

**TEKTRONIX®**

**SG 502  
OSCILLATOR**

INSTRUCTION MANUAL

Tektronix, Inc.  
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Serial Number \_\_\_\_\_

070-1430-01

1176

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**WARNING**

**The remaining portion of this Table of Contents lists servicing instructions that expose personnel to hazardous voltages. These instructions are for qualified service personnel only.**

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CHANGE INFORMATION



1430-01

Fig. 1-1. SG 502 Oscillator Plug-In Module.

# OPERATING INSTRUCTIONS

## INSTRUMENT DESCRIPTION

The SG 502 generates low distortion sine waves and square waves over a frequency range of 5 Hz to 500 kHz. A stable RC oscillator provides 5 V rms output under no load, or 2.5 V rms into a 600  $\Omega$  load. A continuously-variable control affords greater than 40 dB sine-wave attenuation in addition to pushbutton-selected 10, 20, and 40 dB steps. A 0 to +5 V fixed amplitude square wave, at the same frequency as the sine wave, is available from a separate front panel connector. The SG 502 also features an external sync input which locks the output frequency to

a synchronizing signal. A single dial and five decade pushbuttons provide frequency selection.

The electrical characteristics are valid only if the SG 502 is calibrated at an ambient temperature between +20°C and +30°C and operated between 0°C and +50°C, unless otherwise noted. The outputs must be terminated in 600  $\Omega$  loads.

## PREPARATION FOR USE

### Installation and Removal

#### CAUTION

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

Refer to Fig. 1-2. Check to see that the plastic barriers on the interconnecting jack of the selected Power Module compartment match the cut-outs in the SG 502 circuit board edge connector.

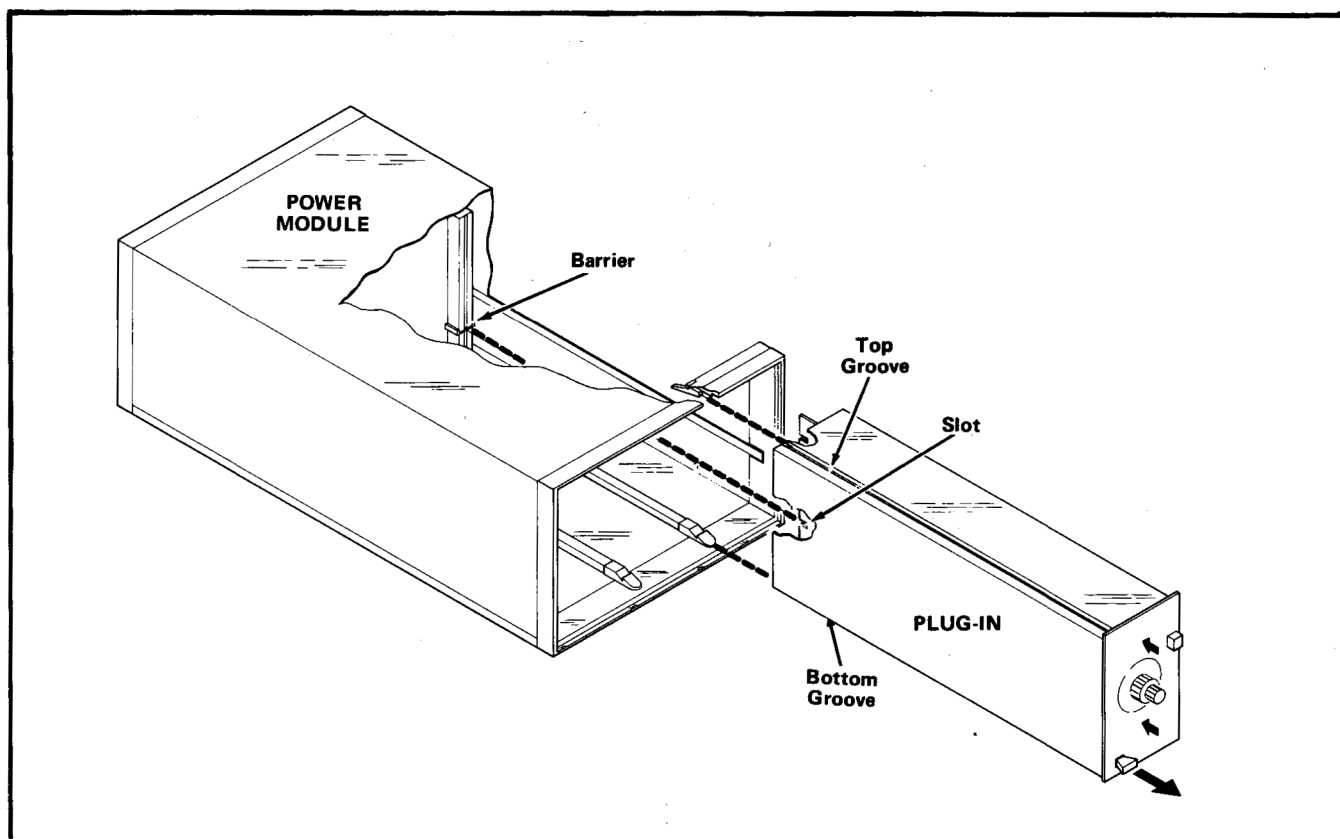


Fig. 1-2. Plug-In Module Installation/removal.

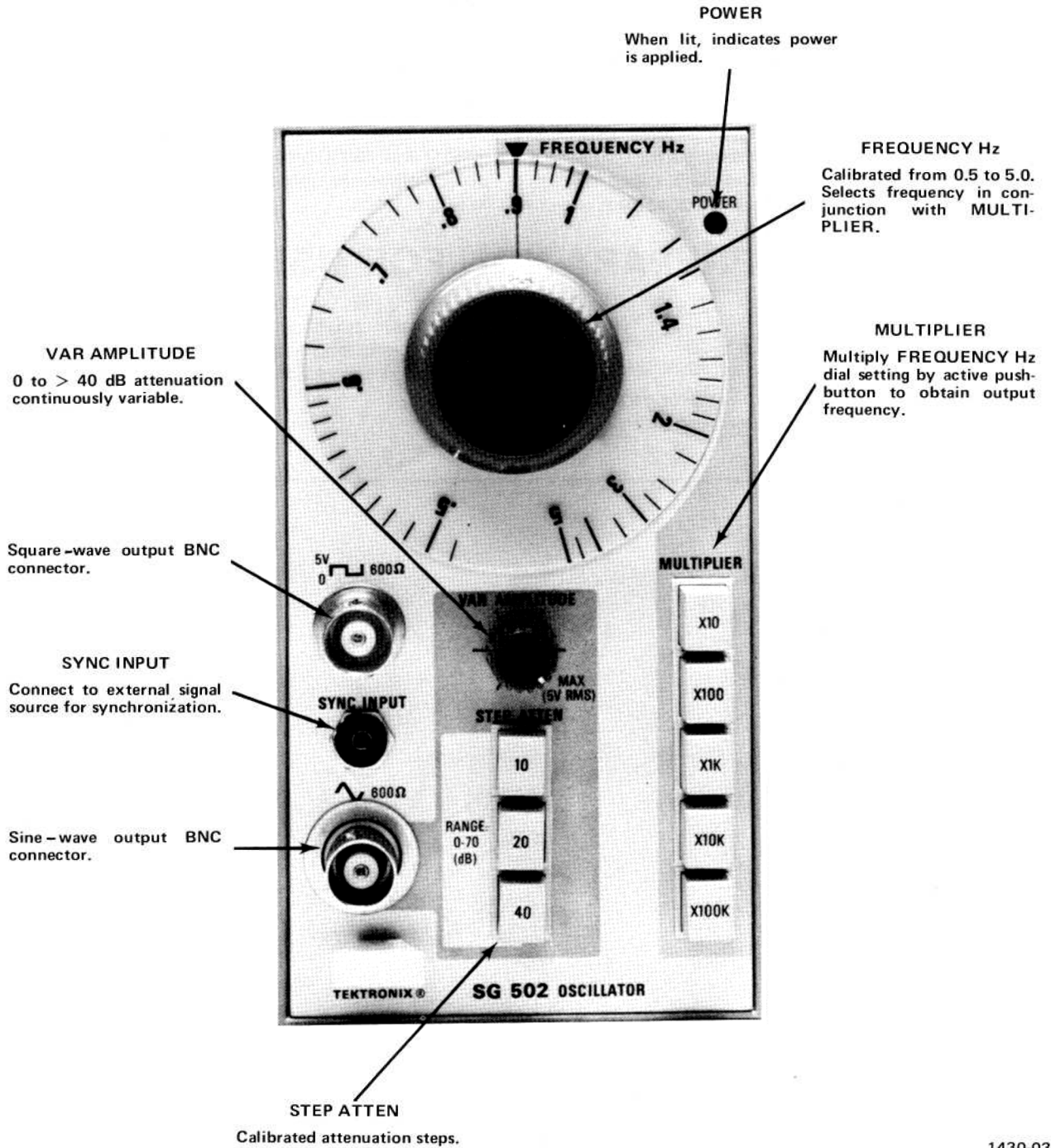


Fig. 1-3. Front panel controls and connectors.

Align the SG 502 chassis with the upper and lower guides of the selected compartment. Push the module in and press firmly to seat the circuit board in the interconnecting jack.

To remove the SG 502, pull on the release latch, located in the lower left corner, until the interconnecting jack disengages and the SG 502 will slide out.

Apply power to the SG 502 by pulling out the power switch knob of the Power Module.

## Controls and Connectors

Refer to Fig. 1-3. Even though the SG 502 is fully calibrated and ready to use, the functions and actions of the controls and connectors should be reviewed before attempting to use it. Note the STEP ATTEN pushbuttons are push-push actions, while all the rest are self-cancelling actions. Note also that the POWER light is the only visual indication that the power is being applied to the SG 502.

# OPERATING CONSIDERATIONS

## Making Connections

Fig. 1-4 shows an equivalent circuit for the  $600\ \Omega$  sine-wave and square-wave outputs of the SG 502. A  $50\ \Omega$  coaxial cable adds about  $30\ \text{pF}$  per foot to the output. Use short cables to avoid reduced sine-wave amplitude and rounded square waves, especially at higher frequencies.

## Synchronization With an External Device

To synchronize the SG 502 with an external oscillator, plug the sine-wave output of the external oscillator into the SYNC INPUT jack on the front panel. Attempting synchronization with other than a sine-wave may cause harmonic distortion of the SG 502 output. Maximum purity is obtained when both signals are the same frequency.

The frequency range over which the synchronization occurs depends upon the amplitude of the synchronizing signal. The voltage required for synchronization varies linearly from  $0\ \text{V}$  (when the frequencies are identical) to approximately  $5\ \text{V rms}$  (when the frequencies differ by 5%).

Approximately a  $1\ \text{V p-p}$  sine wave at the oscillator frequency is available from the SYNC INPUT connector. The source impedance is  $10\ \text{k}\Omega$ .

## Synchronizing an External Device

The  $+5\ \text{V}$  square-wave output can be used to synchronize an external device such as a counter or oscilloscope. The square-wave amplitude will be  $+5\ \text{V}$  open-circuited, and will decrease as the load impedance decreases.

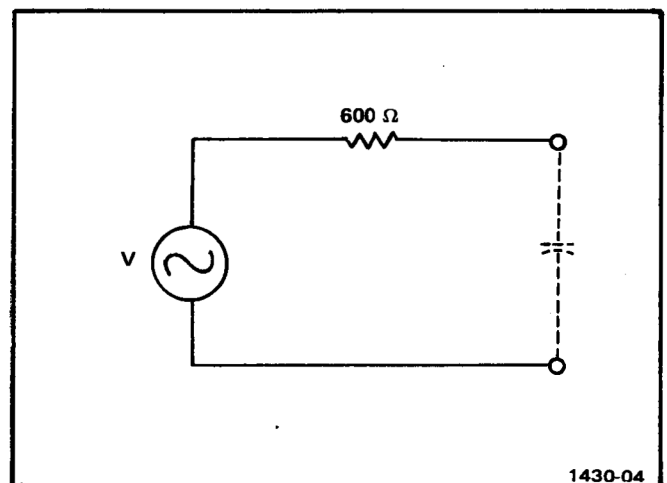


Fig. 1-4. Equivalent  $600\ \Omega$  output circuits.

## 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**

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

# SPECIFICATION AND PERFORMANCE CHECK

## SPECIFICATIONS

Table 2-1

### Electrical Characteristics

| Characteristics        | Performance Requirements                                                                                   | Supplemental Information |
|------------------------|------------------------------------------------------------------------------------------------------------|--------------------------|
| Sine Wave              |                                                                                                            |                          |
| Frequency Range        | 5 Hz to 500 kHz                                                                                            |                          |
| Calibration Accuracy   | Within 5% of dial setting from 5 Hz to less than 50 kHz; within 10% of dial setting from 50 kHz to 500 kHz |                          |
| Amplitude Response     | Within 0.3 dB over entire range (1 kHz reference)                                                          |                          |
| Maximum Output Voltage | 5 V rms, open circuit, 2.5 V rms into a 600 $\Omega$ load                                                  |                          |
| Harmonic Distortion    | Less than 0.035% from 20 Hz to 50 kHz. Less than 0.15% over the remaining frequency range                  |                          |
| Hum/Noise              | Less than 0.1% of rated output                                                                             |                          |
| Attenuation            | 0 to greater than 40 dB continuously variable. 10, 20, and 40 dB steps within $\pm 2\%$ for each step      |                          |
| Square Wave            |                                                                                                            |                          |
| Frequency Range        | 5 Hz to 500 kHz                                                                                            |                          |
| Amplitude              | Approximately +5 V open-circuit (+2.5 V into a 600 $\Omega$ load)                                          |                          |
| Rise and Fall Time     | Less than 50 ns into 50 $\Omega$ or 600 $\Omega$ ; terminated and measured at the front panel              |                          |
| Sync Input             |                                                                                                            |                          |
| Input Impedance        |                                                                                                            | 10 k $\Omega$            |

## PERFORMANCE CHECK

### Introduction

This procedure checks the electrical characteristics of the SG 502 that appear in the Specification. If the instrument fails to meet the requirements given in this performance check, the calibration procedure should be performed. This procedure can also be used by an incoming inspection facility to determine acceptability of performance.

The electrical characteristics are valid only if the SG 502 is calibrated at an ambient temperature of +20°C to +30°C and operated at an ambient temperature of 0°C to +50°C. Forced air circulation is required for ambient temperatures above +40°C.

Tolerances that are specified in this performance check procedure apply to the instrument under test and do not include test equipment error.



## Specifications and Performance Check—SG 502

### Test Equipment Required

The following test equipment, or equivalent, is required to perform the performance check. Test equipment characteristics listed are the minimum required to verify the performance of the equipment under test. Substitute equipment must meet or exceed the stated requirements. All test equipment is assumed to be operating within tolerance.

Special test devices are used where necessary to facilitate the procedure. Most of these are available from Tektronix, Inc. and can be ordered through your local Tektronix Field Office or representative.

**Table 2-2**  
**List of Test Equipment Requirements**

| Description         | Performance Requirements                                                                                                                                                   | Application                                                                                 | Example                                                   |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| Oscilloscope        | Bandwidth, dc to 50 MHz; minimum deflection factor, 5 mV/div; sweep rate, to at least 50 ns/div; differential comparator amplifier, comparison voltage, 0 V to $\pm 10$ V. | Used throughout procedure to provide display.                                               | a. Tektronix 5440, 5A45, 5A13N, 5B42 Oscilloscope System. |
| Counter             | Maximum Frequency, 500 kHz; Period Avg mode capable to $10^3$ ; Output sensitivity, 5 V; Display accuracy, 1 count in $10^3$ .                                             | Used for step 1.                                                                            | a. Tektronix DC 503. <sup>1</sup>                         |
| Distortion Analyzer | Measure harmonic distortion, less than .035% from 20 Hz to 50 kHz; less than 0.15% over the remaining frequency range.                                                     | Used for steps 3, 4, and 6.                                                                 | a. Hewlett-Packard HP334A.                                |
| Power Module        | Accepts TM 500-series plug-ins.                                                                                                                                            | Provides power for SG 502 and DC 503.                                                       | a. Tektronix TM 503.                                      |
| 10X passive probe   | Compatible with test oscilloscope to be used                                                                                                                               | Used for steps 7 and 8.                                                                     | a. Tektronix P6060 probe.                                 |
| Termination         | Impedance, 50 $\Omega$ ; connectors, BNC; accuracy, 2%                                                                                                                     | Output termination for signal generators, if amplifier is not 50 $\Omega$ input impedance.  | a. Tektronix Part No. 011-0049-01.                        |
| Termination         | Impedance, 600 $\Omega$ ; connectors, BNC.                                                                                                                                 | Output termination for signal generators, if amplifier is not 600 $\Omega$ input impedance. | a. Tektronix Part No. 011-0092-00.                        |
| Adapter             | Connectors, banana plug to BNC.                                                                                                                                            | Harmonic distortion and sine-wave output check.                                             | a. Tektronix Part No. 103-0090-00.                        |
| Cable               | Impedance, 50 $\Omega$ ; type RG-58U; length, 42 inches; connectors, BNC.                                                                                                  | Used for signal connection throughout procedure.                                            | a. Tektronix Part No. 012-0057-01.                        |

<sup>1</sup>Requires TM 500 series power module.

