018C0H0829C
C327	283-0111-00			CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M
C329	290-0530-00			CAP., FXD, ELCTLT: 68UF, 20%, 6V	90201	TDC686M006NLF
C348	283-0084-00			CAP., FXD, CER DI: 270PF, 5%, 1000V	72982	838-533B271J
C349	283-0076-00			CAP., FXD, CER DI: 27PF, 10%, 500V	56289	40C287A2
C353	290-0524-00			CAP., FXD, ELCTLT: 4.7UF, 20%, 10V	90201	TDC475M010EL
C362	295-0144-00			CAP SET, MATCHED: 1UF, 0.001UF, MATCHED  (C362, C363, C364, INDIVIDUAL TIMING CAPACITORS IN THIS ASSEMBLY MUST BE ORDERED BY THE 9-DIGIT PART NUMBER, LETTER SUFFIX PRINTED ON THE TIMING CAPACITOR TO BE REPLACED. THE LETTER SUFFIX AND TOLERANCE SHOULD BE THE SAME FOR ALL THE TIMING CAPACITORS IN THE ASSEMBLY. EXAMPLE: 285-XXXX-XX F)	84411	TEK101-0009R5
C363						
C364						

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
C368	283-0204-00			CAP., FXD, CER DI: 0.01UF, 20%, 50V	72982	8121N061Z5U0103M
C370	283-0251-00	XB056849		CAP., FXD, CER DI: 87 PF, 5%, 100V	72982	8121B145COG0870J
C371	290-0523-00			CAP., FXD, ELCTLT: 2.2UF, 20%, 20V	56289	196D225X0020HA1
C372	-----			(PART OF CIRCUIT BOARD)		
C373	283-0068-00			CAP., FXD, CER DI: 0.01UF, +100-0%, 500V	56289	19C241
C374	290-0523-00		CAP., FXD, ELCTLT: 2.2UF, 20%, 20V	56289	196D225X0020HA1	
C376	290-0534-00		CAP., FXD, ELCTLT: 1UF, 20%, 35V	56289	196D105X0035HA1	
C378	283-0068-00		CAP., FXD, CER DI: 0.01UF, +100-0%, 500V	56289	19C241	
C381	283-0000-00		CAP., FXD, CER DI: 0.001UF, +100-0%, 500V	72982	831-516E102P	
C382	283-0000-00		CAP., FXD, CER DI: 0.001UF, +100-0%, 500V	72982	831-516E102P	
C383	283-0111-00		CAP., FXD, CER DI: 0.1UF, 20%, 50V	72982	8121-N088Z5U104M	
C385	283-0103-00		CAP., FXD, CER DI: 180PF, 5%, 500V	56289	40C638	
C392	283-0087-00		CAP., FXD, CER DI: 300PF, 10%, 1000V	56289	403637	
C395	283-0013-00		CAP., FXD, CER DI: 0.01UF, +100-0%, 1000V	56289	33C29A7	
C401	285-0697-06		CAP., FXD, PLSTC: 0.1UF, +5-15%, 600V	80009	285-0697-06	
C406B)	307-0307-00		NTWK, HYB CKT: (FURNISHED AS A UNIT WITH R406A-F)	80009	307-0307-00	
C406D)		-----				
C406F)		-----				
C407	281-0178-00		CAP., VAR, PLSTC: 1-3.5PF, 500V	80031	2805D013R5BH02F0	
C408	281-0178-00		CAP., VAR, PLSTC: 1-3.5PF, 500V	80031	2805D013R5BH02F0	
C409	281-0178-00		CAP., VAR, PLSTC: 1-3.5PF, 500V	80031	2805D013R5BH02F0	
C413	283-0000-00		CAP., FXD, CER DI: 0.001UF, +100-0%, 500V	72982	831-516E102P	
C421	283-0168-00		CAP., FXD, CER DI: 12PF, 5%, 100V	72982	8101B121COG0120J	
C423	281-0645-00	B010100	B010167	CAP., FXD, CER DI: 8.2PF, +/-0.25PF, 500V	72982	374018COH0829C
C423	281-0612-00	B010168	B053776	CAP., FXD, CER DI: 5.6PF, +/-0.5PF, 500V	72982	374-001COH0569D
C423	281-0612-00	B053777		CAP., FXD, CER DI: 5.6PF, +/-0.5PF, 500V	72982	374-001COH0569D
C453	290-0524-00		CAP., FXD, ELCTLT: 4.7UF, 20%, 10V	90201	TDC475M010EL	
C491	290-0535-01		CAP., FXD, ELCTLT: 33UF, 20%, 10V	56289	196D336X0010KA1	
C493	290-0535-01		CAP., FXD, ELCTLT: 33UF, 20%, 10V	56289	196D336X0010KA1	
CR215	152-0488-00		SEMICOND DEVICE: SILICON, 200V, 1500MA	04713	3N55 FAMILY	
CR240	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 50NA	01295	1N4152R	
CR241	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 50NA	01295	1N4152R	
CR251	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 50NA	01295	1N4152R	
CR252	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 50NA	01295	1N4152R	
CR253	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 50NA	01295	1N4152R	
CR254	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 50NA	01295	1N4152R	
CR156	152-0333-00		SEMICOND DEVICE: SILICON, 55V, 200MA	07263	FDH-6012	
CR258	152-0333-00		SEMICOND DEVICE: SILICON, 55V, 200MA	07263	FDH-6012	
CR261	152-0107-00	B010100	B039999	SEMICOND DEVICE: SILICON, 400V, 400MA	01295	G727
CR261	152-0107-03	B040000		SEMICOND DEVICE: SILICON, 375V, 400MA, SEL	80009	152-0107-03
CR262	152-0107-00	B010100	B039999	SEMICOND DEVICE: SILICON, 400V, 400MA	01295	G727
CR262	152-0107-03	B040000		SEMICOND DEVICE: SILICON, 375V, 400MA, SEL	80009	152-0107-03
CR263	152-0107-00	B010100	B039999	SEMICOND DEVICE: SILICON, 400V, 400MA	01295	G727
CR263	152-0107-03	B040000		SEMICOND DEVICE: SILICON, 375V, 400MA, SEL	80009	152-0107-03
CR264	152-0107-00	B010100	B039999	SEMICOND DEVICE: SILICON, 400V, 400MA	01295	G727
CR364	152-0107-03	B040000		SEMICOND DEVICE: SILICON, 375V, 400MA, SEL	80009	152-0107-03
CR265	152-0107-00	B010100	B039999	SEMICOND DEVICE: SILICON, 400V, 400MA	01295	G727
CR265	152-0107-03	B040000		SEMICOND DEVICE: SILICON, 375V, 400MA, SEL	80009	152-0107-03
CR266	152-0107-00	B010100	B039999	SEMICOND DEVICE: SILICON, 400V, 400MA	01295	G727
CR266	152-0107-03	B040000		SEMICOND DEVICE: SILICON, 375V, 400MA, SEL	80009	152-0107-03
CR267	152-0107-00	B010100	B039999	SEMICOND DEVICE: SILICON, 400V, 400MA	01295	G727
CR267	152-0107-03	B040000		SEMICOND DEVICE: SILICON, 375V, 400MA, SEL	80009	152-0107-03
CR268	152-0107-00	B010100	B039999	SEMICOND DEVICE: SILICON, 400V, 400MA	01295	G727
CR268	152-0107-03	B040000		SEMICOND DEVICE: SILICON, 375V, 400MA, SEL	80009	152-0107-03
CR313	152-0246-00		SEMICOND DEVICE: SW, SI, 40V, 200MA	03508	DE140	
CR342	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 50NA	01295	1N4152R	
CR343	152-0141-02		SEMICOND DEVICE: SILICON, 30V, 50NA	01295	1N4152R	

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Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
CR346	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR370	152-0141-02	XB030000		SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR389	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
CR413	152-0246-00			SEMICONV DEVICE: SW, SI, 40V, 200MA	03508	DE140
CR446	152-0141-02			SEMICONV DEVICE: SILICON, 30V, 50NA	01295	1N4152R
DS310	150-1004-02	B010100	B055576	LT EMITTING DIO: RED, 15MA, W/HOLDER & LEADS	80009	150-1004-02
DS310	150-1031-01	B055577		LAMP, LED: W/DIODE, WIRE AND CONN	80009	150-1031-01
DS320	150-1061-00	XB080000		LT EMITTING DIO: RED, 660NM, 50MA MAX	27014	SJ62775
DS420	150-1061-00	XB080000		LT EMITTING DIO: RED, 660NM, 50MA, MAX	27014	SJ62775
F201	159-0103-00	B010100	B029999	FUSE, CARTRIDGE: 0.4A, 125V, 0.25SEC, 1.0 LEAD (USED FOR ALL LINE VOLT & FREQ APPLICATIONS.)	75915	279.400
F201	159-0121-00	B030000		FUSE, CARTRIDGE: DIN, 0.4A, 250V, 5 SEC (USED FOR ALL LINE VOLT & FREQ APPLICATIONS.)	75915	212.400
L108	108-0691-00			COIL, RF: 1.8MH	76493	02279
L111	108-0691-00			COIL, RF: 1.8MH	76493	02279
L257	108-0654-00			COIL, RF: 2.2MH	76493	01872
L300	-----			(FURNISHED AS A UNIT WITH CRT.)		
Q107	153-0601-00	B010100	B019999	SEMICONV DEVICE: 2N3565, SEL	80009	153-0601-00
Q107	151-0432-00	B020000		TRANSISTOR: SILICON, NPN	80009	151-0432-00
Q110	153-0601-00	B010100	B019999	SEMICONV DEVICE: 2N3565, SEL	80009	153-0601-00
Q110	151-0432-00	B020000		TRANSISTOR: SILICON, NPN	80009	151-0432-00
Q119	151-0601-00	B010100	B019999	TRANSISTOR: SILICON, MATCHED	80009	151-0601-00
Q119	151-0432-00	B020000		TRANSISTOR: SILICON, NPN	80009	151-0432-00
Q122	153-0601-00	B010100	B019999	SEMICONV DEVICE: 2N3565, SEL	80009	153-0601-00
Q122	151-0432-00	B020000		TRANSISTOR: SILICON, NPN	80009	151-0432-00
Q134	153-0601-00	B010100	B019999	SEMICONV DEVICE: 2N3565, SEL	80009	153-0601-00
Q134	151-0432-00	B020000		TRANSISTOR: SILICON, NPN	80009	151-0432-00
Q231	151-0341-00			TRANSISTOR: SILICON, NPN	07263	S040065
Q235	151-0220-00			TRANSISTOR: SILICON, PNP	07263	S036228
Q242	151-0136-00			TRANSISTOR: SILICON, NPN	02735	35495
Q249	151-0136-00			TRANSISTOR: SILICON, NPN	02735	35495
Q314A, B	151-1072-00	B010100	B079999	TRANSISTOR: SILICON, JFE, P-CHAN, DUAL	80009	151-1072-00
Q314A, B	151-1057-00	B080000		TRANSISTOR: SILICON, FE, N-CHANNEL, DUAL	80009	151-1057-00
Q326	151-0341-00			TRANSISTOR: SILICON, NPN	07263	S040065
Q328	151-0341-00			TRANSISTOR: SILICON, NPN	07263	S040065
Q380	151-0341-00			TRANSISTOR: SILICON, NPN	07263	S040065
Q388	151-0504-00			TRANSISTOR: SILICON, N-CHAN, UNIJUNCTION	04713	2N4851
Q392	153-0601-00	B010100	B019999	SEMICONV DEVICE: 2N3565, SEL	80009	153-0601-00
Q392	151-0432-00	B020000		TRANSISTOR: SILICON, NPN	80009	151-0432-00
Q414A, B	151-1072-00	B010100	B079999	TRANSISTOR: SILICON, JFE, P-CHAN, DUAL	80009	151-1072-00
Q414A, B	151-1057-00	B080000		TRANSISTOR: SILICON, FE, N-CHANNEL, DUAL	80009	151-1057-00
Q454	151-0341-00			TRANSISTOR: SILICON, NPN	07263	S040065
R101	311-1235-00			RES., VAR, NONWIR: 100K OHM, 20%, 0.50W	32997	3386F-T04-104
R105	321-0218-00			RES., FXD, FILM: 1.82K OHM, 1%, 0.125W	91637	MFF1816G18200F
R106	316-0471-00			RES., FXD, CMPSN: 470 OHM, 10%, 0.25W	01121	CB4711
R107	322-0331-00			RES., FXD, FILM: 27.4K OHM, 1%, 0.25W	01121	0BD
R108	316-0223-00			RES., FXD, CMPSN: 22K OHM, 10%, 0.25W	01121	CB2231
R109	316-0471-00			RES., FXD, CMPSN: 470 OHM, 10%, 0.25W	01121	CB4711
R110	322-0331-00			RES., FXD, FILM: 27.4K OHM, 1%, 0.25W	01121	0BD
R111	316-0223-00			RES., FXD, CMPSN: 22K OHM, 10%, 0.25W	01121	CB2231
R117	321-0260-00			RES., FXD, FILM: 4.99K OHM, 1%, 0.125W	91637	MFF1816G49900F
R118	316-0471-00			RES., FXD, CMPSN: 470 OHM, 10%, 0.25W	01121	CB4711
R119	321-0373-00			RES., FXD, FILM: 75K OHM, 1%, 0.125W	91637	MFF1816G75001F
R121	316-0471-00			RES., FXD, CMPSN: 470 OHM, 10%, 0.25W	01121	CB4711
R122	321-0373-00			RES., FXD, FILM: 75K OHM, 1%, 0.125W	91637	MFF1816G75001F