**Preliminary Procedure**

1. Ensure that the correct nominal line selector block has been installed on the line selector pins on the Power Module interface board and the regulating range selected includes the applied line voltage. Refer to the installation section of the Power Module manual.

2. Ensure that all test equipment is suitably adapted to the applied line voltage.

3. Install the SG 502 into the Power Module, and if applicable, install the TM 500 series test equipment into the test equipment Power Module.

4. Connect the equipment under test and the test equipment to a suitable line voltage source. Turn all equipment on and allow at least 20 minutes for the equipment to stabilize.

**Initial Control Settings**

Set the following controls during warm-up time:

**Oscilloscope**

Intensity, Focus                      Set for well-defined trace and normal brightness.

**Differential Comparator**

Volts/Div                                1 V  
 Variable                                fully clockwise (cal)  
 + Input                                 DC  
 - Input                                 GND  
 Bandwidth Limit                      pushbutton in  
                                               (Full bandwidth)

**Time Base Plug-in**

Seconds/Div                            1 ms  
 Main Variable                        fully clockwise (cal)  
 Triggering                             selected  
     + Slope                             selected  
     Auto Trig                          selected  
     AC Coupl                          selected  
     Source                              Left  
 Position                                Set so trace starts at left side of graticule.  
 Swp Mag                                normal sweep

**Counter**

CH A                                      (not used)  
 CH B                                      (not used)  
 Level                                      External source and mid-range  
 Attenuation                            X1  
 Coupling                                dc  
     + Slope                             selected  
 Function                                Period B  
 N/Clock Rate switch                10<sup>3</sup>—1 ms  
 Hold                                        fully counterclockwise  
                                               (minimum)

**SG 502**

VAR AMPLITUDE                      fully clockwise  
 MULTIPLIER switch                X100K (pushbutton in)  
 STEP ATTEN                          all pushbuttons out  
 FREQUENCY Hz dial                any position

# PERFORMANCE CHECK PROCEDURE

## 1. Check Dial Accuracy; dial accuracy is within 5%, 5 Hz to less than 50 kHz; within 10%, 50 kHz to 500 kHz.

- a. Connect a 50 Ω cable to the SG 502 Square-wave output connector.
- b. Connect a 600 Ω termination to the other end of the cable.
- c. Connect the 600 Ω termination to the Counter CH B input connector.
- d. CHECK—Dial settings and display using the following chart.

| SG 502 MULTIPLIER | SG 502 FREQUENCY Hz dial | Counter RATE Switch | Counter Reading |
|-------------------|--------------------------|---------------------|-----------------|
| X100K             | 5                        | 10 <sup>3</sup>     | 1.80—2.20 μs    |
| X10K              | 5                        | 10 <sup>3</sup>     | 18.0—22.0 μs    |
| X1K               | 5                        | 10 <sup>3</sup>     | 190—210 μs      |
| X100              | 5                        | 1                   | 1.90—2.10 ms    |
| X10               | 5                        | 1                   | 19.0—21.0 ms    |
| X10               | .5                       | 1                   | 190—210 ms      |
| X100              | .5                       | 1                   | 19.0—21.0 ms    |
| X1K               | .5                       | 1                   | 1.90—2.10 ms    |
| X10K              | .5                       | 10 <sup>3</sup>     | 190—210 μs      |
| X100K             | .5                       | 10 <sup>3</sup>     | 18.0—22.0 μs    |
| X100K             | 1                        | 10 <sup>3</sup>     | 9.00—11.0 μs    |
| X10K              | 1                        | 10 <sup>3</sup>     | 95.0—105 μs     |
| X1K               | 1                        | 1                   | .095—1.05 ms    |
| X100              | 1                        | 1                   | 9.50—10.5 ms    |
| X10               | 1                        | 1                   | 95.0—105ms      |

- e. Disconnect the 600 Ω termination from the Counter and connect it to the SG 502 sine-wave output connector.
- f. Disconnect the 50 Ω cable from the SG 502 square-wave output connector, and connect it to the Vertical Amplifier + Input.

## 2. Check Sine-wave Amplitude; response is within .3 dB over entire range (1 kHz reference).

- a. Set time-base Time/Div switch to .5 μs.
- b. Set the time-base triggering controls for an un-triggered condition.
- c. Adjust SG 502 VAR AMPLITUDE control for a 6 division display on the oscilloscope.

- d. Use the following chart to check the sine-wave response.

| SG 502 MULTIPLIER Switch | SG 502 FREQUENCY Hz dial | Oscilloscope display Amplitude Limits |
|--------------------------|--------------------------|---------------------------------------|
| X10                      | .5                       | 5.79 to 6.21 div                      |
| X100                     | .5                       | "                                     |
| X1K                      | .5                       | "                                     |
| X10K                     | .5                       | "                                     |
| X100K                    | .5                       | "                                     |
| X100K                    | 1                        | "                                     |
| X10K                     | 1                        | "                                     |
| X1K                      | 1                        | "                                     |
| X100                     | 1                        | "                                     |
| X10                      | 1                        | "                                     |
| X10                      | 5                        | "                                     |
| X100                     | 5                        | "                                     |
| X1K                      | 5                        | "                                     |
| X10K                     | 5                        | "                                     |
| X100K                    | 5                        | "                                     |

- e. Disconnect the 50 Ω cable from the Vertical Amplifier + Input connector.

## 3. Check Sine-wave Output Voltage; 2.5 V rms, into 600 Ω, ±0.15 V.

- a. Preset the following front-panel control setting:
 

|                     |           |
|---------------------|-----------|
| Distortion Analyzer |           |
| Function            | Voltmeter |
| Meter Range         | 3 volts   |
| Input               | Norm      |
| SG 502              |           |
| Var Amplitude       | Fully cw  |

- b. Connect a Banana-to-BNC adapter to the Distortion Analyzer Input.
- c. Connect the 50 Ω cable from the 600 Ω termination on the SG 502, to the adapter.
- d. CHECK—Meter reads between 2.45 and 2.65 volts on the 0 to 3 volt scale.
- e. Disconnect the cable from the adapter, and connect it to the + Input of the Vertical Amplifier.

**4. Check Attenuation; 10, 20, and 40 dB steps within  $\pm 2\%$  for each step.**

- a. Set SG 502 FREQUENCY dial to 1.
- b. Set SG 502 MULTIPLIER switch to X1K (pushbutton in).
- c. Adjust SG 502 VAR AMPLITUDE control for a 5 division display on test oscilloscope.
- d. Set SG 502 STEP ATTEN switch to 10 (pushbutton in).
- e. Set 5A13N Volts/Div switch to 0.5 V/Div.
- f. CHECK—Display on test oscilloscope is between 3.1 and 3.3 divisions in amplitude.
- g. Set SG 502 STEP ATTEN switch to 20 (pushbutton in).
- h. Push and release SG 502 STEP ATTEN 10 switch (pushbutton out).
- i. Set 5A13N Volts/Div switch to 0.1 V.
- j. CHECK—Display on test oscilloscope is between 4.9 and 5.1 divisions in amplitude.
- k. Set SG 502 STEP ATTEN switch to 40 (pushbutton in).
- l. Push and release SG 502 STEP ATTEN 20 switch (pushbutton out).
- m. Set 5A13N Volts/Div switch to 10 mV.
- n. CHECK—Display on test oscilloscope is between 4.9 and 5.1 divisions in amplitude.
- o. Set 5A13N Volts/Div switch to 1 V.
- p. Push and release SG 502 STEP ATTEN 40 switch (pushbutton out).
- q. Adjust SG 502 VAR AMPLITUDE slowly counterclockwise and observe display on test oscilloscope for a smooth decrease in amplitude.
- r. Set SG 502 VAR AMPLITUDE fully clockwise.

**5. Check Hum/Noise; is less than 0.1% of rated output.**

- a. Adjust SG 502 VAR AMPLITUDE for a 6-division display on the test oscilloscope.
- b. Set SG 502 FREQUENCY dial to 5 and MULTIPLIER switch to X10 (pushbutton in).
- c. Set the time-base sweep rate to 20 ms.
- d. Set the 5A13N – Input to Vc (pushbutton in), and the Volts/Div switch to 5 mV.
- e. Adjust the 5A13N Comparison Voltage Fine control to position the top of the trace to the center of the graticule area.
- f. CHECK—Hum/Noise is less than 1.2 division.
- g. Set the time-base sweep rate to 10 ms.
- h. Set the SG 502 MULTIPLIER switch to X100 (pushbutton in).
- i. CHECK—Hum/Noise is less than 1.2 division.
- j. Set SG 502 MULTIPLIER switch to X1K (pushbutton in).
- k. CHECK—Hum/Noise is less than 1.2 division.
- l. Set SG 502 MULTIPLIER switch to X10K (pushbutton in).
- m. Set the time-base sweep rate to 5 ms.
- n. Set the 5A13N Comparison Voltage Fine control so the Volts display reads 3.00, then adjust the control counterclockwise to position the top of the trace to the center of graticule area.
- o. CHECK—Hum/Noise is less than 1.2 division.
- p. Set SG 502 MULTIPLIER switch to X100K (pushbutton in).
- q. CHECK—Hum/Noise is less than 1.2 division.
- r. Remove the 50  $\Omega$  cable from the 5A13N + Input.
- s. Set the 5A13N – Input to GND.

## Specifications and Performance Check—SG 502

### 6. Check Harmonic Distortion; is less than 0.035% from 20 Hz to 50 kHz; less than 0.15% over the remaining frequency range.

- a. Preset the following front-panel controls settings:

#### SG 502 Oscillator

|                   |                     |
|-------------------|---------------------|
| VAR AMPLITUDE     | fully clockwise     |
| MULTIPLIER switch | X10 (pushbutton in) |
| STEP ATTEN        | pushbuttons out     |
| FREQUENCY Hz dial | .5                  |

#### HP334A Distortion Analyzer

|                         |           |
|-------------------------|-----------|
| Line                    | ON        |
| Input                   | Norm      |
| Function                | Set Level |
| Sensitivity             | Min       |
| Vernier                 | midrange  |
| Mode                    | Automatic |
| Frequency               | 5 Hz      |
| Frequency Range         | 1 Hz      |
| Balance Coarse and Fine | midrange  |
| High Pass Filter        | OUT       |
| Meter Range             | Set Level |

- b. Connect a Banana plug to BNC adapter to the Analyzer INPUT.

- c. Connect a 600  $\Omega$  termination to the Banana plug to BNC adapter.

- d. Connect a 50  $\Omega$  cable from the SG 502 sine-wave output connector to the 600  $\Omega$  termination.

- e. Set the Analyzer Sensitivity and Vernier for a meter reading of 1 on the 0 to 1 scale.

- f. Set Analyzer Function control to Distortion.

- g. Adjust Analyzer Frequency dial and Balance controls for minimum reading on the meter.

- h. Set the Analyzer Meter Range control to .3 on the percentage scale.

- i. CHECK—Analyzer meter reads less than 1.5 on the 0 to 3 scale.

- j. Set Analyzer Meter Range and the Function controls to Set Level.

- k. Set SG 502 Frequency dial to 2, and the MULTIPLIER switch to X100.

- l. Set Analyzer Frequency dial to approximately 20; set Analyzer Frequency Range control to X10 (frequency 200 Hz).

- m. Set Analyzer Vernier control for a meter reading of 1 on the 0 to 1 scale.

- n. Set Analyzer Function control to Distortion.

- o. Adjust Analyzer Frequency dial and Balance controls for minimum reading on the meter.

- p. Set Analyzer Meter Range control to .1 on the percentage scale.

- q. CHECK—Analyzer meter reads less than .035 on the 0 to .1 scale.

- r. Set Analyzer Meter Range and Function controls to Set Level.

- s. Set SG 502 FREQUENCY dial to 5, and the MULTIPLIER switch to X1K.

- t. Set Analyzer Frequency dial to approximately 50.

- u. Set Analyzer Frequency Range control to X100, (frequency 5 kHz).

- v. Repeat parts m, n, o, and p of this step.

- w. CHECK—Analyzer meter reads less than .035 on the 0 to .1 scale.

- x. Set Analyzer Meter Range and Function controls to Set Level; set Analyzer Frequency Range control to X1K (frequency 50 kHz).

- y. Set SG 502 MULTIPLIER switch to X10K.

- z. Repeat parts m, n, o, and p of this step.

- aa. CHECK—Analyzer meter reads less than .035 on the 0 to .1 scale.

- ab. Set Analyzer Meter Range and Function controls to Set Level.

- ac. Set SG 502 MULTIPLIER switch to X100K.

- ad. Set Analyzer Frequency Range control to X10K, (frequency 500 kHz).

- ae. Repeat parts m, n, and o of this step.

- af. Set Analyzer Meter Range control to .3 on the percentage scale.

- ag. CHECK—Analyzer meter reads less than 1.5 on the 0 to 3 scale.

- ah. Remove the 600  $\Omega$  termination and 50  $\Omega$  cable from the SG 502 and the Analyzer.

**7. Check Square-wave amplitude; 2.5 V into 600 Ω, within 250 mV.**

- a. Preset the following front-panel control settings:

**Oscilloscope**

Intensity, Focus                      Set for well-defined trace and normal brightness.

**Differential Comparator Plug-In**

Volts/Div                                50 mV  
 Variable                                fully clockwise (cal)  
 + Input                                 DC  
 – Input                                 GND

**Time Base Plug-In**

Time/Div                                1 ms  
 Variable                                fully clockwise (cal)  
 Triggering  
     Level/Slope                        positive slope region  
     Mode                                AUTO TRIG  
     Coupling                            AC  
     Source                              Internal  
 Position                                Set so trace starts at left side of graticule.  
 Swp Mag                                out

**SG 502**

FREQUENCY Hz dial                5  
 MULTIPLIER Switch                X100K (pushbutton in)

- b. Connect a 600 Ω termination to the SG 502 square-wave output connector.
- c. Connect a 10X probe to the 5A13N + Input connector.
- d. Connect the probe ground clip to the outer portion of the 600 Ω termination.
- e. Connect the probe tip to the inner connector of the 600 Ω termination.
- f. CHECK—Display on test oscilloscope is between 4.5 and 5.5 division in amplitude.

**8. Check Square-wave rise and fall time; 50 ns or less.**

- a. Leave controls of test equipment and cable connections as described in step 7 a through e.
- b. Set 5A45 Volts/Div switch to 20 mV.
- c. Adjust the 5A45 Variable control for a 6-division display.
- d. Set time-base Time/Div switch to 50 ns.
- e. CHECK—Waveform rises from its 10% to 90% point within 50 ns (1 division).
- f. Adjust the time-base Level/Slope control to its negative slope region.
- g. CHECK—Waveform falls from its 90% to 10% point within 50 ns (1 division).
- h. Remove all connections from the SG 502 and 5A45.

This completes the performance check of the SG 502.

# ADJUSTMENT

## Introduction

This adjustment procedure is to be used to restore the SG 502 to its original performance specification. Adjustment need not be performed unless the instrument fails to meet the requirements listed in the Specification section, or the Performance Check cannot be completed satisfactorily.

Completion of all adjustment steps in this procedure ensures that the instrument will meet the performance requirements listed in the Specification section. However, to fully ensure satisfactory performance, it is recommended that the Performance Check be performed after any adjustment is made.

## Services Available

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

## Test Equipment Required

The following test equipment is required to perform the Adjustment Procedure. A dc voltmeter with the following specifications is required for checking the dc power supplies: Range:  $\pm 20$  volts; Accuracy: 1% or better; Recommended equipment: Tektronix DM 501 Digital Multimeter.

A flexible plug-in extender, Tektronix Part No. 067-0645-01, is useful for troubleshooting or adjusting the SG 502; however, the complete Adjustment Procedure can be performed without use of the extender.

A TM 500-series Power Module is required for troubleshooting or adjusting the SG 502. Recommended equipment: Tektronix TM 503.

## Preparation

a. Remove the left side cover of the SG 502 to gain access to the component side of the circuit board. Pull the rear end of the side cover outward from the side of the instrument (the cover snaps into place).

b. If the SG 502 is to be adjusted without use of the flexible plug-in extender, remove the Power Module cabinet cover.

c. Install the SG 502 into the left Power Module compartment, or if appropriate, connect the SG 502 to the Power Module by means of the flexible plug-in extender.

d. Set the Power Module for the line voltage to be applied (see Power Module manual) and connect it to the line voltage source. Be sure that the power switch is off.

e. Install all TM 500-series equipment, including the SG 502 into the Power Module.

f. Connect all test equipment to a suitable line voltage source.

g. Turn on all test equipment and allow at least twenty minutes for the equipment to warm up and stabilize.

## Initial Control Settings

Set the following controls during warm-up time:

### SG 502 Oscillator

|                   |                       |
|-------------------|-----------------------|
| VAR AMPLITUDE     | fully clockwise       |
| MULTIPLIER switch | X100K (pushbutton in) |
| STEP ATTEN        | all pushbuttons out   |
| FREQUENCY Hz dial | any position          |

## Adjustment—SG 502

### 1. Check Power Supply Voltages

- a. Connect the digital voltmeter between +20 V test point on the circuit board, and chassis ground. See Fig. 3-1 for voltage test point location.
- b. CHECK—For a meter reading of +21.0 to +19.0 volts.
- c. Repeat part a of this step for the -20 volt supply.
- d. CHECK—For a meter reading of -21.0 to -19.0 volts.
- e. Disconnect the digital voltmeter.

### 2. Adjust AGC Voltage

- a. Connect the digital voltmeter between the AGC test point on the circuit board, and chassis ground. See Fig. 3-1 for test point location.
- b. Set the Oscillator FREQUENCY Hz dial to 5, the VAR AMPLITUDE control fully clockwise, and press in the X100K MULTIPLIER pushbutton. All STEP ATTEN pushbuttons must be out.
- c. ADJUST—AGC Adjust, R115, for a meter reading of -2.5 volts. See Fig. 3-1 for adjustment location.
- d. Disconnect the digital voltmeter.

### 3. Adjust Output Voltage

- a. Connect an ac voltmeter between the sinewave output BNC connector on the front panel and chassis ground.
- b. Turn the VAR AMPLITUDE control fully clockwise and check that all STEP ATTEN pushbuttons are out.
- c. Set the FREQUENCY Hz dial and the MULTIPLIER pushbuttons for a 1 kHz signal.
- d. ADJUST—Gain Adjust, R191, for a meter reading of 5 volts, rms. See Fig. 3-1 for adjustment location.
- e. Connect a 600  $\Omega$  termination to the BNC sinewave output connector.
- f. Connect an ac voltmeter between the 600  $\Omega$  termination and chassis ground.
- g. CHECK—For a meter reading of 2.5 volts, rms.
- h. Disconnect the voltmeter and remove the 600  $\Omega$  termination.

This completes the Adjustment procedure of the SG 502 Oscillator.

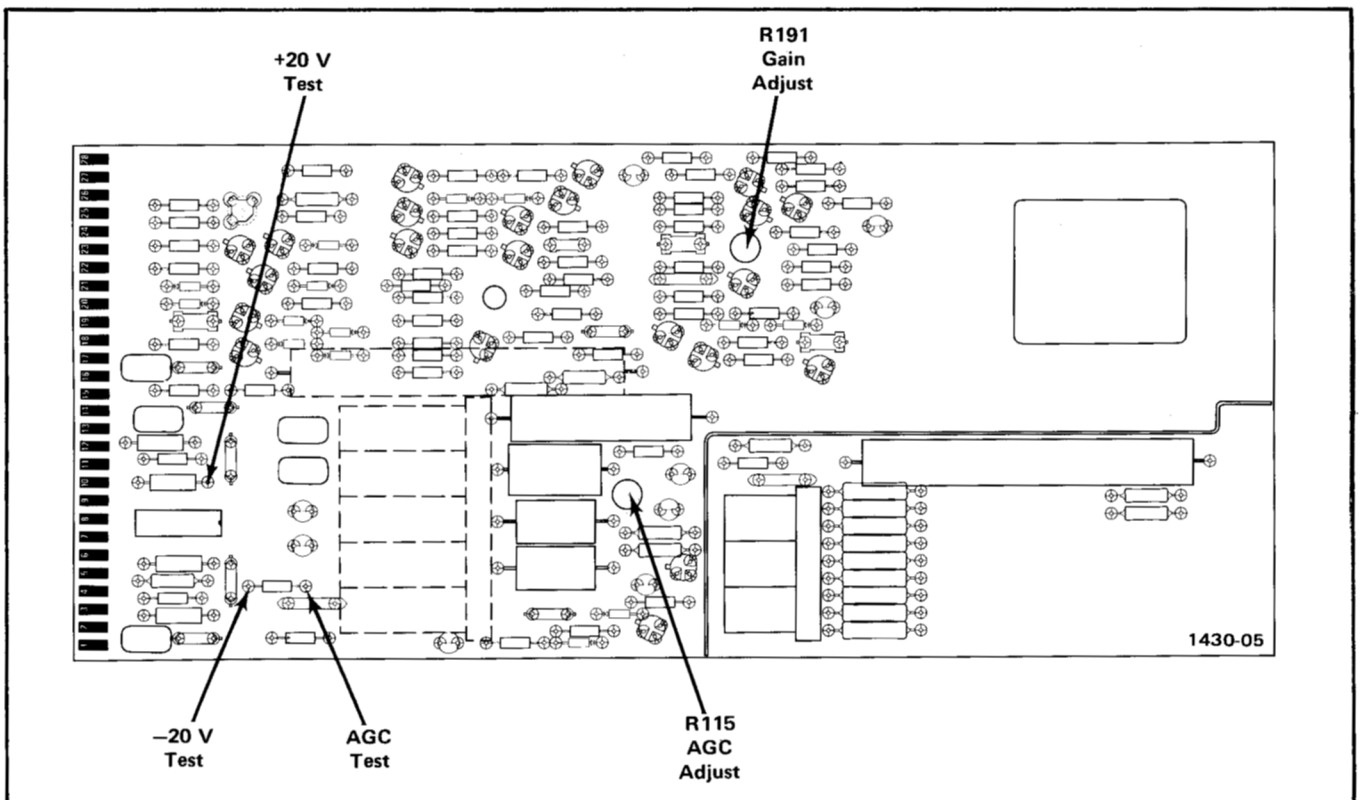


Fig. 3-1. Location of test points, AGC and Gain adjustments.



# MAINTENANCE AND INTERFACING INFORMATION

**Preventive Maintenance**

There are no special preventive maintenance procedures that apply to the SG 502. Refer to the Power Module instruction manual for general preventive maintenance procedures and instructions.

**Corrective Maintenance**

Refer to the Power Module instruction manual for general corrective maintenance procedures and instructions.

**Troubleshooting**

Use the Performance Check, Adjustment Procedure, and Circuit Description as aids to locate trouble in the event of equipment failure. The test equipment listed in the Performance Check and Adjustment Procedures will prove useful in troubleshooting the SG 502.

**Functions Available at Rear Connector**

A slot between pins 23 and 24 on the rear connector identifies the SG 502 as a member of the signal source family. Insert a barrier in the corresponding position of the Power Module jack to prevent other than signal source plug-ins from being used in that compartment. This protects the plug-in should specialized connections be made to that compartment. Consult the Building A System section of the Power Module manual for further information.

Signal outputs, or other specialized connections, are made to the rear interface connectors as shown in Fig. 4-1. The Sync In and Sync Ground are not factory wired. The Sync Out signal is a sine wave of the same frequency as the output signal. It has an amplitude of at least 1 V rms, which is essentially constant over the entire frequency range. The source impedance is 1 kΩ. Use this signal to trigger external devices such as oscilloscopes or counters etc.

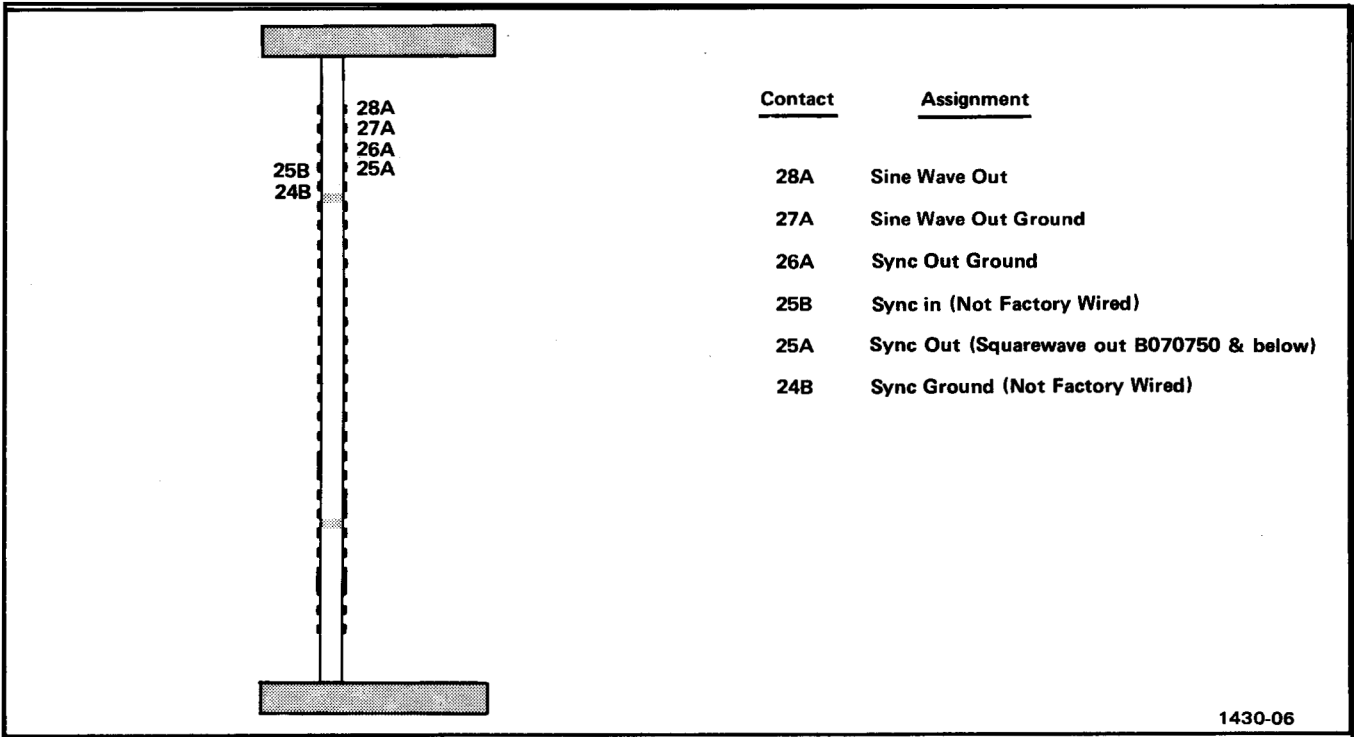


Fig. 4-1. Input/Output assignments at rear connector.

# CIRCUIT DESCRIPTION

## Introduction

This section of the manual contains a description of the circuitry used in the SG 502 Oscillator. Individual descriptions are separated into the following parts: Sync Input, Oscillator Amplifier, Automatic Gain Control, Frequency Control, Buffer Amplifier, Attenuator, Square-Wave Output, and Power Supply. Refer to the appropriate diagrams in the Diagrams section of this manual while reading the circuit description.

## Sync Input

The Sync Input signal is applied to the + side (Q10A) of the oscillator amplifier through C10 and R10.

## Oscillator Amplifier

Dual FET's Q10A and Q10B provide differential amplification, with Q70, R71, R73 and R75 serving as their constant current source. The FET's drive differential transistors Q20 and Q24, with Q30, R32, R35, and R36 serving as their constant current source. Q86 supplies constant current to emitter-follower Q80, which drives output emitter-followers Q82 and Q88. Positive feedback for oscillation occurs through R117 and C12.

## Automatic Gain Control (AGC)

Peak detector Q90 and FET Q110 compose an automatic gain control circuit. The FET operates as a variable resistor in a divider configuration composed of R115 (AGC adjustment), R116, and R117. The divider is connected from the output of the oscillator amplifier to ground, and varies the amount of positive feedback. Voltage at the gate of Q110 is proportional to the peak sine-wave amplitude. The shunt capacitors provide smoothing at the various frequencies.

## Frequency Control

The output from Q82 and Q88 is fed back to the minus input (Q10B) of the oscillator amplifier as negative feedback through the bridged T notch filter. Minimum voltage transfer occurs at the output frequency. Adjusting the ganged controls R50A and R50B (labeled FREQUENCY Hz and located on the front panel) varies the notch frequency.

## Buffer Amplifier

The buffer amplifier (Q120, Q128, and Q130) provides isolation between the oscillator amplifier and the output circuitry. Q120 and Q128 form a differential amplifier supplied by a constant current source Q130, R130, R132, and R133. The collector of Q120 drives the base of Q140, cascoded with Q145. The collector of Q145 drives Q150 and Q154 in a common emitter configuration. CR150 and CR154 provide proper biasing. Negative feedback occurs through C120. Gain is set by Gain Adjust 191.

## Attenuator

Four T sections, three fixed and one variable, comprise the constant-impedance 600  $\Omega$  attenuator. R160 determines the input impedance. Each section except the variable is switchable in or out to provide attenuation steps.

## Square-Wave Output

The output sine-wave from the buffer amplifier is fed through R195 to diodes CR195, CR196, CR198, and CR199, which limit the positive and negative excursions. Collectors of Q200 and Q210, a differential amplifier, are further clamped by diodes CR200 and CR202. The output, at 600  $\Omega$ , is taken from the collector of Q220, which forms a differential amplifier with Q230. Their constant current source is supplied by Q235, R235, R238, and R240. Positive feedback from the collector of Q230 ensures fast switching. Diodes CR210 and CR212 limit the voltage excursions and ensure operation in the non-saturated mode.

## Power Supply

Integrated circuit U320 provides the regulated dc voltage supply for the circuits. Conduction of the series-pass transistors in the mainframe is controlled by the current through U320. This current determines the voltage drop across R320 and R340. Therefore, U320 carries only part of the necessary current, with the remainder being supplied by the series-pass transistors. The voltage drop across R322 and R342 activates hard current-limiting in U320. R348 determines the output voltage, while C322 and C342 provide negative ac feedback for smoothing.