Ckt No.	Tektronix Part No.	Serial/Model No.		Name & Description	Mfr	
		Eff	Dscont		Code	Mfr Part Number
R125	316-0150-00			RES., FXD, CMPSN: 15 OHM, 10%, 0.25W	01121	CB1501
R127	316-0150-00			RES., FXD, CMPSN: 15 OHM, 10%, 0.25W	01121	CB1501
R129	321-0169-00			RES., FXD, FILM: 562 OHM, 1%, 0.125W	91637	MFF1816G562R0F
R132	315-0123-00			RES., FXD, CMPSN: 12K OHM, 5%, 0.25W	01121	CB1235
R134	321-0354-00			RES., FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	MFF1816G47501F
R135	321-0377-00			RES., FXD, FILM: 82.5K OHM, 1%, 0.125W	91637	MFF1816G82501F
R136	315-0332-00			RES., FXD, CMPSN: 3.3K OHM, 5%, 0.25W	01121	CB3325
R137	315-0202-00			RES., FXD, CMPSN: 2K OHM, 5%, 0.25W	01121	CB2025
R141	311-1232-00			RES., VAR, NONWIR: 50K OHM, 20%, 0.50W	32997	3386F-T04-503
R144	321-0354-00			RES., FXD, FILM: 47.5K OHM, 1%, 0.125W	91637	MFF1816G47501F
R145	321-0377-00			RES., FXD, FILM: 82.5K OHM, 1%, 0.125W	91637	MFF1816G82501F
R150	316-0470-00			RES., FXD, CMPSN: 47 OHM, 10%, 0.25W	01121	CB4701
R151	315-0153-00			RES., FXD, CMPSN: 15K OHM, 5%, 0.25W	01121	CB1535
R153	316-0470-00			RES., FXD, CMPSN: 47 OHM, 10%, 0.25W	01121	CB4701
R154	315-0473-00			RES., FXD, CMPSN: 47K OHM, 5%, 0.25W	01121	CB4735
R155	316-0392-00			RES., FXD, CMPSN: 3.9K OHM, 10%, 0.25W	01121	CB3921
R204	316-0225-00	B010100	B039999	RES., FXD, CMPSN: 2.2M OHM, 10%, 0.25W	01121	CB2251
R204	316-0475-00	B040000		RES., FXD, CMPSN: 4.7M OHM, 10%, 0.25W	01121	CB4751
R205	316-0225-00	B010100	B039999	RES., FXD, CMPSN: 2.2M OHM, 10%, 0.25W	01121	CB2251
R205	316-0475-00	B040000		RES., FXD, CMPSN: 4.7M OHM, 10%, 0.25W	01121	CB4751
R208	316-0225-00			RES., FXD, CMPSN: 2.2M OHM, 10%, 0.25W	01121	CB2251
R209	316-0225-00			RES., FXD, CMPSN: 2.2M OHM, 10%, 0.25W	01121	CB2251
R210	302-0154-00			RES., FXD, CMPSN: 150K OHM, 10%, 0.50W	01121	EB1541
R211	302-0120-00			RES., FXD, CMPSN: 12 OHM, 10%, 0.50W	01121	EB1201
R212	302-0154-00			RES., FXD, CMPSN: 150K OHM, 10%, 0.50W	01121	EB1541
R213	302-0120-00			RES., FXD, CMPSN: 12 OHM, 10%, 0.50W	01121	EB1201
R225	315-0271-00			RES., FXD, CMPSN: 270 OHM, 5%, 0.25W	01121	CB2715
R227	316-0103-00			RES., FXD, CMPSN: 10K OHM, 10%, 0.25W	01121	CB1031
R229	316-0102-00			RES., FXD, CMPSN: 1K OHM, 10%, 0.25W	01121	CB1021
R230	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R231	316-0472-00			RES., FXD, CMPSN: 4.7K OHM, 10%, 0.25W	01121	CB4721
R232	316-0393-00			RES., FXD, CMPSN: 39K OHM, 10%, 0.25W	01121	CB3931
R235	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R236	315-0181-00	B010100	B053859	RES., FXD, CMPSN: 180 OHM, 5%, 0.25W	01121	CB1815
R236	315-0391-00	B053860		RES., FXD, CMPSN: 390 OHM, 5%, 0.25W	01121	CB3915
R238	316-0102-00			RES., FXD, CMPSN: 1K OHM, 10%, 0.25W	01121	CB1021
R239	315-0121-00	XB060000		RES., FXD, CMPSN: 120 OHM, 5%, 0.25W	01121	CB1215
R241	315-0131-00	B010100	B053859	RES., FXD, CMPSN: 130 OHM, 5%, 0.25W	01121	CB1315
R241	315-0910-00	B053860		RES., FXD, CMPSN: 91 OHM, 5%, 0.25W	01121	CB9105
R264	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R268	315-0274-00			RES., FXD, CMPSN: 270K OHM, 5%, 0.25W	01121	CB2745
R271	316-0274-00			RES., FXD, CMPSN: 270K OHM, 10%, 0.25W	01121	CB2741
R272	315-0125-00	B010100	B039999	RES., FXD, CMPSN: 1.2M OHM, 5%, 0.25W	01121	CB1255
R272	315-0105-00	B040000		RES., FXD, CMPSN: 1M OHM, 5%, 0.25W	01121	CB1055
R273	311-1252-00			RES., VAR, NONWIR: 500K OHM, 20%, 0.50W	32997	3386F-T04-504
R278	316-0100-00			RES., FXD, CMPSN: 10 OHM, 10%, 0.25W	01121	CB1001
R279	316-0100-00			RES., FXD, CMPSN: 10 OHM, 10%, 0.25W	01121	CB1001
R301	315-0105-00			RES., FXD, CMPSN: 1M OHM, 5%, 0.25W	01121	CB1055
R306A-F	307-0307-00			NTWK, HYB CKT: (FURNISHED AS A UNIT WITH C306B, D, F)	80009	307-0307-00
R311	315-0107-00			RES., FXD, CMPSN: 100M OHM, 5%, 0.25W	01121	CB1075
R312	315-0474-00			RES., FXD, CMPSN: 470K OHM, 5%, 0.25W	01121	CB4745
R313	315-0273-00			RES., FXD, CMPSN: 27K OHM, 5%, 0.25W	01121	CB2735
R314	321-0164-00	XB080000		RES., FXD, FILM: 499 OHM, 1%, 0.125W	91637	MFF1816G499R0F
R315	311-0634-00	B010100	B079999	RES., VAR, NONWIR: TRMR, 500 OHM, 0.5W	32997	3326H-G48-501
R315	311-0622-00	B080000		RES., VAR, NONWIR: 100 OHM, 10%, 0.50W	32997	3326H-G48-101
R316	321-0318-02	B010100	B079999	RES., FXD, FILM: 20K OHM, 0.5%, 0.125W	91637	MFF1816D20001D

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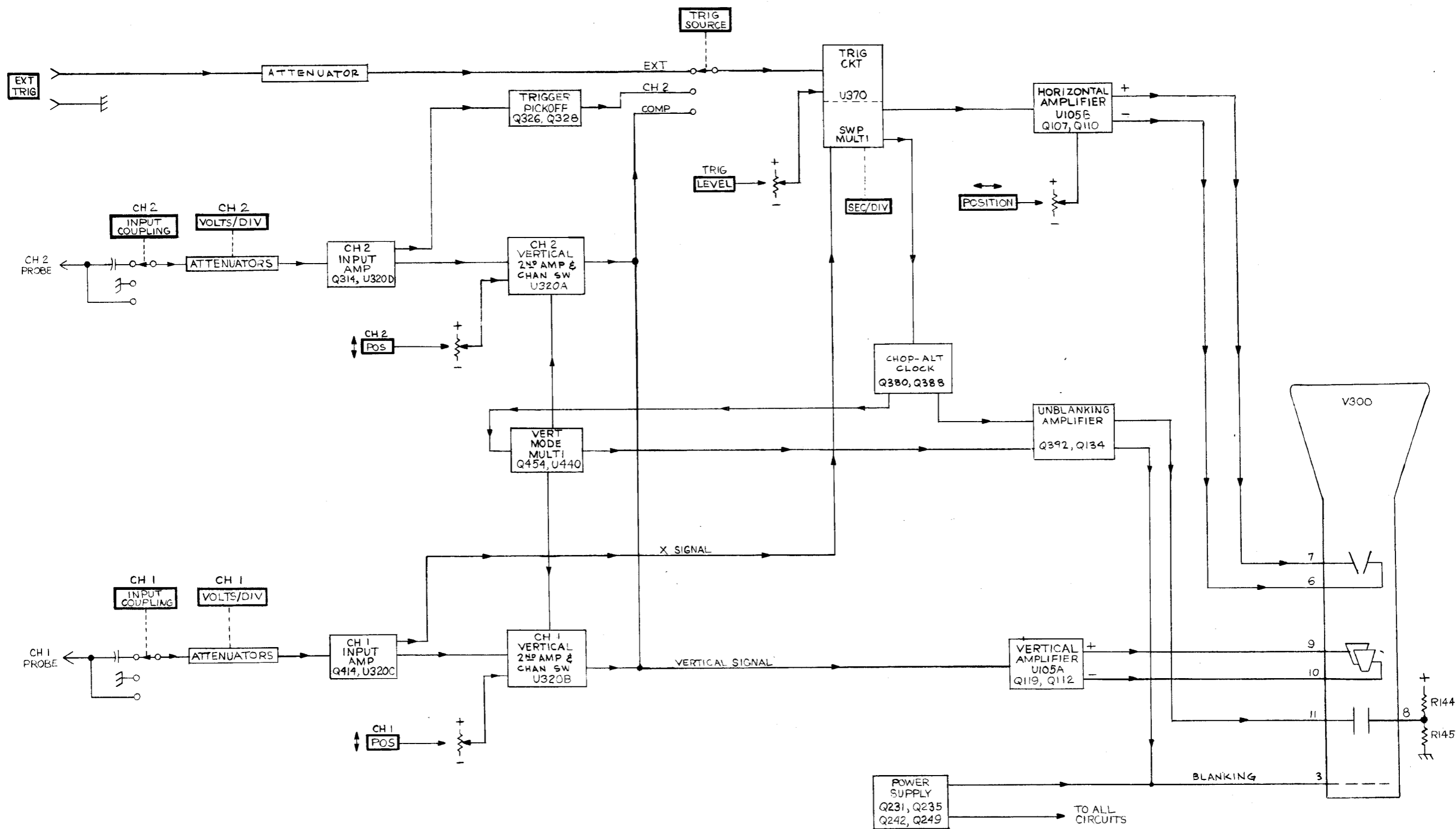
Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R316	321-0776-03	B080000		RES.,FXD,FILM:3.501K OHM,0.25%,0.125W	91637	MFF1816D35010C
R317	315-0271-00	B010100	B079999	RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
R317	321-0168-00	B080000		RES.,FXD,FILM:549 OHM,1%,0.125W	91637	MFF1816G549ROF
R318	321-0318-02	B010100	B079999	RES.,FXD,FILM:20K OHM,0.5%,0.125W	91637	MFF1816D20001D
R318	321-0776-03	B080000		RES.,FXD,FILM:3.501K OHM,0.25%,0.125W	91637	MFF1816D35010C
R319A-E	307-0395-00			RES.,FXD,FILM:5 RES NETWORK	80009	307-0395-00
R320	311-1406-00			RES.,VAR,NONWIR:20K OHM,0.25W,W/SW (FURNISHED AS A UNIT WITH S326)	771450	200-YA5557
R371	317-0391-00	XB070000		RES.,FXD,CMPSN:390 OHM,5%,0.125W	01121	BB3915
R321	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R322	315-0512-00	XB080000		RES.,FXD,CMPSN:5.1K OHM,5%,0.25W	01121	CB5125
R323	321-0306-00			RES.,FXD,FILM:15K OHM,1%,0.125W	91637	MFF1816G15001F
R324	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
R326	315-0473-00			RES.,FXD,CMPSN:47K OHM,5%,0.25W	01121	CB4735
R327	315-0822-00			RES.,FXD,CMPSN:8.2K OHM,5%,0.25W	01121	CB8225
R328	315-0162-00			RES.,FXD,CMPSN:1.6K OHM,5%,0.25W	01121	CB1625
R329	315-0183-00			RES.,FXD,CMPSN:18K OHM,5%,0.25W	01121	CB1835
R340	311-1422-00			RES.,VAR,NONWIR:20K OHM,20%,0.25W (FURNISHED AS A UNIT WITH S340)	11237	CTS-200
R341	315-0393-00			RES.,FXD,CMPSN:39K OHM,5%,0.25W	01121	CB3935
R342	321-0309-00			RES.,FXD,FILM:16.2K OHM,1%,0.125W	91637	MFF1816G16201F
R343	321-0251-00			RES.,FXD,FILM:4.02K OHM,1%,0.125W	91637	MFF1816G40200F
R344	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R346	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R348	315-0114-00			RES.,FXD,CMPSN:110K OHM,5%,0.25W	01121	CB1145
R349	315-0914-00			RES.,FXD,CMPSN:910K OHM,5%,0.25W	01121	CB9145
R351	315-0912-00			RES.,FXD,CMPSN:9.1K OHM,5%,0.25W	01121	CB9125
R352	315-0222-00			RES.,FXD,CMPSN:2.2K OHM,5%,0.25W	01121	CB2225
R355	315-0273-00			RES.,FXD,CMPSN:27K OHM,5%,0.25W	01121	CB2735
R361A	307-0308-00			RES.,FXD,FILM:TIMING,HYBRID CKT	80009	307-0308-00
R361B						
R361C						
R361D						
R361E						
R361F						
R362	325-0118-00			RES.,FXD,FILM:3M OHM,1%,0.125W	03888	PME55-G30003F
R364	315-0104-00			RES.,FXD,CMPSN:100K OHM,5%,0.25W	01121	CB1045
R365	315-0204-00			RES.,FXD,CMPSN:200K OHM,5%,0.25W	01121	CB2045
R366	311-1243-00			RES.,VAR,NONWIR:500K OHM,10%,0.50W	73138	72-34-0
R368	315-0223-00			RES.,FXD,CMPSN:22K OHM,5%,0.25W	01121	CB2235
R369	315-0273-00			RES.,FXD,CMPSN:27K OHM,5%,0.25W	01121	CB2735
R370	311-1272-00			RES.,VAR,NONWIR:100K OHM,10%,0.50W	32997	3329P-L58-104
R371	317-0391-00	XB078540		RES.,FXD,CMPSN:390 OHM,5%,0.125W	01121	BB3915
R372	315-0105-00			RES.,FXD,CMPSN:1M OHM,5%,0.25W	01121	CB1055
R374	311-1269-00			RES.,VAR,NONWIR:20K OHM,10%,0.50W	32997	3329P-L58-203
R375	311-1173-00			RES.,VAR,NONWIR:20K OHM,20%,0.25W (FURNISHED AS A UNIT WITH S375)	71450	200-YA5541
R376	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R380	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R381	315-0183-00			RES.,FXD,CMPSN:18K OHM,5%,0.25W	01121	CB1835
R383	315-0471-00	B010100	B029999	RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R383	315-0122-00	B030000		RES.,FXD,CMPSN:1.2K OHM,5%,0.25W	01121	CB1225
R385	315-0224-00			RES.,FXD,CMPSN:220K OHM,5%,0.25W	01121	CB2245
R388	315-0271-00			RES.,FXD,CMPSN:270 OHM,5%,0.25W	01121	CB2715
R390	315-0682-00			RES.,FXD,CMPSN:6.8K OHM,5%,0.25W	01121	CB6825
R391	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R392	315-0333-00			RES.,FXD,CMPSN:33K OHM,5%,0.25W	01121	CB3335