# REPLACEABLE ELECTRICAL PARTS

## PARTS ORDERING INFORMATION

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

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

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

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

## SPECIAL NOTES AND SYMBOLS

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

## ITEM NAME

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

## ABBREVIATIONS

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

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

| Mfr. Code | Manufacturer                                                  | Address                                 | City, State, Zip           |
|-----------|---------------------------------------------------------------|-----------------------------------------|----------------------------|
| 00853     | SANGAMO ELECTRIC CO., S. CAROLINA DIV.                        | P O BOX 128                             | PICKENS, SC 29671          |
| 01121     | ALLEN-BRADLEY COMPANY                                         | 1201 2ND STREET SOUTH                   | MILWAUKEE, WI 53204        |
| 02111     | SPECTROL ELECTRONICS CORPORATION                              | 17070 EAST GALE AVENUE                  | CITY OF INDUSTRY, CA 91745 |
| 04222     | AVX CERAMICS, DIVISION OF AVX CORP.                           | P O BOX 867, 19TH AVE. SOUTH            | MURTL BEACH, SC 29577      |
| 04713     | MOTOROLA, INC., SEMICONDUCTOR PROD. DIV.                      | 5005 E MCDOWELL RD, PO BOX 20923        | PHOENIX, AZ 85036          |
| 05091     | TRI-ORDINATE CORPORATION                                      | 343 SNYDER AVENUE                       | BERKELEY HEIGHTS, NJ 07922 |
| 07910     | TELEDYNE SEMICONDUCTOR                                        | 12515 CHADRON AVE.                      | HAWTHORNE, CA 90250        |
| 17117     | ELECTRONIC MOLDING CORP.                                      | 96 MILL ST.                             | WOONSOCKET, RI 02895       |
| 56289     | SPRAGUE ELECTRIC CO.                                          |                                         | NORTH ADAMS, MA 01247      |
| 71744     | CHICAGO MINIATURE LAMP WORKS                                  | 4433 RAVENSWOOD AVE.                    | CHICAGO, IL 60640          |
| 72982     | ERIE TECHNOLOGICAL PRODUCTS, INC.                             | 644 W. 12TH ST.                         | ERIE, PA 16512             |
| 73138     | BECKMAN INSTRUMENTS, INC., HELIPOT DIV.                       | 2500 HARBOR BLVD.                       | FULLERTON, CA 92634        |
| 80009     | TEKTRONIX, INC.                                               | P O BOX 500                             | BEAVERTON, OR 97077        |
| 80740     | BECKMAN INSTRUMENTS, INC.                                     | 2500 HARBOR BLVD.                       | FULLERTON, CA 92634        |
| 90201     | MALLORY CAPACITOR CO., DIV. OF<br>P. R. MALLORY AND CO., INC. | 3029 E WASHINGTON STREET<br>P O BOX 372 | INDIANAPOLIS, IN 46206     |
| 91637     | DALE ELECTRONICS, INC.                                        | P. O. BOX 609                           | COLUMBUS, NE 68601         |
| 91836     | KINGS ELECTRONICS CO., INC.                                   | 40 MARBLEDALE ROAD                      | TUCKAHOE, NY 10707         |

| Ckt No.          | Tektronix Part No. | Serial/Model No. Eff | Dscont | Name & Description                  | Mfr Code | Mfr Part Number  |
|------------------|--------------------|----------------------|--------|-------------------------------------|----------|------------------|
| A1               | 670-2215-00        |                      |        | CKT BOARD ASSY:MAIN                 | 80009    | 670-2215-00      |
| C10              | 283-0177-00        |                      |        | CAP.,FXD,CER DI:1UF,+80-20%,25V     | 72982    | 8131N039 E 105Z  |
| C12              | 283-0177-00        |                      |        | CAP.,FXD,CER DI:1UF,+80-20%,25V     | 72982    | 8131N039 E 105Z  |
| C18              | 281-0656-00        |                      |        | CAP.,FXD,CER DI:22PF,5%,500V        | 72982    | 374-000C0G0220J  |
| C50 <sup>1</sup> | 285-0784-01        |                      |        | CAP.,FXD,PLSTC:10.0UF,3%,25V        | 80009    | 285-0784-01      |
| C51 <sup>1</sup> | 285-0895-00        |                      |        | CAP.,FXD,PLSTC:1.0UF,3%,25V         | 80009    | 285-0895-00      |
| C52 <sup>1</sup> | 285-0891-00        |                      |        | CAP.,FXD,PLSTC:0.1UF,3%,100V        | 80009    | 285-0891-00      |
| C53 <sup>1</sup> | 285-0753-01        |                      |        | CAP.,FXD,PLSTC:0.01UF,3%,100V       | 80009    | 285-0753-01      |
| C54 <sup>1</sup> | 285-0754-01        |                      |        | CAP.,FXD,PLSTC:995UF,3%,400V        | 80009    | 285-0754-01      |
| C55              | 283-0632-00        |                      |        | CAP.,FXD,MICA D:87PF,1%,100V        | 00853    | D151E870F0       |
| C91              | 290-0512-00        |                      |        | CAP.,FXD,ELCTLT:22UF,20%,15V        | 56289    | 196D226X0015KA1  |
| C97              | 290-0536-00        |                      |        | CAP.,FXD,ELCTLT:10UF,20%,25V        | 90201    | TDC106M025FL     |
| C101             | 290-0531-00        |                      |        | CAP.,FXD,ELCTLT:100UF,20%,10V       | 90201    | TDC107M010WLC    |
| C103             | 290-0531-00        |                      |        | CAP.,FXD,ELCTLT:100UF,20%,10V       | 90201    | TDC107M010WLC    |
| C105             | 290-0536-00        |                      |        | CAP.,FXD,ELCTLT:10UF,20%,25V        | 90201    | TDC106M025FL     |
| C107             | 290-0536-00        |                      |        | CAP.,FXD,ELCTLT:10UF,20%,25V        | 90201    | TDC106M025FL     |
| C109             | 290-0534-00        |                      |        | CAP.,FXD,ELCTLT:1UF,20%,35V         | 56289    | 196D105X0035HA1  |
| C110             | 290-0517-00        |                      |        | CAP.,FXD,ELCTLT:6.8UF,20%,35V       | 56289    | 196D685X0035KA1  |
| C112             | 290-0517-00        |                      |        | CAP.,FXD,ELCTLT:6.8UF,20%,35V       | 56289    | 196D685X0035KA1  |
| C120             | 281-0504-00        |                      |        | CAP.,FXD,CER DI:10PF,+/-1PF,500V    | 72982    | 301-055C0G0100F  |
| C140             | 283-0003-00        |                      |        | CAP.,FXD,CER DI:0.01UF,+80-20%,150V | 72982    | 855-558Z5U-103Z  |
| C146             | 290-0512-00        |                      |        | CAP.,FXD,ELCTLT:22UF,20%,15V        | 56289    | 196D226X0015KA1  |
| C150             | 281-0504-00        |                      |        | CAP.,FXD,CER DI:10PF,+/-1PF,500V    | 72982    | 301-055C0G0100F  |
| C160             | 290-0208-00        |                      |        | CAP.,FXD,ELCTLT:350UF,+75-15%,15V   | 56289    | 113D357C7015P1   |
| C200             | 281-0525-00        |                      |        | CAP.,FXD,CER DI:470PF,+/-94PF,500V  | 04222    | 7001-1364        |
| C321             | 283-0003-00        |                      |        | CAP.,FXD,CER DI:0.01UF,+80-20%,150V | 72982    | 855-558Z5U-103Z  |
| C322             | 283-0111-00        |                      |        | CAP.,FXD,CER DI:0.1UF,20%,50V       | 72982    | 8121-N088Z5U104M |
| C324             | 290-0528-00        |                      |        | CAP.,FXD,ELCTLT:15UF,20%,50V        | 90201    | TDC156M050WLC    |
| C325             | 290-0517-00        |                      |        | CAP.,FXD,ELCTLT:6.8UF,20%,35V       | 56289    | 196D685X0035KA1  |
| C330             | 290-0534-00        |                      |        | CAP.,FXD,ELCTLT:1UF,20%,35V         | 56289    | 196D105X0035HA1  |
| C341             | 283-0003-00        |                      |        | CAP.,FXD,CER DI:0.01UF,+80-20%,150V | 72982    | 855-558Z5U-103Z  |
| C342             | 283-0111-00        |                      |        | CAP.,FXD,CER DI:0.1UF,20%,50V       | 72982    | 8121-N088Z5U104M |
| C344             | 290-0528-00        |                      |        | CAP.,FXD,ELCTLT:15UF,20%,50V        | 90201    | TDC156M050WLC    |
| C345             | 290-0517-00        |                      |        | CAP.,FXD,ELCTLT:6.8UF,20%,35V       | 56289    | 196D685X0035KA1  |
| C350             | 290-0534-00        |                      |        | CAP.,FXD,ELCTLT:1UF,20%,35V         | 56289    | 196D105X0035HA1  |
| CR80             | 152-0141-02        |                      |        | SEMICONV DEVICE:SILICON,30V,150MA   | 07910    | 1N4152           |
| CR86             | 152-0141-02        |                      |        | SEMICONV DEVICE:SILICON,30V,150MA   | 07910    | 1N4152           |
| CR90             | 152-0141-02        |                      |        | SEMICONV DEVICE:SILICON,30V,150MA   | 07910    | 1N4152           |
| CR91             | 152-0141-02        |                      |        | SEMICONV DEVICE:SILICON,30V,150MA   | 07910    | 1N4152           |
| CR150            | 152-0141-02        |                      |        | SEMICONV DEVICE:SILICON,30V,150MA   | 07910    | 1N4152           |
| CR154            | 152-0141-02        |                      |        | SEMICONV DEVICE:SILICON,30V,150MA   | 07910    | 1N4152           |
| CR195            | 152-0141-02        |                      |        | SEMICONV DEVICE:SILICON,30V,150MA   | 07910    | 1N4152           |
| CR196            | 152-0141-02        |                      |        | SEMICONV DEVICE:SILICON,30V,150MA   | 07910    | 1N4152           |
| CR198            | 152-0141-02        |                      |        | SEMICONV DEVICE:SILICON,30V,150MA   | 07910    | 1N4152           |
| CR199            | 152-0141-02        |                      |        | SEMICONV DEVICE:SILICON,30V,150MA   | 07910    | 1N4152           |
| CR200            | 152-0141-02        |                      |        | SEMICONV DEVICE:SILICON,30V,150MA   | 07910    | 1N4152           |
| CR202            | 152-0141-02        |                      |        | SEMICONV DEVICE:SILICON,30V,150MA   | 07910    | 1N4152           |
| CR210            | 152-0141-02        |                      |        | SEMICONV DEVICE:SILICON,30V,150MA   | 07910    | 1N4152           |
| CR212            | 152-0141-02        |                      |        | SEMICONV DEVICE:SILICON,30V,150MA   | 07910    | 1N4152           |
| CR322            | 152-0066-00        | XB040000             |        | SEMICONV DEVICE:SILICON,400V,750MA  | 80009    | 152-0066-00      |
| CR324            | 152-0107-00        | XB040000             |        | SEMICONV DEVICE:SILICON,400V,400MA  | 80009    | 152-0107-00      |
| CR342            | 152-0066-00        | XB040000             |        | SEMICONV DEVICE:SILICON,400V,750MA  | 80009    | 152-0066-00      |

<sup>1</sup> Available as a matched set; part number 295-0161-00. The letter suffix and the tolerance should be the same for all of the timing capacitor in the assembly.

Replaceable Electrical Parts—SG 502

| Ckt No. | Tektronix Part No. | Serial/Model No. Eff Dscont | Name & Description                          | Mfr Code | Mfr Part Number |
|---------|--------------------|-----------------------------|---------------------------------------------|----------|-----------------|
| CR344   | 152-0107-00        | XB040000                    | SEMICONV DEVICE:SILICON,400V,400MA          | 80009    | 152-0107-00     |
| DS346   | 150-0109-00        |                             | LAMP,INCAND:18V,26MA                        | 71744    | CM7220          |
| J10     | 136-0187-00        |                             | JACK,TIP:                                   | 17117    | 4653-113-0      |
| J180    | 131-0274-00        |                             | CONNECTOR,RCPT,:BNC                         | 91836    | KC79-67         |
| J205    | 210-0774-00        |                             | EYELET,METALLIC:0.152 OD X 0.245 INCH L,BRS | 80009    | 210-0774-00     |
|         | 210-0775-00        |                             | EYELET,METALLIC:0.126 OD X 0.23 INCH L,BRS  | 80009    | 210-0775-00     |
| J210    | 131-0955-00        |                             | CONNECTOR,RCPT,:BNC,FEMALE,W/HARDWARE       | 05091    | 31-279          |
| P205    | 131-1003-00        |                             | CONNECTOR BODY,:CKT CD MT,3 PRONG           | 80009    | 131-1003-00     |
| Q10A,B  | 151-1054-00        |                             | TRANSISTOR:SILICON,JFE,N-CHANNEL,DUAL       | 80009    | 151-1054-00     |
| Q20     | 151-0188-00        |                             | TRANSISTOR:SILICON,PNP                      | 80009    | 151-0188-00     |
| Q24     | 151-0188-00        |                             | TRANSISTOR:SILICON,PNP                      | 80009    | 151-0188-00     |
| Q30     | 151-0188-00        |                             | TRANSISTOR:SILICON,PNP                      | 80009    | 151-0188-00     |
| Q70     | 151-0190-00        |                             | TRANSISTOR:SILICON,NPN                      | 80009    | 151-0190-00     |
| Q80     | 151-0190-00        |                             | TRANSISTOR:SILICON,NPN                      | 80009    | 151-0190-00     |
| Q82     | 151-0302-00        |                             | TRANSISTOR:SILICON,NPN                      | 80009    | 151-0302-00     |
| Q86     | 151-0190-00        |                             | TRANSISTOR:SILICON,NPN                      | 80009    | 151-0190-00     |
| Q88     | 151-0301-00        |                             | TRANSISTOR:SILICON,PNP                      | 04713    | 2N2907A         |
| Q90     | 151-0302-00        |                             | TRANSISTOR:SILICON,NPN                      | 80009    | 151-0302-00     |
| Q110    | 151-1021-00        |                             | TRANSISTOR:SILICON,JFE                      | 80009    | 151-1021-00     |
| Q120    | 151-0190-00        |                             | TRANSISTOR:SILICON,NPN                      | 80009    | 151-0190-00     |
| Q128    | 151-0190-00        |                             | TRANSISTOR:SILICON,NPN                      | 80009    | 151-0190-00     |
| Q130    | 151-0190-00        |                             | TRANSISTOR:SILICON,NPN                      | 80009    | 151-0190-00     |
| Q140    | 151-0188-00        |                             | TRANSISTOR:SILICON,PNP                      | 80009    | 151-0188-00     |
| Q145    | 151-0188-00        |                             | TRANSISTOR:SILICON,PNP                      | 80009    | 151-0188-00     |
| Q150    | 151-0302-00        |                             | TRANSISTOR:SILICON,NPN                      | 80009    | 151-0302-00     |
| Q154    | 151-0301-00        |                             | TRANSISTOR:SILICON,PNP                      | 04713    | 2N2907A         |
| Q200    | 151-0190-00        |                             | TRANSISTOR:SILICON,NPN                      | 80009    | 151-0190-00     |
| Q210    | 151-0190-00        |                             | TRANSISTOR:SILICON,NPN                      | 80009    | 151-0190-00     |
| Q220    | 151-0188-00        |                             | TRANSISTOR:SILICON,PNP                      | 80009    | 151-0188-00     |
| Q230    | 151-0188-00        |                             | TRANSISTOR:SILICON,PNP                      | 80009    | 151-0188-00     |
| Q235    | 151-0188-00        |                             | TRANSISTOR:SILICON,PNP                      | 80009    | 151-0188-00     |
| R10     | 315-0103-00        |                             | RES.,FXD,CMPSN:10K OHM,5%,0.25W             | 01121    | CB1035          |
| R12     | 315-0105-00        |                             | RES.,FXD,CMPSN:1M OHM,5%,0.25W              | 01121    | CB1055          |
| R15     | 315-0121-00        |                             | RES.,FXD,CMPSN:120 OHM,5%,0.25W             | 01121    | CB1215          |
| R18     | 315-0752-00        |                             | RES.,FXD,CMPSN:7.5K OHM,5%,0.25W            | 01121    | CB7525          |
| R22     | 315-0512-00        |                             | RES.,FXD,CMPSN:5.1K OHM,5%,0.25W            | 01121    | CB5125          |
| R25     | 315-0220-00        |                             | RES.,FXD,CMPSN:22 OHM,5%,0.25W              | 01121    | CB2205          |
| R27     | 315-0512-00        |                             | RES.,FXD,CMPSN:5.1K OHM,5%,0.25W            | 01121    | CB5125          |
| R29     | 315-0220-00        |                             | RES.,FXD,CMPSN:22 OHM,5%,0.25W              | 01121    | CB2205          |
| R32     | 315-0561-00        |                             | RES.,FXD,CMPSN:560 OHM,5%,0.25W             | 01121    | CB5615          |
| R35     | 315-0132-00        |                             | RES.,FXD,CMPSN:1.3K OHM,5%,0.25W            | 01121    | CB1325          |
| R36     | 315-0392-00        |                             | RES.,FXD,CMPSN:3.9K OHM,5%,0.25W            | 01121    | CB3925          |
| R38     | 315-0752-00        |                             | RES.,FXD,CMPSN:7.5K OHM,5%,0.25W            | 01121    | CB7525          |
| R40     | 315-0121-00        |                             | RES.,FXD,CMPSN:120 OHM,5%,0.25W             | 01121    | CB1215          |
| R45     | 321-0661-00        |                             | RES.,FXD,FILM:600 OHM,1%,0.125W             | 91637    | MFF1816G600ROF  |
| R50A,B  | 311-1502-00        |                             | RES.,VAR,WW:PNL,2 X 10K OHM,2.75W           | 02111    | 100-9625        |
| R55     | 321-0661-00        |                             | RES.,FXD,FILM:600 OHM,1%,0.125W             | 91637    | MFF1816G600ROF  |
| R71     | 315-0222-00        |                             | RES.,FXD,CMPSN:2.2K OHM,5%,0.25W            | 01121    | CB2225          |
| R73     | 315-0392-00        |                             | RES.,FXD,CMPSN:3.9K OHM,5%,0.25W            | 01121    | CB3925          |

| Ckt No. | Tektronix Part No. | Serial/Model No. Eff | Dscont                           | Name & Description                  | Mfr Code | Mfr Part Number |
|---------|--------------------|----------------------|----------------------------------|-------------------------------------|----------|-----------------|
| R75     | 315-0132-00        |                      |                                  | RES.,FXD,CMPSN:1.3K OHM,5%,0.25W    | 01121    | CB1325          |
| R82     | 315-0220-00        |                      |                                  | RES.,FXD,CMPSN:22 OHM,5%,0.25W      | 01121    | CB2205          |
| R84     | 315-0102-00        | XB070000             |                                  | RES.,FXD,CMPSN:1K OHM,5%,0.25W      | 01121    | CB1025          |
| R86     | 315-0112-00        |                      | RES.,FXD,CMPSN:1.1K OHM,5%,0.25W | 01121                               | CB1125   |                 |
| R88     | 315-0220-00        |                      | RES.,FXD,CMPSN:22 OHM,5%,0.25W   | 01121                               | CB2205   |                 |
| R91     | 315-0681-00        |                      | RES.,FXD,CMPSN:680 OHM,5%,0.25W  | 01121                               | CB6815   |                 |
| R93     | 315-0303-00        |                      | RES.,FXD,CMPSN:30K OHM,5%,0.25W  | 01121                               | CB3035   |                 |
| R95     | 315-0753-00        |                      |                                  | RES.,FXD,CMPSN:75K OHM,5%,0.25W     | 01121    | CB7535          |
| R97     | 315-0302-00        |                      |                                  | RES.,FXD,CMPSN:3K OHM,5%,0.25W      | 01121    | CB3025          |
| R110    | 321-0364-00        |                      |                                  | RES.,FXD,FILM:60.4K OHM,1%,0.125W   | 91637    | MFF1816G60401F  |
| R113    | 321-0364-00        |                      |                                  | RES.,FXD,FILM:60.4K OHM,1%,0.125W   | 91637    | MFF1816G60401F  |
| R115    | 311-0978-00        |                      |                                  | RES.,VAR,NONWIR:250 OHM,10%,0.50W   | 80740    | 62-67-3         |
| R116    | 315-0102-00        |                      |                                  | RES.,FXD,CMPSN:1K OHM,5%,0.25W      | 01121    | CB1025          |
| R117    | 315-0102-00        |                      |                                  | RES.,FXD,CMPSN:1K OHM,5%,0.25W      | 01121    | CB1025          |
| R120    | 315-0220-00        |                      |                                  | RES.,FXD,CMPSN:22 OHM,5%,0.25W      | 01121    | CB2205          |
| R123    | 315-0220-00        |                      |                                  | RES.,FXD,CMPSN:22 OHM,5%,0.25W      | 01121    | CB2205          |
| R125    | 315-0242-00        |                      |                                  | RES.,FXD,CMPSN:2.4K OHM,5%,0.25W    | 01121    | CB2425          |
| R126    | 315-0220-00        |                      |                                  | RES.,FXD,CMPSN:22 OHM,5%,0.25W      | 01121    | CB2205          |
| R129    | 315-0242-00        |                      |                                  | RES.,FXD,CMPSN:2.4K OHM,5%,0.25W    | 01121    | CB2425          |
| R130    | 315-0202-00        |                      |                                  | RES.,FXD,CMPSN:2K OHM,5%,0.25W      | 01121    | CB2025          |
| R132    | 315-0102-00        |                      |                                  | RES.,FXD,CMPSN:1K OHM,5%,0.25W      | 01121    | CB1025          |
| R133    | 315-0102-00        |                      |                                  | RES.,FXD,CMPSN:1K OHM,5%,0.25W      | 01121    | CB1025          |
| R140    | 315-0122-00        |                      |                                  | RES.,FXD,CMPSN:1.2K OHM,5%,0.25W    | 01121    | CB1225          |
| R143    | 315-0201-00        |                      |                                  | RES.,FXD,CMPSN:200 OHM,5%,0.25W     | 01121    | CB2015          |
| R146    | 315-0102-00        |                      |                                  | RES.,FXD,CMPSN:1K OHM,5%,0.25W      | 01121    | CB1025          |
| R150    | 315-0220-00        |                      |                                  | RES.,FXD,CMPSN:22 OHM,5%,0.25W      | 01121    | CB2205          |
| R154    | 315-0220-00        |                      |                                  | RES.,FXD,CMPSN:22 OHM,5%,0.25W      | 01121    | CB2205          |
| R156    | 315-0472-00        |                      |                                  | RES.,FXD,CMPSN:4.7K OHM,5%,0.25W    | 01121    | CB4725          |
| R160    | 321-0661-00        |                      |                                  | RES.,FXD,FILM:600 OHM,1%,0.125W     | 91637    | MFF1816G600ROF  |
| R164    | 321-0661-00        |                      |                                  | RES.,FXD,FILM:600 OHM,1%,0.125W     | 91637    | MFF1816G600ROF  |
| R165A,B | 311-1440-00        |                      |                                  | RES.,VAR,NONWIR:250K X 30K OHM      | 01121    | 10M479          |
| R166    | 321-0661-00        |                      |                                  | RES.,FXD,FILM:600 OHM,1%,0.125W     | 91637    | MFF1816G600ROF  |
| R170    | 322-0703-07        |                      |                                  | RES.,FXD,FILM:311.7 OHM,0.1%,0.25W  | 91637    | MFF1421C311R7B  |
| R171    | 322-0702-07        |                      |                                  | RES.,FXD,FILM:421.6 OHM,0.1%,0.25 W | 91637    | MFF1421C421R6B  |
| R172    | 322-0703-07        |                      |                                  | RES.,FXD,FILM:311.7 OHM,0.1%,0.25W  | 91637    | MFF1421C311R7B  |
| R174    | 322-0701-07        |                      |                                  | RES.,FXD,FILM:490.9 OHM,0.1%,0.25W  | 91637    | MFF1421C490R9B  |
| R175    | 322-0704-07        |                      |                                  | RES.,FXD,FILM:121.2 OHM,0.1%,0.25W  | 91637    | MFF1421C121R2B  |
| R176    | 322-0701-07        |                      |                                  | RES.,FXD,FILM:490.9 OHM,0.1%,0.25W  | 91637    | MFF1421C490R9B  |
| R178    | 322-0700-07        |                      |                                  | RES.,FXD,FILM:588.1 OHM,0.1%,0.25W  | 91637    | MPP1421C588R1B  |
| R179    | 321-1008-04        |                      |                                  | RES.,FXD,FILM:12.0 OHM,0.1%,0.125W  | 91637    | MFF1816D12R00B  |
| R180    | 322-0700-07        |                      |                                  | RES.,FXD,FILM:588.1 OHM,0.1%,0.25W  | 91637    | MPP1421C588R1B  |
| R191    | 311-0633-00        |                      |                                  | RES.,VAR,NONWIR:5K OHM,10%,0.50W    | 73138    | 82-30-0         |
| R194    | 315-0102-00        |                      |                                  | RES.,FXD,CMPSN:1K OHM,5%,0.25W      | 01121    | CB1025          |
| R195    | 315-0103-00        |                      |                                  | RES.,FXD,CMPSN:10K OHM,5%,0.25W     | 01121    | CB1035          |
| R200    | 315-0202-00        |                      |                                  | RES.,FXD,CMPSN:2K OHM,5%,0.25W      | 01121    | CB2025          |
| R206    | 315-0202-00        |                      |                                  | RES.,FXD,CMPSN:2K OHM,5%,0.25W      | 01121    | CB2025          |
| R210    | 315-0202-00        |                      |                                  | RES.,FXD,CMPSN:2K OHM,5%,0.25W      | 01121    | CB2025          |
| R212    | 315-0472-00        |                      |                                  | RES.,FXD,CMPSN:4.7K OHM,5%,0.25W    | 01121    | CB4725          |
| R220    | 315-0301-00        |                      |                                  | RES.,FXD,CMPSN:300 OHM,5%,0.25W     | 01121    | CB3015          |
| R224    | 321-0661-00        |                      |                                  | RES.,FXD,FILM:600 OHM,1%,0.125W     | 91637    | MFF1816G600ROF  |
| R235    | 315-0511-00        |                      |                                  | RES.,FXD,CMPSN:510 OHM,5%,0.25W     | 01121    | CB5115          |
| R238    | 315-0102-00        |                      |                                  | RES.,FXD,CMPSN:1K OHM,5%,0.25W      | 01121    | CB1025          |
| R240    | 315-0302-00        |                      |                                  | RES.,FXD,CMPSN:3K OHM,5%,0.25W      | 01121    | CB3025          |

Replaceable Electrical Parts—SG 502

| Ckt No. | Tektronix Part No. | Serial/Model No. Eff | Dscont  | Name & Description                        | Mfr Code | Mfr Part Number |
|---------|--------------------|----------------------|---------|-------------------------------------------|----------|-----------------|
| R320    | 301-0201-00        |                      |         | RES.,FXD,CMPSN:200 OHM,5%,0.50W           | 01121    | EB2015          |
| R321    | 315-0510-00        |                      |         | RES.,FXD,CMPSN:51 OHM,5%,0.25W            | 01121    | CB5105          |
| R322    | 307-0051-00        |                      |         | RES.,FXD,CMPSN:2.7 OHM,5%,0.50W           | 01121    | EB27G5          |
| R325    | 315-0100-00        |                      |         | RES.,FXD,CMPSN:10 OHM,5%,0.25W            | 01121    | CB1005          |
| R330    | 315-0100-00        |                      |         | RES.,FXD,CMPSN:10 OHM,5%,0.25W            | 01121    | CB1005          |
| R340    | 301-0201-00        |                      |         | RES.,FXD,CMPSN:200 OHM,5%,0.50W           | 01121    | EB2015          |
| R341    | 315-0510-00        |                      |         | RES.,FXD,CMPSN:51 OHM,5%,0.25W            | 01121    | CB5105          |
| R342    | 307-0051-00        |                      |         | RES.,FXD,CMPSN:2.7 OHM,5%,0.50W           | 01121    | EB27G5          |
| R345    | 315-0100-00        |                      |         | RES.,FXD,CMPSN:10 OHM,5%,0.25W            | 01121    | CB1005          |
| R346    | 315-0301-00        |                      |         | RES.,FXD,CMPSN:300 OHM,5%,0.25W           | 01121    | CB3015          |
| R348    | 321-0314-00        | B010100              | B029999 | RES.,FXD,FILM:18.2K OHM,1%,0.125W         | 91637    | MFF1816G18201F  |
| R348    | 321-0314-00        | B030000              |         | RES.,FXD,FILM:18.2K OHM,1%,0.125W         | 91637    | MFF1816G18201F  |
| R350    | 315-0100-00        |                      |         | RES.,FXD,CMPSN:10 OHM,5%,0.25W            | 01121    | CB1005          |
| S50A    | 260-1449-00        |                      |         | SWITCH,TOGGLE:5 STA, NON-SHORT, INTERLOCK | 80009    | 260-1449-00     |
| S50B    |                    |                      |         |                                           |          |                 |
| S50C    |                    |                      |         |                                           |          |                 |
| S50D    |                    |                      |         |                                           |          |                 |
| S50E    |                    |                      |         |                                           |          |                 |
| S160A   | 260-1448-00        |                      |         | SWITCH,TOGGLE:3 STA, NON-SHORT            | 80009    | 260-1448-00     |
| S160B   |                    |                      |         |                                           |          |                 |
| S160C   |                    |                      |         |                                           |          |                 |
| U320    | 156-0208-00        |                      |         | MICROCIRCUIT,LI:DUAL TRACKING VOLT REG    | 80009    | 156-0208-00     |
| VR91    | 152-0149-00        |                      |         | SEMICONV DEVICE:ZENER,0.4W,10V,5%         | 04713    | 1N961B          |
| VR146   | 152-0149-00        |                      |         | SEMICONV DEVICE:ZENER,0.4W,10V,5%         | 04713    | 1N961B          |



# DIAGRAMS AND CIRCUIT BOARD ILLUSTRATION

## Symbols and Reference Designators

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

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

Resistors = Ohms (Ω).

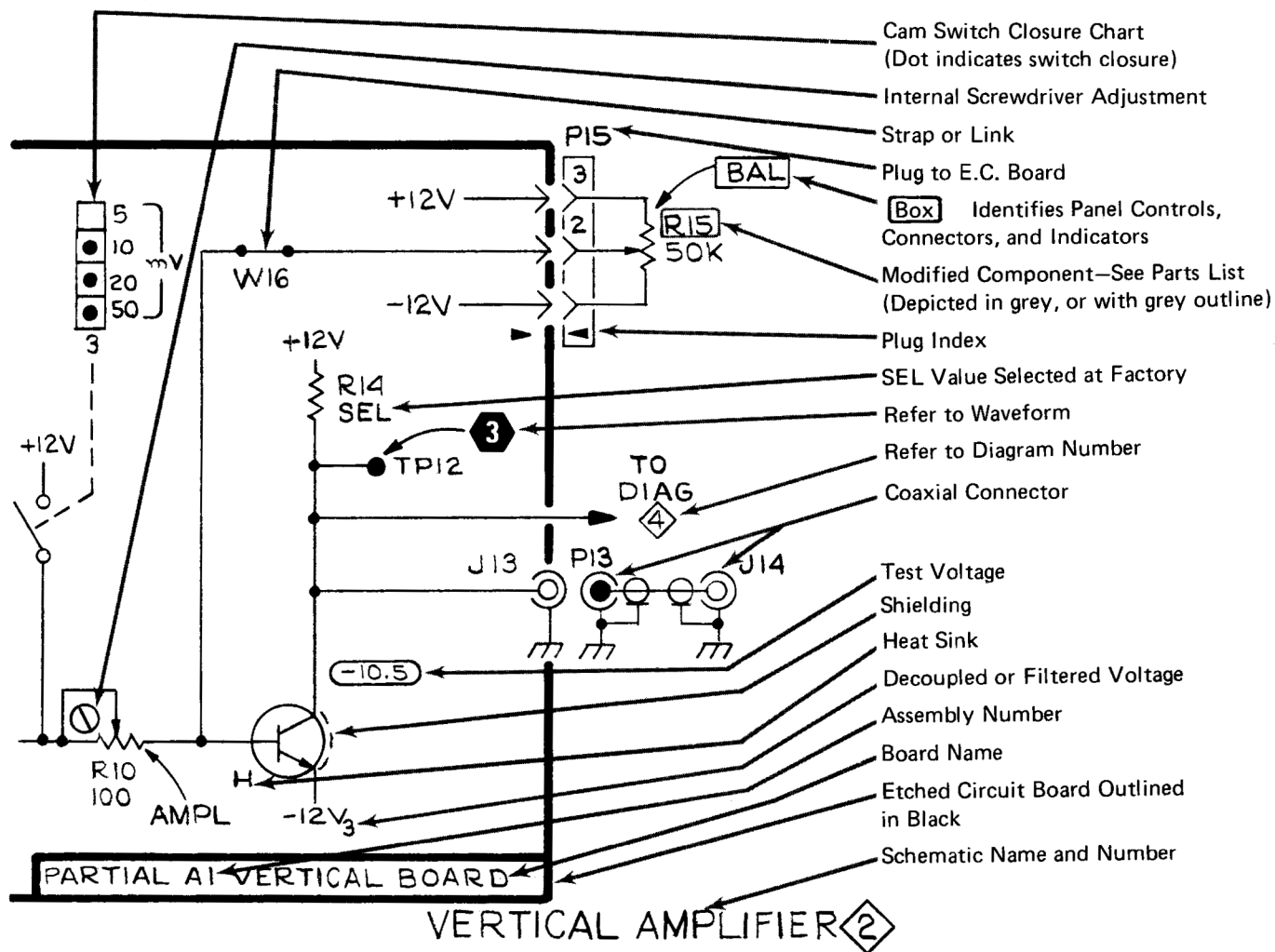
Symbols used on the diagrams are based on ANSI Standard Y32.2-1975.