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R393	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R394	311-1275-00			RES., VAR, NONWIR: 1M OHM, 10%, 0.50W	32997	3329P-L58-105
R395	311-1169-00			RES., VAR, NONWIR: PNL, 2M OHM, 0.2W	71450	OBD
R396	316-0225-00			RES., FXD, CMPSN: 2.2M OHM, 10%, 0.25W	01121	CB2251
R401	315-0105-00			RES., FXD, CMPSN: 1M OHM, 5%, 0.25W	01121	CB1055
R406A-F	307-0307-00			NTWK, HYB CKT: (FURNISHED AS A UNIT WITH C406B, D, F)	80009	307-0307-00
R411	315-0107-00			RES., FXD, CMPSN: 100M OHM, 5%, 0.25W	01121	CB1075
R412	315-0474-00			RES., FXD, CMPSN: 470K OHM, 5%, 0.25W	01121	CB4745
R413	315-0273-00			RES., FXD, CMPSN: 27K OHM, 5%, 0.25W	01121	CB2735
R414	321-0164-00	XB080000		RES., FXD, FILM: 499 OHM, 1%, 0.125W	91637	MFF1816G499R0F
R415	315-0271-00	B010100	B079999	RES., FXD, CMPSN: 270 OHM, 5%, 0.25W	01121	CB2715
R415	321-0168-00	B080000		RES., FXD, FILM: 549 OHM, 1%, 0.125W	91637	MFF1816G549R0F
R416	321-0318-02	B010100	B079999	RES., FXD, FILM: 20K OHM, 0.5%, 0.125W	91637	MFF1816D20001D
R416	321-0776-03	B080000		RES., FXD, FILM: 3.501K OHM, 0.25%, 0.125W	91637	MFF1816D35010C
R417	311-0634-00	B010100	B079999	RES., VAR, NONWIR: TRMR, 500 OHM, 0.5W	32997	3326H-G48-501
R417	311-0622-00	B080000		RES., VAR, NONWIR: 100 OHM, 10%, 0.50W	32997	3326H-G48-101
R418	321-0318-02	B010100	B079999	RES., FXD, FILM: 20K OHM, 0.5%, 0.125W	91637	MFF1816D20001D
R418	321-0776-03	B080000		RES., FXD, FILM: 3.501K OHM, 0.25%, 0.125W	91637	MFF1816D35010C
R419A-E	307-0395-00			RES., FXD, FILM: 5 RES NETWORK	80009	307-0395-00
R420	311-1406-00			RES., VAR, NONWIR: 20K OHM, 0.25W, W/SW (FURNISHED AS A UNIT WITH S420)	71450	200-YA5557
R421	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R422	315-0512-00	XB080000		RES., FXD, CMPSN: 5.1K OHM, 5%, 0.25W	01121	CB5125
R423	321-0306-00			RES., FXD, FILM: 15K OHM, 1%, 0.125W	91637	MFF1816G15001F
R424	315-0561-00			RES., FXD, CMPSN: 560 OHM, 5%, 0.25W	01121	CB5615
R425	315-0243-00			RES., FXD, CMPSN: 24K OHM, 5%, 0.25W	01121	CB2435
R440	311-1422-00			RES., VAR, NONWIR: 20K OHM, 20%, 0.25W (FURNISHED AS A UNIT WITH S440)	11237	CTS-200
R441	315-0393-00			RES., FXD, CMPSN: 39K OHM, 5%, 0.25W	01121	CB3935
R442	321-0309-00			RES., FXD, FILM: 16.2K OHM, 1%, 0.125W	91637	MFF1816G16201F
R443	321-0251-00			RES., FXD, FILM: 4.02K OHM, 1%, 0.125W	91637	MFF1816G40200F
R446	315-0104-00			RES., FXD, CMPSN: 100K OHM, 5%, 0.25W	01121	CB1045
R451	315-0912-00			RES., FXD, CMPSN: 9.1K OHM, 5%, 0.25W	01121	CB9125
R452	315-0222-00			RES., FXD, CMPSN: 2.2K OHM, 5%, 0.25W	01121	CB2225
R454	315-0102-00			RES., FXD, CMPSN: 1K OHM, 5%, 0.25W	01121	CB1025
R470	311-1269-00			RES., VAR, NONWIR: 20K OHM, 10%, 0.50W	32997	3329P-L58-203
R471	315-0223-00			RES., FXD, CMPSN: 22K OHM, 5%, 0.25W	01121	CB2235
R472	315-0223-00			RES., FXD, CMPSN: 22K OHM, 5%, 0.25W	01121	CB2235
R473	315-0472-00			RES., FXD, CMPSN: 4.7K OHM, 5%, 0.25W	01121	CB4725
R474	315-0103-00			RES., FXD, CMPSN: 10K OHM, 5%, 0.25W	01121	CB1035
R475	311-1269-00			RES., VAR, NONWIR: 20K OHM, 10%, 0.50W	32997	3329P-L58-203
R476	311-1172-00			RES., VAR, NONWIR: PNL, 50K OHM, 0.2W, W/SW (FURNISHED AS A UNIT WITH S476)	71450	200-YA5540
R477	315-0333-00			RES., FXD, CMPSN: 33K OHM, 5%, 0.25W	01121	CB3335
R480	311-1171-00			RES., VAR, NONWIR: PNL, 100K OHM, 0.25W	71450	200-YA5539
R481	315-0333-00			RES., FXD, CMPSN: 33K OHM, 5%, 0.25W	01121	CB3335
R482	315-0683-00			RES., FXD, CMPSN: 68K OHM, 5%, 0.25W	01121	CB6835
R485	315-0224-00			RES., FXD, CMPSN: 220K OHM, 5%, 0.25W	01121	CB2245
R491	315-0150-00			RES., FXD, CMPSN: 15 OHM, 5%, 0.25W	01121	CB1505
R493	315-0150-00			RES., FXD, CMPSN: 15 OHM, 5%, 0.25W	01121	CB1505
S215	260-0723-00			SWITCH, SLIDE: DPDT, 0.5A, 125VAC	79727	GF126-0028
S305	260-0984-00	B010100	B043699	SWITCH, SLIDE: DP3T, 0.5A, 125V	79727	G-128-S-0012
S305	260-0984-01	B043700		SWITCH, SLIDE: DP3T W/PLASTIC PLATE	79727	G-128SPC/
S310	-----			(SEE MPL FOR REPLACEMENT PARTS)		
S340	-----			(FURNISHED AS A UNIT WITH R340)		
S345	260-0984-00	B010100	B034699	SWITCH, SLIDE: DP3T, 0.5A, 125V	79727	G-128-S-0012

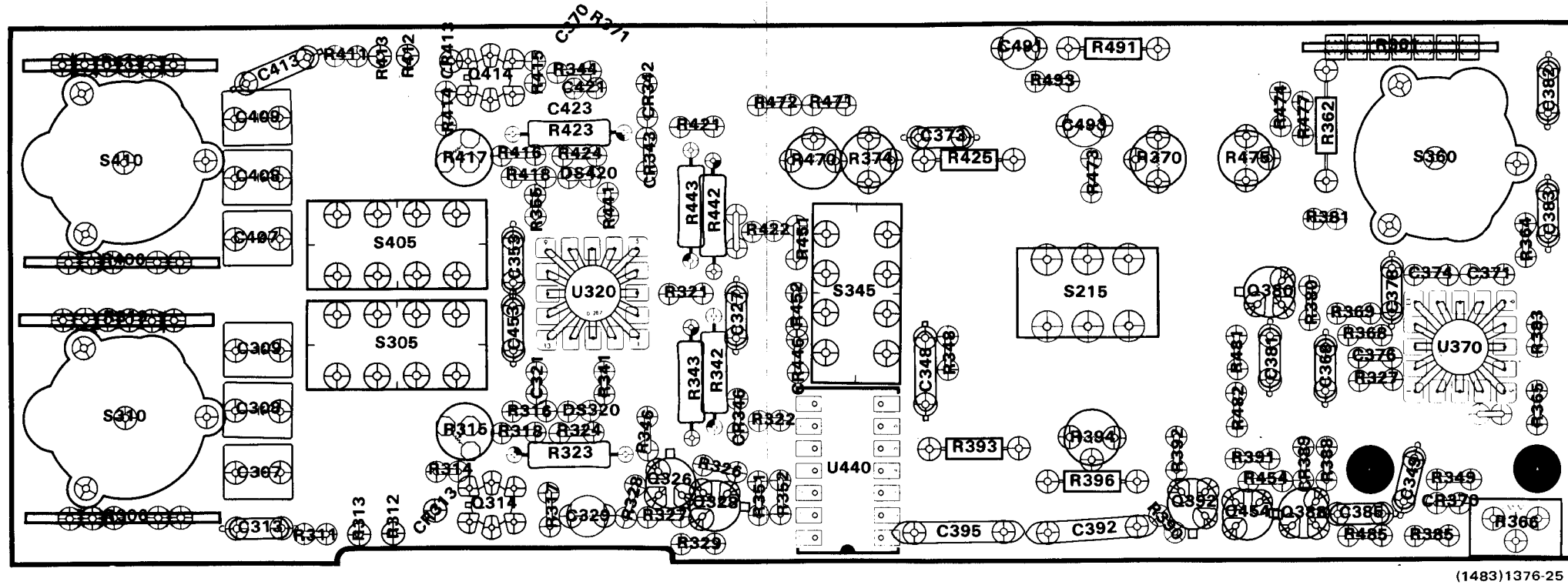
Replaceable Electrical Parts—212

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
S345	260-0984-01	B043700		SWITCH,SLIDE:DP3T W/PLASTIC PLATE	79727	G-128SPC/
S360	-----			(SEE MPL FOR REPLACEMENT PARTS)		
S375	-----			(FURNISHED AS A UNIT WITH R375)		
S405	260-0984-00	B010100	B043699	SWITCH,SLIDE:DP3T,0.5A,125V	79727	G-128-S-0012
S405	260-0984-01	B043700		SWITCH,SLIDE:DP3T W/PLASTIC PLATE	79727	G-128SPC/
S410	-----			(SEE MPL FOR REPLACEMENT PARTS)		
S440	-----			(FURNISHED AS A UNIT WITH R440)		
S476	-----			(FURNISHED AS A UNIT WITH R476)		
T207	120-0738-00	B010100	B054497	TRANSFORMER,CMR:	80009	120-0738-00
T207	120-1043-00	B054498	B055929	TRANSFORMER,RF:COMMON MODE REJ,POT CORE	80009	120-1043-00
T207	120-1103-00	B055930		XFMR,RF:POT CORE	80009	120-1103-00
T250	120-0735-00			XFMR,PWR,SDN&SU:	80009	120-0735-00
T270	108-0395-00			COIL,RF:64UH	80009	108-0395-00
U105	155-0047-00			MICROCIRCUIT,LI:OUTPUT AMPLIFIER	80009	155-0047-00
U320	155-0083-00			MICROCIRCUIT,LI:DUAL OPNL AMPL & CHAN SW	80009	155-0083-00
U370	155-0048-01			MICROCIRCUIT,DI:TRIGGER AND SWEEP,SEL	80009	155-0048-01
U440	156-0280-00			MICROCIRCUIT,DI:J-K MASTER-SLAVE FLIP-FLOP	80009	156-0280-00
V300	154-0699-00			ELECTRON TUBE:CRT,P31,INT SCALE	80009	154-0699-00
VR228	152-0306-00			SEMICONV DEVICE:ZENER,0.4W,9.1V,5%	14433	1N960B
VR238	152-0514-00			SEMICONV DEVICE:ZENER,0.4W,10V,1%	80009	152-0514-00



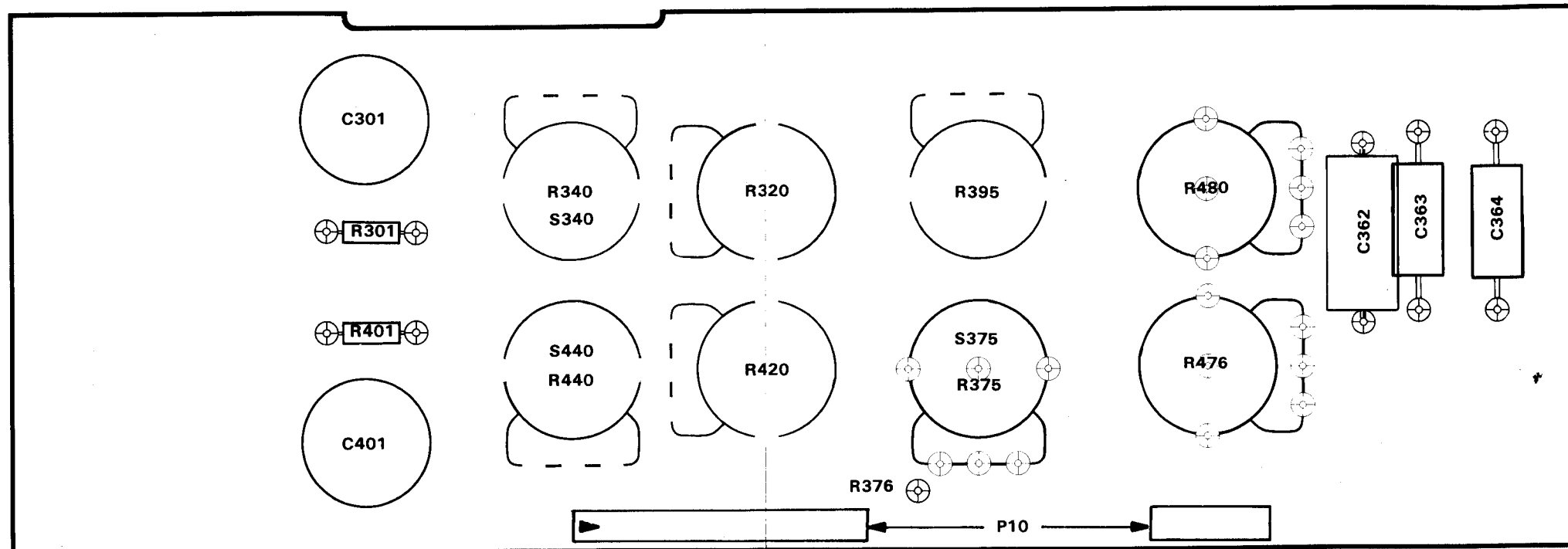


BLOCK DIAGRAM



(1483)1376-25

Fig. 8-1A. A1 Input Circuit Board (Front), SN B090000 & up.

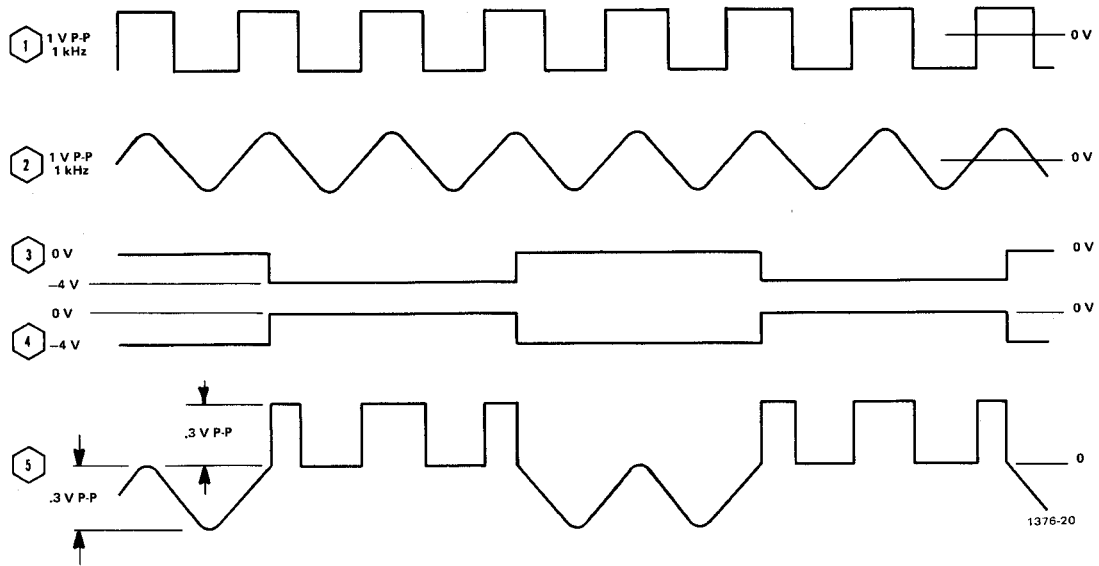


(1483)1376-26

Fig. 8-1B. A1 Input Circuit Board (Rear), SN B090000 & up.