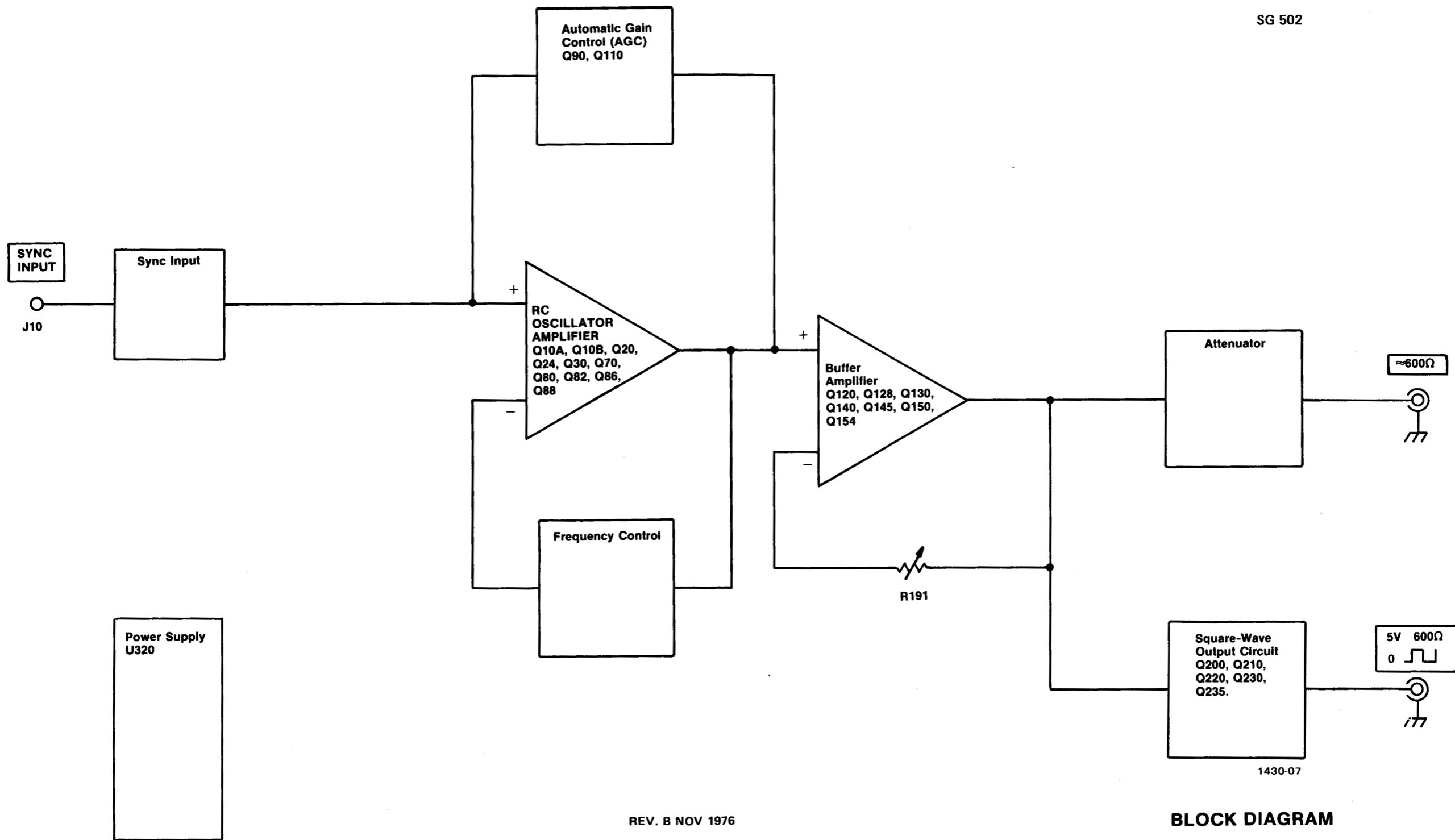
Logic symbology is based on ANSI Y32.14-1973 in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

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

|    |                                                         |    |                                                          |    |                                                                    |
|----|---------------------------------------------------------|----|----------------------------------------------------------|----|--------------------------------------------------------------------|
| A  | Assembly, separable or repairable (circuit board, etc.) | H  | Heat dissipating device (heat sink, heat radiator, etc.) | S  | Switch or contactor                                                |
| AT | Attenuator, fixed or variable                           | HR | Heater                                                   | T  | Transformer                                                        |
| B  | Motor                                                   | HY | Hybrid circuit                                           | TC | Thermocouple                                                       |
| BT | Battery                                                 | J  | Connector, stationary portion                            | TP | Test point                                                         |
| C  | Capacitor, fixed or variable                            | K  | Relay                                                    | U  | Assembly, inseparable or non-repairable (integrated circuit, etc.) |
| CB | Circuit breaker                                         | L  | Inductor, fixed or variable                              | V  | Electron tube                                                      |
| CR | Diode, signal or rectifier                              | M  | Meter                                                    | VR | Voltage regulator (zener diode, etc.)                              |
| DL | Delay line                                              | P  | Connector, movable portion                               | W  | Wirestrap or cable                                                 |
| DS | Indicating device (lamp)                                | Q  | Transistor or silicon-controlled rectifier               | Y  | Crystal                                                            |
| E  | Spark Gap                                               | R  | Resistor, fixed or variable                              | Z  | Phase shifter                                                      |
| F  | Fuse                                                    | RT | Thermistor                                               |    |                                                                    |
| FL | Filter                                                  |    |                                                          |    |                                                                    |

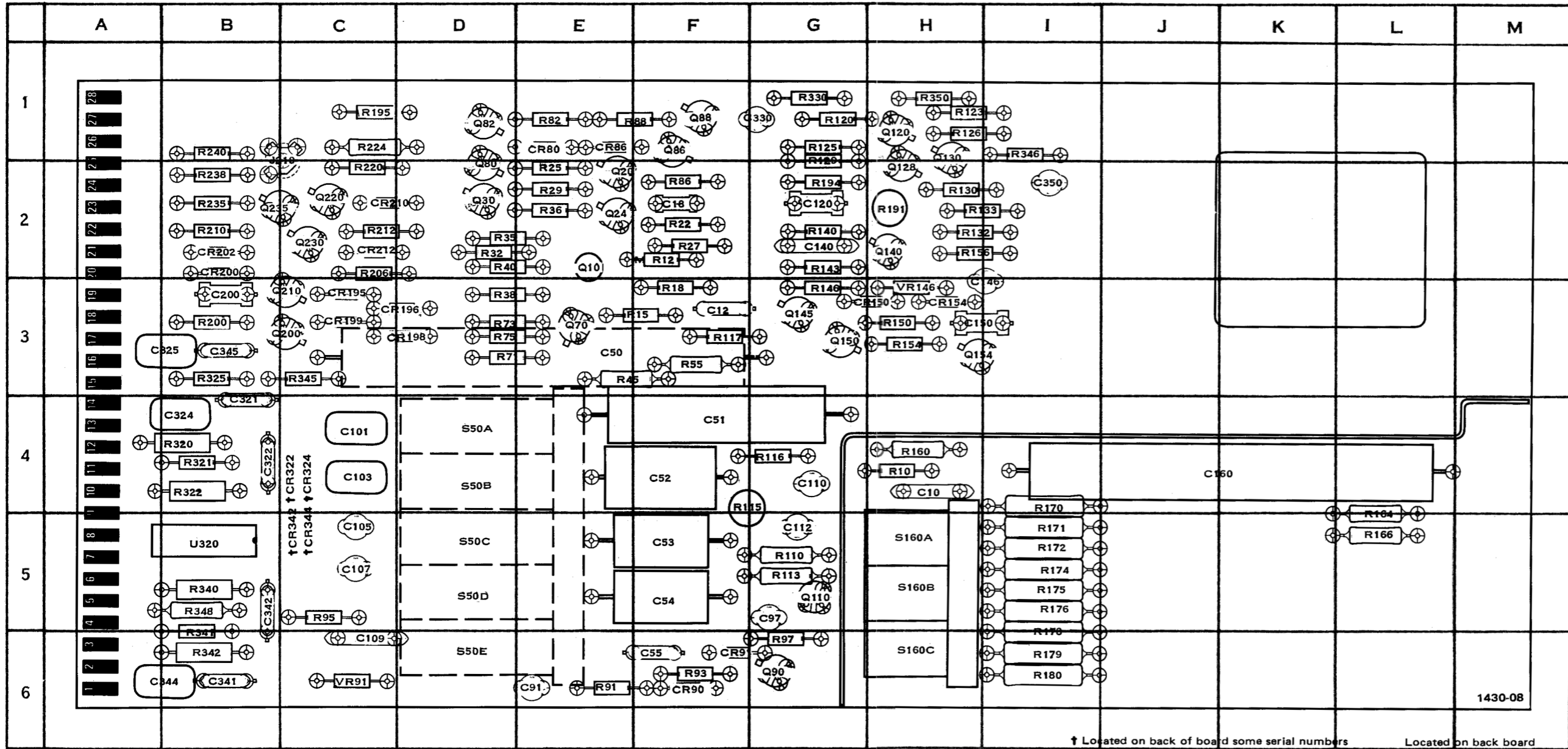
The following special symbols are used on the diagrams:





REV. B NOV 1976

**BLOCK DIAGRAM**



NOTE: COMPONENTS SHOWN WITH DASHED LINES ARE LOCATED ON BACK SIDE OF BOARD.

A1—Main circuit board.

REV. C NOV 1976

| CKT NO  | GRID LOC | CKT NO | GRID LOC | CKT NO | GRID LOC |
|---------|----------|--------|----------|--------|----------|
| C10     | H4       | Q10A,B | E2       | R132   | H2       |
| C12     | F3       | Q20    | E2       | R133   | H2       |
| C18     | F2       | Q24    | E2       | R140   | G2       |
| C50     | E3       | Q30    | D2       | R143   | G2       |
| C51     | F4       | Q70    | E3       | R146   | G3       |
| C52     | F4       | Q80    | D2       | R150   | H3       |
| C53     | F5       | Q82    | D1       | R154   | H3       |
| C54     | F5       | Q86    | F1       | R156   | H2       |
| C55     | F6       | Q88    | F1       | R160   | H4       |
| C91     | E6       | Q90    | G6       | R164   | L4       |
| C97     | G5       | Q110   | G5       |        |          |
| C101    | C4       | Q120   | H1       | R166   | L5       |
| C103    | C4       | Q128   | H2       | R170   | I4       |
| C105    | C6       | Q130   | H1       | R171   | I5       |
| C107    | C5       | Q140   | H2       | R172   | I5       |
| C109    | C6       | Q145   | G3       | R174   | I5       |
| C110    | G4       | Q150   | G3       | R175   | I5       |
| C112    | G5       | Q154   | H3       | R176   | I5       |
| C120    | G2       | Q200   | C3       | R178   | I5       |
| C140    | G2       | Q210   | C3       | R179   | I6       |
| C146    | I3       | Q220   | C2       | R180   | I6       |
| C150    | H3       | Q230   | C2       | R191   | H2       |
| C160    | K4       | Q235   | B2       | R194   | G2       |
| C200    | B3       |        |          | R195   | C1       |
| C321    | B4       |        |          | R200   | B3       |
| C322    | B4       | R10    | H4       | R206   | B3       |
| C324    | B4       | R12    | F2       | R210   | B2       |
| C325    | B3       | R15    | F3       | R212   | C2       |
| C330    | G1       | R18    | F3       | R220   | C2       |
| C341    | B6       | R22    | F2       | R224   | C1       |
| C342    | B5       | R25    | E2       | R235   | B2       |
| C344    | B6       | R27    | F2       | R238   | B2       |
| C345    | B3       | R29    | E2       | R240   | B1       |
| C350    | I2       | R32    | D2       | R320   | B4       |
|         |          | R35    | D2       | R321   | B4       |
|         |          | R36    | E2       | R322   | B4       |
| CR80    | E1       | R38    | D3       | R325   | B3       |
| CR86    | E1       | R40    | D2       | R330   | G1       |
| CR90    | F6       | R45    | E3       | R340   | B5       |
| CR91    | F6       |        |          | R341   | B6       |
| CR150   | H3       | R55    | F3       | R342   | B6       |
| CR154   | H3       | R71    | D3       | R345   | C3       |
| CR195   | C3       | R73    | D3       | R346   | I1       |
| CR196   | D3       | R75    | D3       | R348   | B5       |
| CR198   | D3       | R82    | E1       | R350   | H1       |
| CR199   | C3       | R84*   |          |        |          |
| CR200   | B2       | R86    | F2       | S50A   | D4       |
| CR202   | B2       | R88    | E1       | S50B   | D4       |
| CR210   | C2       | R91    | E6       | S50C   | D5       |
| CR212   | C2       | R93    | F6       | S50D   | D5       |
| CR322*† |          | R95    | C5       | S50E   | D6       |
| CR324*† |          | R97    | G6       |        |          |
| CR342*† |          | R110   | G5       | S160A  | H5       |
| CR344*† |          | R113   | G5       | S160B  | H5       |
|         |          | R115   | F4       | S160C  | H6       |
| DS346   |          | R116   | G4       | U320   | B5       |
|         |          | R117   | F3       |        |          |
| J10     |          | R120   | G1       | VR91   | C6       |
| J180    |          | R123   | H1       | VR146  | H3       |
| J205    |          | R125   | G1       |        |          |
| J210    | B1       | R126   | H1       |        |          |
| P205    |          | R129   | G1       |        |          |
|         |          | R130   | H2       |        |          |

# VOLTAGE AND WAVEFORM CONDITIONS

## WARNING

*Dangerous potentials exist at several points throughout this instrument. When the instrument is operated with the covers removed, do not touch exposed connections or components. Some transistors have voltages present on their cases. Disconnect the power source before replacing parts.*

The voltages and waveforms shown on diagram 1 were taken with no input signal and the SG 502 front panel controls set as follows:

### VOLTAGES

|                   |                     |
|-------------------|---------------------|
| FREQUENCY Hz dial | 1                   |
| MULTIPLIER        | all pushbuttons out |
| VAR ATTEN         | fully clockwise     |
| STEP ATTEN        | all pushbuttons out |

### \*WAVEFORMS

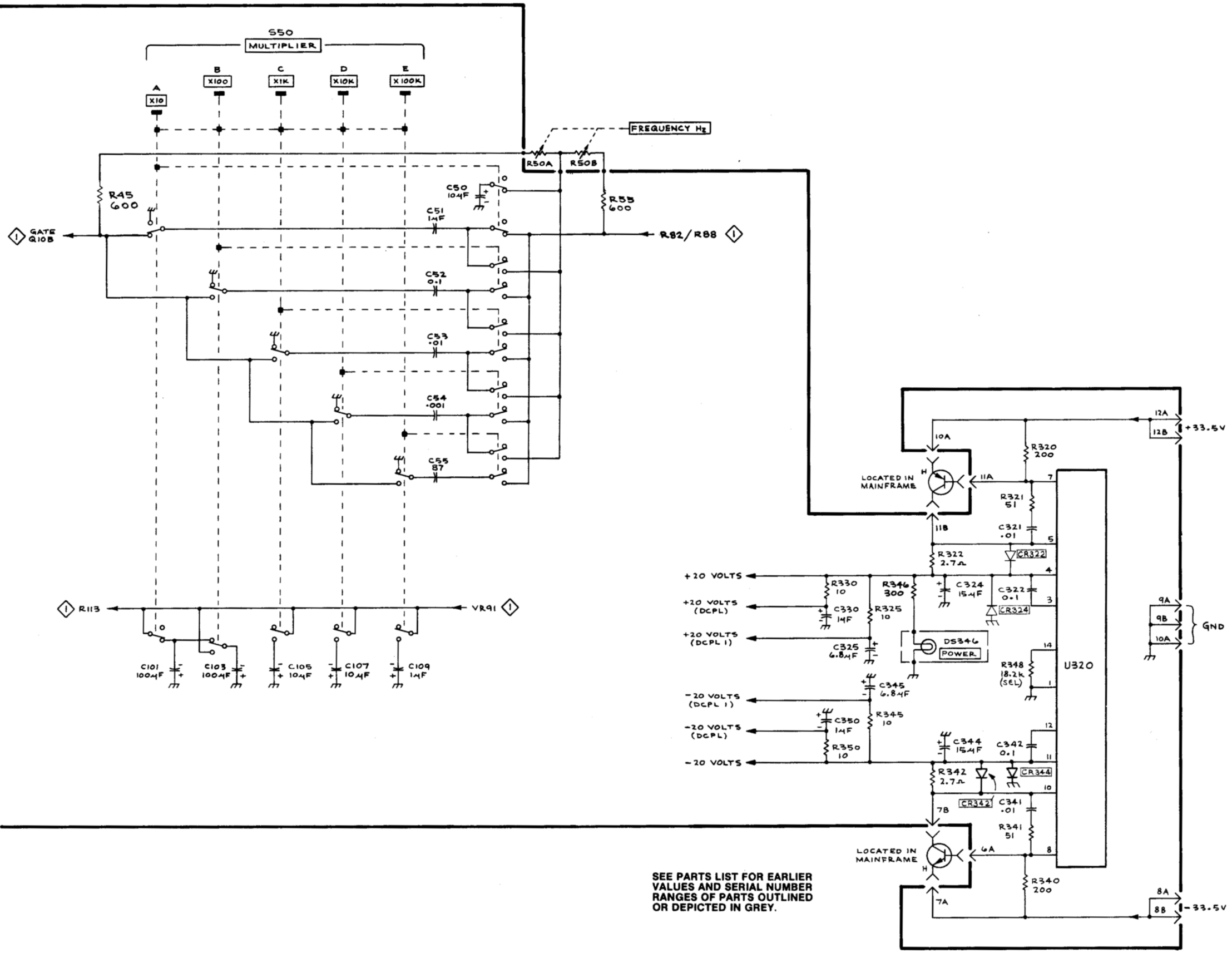
|                   |                     |
|-------------------|---------------------|
| FREQUENCY Hz dial | 1                   |
| MULTIPLIER        | X1K                 |
| VAR ATTEN         | fully clockwise     |
| STEP ATTEN        | all pushbuttons out |

\*gnd reference: center horizontal graticule line

**Voltage Conditions.** The voltages shown on the diagram were obtained using a digital multimeter with a 10 M $\Omega$  input impedance (Tektronix DM 501 Digital Multimeter or Tektronix 7D13 Digital Multimeter used with readout equipped, 7000-series oscilloscope).