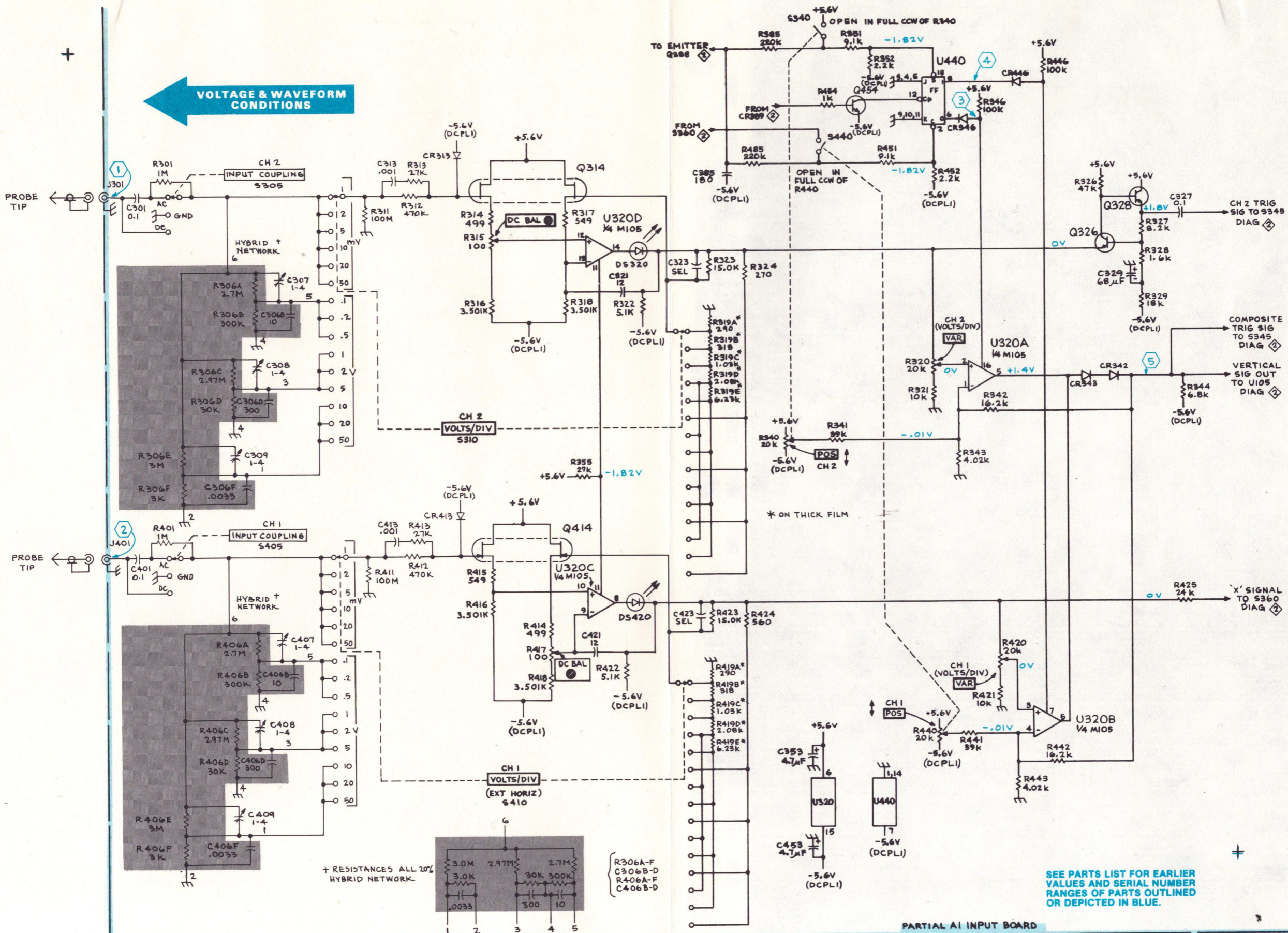
WAVEFORM CONDITIONS

TRIGGER SOURCE - CH 2  
TRIGGER LEVEL - AUTO  
SEC/DIV - 0.1 m  
VOLTS/DIV - 0.5

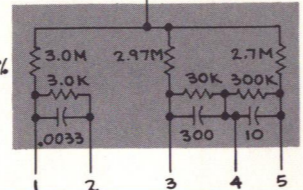




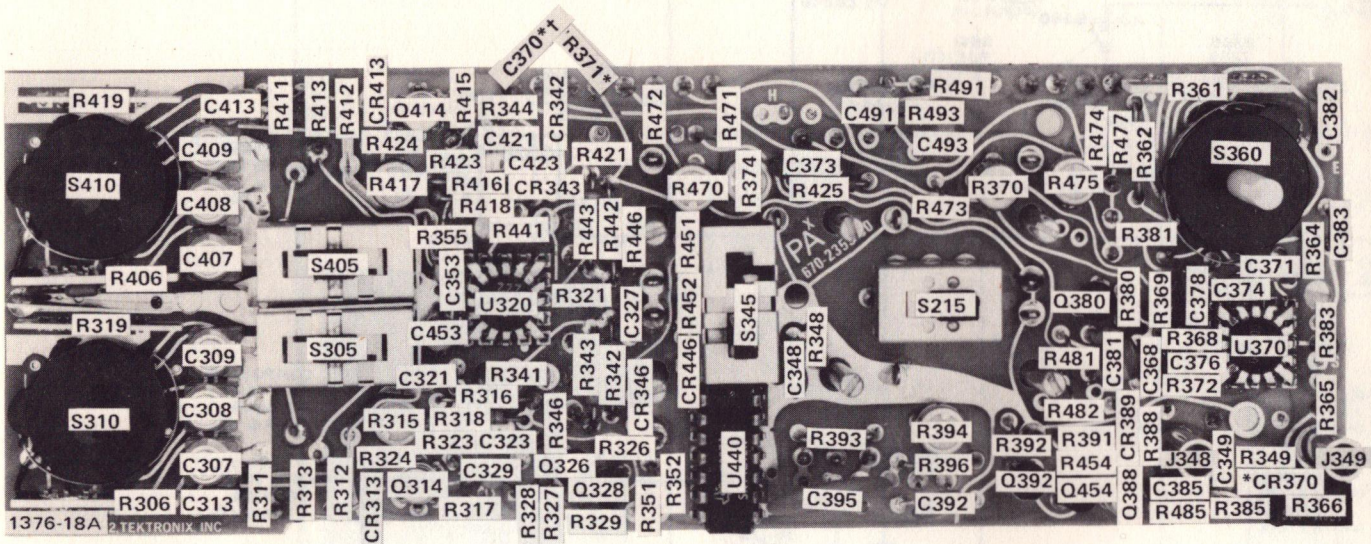
VOLTAGE & WAVEFORM CONDITIONS



+ RESISTANCES ALL 20% HYBRID NETWORK







\*See Parts List for serial number ranges.

†C370 moved from back of board to front at SN B070000.

Fig. 8-1C. A1 Input Circuit Board (Front), SN B010100-B089999.

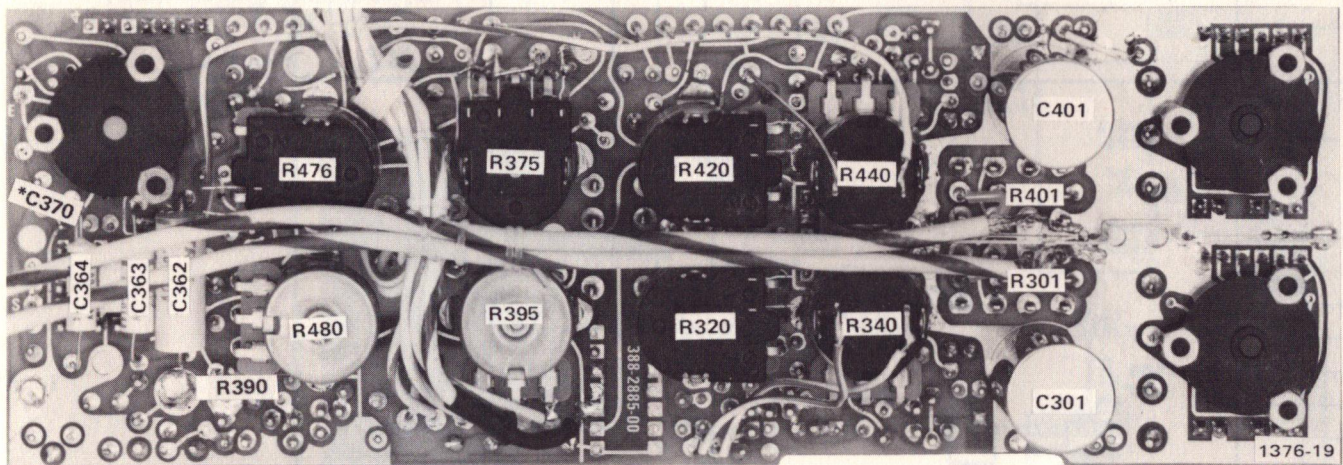


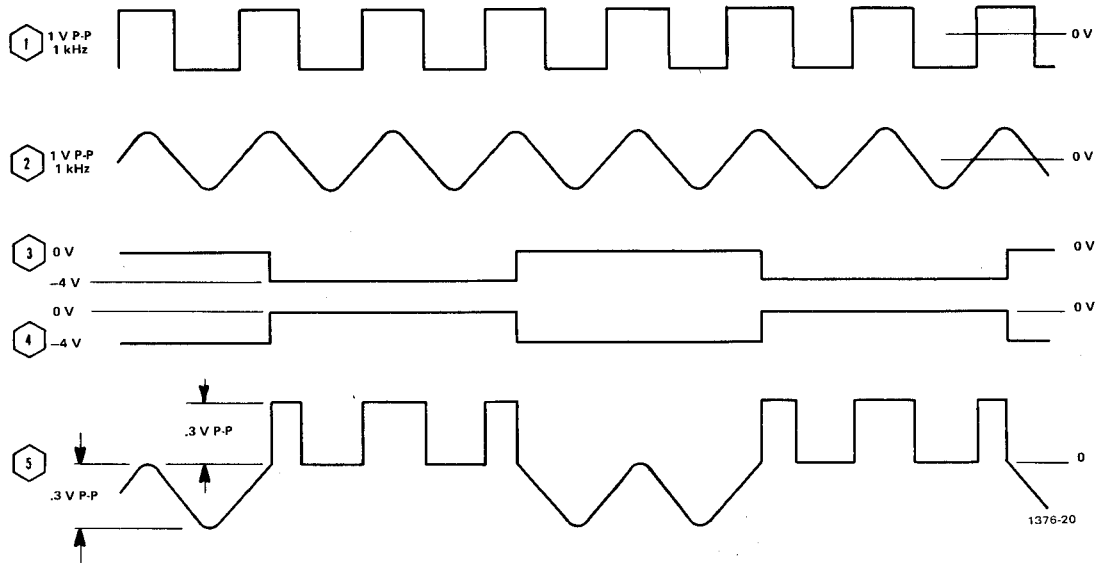
Fig. 8-1D. A1 Input Circuit Board (Rear), SN B010100-B089999.