**Waveform Conditions.** The waveforms shown are actual waveform photographs taken with a Tektronix Oscilloscope Camera System and Projected Graticule. Vertical deflection factor shown on the waveform is the actual deflection factor from the probe tip. Voltages and waveforms on the diagrams are not absolute and may vary between instruments because of component tolerances, internal calibration, or front-panel settings. Readouts are simulated in larger-than-normal type.





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

# REPLACEABLE MECHANICAL PARTS

## PARTS ORDERING INFORMATION

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

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

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

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

## SPECIAL NOTES AND SYMBOLS

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

## FIGURE AND INDEX NUMBERS

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

## INDENTATION SYSTEM

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

```

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

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

**Attaching parts must be purchased separately, unless otherwise specified.**

## ITEM NAME

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

## ABBREVIATIONS

|       |                    |         |                       |          |                      |          |                 |
|-------|--------------------|---------|-----------------------|----------|----------------------|----------|-----------------|
| "     | INCH               | ELCTRN  | ELECTRON              | IN       | INCH                 | SE       | SINGLE END      |
| #     | NUMBER SIZE        | ELEC    | ELECTRICAL            | INCAND   | INCANDESCENT         | SECT     | SECTION         |
| ACTR  | ACTUATOR           | ELCTLT  | ELECTROLYTIC          | INSUL    | INSULATOR            | SEMICOND | SEMICONDUCTOR   |
| ADPTR | ADAPTER            | ELEM    | ELEMENT               | INTL     | INTERNAL             | SHLD     | SHIELD          |
| ALIGN | ALIGNMENT          | EPL     | ELECTRICAL PARTS LIST | LPHLDR   | LAMPHOLDER           | SHLDR    | SHOULDERED      |
| AL    | ALUMINUM           | EQPT    | EQUIPMENT             | MACH     | MACHINE              | SKT      | SOCKET          |
| ASSEM | ASSEMBLED          | EXT     | EXTERNAL              | MECH     | MECHANICAL           | SL       | SLIDE           |
| ASSY  | ASSEMBLY           | FIL     | FILLISTER HEAD        | MTG      | MOUNTING             | SLFLKG   | SELF-LOCKING    |
| ATTEN | ATTENUATOR         | FLEX    | FLEXIBLE              | NIP      | NIPPLE               | SLVG     | SLEEVING        |
| AWG   | AMERICAN WIRE GAGE | FLH     | FLAT HEAD             | NON WIRE | NOT WIRE WOUND       | SPR      | SPRING          |
| BD    | BOARD              | FLTR    | FILTER                | OBD      | ORDER BY DESCRIPTION | SQ       | SQUARE          |
| BRKT  | BRACKET            | FR      | FRAME or FRONT        | OD       | OUTSIDE DIAMETER     | SST      | STAINLESS STEEL |
| BRS   | BRASS              | FSTNR   | FASTENER              | OVH      | OVAL HEAD            | STL      | STEEL           |
| BRZ   | BRONZE             | FT      | FOOT                  | PH BRZ   | PHOSPHOR BRONZE      | SW       | SWITCH          |
| BSHG  | BUSHING            | FXD     | FIXED                 | PL       | PLAIN or PLATE       | T        | TUBE            |
| CAB   | CABINET            | GSKT    | GASKET                | PLSTC    | PLASTIC              | TERM     | TERMINAL        |
| CAP   | CAPACITOR          | HDL     | HANDLE                | PN       | PART NUMBER          | THD      | THREAD          |
| CER   | CERAMIC            | HEX     | HEXAGON               | PNH      | PAN HEAD             | THK      | THICK           |
| CHAS  | CHASSIS            | HEX HD  | HEXAGONAL HEAD        | PWR      | POWER                | TNSN     | TENSION         |
| CKT   | CIRCUIT            | HEX SOC | HEXAGONAL SOCKET      | RCPT     | RECEPTACLE           | TPG      | TAPPING         |
| COMP  | COMPOSITION        | HLCP    | HELICAL COMPRESSION   | RES      | RESISTOR             | TRH      | TRUSS HEAD      |
| CONN  | CONNECTOR          | HLEXT   | HELICAL EXTENSION     | RGD      | RIGID                | V        | VOLTAGE         |
| COV   | COVER              | HV      | HIGH VOLTAGE          | RLF      | RELIEF               | VAR      | VARIABLE        |
| CPLG  | COUPLING           | IC      | INTEGRATED CIRCUIT    | RTNR     | RETAINER             | W/       | WITH            |
| CRT   | CATHODE RAY TUBE   | ID      | INSIDE DIAMETER       | SCH      | SOCKET HEAD          | WSHR     | WASHER          |
| DEG   | DEGREE             | IDENT   | IDENTIFICATION        | SCOPE    | OSCILLOSCOPE         | XFMR     | TRANSFORMER     |
| DWR   | DRAWER             | IMPLR   | IMPELLER              | SCR      | SCREW                | XSTR     | TRANSISTOR      |

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

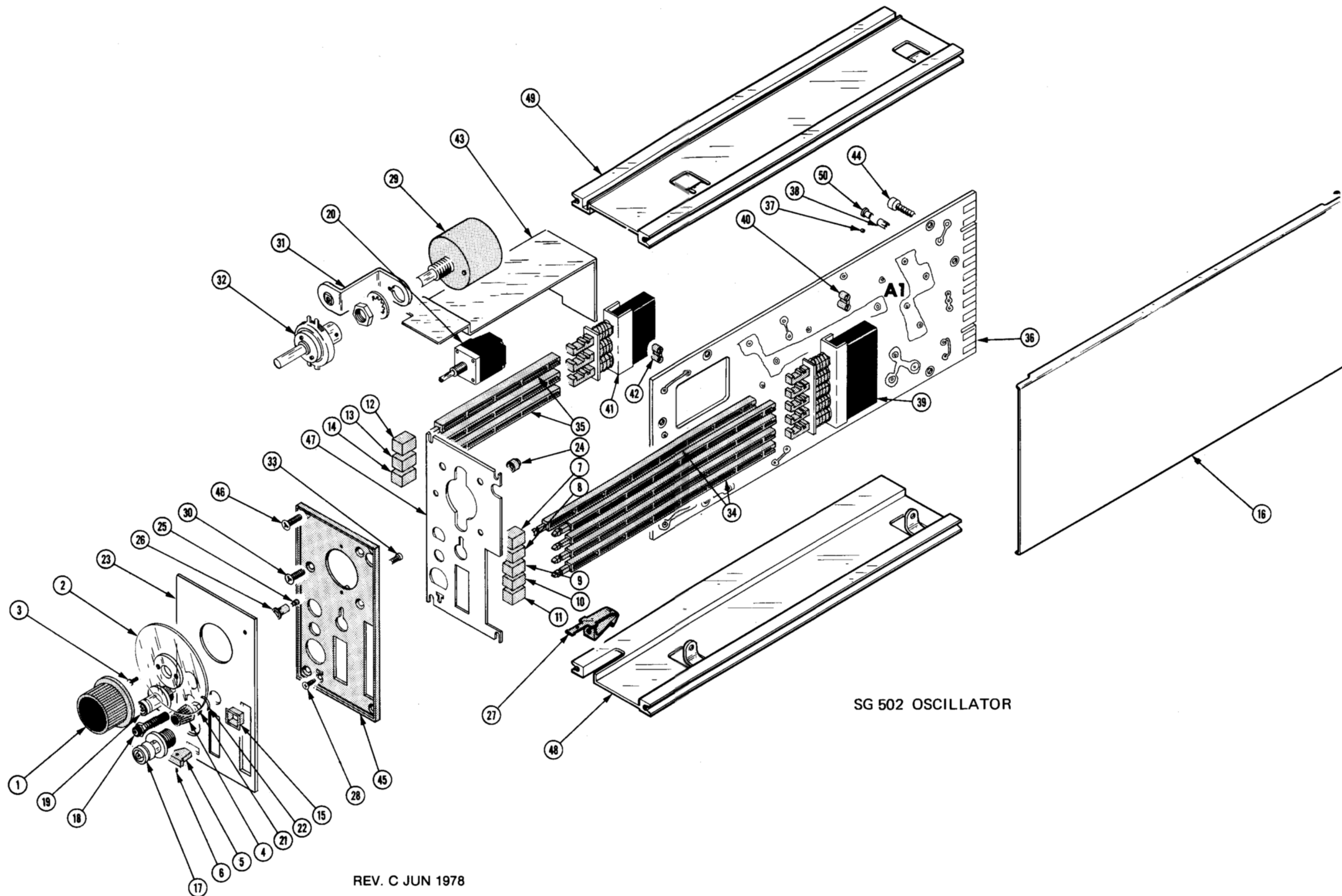
| Mfr. Code | Manufacturer                                                   | Address               | City, State, Zip           |
|-----------|----------------------------------------------------------------|-----------------------|----------------------------|
| 05091     | TRI-ORDINATE CORPORATION                                       | 343 SNYDER AVENUE     | BERKELEY HEIGHTS, NJ 07922 |
| 10539     | JACKSON BROS., LONDON, LTD.                                    |                       | CROYDEN, SURREY, ENGLAND   |
| 17117     | ELECTRONIC MOLDING CORP.                                       | 96 MILL ST.           | WOONSOCKET, RI 02895       |
| 22526     | BERG ELECTRONICS, INC.                                         | YOUK EXPRESSWAY       | NEW CUMBERLAND, PA 17070   |
| 45722     | USM CORP., PARKER-KALON FASTENER DIV.                          |                       | CAMPBELLSVILLE, KY 42718   |
| 73743     | FISCHER SPECIAL MFG. CO.                                       | 446 MORGAN ST.        | CINCINNATI, OH 45206       |
| 74445     | HOLO-KROME CO.                                                 | 31 BROOK ST. WEST     | HARTFORD, CT 06110         |
| 77250     | PHEOLL MANUFACTURING CO., DIVISION<br>OF ALLIED PRODUCTS CORP. | 5700 W. ROOSEVELT RD. | CHICAGO, IL 60650          |
| 78471     | TILLEY MFG. CO.                                                | 900 INDUSTRIAL RD.    | SAN CARLOS, CA 94070       |
| 79807     | WROUGHT WASHER MFG. CO.                                        | 2100 S. O BAY ST.     | MILWAUKEE, WI 53207        |
| 80009     | TEKTRONIX, INC.                                                | P O BOX 500           | BEAVERTON, OR 97077        |
| 83385     | CENTRAL SCREW CO.                                              | 2530 CRESCENT DR.     | BROADVIEW, IL 60153        |
| 91836     | KINGS ELECTRONICS CO., INC.                                    | 40 MARBLEDALE ROAD    | TUCKAHOE, NY 10707         |
| 93907     | CAMCAR SCREW AND MFG. CO.                                      | 600 18TH AVE.         | ROCKFORD, IL 61101         |



| Fig. & Index No. | Tektronix Part No. | Serial/Model No. |          | Qty | 1 2 3 4 5 |  |  |  |  | Name & Description | Mfr Code                                                        | Mfr Part Number   |
|------------------|--------------------|------------------|----------|-----|-----------|--|--|--|--|--------------------|-----------------------------------------------------------------|-------------------|
|                  |                    | Eff              | Dscont   |     |           |  |  |  |  |                    |                                                                 |                   |
| 1-1              | 366-1007-01        |                  |          | 1   |           |  |  |  |  | 1                  | KNOB:GRAY                                                       | 80009 366-1007-01 |
|                  | 213-0153-00        |                  |          | 2   |           |  |  |  |  | 2                  | . SETSCREW:5-40 X 0.125 INCH,HEX SOC STL                        | 74445 OBD         |
| -2               | 354-0437-02        |                  |          | 1   |           |  |  |  |  | 1                  | RING,KNOB SKIRT:<br>(ATTACHING PARTS)                           | 80009 354-0437-02 |
| -3               | 211-0030-00        | B010100          | B060599  | 2   |           |  |  |  |  | 2                  | SCREW,MACHINE:2-56 X 0.25"82 DEG,FLH STL                        | 83385 OBD         |
|                  | 211-0088-00        | B060600          |          | 2   |           |  |  |  |  | 2                  | SCREW,MACHINE:2-56 X 0.281"82 DEG,FLH STL                       | 77250 OBD         |
|                  | 210-0978-00        | XB060600         |          | 1   |           |  |  |  |  | 1                  | WASHER,FLAT:0.375 ID X 0.50 INCH OD,STL<br>- - - * - - -        | 78471 OBD         |
| -4               | 366-1023-01        |                  |          | 1   |           |  |  |  |  | 1                  | KNOB:GRAY                                                       | 80009 366-1023-01 |
|                  | 213-0153-00        |                  |          | 1   |           |  |  |  |  | 1                  | . SETSCREW:5-40 X 0.125 INCH,HEX SOC STL                        | 74445 OBD         |
| -5               | 366-1422-01        | B010100          | B072369  | 1   |           |  |  |  |  | 1                  | KNOB:LATCH                                                      | 80009 366-1422-01 |
|                  | 366-1690-00        | B072370          |          | 1   |           |  |  |  |  | 1                  | KNOB,LATCH:<br>(ATTACHING PARTS)                                | 80009 366-1690-00 |
| -6               | 214-1840-00        | B010100          | B072369X | 1   |           |  |  |  |  | 1                  | PIN,KNOB SECRG:0.094 OD X 0.120 INCH LONG<br>- - - * - - -      | 80009 214-1840-00 |
| -7               | 366-1257-87        |                  |          | 1   |           |  |  |  |  | 1                  | PUSH BUTTON:X10                                                 | 80009 366-1257-87 |
| -8               | 366-1402-41        |                  |          | 1   |           |  |  |  |  | 1                  | PUSH BUTTON:X100                                                | 80009 366-1402-41 |
| -9               | 366-1402-48        |                  |          | 1   |           |  |  |  |  | 1                  | PUSH BUTTON:X1K                                                 | 80009 366-1402-48 |
| -10              | 366-1402-50        |                  |          | 1   |           |  |  |  |  | 1                  | PUSH BUTTON:X10K                                                | 80009 366-1402-50 |
| -11              | 366-1402-49        |                  |          | 1   |           |  |  |  |  | 1                  | PUSH BUTTON:X100K                                               | 80009 366-1402-49 |
| -12              | 366-1402-45        |                  |          | 1   |           |  |  |  |  | 1                  | PUSH BUTTON:10                                                  | 80009 366-1402-45 |
| -13              | 366-1402-46        |                  |          | 1   |           |  |  |  |  | 1                  | PUSH BUTTON:20                                                  | 80009 366-1402-46 |
| -14              | 366-1402-47        |                  |          | 1   |           |  |  |  |  | 1                  | PUSH BUTTON:40                                                  | 80009 366-1402-47 |
| -15              | 426-0681-00        |                  |          | 8   |           |  |  |  |  | 8                  | FR,PUSH BUTTON:GRAY PLASTIC                                     | 80009 426-0681-00 |
| -16              | 337-1399-00        |                  |          | 2   |           |  |  |  |  | 2                  | SHLD,ELECTRICAL:SIDE                                            | 80009 337-1399-00 |
| -17              | 131-0274-00        |                  |          | 1   |           |  |  |  |  | 1                  | CONNECTOR,RCPT,:BNC                                             | 91836 KC79-67     |
| -18              | 136-0187-00        |                  |          | 1   |           |  |  |  |  | 1                  | JACK,TIP:<br>(ATTACHING PARTS)                                  | 17117 4653-113-0  |
|                  | 210-0465-00        |                  |          | 1   |           |  |  |  |  | 1                  | NUT,PLAIN,HEX.:0.25-32 X 0.375 INCH BRS<br>- - - * - - -        | 73743 3095-402    |
| -19              | 131-0955-00        |                  |          | 1   |           |  |  |  |  | 1                  | CONNECTOR,RCPT,:BNC,FEMALE,W/HARDWARE<br>(ATTACHING PARTS)      | 05091 31-279      |
|                  | 210-0255-00        |                  |          | 1   |           |  |  |  |  | 1                  | TERMINAL,LUG:0.391" ID INT TOOTH<br>- - - * - - -               | 80009 210-0255-00 |
| -20              | -----              |                  |          | 1   |           |  |  |  |  | 1                  | RESISTOR,VAR:(SEE R165A,R165B EPL)<br>(ATTACHING PARTS)         |                   |
| -21              | 210-0583-00        |                  |          | 1   |           |  |  |  |  | 1                  | NUT,PLAIN,HEX.:0.25-32 X 0.312 INCH,BRS                         | 73743 2X20224-402 |
| -22              | 210-0940-00        |                  |          | 1   |           |  |  |  |  | 1                  | WASHER,FLAT:0.25 ID X 0.375 INCH OD,STL<br>- - - * - - -        | 79807 OBD         |
| -23              | 333-1643-00        |                  |          | 1   |           |  |  |  |  | 1                  | PANEL,FRONT:                                                    | 80009 333-1643-00 |
| -24              | 200-0935-00        |                  |          | 1   |           |  |  |  |  | 1                  | BASE,LAMPHOLDER:0.29 OD X 0.19 CASE                             | 80009 200-0935-00 |
| -25              | 378-0602-00        |                  |          | 1   |           |  |  |  |  | 1                  | LENS,LIGHT:GREEN                                                | 80009 378-0602-00 |