A1 INPUT CIRCUIT BOARD  
Below SN B090000



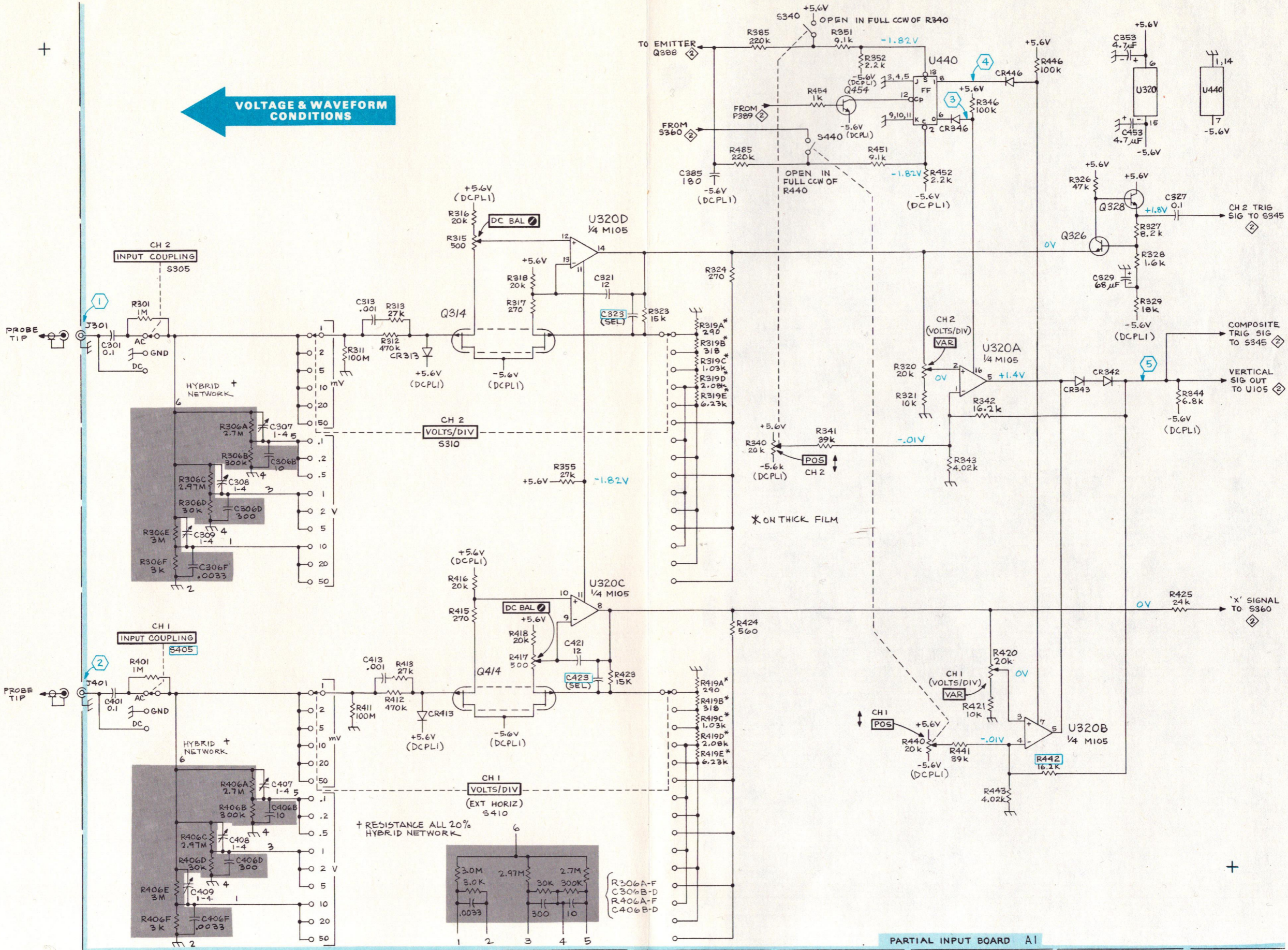
WAVEFORM CONDITIONS

TRIGGER SOURCE - CH 2  
TRIGGER LEVEL - AUTO  
SEC/DIV - 0.1 m  
VOLTS/DIV - 0.5





**VOLTAGE & WAVEFORM CONDITIONS**



PARTIAL INPUT BOARD A1



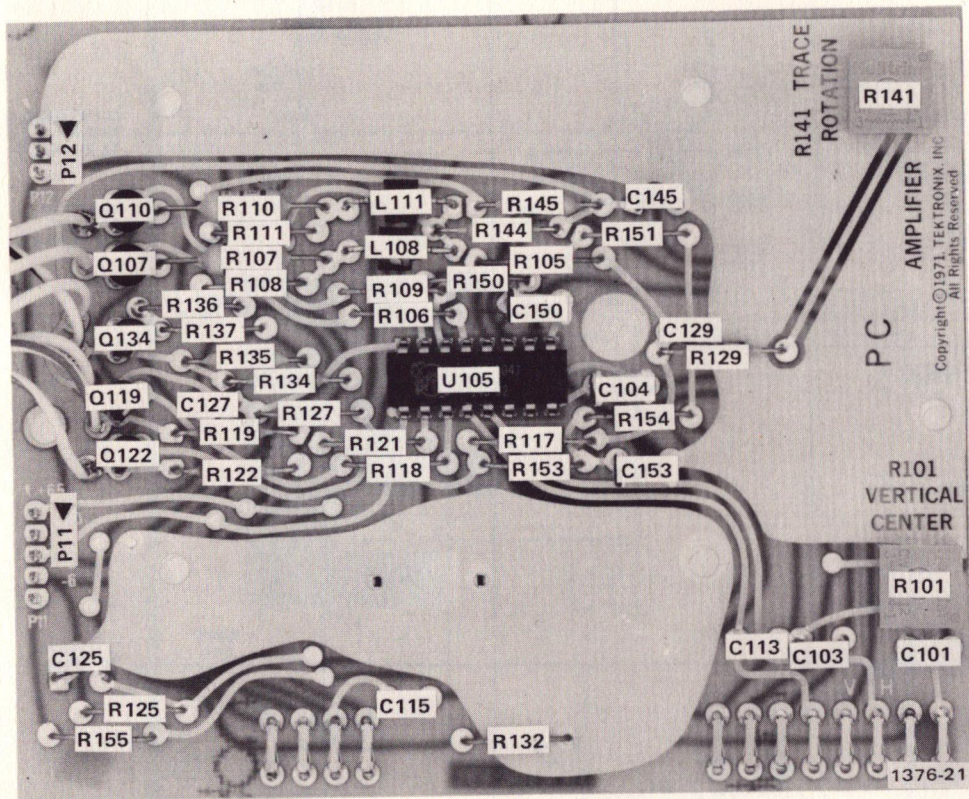
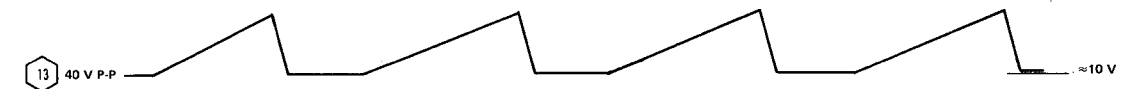
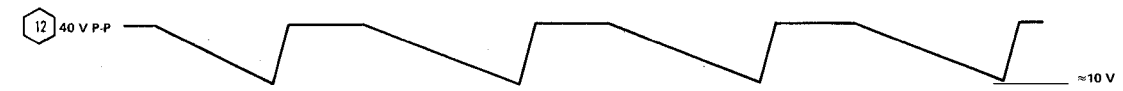
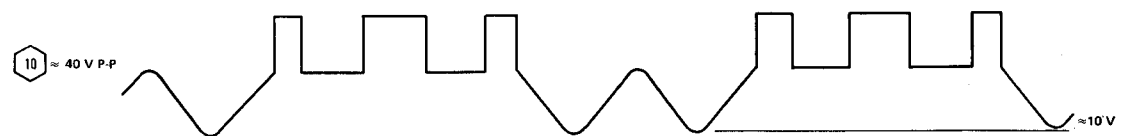
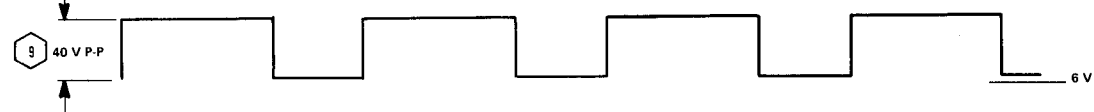
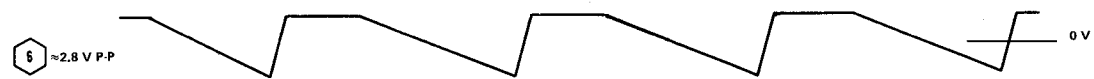
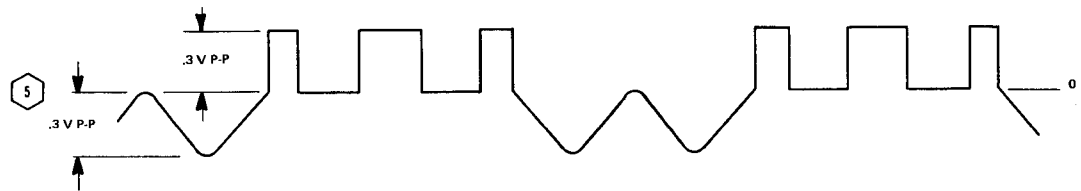


Fig. 8-2. A2 Amplifier Circuit Board.

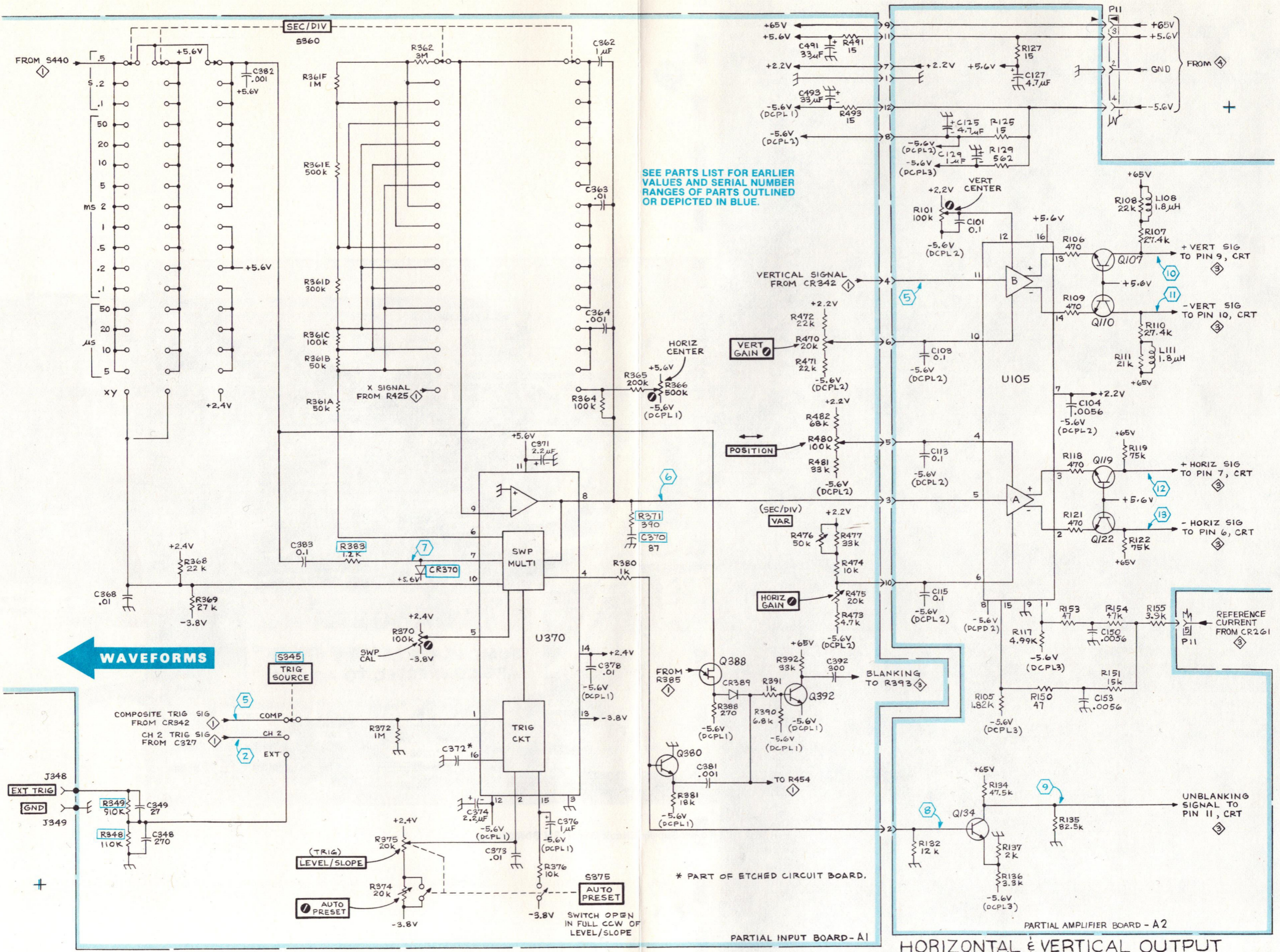


WAVEFORM CONDITIONS

TRIGGER SOURCE - CH 2  
TRIGGER LEVEL - AUTO  
SEC/DIV - 0.1 m  
VOLTS/DIV - 0.5







SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN BLUE.

WAVEFORMS

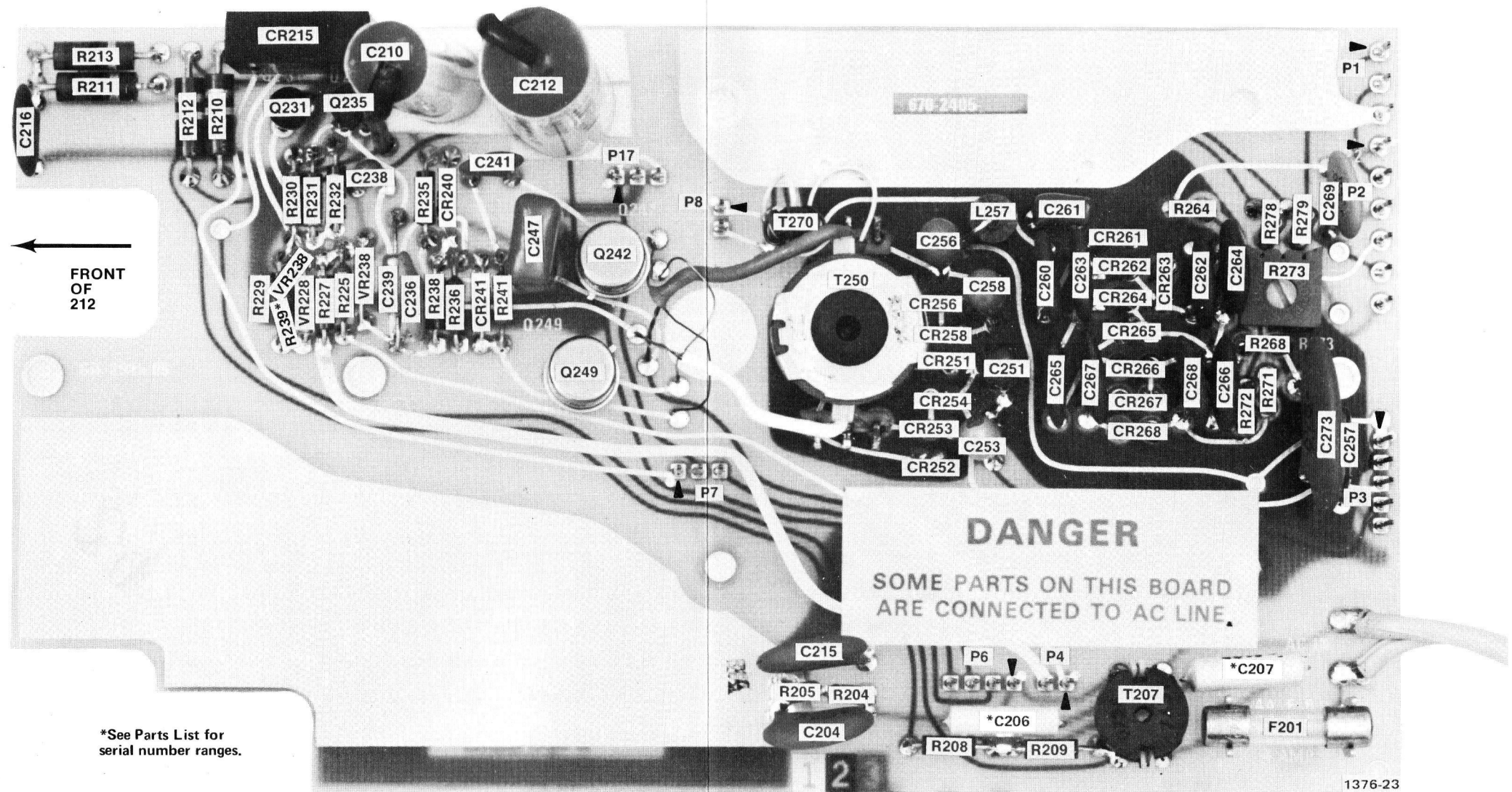
\* PART OF ETCHED CIRCUIT BOARD.

PARTIAL INPUT BOARD - A1

PARTIAL AMPLIFIER BOARD - A2

HORIZONTAL & VERTICAL OUTPUT SWEEP & TRIGGER





\*See Parts List for serial number ranges.

Fig. 8-3A. A3 Power Supply Circuit Board, SN B040000-up.

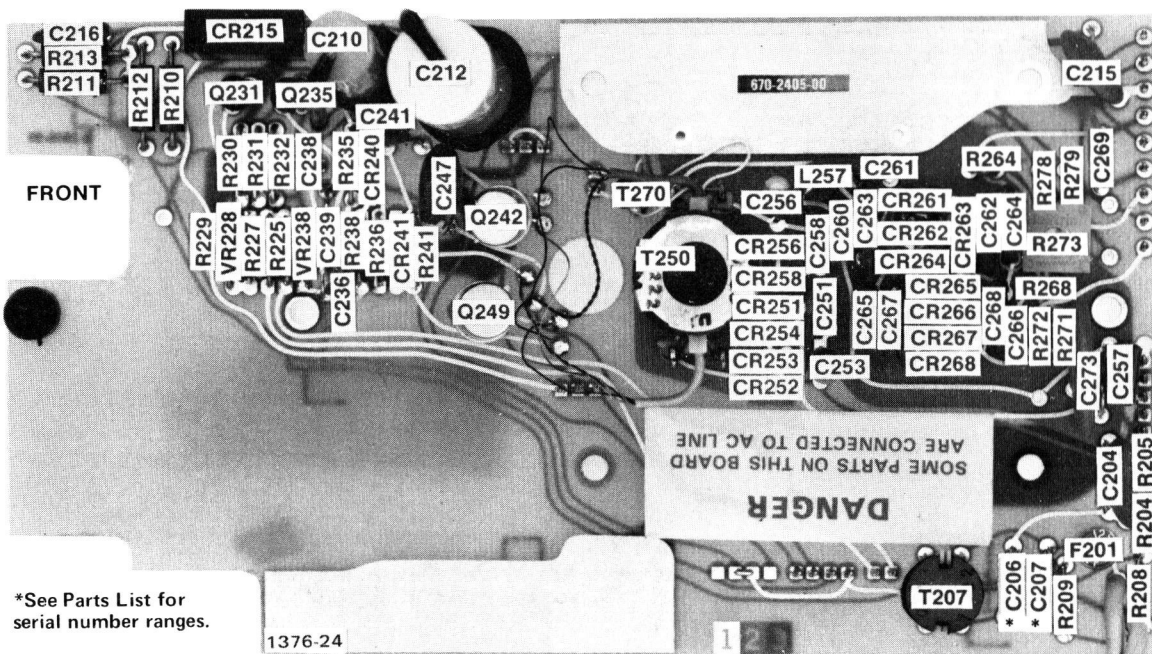
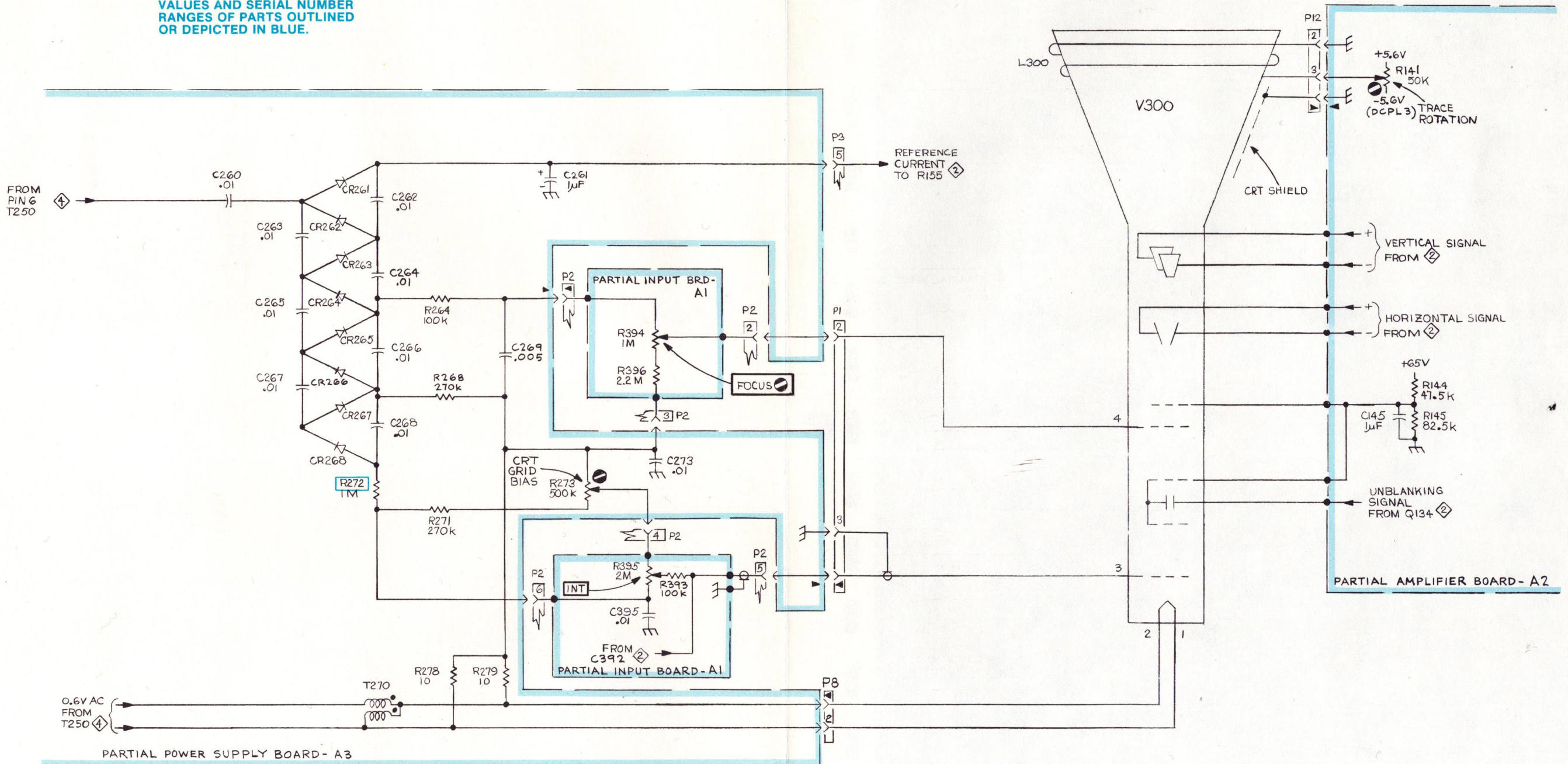


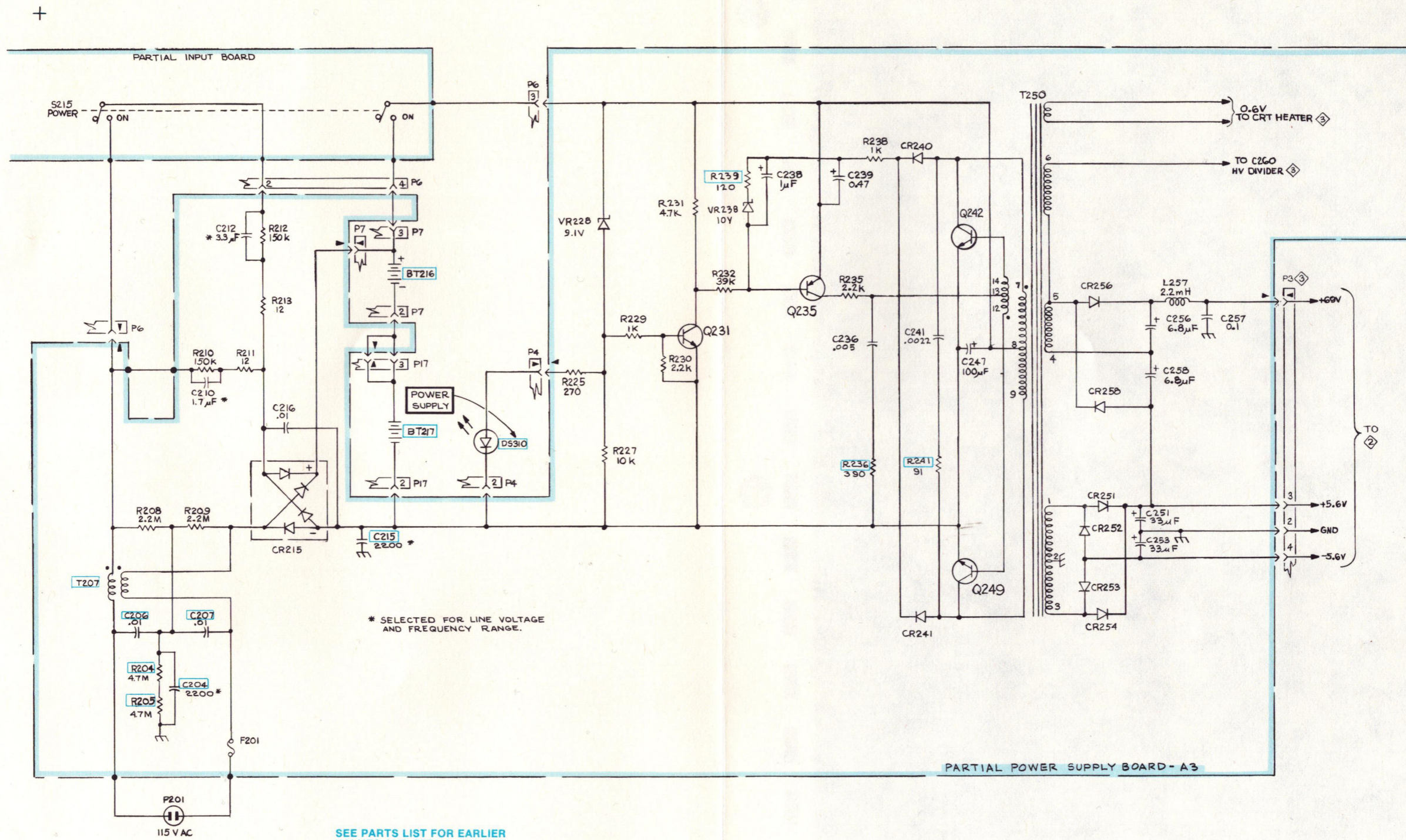
Fig. 8-3B. A3 Power Supply Circuit Board, below SN B040000.



SEE PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES OF PARTS OUTLINED OR DEPICTED IN BLUE.









# 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	ELECTRN	ELECTRON	IN	INCH	SE	SINGLE END
ACTR	NUMBER SIZE	ELEC	ELECTRICAL	INCAND	INCANDESCENT	SECT	SECTION
ADPTR	ACTUATOR	ELECTLT	ELECTROLYTIC	INSUL	INSULATOR	SEMICOND	SEMICONDUCTOR
ALIGN	ADAPTER	ELEM	ELEMENT	INTL	INTERNAL	SHLD	SHIELD
AL	ALIGNMENT	EPL	ELECTRICAL PARTS LIST	LPHLDR	LAMPHOLDER	SHLDR	SHOULDERED
ASSEM	ALUMINUM	EQPT	EQUIPMENT	MACH	MACHINE	SKT	SOCKET
ASSY	ASSEMBLED	EXT	EXTERNAL	MECH	MECHANICAL	SL	SLIDE
ATTEN	ASSEMBLY	FIL	FILLISTER HEAD	MTG	MOUNTING	SLFLKG	SELF-LOCKING
AWG	ATTENUATOR	FLEX	FLEXIBLE	NIP	NIPPLE	SLVG	SLEEVING
BD	AMERICAN WIRE GAGE	FLH	FLAT HEAD	NON WIRE	NOT WIRE WOUND	SPR	SPRING
BRKT	BOARD	FLTR	FILTER	OBD	ORDER BY DESCRIPTION	SQ	SQUARE
BRZ	BRACKET	FR	FRAME or FRONT	OD	OUTSIDE DIAMETER	SST	STAINLESS STEEL
BSHG	BRASS	FSTNR	FASTENER	OVH	OVAL HEAD	STL	STEEL
CAB	BRONZE	FT	FOOT	PH BRZ	PHOSPHOR BRONZE	SW	SWITCH
CAP	BUSHING	FXD	FIXED	PL	PLAIN or PLATE	T	TUBE
CER	CABINET	GSKT	GASKET	PLSTC	PLASTIC	TERM	TERMINAL
CHAS	CAPACITOR	HDL	HANDLE	PN	PART NUMBER	THD	THREAD
CKT	CERAMIC	HEX	HEXAGON	PNH	PAN HEAD	THK	THICK
COMP	CHASSIS	HEX HD	HEXAGONAL HEAD	PWR	POWER	TNSN	TENSION
CONN	CIRCUIT	HEX SOC	HEXAGONAL SOCKET	RCPT	RECEPTACLE	TPG	TAPPING
COV	COMPOSITION	HLCPS	HELICAL COMPRESSION	RES	RESISTOR	TRH	TRUSS HEAD
CPLG	CONNECTOR	HLEXT	HELICAL EXTENSION	RGD	RIGID	V	VOLTAGE
CRT	COVER	HV	HIGH VOLTAGE	RLF	RELIEF	VAR	VARIABLE
DEG	COUPLING	IC	INTEGRATED CIRCUIT	RTNR	RETAINER	W/	WITH
DWR	CATHODE RAY TUBE	ID	INSIDE DIAMETER	SCH	SOCKET HEAD	WSHR	WASHER
	DEGREE	IDENT	IDENTIFICATION	SCOPE	OSCILLOSCOPE	XFMR	TRANSFORMER
	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
08530	RELIANCE MICA CORP.	342-39TH ST.	BROOKLYN, NY 11232
17516	MOORE, MAYNARD H., JR., INC.	430 MAIN ST.	STONEHAM, MA 02180
18121	WILSHIRE FOAM PRODUCTS, INC.	2665 COLUMBIA ST.	TORRANCE, CA 90503
19209	GENERAL ELECTRIC CO., ELECTRONIC CAPACITOR AND BATTERY PRODUCTS DEPT. BATTERY PRODUCTS SEC.	P. O. BOX 114	GAINESVILLE, FL 32601
22526	BERG ELECTRONICS, INC.	YOUK EXPRESSWAY	NEW CUMBERLAND, PA 17070
23050	PRODUCT COMPONENTS CORP	30 LORRAINE AVE.	MT VERNON, NY 10553
71785	TRW, CINCH CONNECTORS	1501 MORSE AVENUE	ELK GROVE VILLAGE, IL 60007
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
75915	LITTELFUSE, INC.	800 E. NORTHWEST HWY	DES PLAINES, IL 60016
76545	MUELLER ELECTRIC CO.	1583 EAST 31ST ST.	CLEVELAND, OH 44114
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120
79727	C-W INDUSTRIES	550 DAVISVILLE RD., P O BOX 96	WARMINISTER, PA 18974
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
80710	ALLEGHENY LUDLUM STEEL CORP., A DIVISION OF ALLEGHENY LUDLUM INDUSTRIES, INC.	BRACKENRIDGE WORKS, RIVER AVE. 2530 CRESCENT DR.	BRACKENRIDGE, PA 15014 BROADVIEW, IL 60153
83385	CENTRAL SCREW CO.		
98278	MALCO A MICRODOT COMPANY, INC. CONNECTOR AND CABLE DIVISION	220 PASADENA AVE.	SOUTH PASADENA, CA 91030



Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-1	366-1468-01		1		KNOB:DARK GRAY	80009	366-1468-01
-2	366-1469-01		1		KNOB:LIGHT GRAY	80009	366-1469-01
-3	366-1322-05		1		KNOB:DARK GRAY--POS	80009	366-1322-05
-4	366-1466-02		1		KNOB:LT GRAY--POS	80009	366-1466-02
-5	366-1322-02		1		KNOB:DARK GRAY--VAR	80009	366-1322-02
-6	366-1466-01		1		KNOB:LT GRAY--VAR	80009	366-1466-01
-7	366-1467-03		1		KNOB:DARK GRAY--TRG	80009	366-1467-03
-8	366-1467-02		1		KNOB:DARK GRAY--INT	80009	366-1467-02
-9	366-1467-01		1		KNOB:DARK GRAY--VAR	80009	366-1467-01
-10	366-1467-04		1		KNOB:DARK GRAY--POS	80009	366-1467-04
-11	366-1470-01		1		KNOB:MEDIUM GRAY	80009	366-1470-01
	-----		1		LAMP,LED:ASSY(SEE DS310 EPL)		
	352-0360-00	B010100 B055576	1		. HOLDER,LED:0.086 ID X 0.20 I OD,PLSTC	80009	352-0360-00
	352-0360-01	B055577	1		. HOLDER,LED:212/214	80009	352-0360-01
-12	348-0285-00		1		FLIP-STAND,CAB:1.94 H X 3.424 INCH WIDE	80009	348-0285-00
-13	211-0018-00		1		SCREW,MACHINE:4-40 X 0.875 PNH,STL	83385	OBD
	437-0147-01		1		CABINET,SCOPE:	80009	437-0147-01
-14	-----		PR		. CABINET,HALVES:		
	337-1703-00		1		. SHIELD,ELEC:UPPER	80009	337-1703-00
	337-1704-00		1		. SHIELD,ELEC:LOWER	80009	337-1704-00
-15	214-1850-00		4		. PIN,ALIGNMENT:CIRCUIT BOARD	80009	214-1850-00
-16	348-0254-00	B010100 B024221	4		. FOOT,CABINET:0.344 H X 0.285 W X 0.8" L	80009	348-0254-00
	348-0254-01	B024222	4		. FOOT,CABINET:BLACK RUBBER	80009	348-0254-01
					(ATTACHING PARTS FOR CABINET)		
-17	211-0213-00		1		SCREW,MACHINE:4-40 X 0.312 INCH,PNH NYLON	23050	OBD
-18	211-0166-00		2		SCREW,MACHINE:4-40 X 1.750,PNH,STL,CD PL	83385	OBD
	355-0181-00		2		STUD,CRYG,HDL:0.312 DIA X 0.50 INCH LONG	80009	355-0181-00
-19	211-0019-00		2		SCREW,MACHINE:4-40 X 1.0 INCH,PNH STL	83385	OBD
					----- * -----		
-20	334-1859-00		1		MARKER,IDENT:STANDARD	80009	334-1859-00
	334-1920-00		1		MARKER,IDENT:90-110V	80009	334-1920-00
	334-1921-00		1		MARKER,IDENT:220-260V	80009	334-1921-00
	-----		-		(OPTION 1 ONLY)		
-21	386-1999-00		1		SUPPORT,CRT:FRONT	80009	386-1999-00
	331-0445-00	XB056450	1		MASK,CRT SCALE:	80009	331-0445-00
-22	378-0691-00		1		FILTER,LT,CRT:BLUE	80009	378-0691-00
-23	354-0423-00		1		RING,SPRT,CRT:RUBBER	80009	354-0423-00
-24	253-0153-00		IN		TAPE,PRESS.SENS:0.25 W X 0.125"THK FOAM	18121	P7/PVC
-25	337-1458-00		1		SHLD,ELECTRON T:CATHODE RAY TUBE	80710	337-1458-00-D
-26	386-2185-00		1		SPRT,CRT SHIELD:REAR	80009	386-2185-00
-27	200-1400-00		1		COVER,PLUG:POWER CORD	80009	200-1400-00
-28	214-1805-00		1		SPOOL,CORD WRAP:	80009	214-1805-00
-29	200-1469-00		2		COVER,CORD WRAP:UPPER & LOWER	80009	200-1469-00
-30	200-1470-00		1		COVER,CORD WRAP:PROBE,UPPER	80009	200-1470-00
-31	200-1467-00		1		COVER,CORD WRAP:PROBE,LOWER	80009	200-1467-00
-32	-----		1		CKT BOARD ASSY:AMPLIFIER(SEE A2 EPL)		
-33	131-0608-00	B010100 B020749	8		. TERMINAL,PIN:0.365 L X 0.25 PH,BRZ,GOLD PL	22526	47357
	131-0608-00	B020750	9		. TERMINAL,PIN:0.365 L X 0.25 PH,BRZ,GOLD PL	22526	47357
-34	131-1172-00		1		. CONTACT,ELEC:CKT CARD GROUND	80009	131-1172-00
-35	136-0252-04		31		. SOCKET,PIN TERM:U/W 0.016-0.018 DIA PINS	22526	75060-007
-36	136-0328-03		12		. SOCKET,PIN TERM:HORIZ,SQ PIN RCPT	22526	47710
	136-0521-00		1		. SOCKET,PLUG-IN:CRT ASSY	80009	136-0521-00
-37	136-0453-00		1		. . . SOCKET,PLUG-IN:11 PIN,CRT	80009	136-0453-00
-38	352-0169-00		1		. . . HLD,TERM CONN:2 WIRE BLACK	80009	352-0169-00
-39	352-0199-00		1		. . . CONN BODY,PL,EL:3 WIRE BLACK	80009	352-0199-00
-40	131-0707-00	B010100 B055769	2		. . . CONNECTOR,TERM.:22-26 AWG,BRS& CU BE GOLD	22526	47439
	131-0707-00	B055770	9		. . . CONNECTOR,TERM.:22-26 AWG,BRS& CU BE GOLD	22526	47439
-41	131-0621-00		3		. . . CONNECTOR,TERM:22-26 AWG,BRS& CU BE GOLD	22526	46231
	131-0371-00	B010100 B055769	7		. . . CONTACT,ELEC:FOR NO.26 AWG WIRE	98278	122-0182-019
	131-1109-00	B010100 B041759	11		. . . CONNECTOR,PLUG:CRIMP ON,FOR 0.4" OD PIN	00779	42869-6
	131-1109-00	B041760	9		. . . CONNECTOR,PLUG:CRIMP ON,FOR 0.4" OD PIN	00779	42869-6
	131-1109-02	B041760	2		. . . CONNECTOR,TERM:CRIMP ON,FOR 0.4" OD PIN	00779	P73-7444
-42	253-0154-00		4		. TAPE,PRESS.SENS:0.125"THK	18121	MT8
-43	342-0113-00		1		. INSULATOR,PLATE:CKT CARD,FILM	80009	342-0113-00
	-----		2		BATTERY ASSY:(SEE BT216/BT217 EPL)		

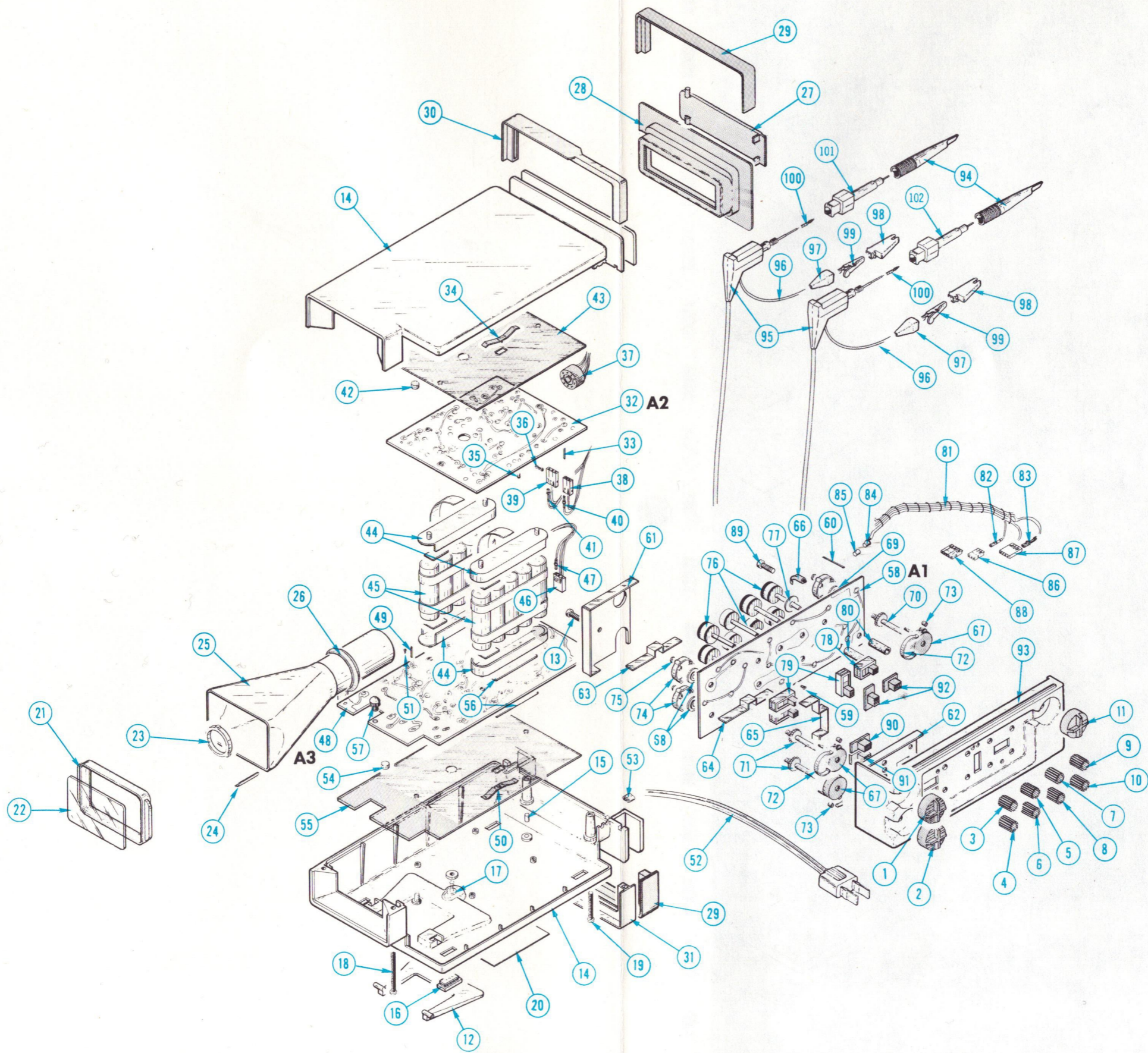
Replaceable Mechanical Parts—212

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
1-44	200-1238-00	B010100 B056119	4	.	.	.	.	.	COVER, BTRY PACK:	80009	200-1238-00
	200-1238-01	B056120	4	.	.	.	.	.	COVER, BAT SET: PLASTIC, BLACK	80009	200-1238-01
-45	146-0016-00	B010100 B056119	2	.	.	.	.	.	BATTERY SET: 6V, 660 MAH, A CELL	19209	41B906FD01-G1
	146-0026-00	B056120	PK	.	.	.	.	.	BATTERY SET: 6V, 660 MAH, 5ACELL	19209	41B906FD02-G1
	198-2129-00	B010100 B056119	1	.	.	.	.	.	WIRE SET, ELEC:	80009	198-2129-00
	198-3183-00	B056120	1	.	.	.	.	.	WIRE SET, ELEC:	80009	198-3183-00
-46	352-0161-00		1	.	.	.	.	.	HLDR, TERM CONN: 3 WIRE BLACK	80009	352-0161-00
-47	131-0707-00		3	.	.	.	.	.	CONNECTOR, TERM.: 22-26 AWG, BRS& CU BE GOLD	22526	47439
	253-0153-00		FT	.	.	.	.	.	TAPE, PRESS. SENS: 0.25 W X 0.125" THK FOAM	18121	P7/PVC
-48	-----		1	.	.	.	.	.	CKT BOARD ASSY: POWER SUPPLY (SEE A3 EPL)		
-49	131-0589-00		27	.	.	.	.	.	TERM, PIN: 0.46 L X 0.025 SQ. PH BRZ GL	22526	47350
-50	131-1172-00		1	.	.	.	.	.	CONTACT, ELEC: CKT CARD GROUND	80009	131-1172-00
-51	136-0252-04		14	.	.	.	.	.	SOCKET, PIN TERM: U/W 0.016-0.018 DIA PINS	22526	75060-007
	344-0255-00	XB030000	2	.	.	.	.	.	CLIP, ELECTRICAL: FUSE MOUNT	80009	344-0255-00
-52	161-0078-01		1	.	.	.	.	.	CABLE ASSY, PWR:	80009	161-0078-01
-53	166-0548-00		1	.	.	.	.	.	FERRULE, RF CA: 0.144 ID X 0.227 OD, GND	80009	166-0548-00
-54	253-0154-00		4	.	.	.	.	.	TAPE, PRESS. SENS: 0.125" THK	18121	MT8
-55	342-0176-00		1	.	.	.	.	.	INSULATOR, FILM: CIRCUIT CARD	80009	342-0176-00
-56	334-1926-00		2	.	.	.	.	.	MARKER, IDENT: DANGER	80009	334-1926-00
-57	348-0089-00		1	.	.	.	.	.	BUMPER, PLASTIC: BLACK VINYL	80009	348-0089-00
-58	-----		1	.	.	.	.	.	CKT BOARD ASSY: INPUT (SEE A1 EPL)		
-59	136-0252-04		74	.	.	.	.	.	SOCKET, PIN TERM: U/W 0.016-0.018 DIA PINS	22526	75060-007
-60	131-0590-00		12	.	.	.	.	.	CONTACT, ELEC: 0.71 INCH LONG	22526	47351
-61	337-1734-00		1	.	.	.	.	.	SHIELD, ELEC: ATTENUATOR, REAR	80009	337-1734-00
-62	337-1735-00		1	.	.	.	.	.	SHIELD, ELEC: ATTENUATOR, FRONT (ATTACHING PARTS)	80009	337-1735-00
	211-0091-00		1	.	.	.	.	.	SCREW, MACHINE: 2-56 X 0.875, OVH, SST	83385	OBD
	210-0001-00		1	.	.	.	.	.	WASHER, LOCK: INTL, 0.092 ID X 0.18" OD, STL	78189	1202-00-00-0541C
	210-0405-00		1	.	.	.	.	.	NUT, PLAIN, HEX.: 2-56 X 0.188 INCH, BRS	73743	2X12157-402
				-	-	-	-	-	* - - - -		
-63	337-1767-00		1	.	.	.	.	.	SHIELD, ELEC: ATTENUATOR, REAR CENTER	80009	337-1767-00
-64	337-1768-00		1	.	.	.	.	.	SHIELD, ELEC: ATTENUATOR, FRONT CENTER	80009	337-1768-00
-65	337-1766-00		1	.	.	.	.	.	SHIELD, ELEC: ATTENUATOR, PERIPHERAL	80009	337-1766-00
-66	343-0213-00		1	.	.	.	.	.	CLAMP, LOOP: PRESS MT, PLASTIC	80009	343-0213-00
-67	380-0244-00		3	.	.	.	.	.	HOUSING, SWITCH: POLYCARBONATE	80009	380-0244-00
-68	401-0127-01		2	.	.	.	.	.	ROTOR, ELEC SW: W/CONTACTS	80009	401-0127-01
-69	401-0127-02		1	.	.	.	.	.	ROTOR-CONT ASSY: DELRIN, W/O CONTACTS	80009	401-0127-02
-70	214-1576-01		1	.	.	.	.	.	DTT-CONT ASSY: 3 CONTACT	80009	214-1576-01
-71	214-1577-01		2	.	.	.	.	.	DTT-CONT ASSY: 2 CONTACT	80009	214-1577-01
-72	214-1579-00		3	.	.	.	.	.	SPRING, DETENT: 0.59 ID X 0.08 W X 0.01 THK	80009	214-1579-00
-73	214-1127-00		3	.	.	.	.	.	ROLLER, DETENT: 0.125 DIA X 0.125 INCH L	80009	214-1127-00
-74	200-1232-00		3	.	.	.	.	.	COVER, RTRY SW: CIRCUIT BOARD (ATTACHING PARTS)	80009	200-1232-00
-75	210-0405-00		9	.	.	.	.	.	NUT, PLAIN, HEX.: 2-56 X 0.188 INCH, BRS	73743	2X12157-402
				-	-	-	-	-	* - - - -		
	200-2262-00	XB057515	2	.	.	.	.	.	COVER, VAR RES:	80009	200-2262-00
-76	-----		8	.	.	.	.	.	RESISTOR, VAR: (SEE R320, R340, R375, R395, R420, R440, R476, R480 EPL)		
	-----		-	.	.	.	.	.	(ATTACHING PARTS)		
-77	210-0933-00		8	.	.	.	.	.	WASHER, NONMETAL: 0.625" DIA, 0.002 MICA	08530	OBD
				-	-	-	-	-	* - - - -		
-78	260-0723-00		1	.	.	.	.	.	SWITCH, SLIDE: DPDT, 0.5A, 125VAC	79727	GF126-0028
-79	260-0984-00	B010100 B043699	3	.	.	.	.	.	SWITCH, SLIDE: DP3T, 0.5A, 125V	79727	G-128-S-0012
	260-0984-01	B043700	3	.	.	.	.	.	SWITCH, SLIDE: DP3T W/PLASTIC PLATE	79727	G-128SPC/
-80	129-0398-00		2	.	.	.	.	.	POST, CONTACT: FOR JACK TIP	80009	129-0398-00
-81	179-1846-00		1	.	.	.	.	.	WIRING HARNESS, :CHASSIS	80009	179-1846-00
-82	131-0707-00		14	.	.	.	.	.	CONNECTOR, TERM.: 22-26 AWG, BRS& CU BE GOLD	22526	47439
-83	131-0621-00		5	.	.	.	.	.	CONNECTOR, TERM: 22-26 AWG, BRS& CU BE GOLD	22526	46231
	131-0622-00		1	.	.	.	.	.	CONTACT, ELEC: 0.577" L, 28-32 AWG WIRE	22526	46241
-84	210-0774-00		1	.	.	.	.	.	EYELET, METALLIC: 0.152 OD X 0.245 INCH L, BRS	80009	210-0774-00
-85	210-0775-00		1	.	.	.	.	.	EYELET, METALLIC: 0.126 OD X 0.23 INCH L, BRS	80009	210-0775-00
-86	352-0162-00		1	.	.	.	.	.	HLDR, TERM CONN: 4 WIRE BLACK	80009	352-0162-00
-87	352-0163-00	B010100 B055318	2	.	.	.	.	.	CONN BODY, PL, EL: 5 WIRE BLACK	80009	352-0163-00
	352-0164-00	B055319	1	.	.	.	.	.	CONN BODY, PL, EL: 6 WIRE BLACK	80009	352-0164-00
	352-0165-00	B055319	1	.	.	.	.	.	CONN BODY, PL, EL: 7 WIRE BLACK	80009	352-0165-00

Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1	2	3	4	5	Name & Description	Mfr Code	Mfr Part Number
1-88	352-0202-00		1	.	.	.	.	.	HLDR,TERM CONN:6 WIRE BLACK (ATTACHING PARTS FOR CKT 8D)	80009	352-0202-00
-89	211-0008-00		3	S	C	R	E	W	SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL - - - * - - -	83385	08D
-90	200-1480-00		1	C	O	V	E	R	COVER,SLIDE SW:DARK GRAY PLASTIC	80009	200-1480-00
-91	200-1480-02		1	C	O	V	E	R	COVER,SLIDE SW:LIGHT GRAY PLASTIC	80009	200-1480-02
-92	200-1480-01		2	C	O	V	E	R	COVER,SLIDE SW:MEDIUM GRAY PLASTIC	80009	200-1480-01
	-----		1	L	A	M	P	A	LAMP ASSY:(SEE 0S310 EPL)		
	352-0360-00	B010100 B055576	1	H	O	L	D	E	HOLDER,LED:0.086 ID X 0.20 I OD,PLSTC	80009	352-0360-00
	352-0360-01	B055577	1	H	O	L	D	E	HOLDER,LED:212/214	80009	352-0360-01
-93	333-1655-00		1	P	A	N	E	L	PANEL,SIDE:	80009	333-1655-00
	010-0262-01	B010100 B054369	1	P	R	O	B	E	PROBE,VOLTAGE:212,48.55 L,PROBE ONLY	80009	010-0262-01
	010-0262-05	B054370	1	P	R	O	B	E	PROBE,VOLTAGE:1 MEG OHM/1 MEG OHM,DARK	80009	010-0262-05
	010-0262-02	B010100 B054369	1	L	E	A	D	,	TEST:1 X,LIGHT GRAY	80009	010-0262-02
	010-0262-04	B054370	1	P	R	O	B	E	PROBE,VOLTAGE:1 X	80009	010-0262-04
-94	013-0107-02		1	T	I	P	,	T	EST PROD:RETRACTABLE HOOK	80009	013-0107-02
-95	175-1288-03	B010100 B054369	1	C	A	B	L	E	CABLE ASSY,RF:94 OHM COAX,49.125 L	80009	175-1288-03
	175-1498-01	B054370	1	C	A	B	L	E	CABLE ASSY,RF:	80009	175-1498-01
-96	175-0940-00	B010100 B054369	1	L	E	A	D	,	ELECTRICAL:STRD,24 AWG,12.5 L	80009	175-0940-00
	175-0940-01	B054370	1	L	E	A	D	,	ELECTRICAL:PROBE COMMON W/CLIP	80009	175-0940-01
-97	200-1281-00	B010100 B054369X	1	C	A	B	L	E	CABLE NIP,ELEC:0.125 ID-0.174 SQ X 0.75	80009	200-1281-00
-98	200-1280-00	B010100 B054369X	1	C	O	V	E	R	COVER,ELEC CLIP:YELLOW VINYL	80009	200-1280-00
-99	344-0024-00	B010100 B054369X	1	C	L	I	P	,	ELECTRICAL:ALLIGATOR TYPE	76545	56896-000
-100	214-0592-00	B010100 B054369X	1	C	O	N	T	A	CONTACT,ELEC:0.429 INCH LONG	71785	318-20-00-003
-101	204-0490-03	B010100 B054369	1	B	O	D	I	,	TEST PROD:DARK GRAY	80009	204-0490-03
	204-0594-01	B054370	1	B	O	D	I	A	SSEMBLY,PROBE:1X	80009	204-0594-01
-102	204-0490-05	B010100 B054369	1	B	O	D	I	,	TEST PROD:LIGHT GRAY	80009	204-0490-05
	204-0594-02	B054370	1	B	O	D	I	A	SSEMBLY,PROBE:1 MEG OHM/1 MEG OHM SILVER	80009	204-0594-02







212 OSCILLOSCOPE



## ACCESSORIES

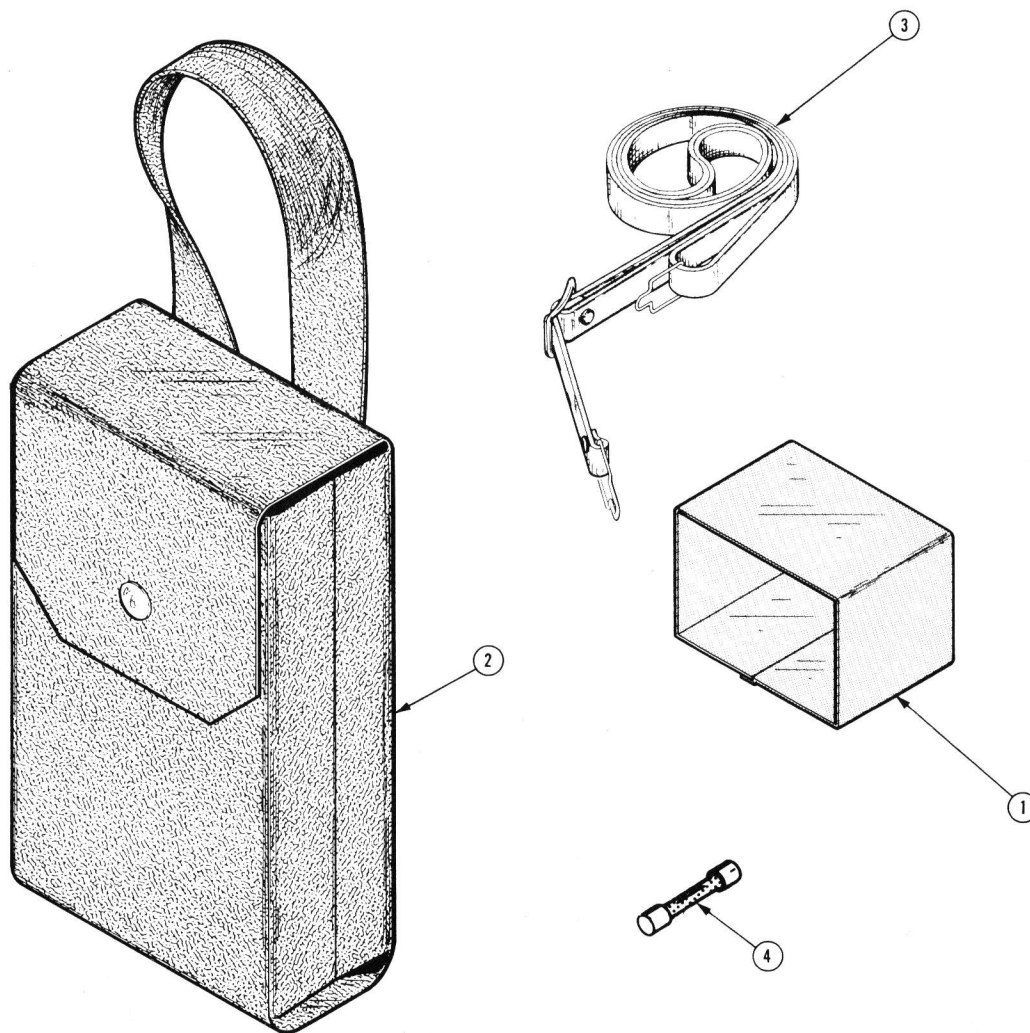
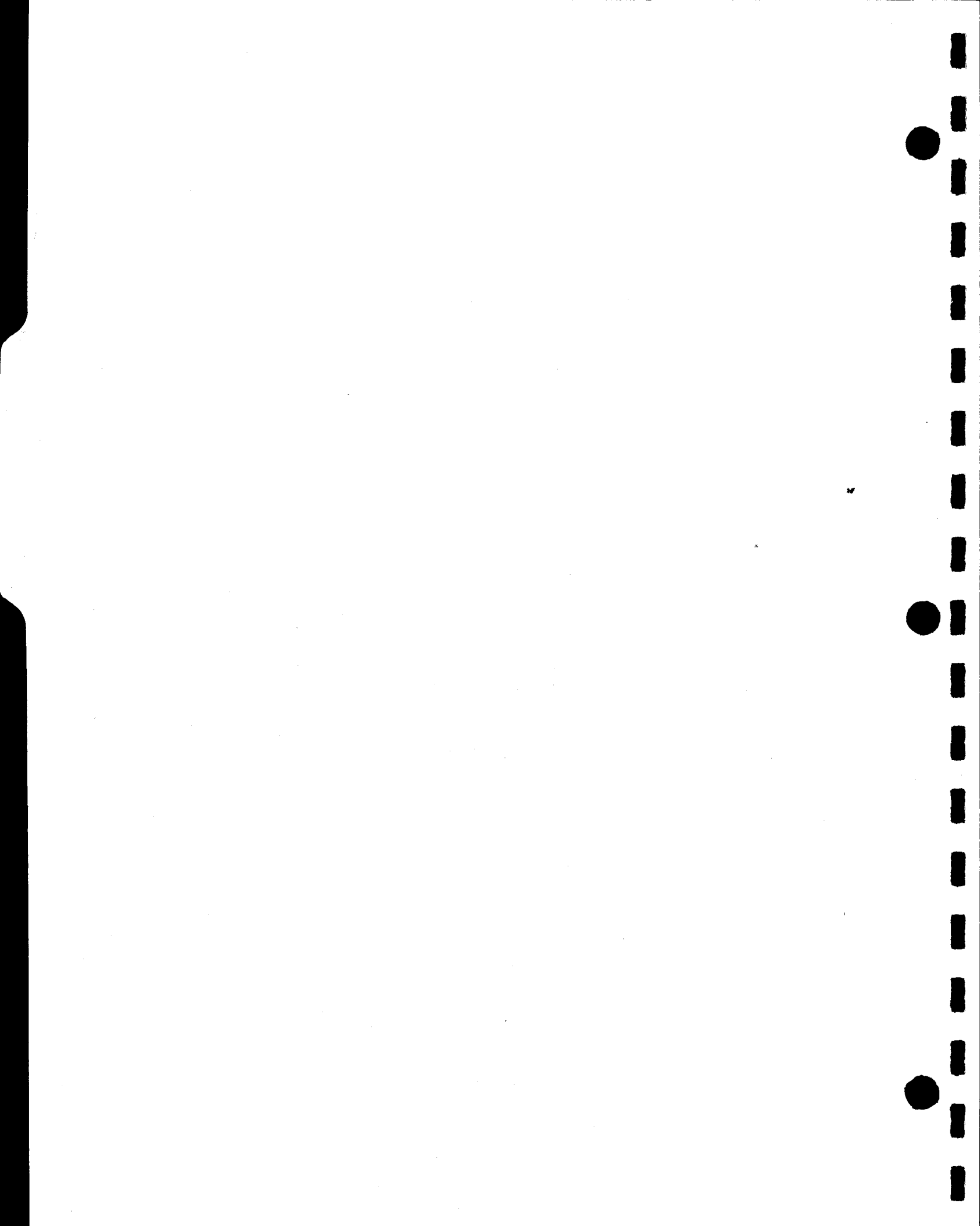


Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Qty	Name & Description					Mfr Code	Mfr Part Number
		Eff	Dscont		1	2	3	4	5		
-1	016-0199-01			1						80009	016-0199-01
-2	016-0512-00			1						80009	016-0512-00
-3	346-0104-00			1						17516	4188-BA
-4	159-0121-00			2						75915	212.400
	070-1375-00			1						80009	070-1375-00
	070-1376-00			1						80009	070-1376-00



## 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 107 108	PG 501 - Risetime less than 3.5 ns into 50 $\Omega$ . PG 501 - 5 V output pulse; 3.5 ns Risetime	107 - Risetime less than 3.0 ns into 50 $\Omega$ . 108 - 10 V output pulse 1 ns Risetime
PG 502 replaces 107 108 111	PG 502 - 5 V output PG 502 - Risetime less than 1 ns; 10 ns Pretrigger pulse delay	108 - 10 V output 111 - Risetime 0.5 ns; 30 to 250 ns Pretrigger pulse delay
PG 508 replaces 114 115 2101	Performance of replacement equipment is the same or better than equipment being replaced.	
PG 506 replaces 106 067-0502-01	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.	190B - Amplitude range 40 mV to 10 V p-p. 0532-01 - Frequency range 65 MHz to 500 MHz.
SG 504 replaces 067-0532-01 067-0650-00	SG 504 - Frequency range 245 MHz to 1050 MHz.	0532-01 - Frequency range 65 MHz to 500 MHz.
TG 501 replaces 180, 180A 181 184 2901	TG 501 - Trigger output-slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time. TG 501 - Trigger output-slaved to market output from 5 sec through 100 ns. One time-mark can be generated at a time. TG 501 - Trigger output-slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.	180A - Trigger pulses 1, 10, 100 Hz; 1, 10, and 100 kHz. Multiple time-marks can be generated simultaneously. 181 - Multiple time-marks 184 - Separate trigger pulses of 1 and 0.1 sec; 10, 1, and 0.1 ms; 10 and 1 $\mu$ s. 2901 - Separate trigger pulses, from 5 sec to 0.1 $\mu$ 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.**