| -26              | 352-0157-00        |                  |          | 1   |           |  |  |  |  | 1                  | LAMPHOLDER:WHITE PLASTIC                                        | 80009 352-0157-00 |
| -27              | 214-1513-01        | B010100          | B072369  | 1   |           |  |  |  |  | 1                  | LCH,PLUG-IN RET:                                                | 80009 214-1513-01 |
|                  | 105-0719-00        | B072370          |          | 1   |           |  |  |  |  | 1                  | LATCH,RETAINING:PLUG-IN<br>(ATTACHING PARTS)                    | 80009 105-0719-00 |
| -28              | 213-0254-00        |                  |          | 1   |           |  |  |  |  | 1                  | SCR,TPG,THD CTG:2-32 X 0.250,100 DEG,FLH<br>- - - * - - -       | 45722 OBD         |
|                  | 105-0718-00        | B072370          |          | 1   |           |  |  |  |  | 1                  | RELEASE,LATCH:                                                  | 80009 105-0718-00 |
| -29              | -----              |                  |          | 1   |           |  |  |  |  | 1                  | RESISTOR,VAR:W/HARDWARE(SEE R50A,R50B EPL)<br>(ATTACHING PARTS) |                   |
| -30              | 211-0559-00        |                  |          | 1   |           |  |  |  |  | 1                  | SCREW,MACHINE:6-32 X 0.375"100 DEG,FLH STL                      | 83385 OBD         |
| -31              | 407-1274-00        |                  |          | 1   |           |  |  |  |  | 1                  | BRKT,RES.MTS:<br>- - - * - - -                                  | 80009 407-1274-00 |
| -32              | 401-0161-00        |                  |          | 1   |           |  |  |  |  | 1                  | DRIVE,TURNS,RED:6 1 REDUCTION<br>(ATTACHING PARTS)              | 10539 4511/DAF    |
| -33              | 213-0138-00        |                  |          | 2   |           |  |  |  |  | 2                  | SCR,TPG,THD FOR:4-40 X 0.188 INCH,PNH STL<br>- - - * - - -      | 83385 OBD         |
| -34              | 384-1059-00        |                  |          | 5   |           |  |  |  |  | 5                  | EXTENSION SHAFT:6.58 INCH LONG                                  | 80009 384-1059-00 |
| -35              | 384-1101-00        |                  |          | 3   |           |  |  |  |  | 3                  | EXTENSION SHAFT:4.14 INCH LONG                                  | 80009 384-1101-00 |
| -36              | -----              |                  |          | 1   |           |  |  |  |  | 1                  | CKT BOARD ASSY:MAIN(SEE A1 EPL)                                 |                   |
| -37              | 136-0252-04        |                  |          | 87  |           |  |  |  |  | 87                 | . SOCKET,PIN TERM:0.188 INCH LONG                               | 22526 75060       |
| -38              | 131-1003-00        |                  |          | 1   |           |  |  |  |  | 1                  | . CONNECTOR BODY,:CKT CD MT,3 PRONG                             | 80009 131-1003-00 |

Replaceable Mechanical Parts—SG 502

| Fig. & Index No. | Tektronix Part No. | Serial/Model No. Eff | Dscont | Qty | 1                                                             | 2 | 3 | 4 | 5 | Name & Description                                           | Mfr Code | Mfr Part Number |
|------------------|--------------------|----------------------|--------|-----|---------------------------------------------------------------|---|---|---|---|--------------------------------------------------------------|----------|-----------------|
| 1-39             | -----              | -----                |        | 1   | .                                                             |   |   |   |   | SWITCH,PUSH:MULTIPLIER(SEE S50A-E EPL)<br>(ATTACHING PARTS)  |          |                 |
| -40              | 361-0384-00        |                      |        | 9   | .                                                             |   |   |   |   | SPACER,PB SW:0.133 INCH LONG<br>- - - * - - -                | 80009    | 361-0384-00     |
| -41              | 260-1448-00        |                      |        | 1   | .                                                             |   |   |   |   | SWITCH,PUSH:STEP ATTEN(SEE S160A-C EPL)<br>(ATTACHING PARTS) |          |                 |
| -42              | 361-0382-00        |                      |        | 5   | .                                                             |   |   |   |   | SPACER,PB SW:BROWN,0.275 INCH LONG<br>- - - * - - -          | 80009    | 361-0382-00     |
| -43              | 337-1802-00        |                      |        | 1   | .                                                             |   |   |   |   | SHIELD,ELEC:<br>(ATTACHING PARTS FOR CKT BOARD)              | 80009    | 337-1802-00     |
| -44              | 213-0146-00        |                      |        | 4   | SCR,TPG,THD FOR:6-20 X 0.313 INCH,PNH STL<br>- - - * - - -    |   |   |   |   |                                                              | 83385    | OBD             |
| -45              | 386-2371-00        |                      |        | 1   | SUBPANEL,FRONT:<br>(ATTACHING PARTS)                          |   |   |   |   |                                                              | 80009    | 386-237-100     |
| -46              | 213-0229-00        |                      |        | 4   | SCR,TPG,THD FOR:6-20 X 0.375"100 DEG,FLH STL<br>- - - * - - - |   |   |   |   |                                                              | 93907    | OBD             |
| -47              | 337-1710-00        |                      |        | 1   | SHIELD,ELEC:REAR SUBPANEL                                     |   |   |   |   |                                                              | 80009    | 337-1710-00     |
|                  | 386-3657-00        | XB072380             |        | 2   | SUPPORT,PLUG-IN:                                              |   |   |   |   |                                                              | 80009    | 386-3657-00     |
|                  | 210-1270-00        | XB072380             |        | 2   | WASHER,FLAT:0.141 ID X 0.04 THK,AL                            |   |   |   |   |                                                              | 80009    | 210-1270-00     |
| -48              | 426-0724-00        |                      |        | 1   | FR SECT,PLUG-IN:BOTTOM                                        |   |   |   |   |                                                              | 80009    | 426-0724-00     |
| -49              | 426-0725-00        |                      |        | 1   | FR SECT,PLUG-IN:TOP                                           |   |   |   |   |                                                              | 80009    | 426-0725-00     |
|                  | 214-1061-00        | XB010115             |        | 1   | SPRING,GROUND:FLAT                                            |   |   |   |   |                                                              | 80009    | 214-1061-00     |
|                  | 179-2280-00        | XB060600             |        | 1   | WIRING HARNESS:                                               |   |   |   |   |                                                              | 80009    | 179-2280-00     |
| -50              | 210-0774-00        |                      |        | 1   | . EYELET,METALLIC:0.152 OD X 0.245 INCH L,BRS                 |   |   |   |   |                                                              | 80009    | 210-0774-00     |
|                  | 210-0775-00        |                      |        | 1   | . EYELET,METALLIC:0.126 OD X 0.23 INCH L,BRS                  |   |   |   |   |                                                              | 80009    | 210-0775-00     |



SG 502 OSCILLATOR

REV. C JUN 1978

**STANDARD ACCESSORIES**

| Fig. &<br>Index<br>No. | Tektronix<br>Part No. | Serial/Model No.<br>Eff | Dscont | Qty | 1 | 2 | 3 | 4 | 5 | Name & Description        | Mfr<br>Code | Mfr Part Number |
|------------------------|-----------------------|-------------------------|--------|-----|---|---|---|---|---|---------------------------|-------------|-----------------|
|                        | 070-1430-01           |                         |        | 1   |   |   |   |   |   | MANUAL, TECH: INSTRUCTION | 80009       | 070-1430-01     |

## **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<br>108                            | PG 501 - Risetime less than 3.5 ns into 50 Ω.<br>PG 501 - 5 V output pulse; 3.5 ns Risetime                                                                                                                                                                                                                                                                          | 107 - Risetime less than 3.0 ns into 50 Ω.<br>108 - 10 V output pulse 1 ns Risetime                                                                                                                                                                                                                                                         |
| PG 502 replaces 107<br>108<br>111                     | PG 502 - 5 V output<br>PG 502 - Risetime less than 1 ns; 10 ns<br>Pretrigger pulse delay                                                                                                                                                                                                                                                                             | 108 - 10 V output<br>111 - Risetime 0.5 ns; 30 to 250 ns<br>Pretrigger pulse delay                                                                                                                                                                                                                                                          |
| PG 508 replaces 114<br>115<br>2101                    | Performance of replacement equipment is the same or better than equipment being replaced.                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                             |
| PG 506 replaces 106<br>067-0502-01                    | PG 506 - Positive-going trigger output signal at least 1 V; High Amplitude output, 60 V.<br>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.<br>0502-01 - Comparator output can be alternately chopped to a reference voltage.                                                                                                                                                     |
| SG 503 replaces 190, 190A, 190B<br>191<br>067-0532-01 | SG 503 - Amplitude range 5 mV to 5.5 V p-p.<br>SG 503 - Frequency range 250 kHz to 250 MHz.                                                                                                                                                                                                                                                                          | 190B - Amplitude range 40 mV to 10 V p-p.<br>0532-01 - Frequency range 65 MHz to 500 MHz.                                                                                                                                                                                                                                                   |
| SG 504 replaces 067-0532-01<br>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<br>181<br>184<br>2901       | TG 501 - Trigger output-slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.<br>TG 501 - Trigger output-slaved to marker output from 5 sec through 100 ns. One time-mark can be generated at a time.<br>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.<br>181 - Multiple time-marks<br>184 - Separate trigger pulses of 1 and 0.1 sec; 10, 1, and 0.1 ms; 10 and 1 μs.<br>2901 - Separate trigger pulses, from 5 sec to 0.1 μs. Multiple time-marks can be generated simultaneously. |

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



**TEKTRONIX®**  
committed to  
technical excellence

# MANUAL CHANGE INFORMATION

PRODUCT SG 502  
070-1430-01

CHANGE REFERENCE M34075  
DATE 1-19-79

| CHANGE: | DESCRIPTION |
|---------|-------------|
|---------|-------------|

EFF SN B073750

ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES

CHANGE TO:

|      |             |                                       |
|------|-------------|---------------------------------------|
| A1   | 670-2215-01 | CKT BOARD ASSY:MAIN                   |
| C18  | 281-0612-00 | CAP., FXD, CER DI:5.6PF, ±0.5PF, 500V |
| C110 | 290-0529-00 | CAP., FXD, ELCTLT:47UF, 20%, 20V      |
| C140 | 290-0529-00 | CAP., FXD, ELCTLT:47UF, 20%, 20V      |
| R110 | 321-0210-00 | RES., FXD, FILM:1.5K OHM, 1%, 0.125W  |
| R113 | 321-0210-00 | RES., FXD, FILM:1.5K OHM, 1%, 0.125W  |
| R115 | 321-0116-00 | RES., FXD, FILM:158 OHM, 1%, 0.125W   |
| R117 | 321-0193-00 | RES., FXD, FILM:1K OHM, 1%, 0.125W    |
| R160 | 321-0121-00 | RES., FXD, FILM:178 OHM, 1%, 0.125W   |
| R166 | 321-0157-00 | RES., FXD, FILM:422 OHM, 1%, 0.125W   |
| R165 | 311-2035-00 | RES., VAR, NONWIR:1K OHM, 10%, 0.5W   |

REMOVE:

|      |             |                                     |
|------|-------------|-------------------------------------|
| C112 | 290-0517-00 | CAP., FXD, ELCTLT:6.8UF, 20%, 35V   |
| R133 | 315-0102-00 | RES., FXD, CMPSN:1K OHM, 5%, 0.25W  |
| R164 | 321-0661-00 | RES., FXD, FILM:600 OHM, 1%, 0.125W |

ADD:

|       |             |                                      |
|-------|-------------|--------------------------------------|
| C27   | 281-0656-00 | CAP., FXD, CER DI:22PF, 5%, 500V     |
| C45   | 281-0546-00 | CAP., FXD, CER DI:330PF, 10%, 500V   |
| C93   | 281-0524-00 | CAP., FXD, CER DI:150PF, ±30PF, 500V |
| R107  | 315-0270-00 | RES., FXD, CMPSN:27 OHM, 5%, 0.25W   |
| VR133 | 152-0149-00 | SEMICOND DEVICE:ZENER, 0.4W, 10V, 5% |

TEXT CORRECTIONS

- Page 3-2 For instruments B073750 & up  
DELETE: Step 2 (No AGC Voltage Adjust)
- Page 3-2 For instruments B073749 & below  
Step 2b. Add the following:  
Vary the FREQUENCY Hz for a minimum DC Voltmeter reading.  
Step 2c. Change -2.5 volts to read:-0.6 volts dc.

CHANGE:

DESCRIPTION

SCHEMATIC CHANGES

DIAGRAM 1 RC OSCILLATOR - Partial

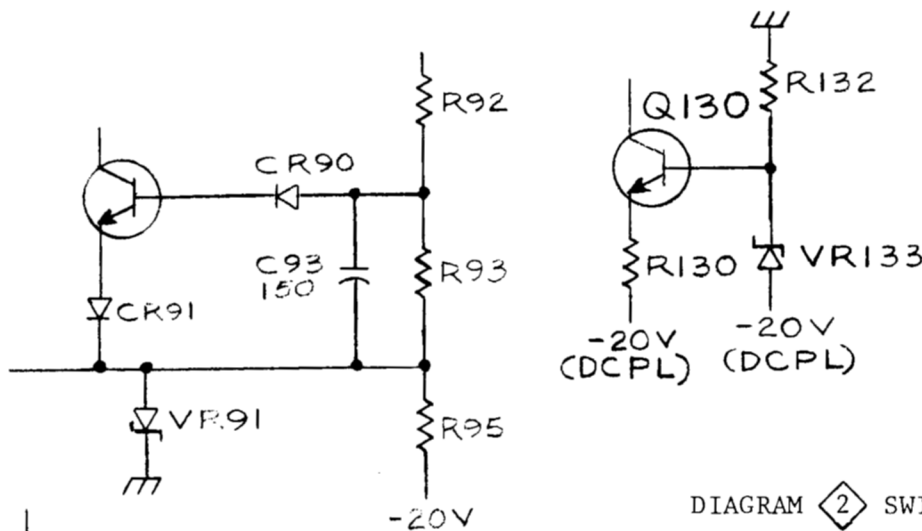
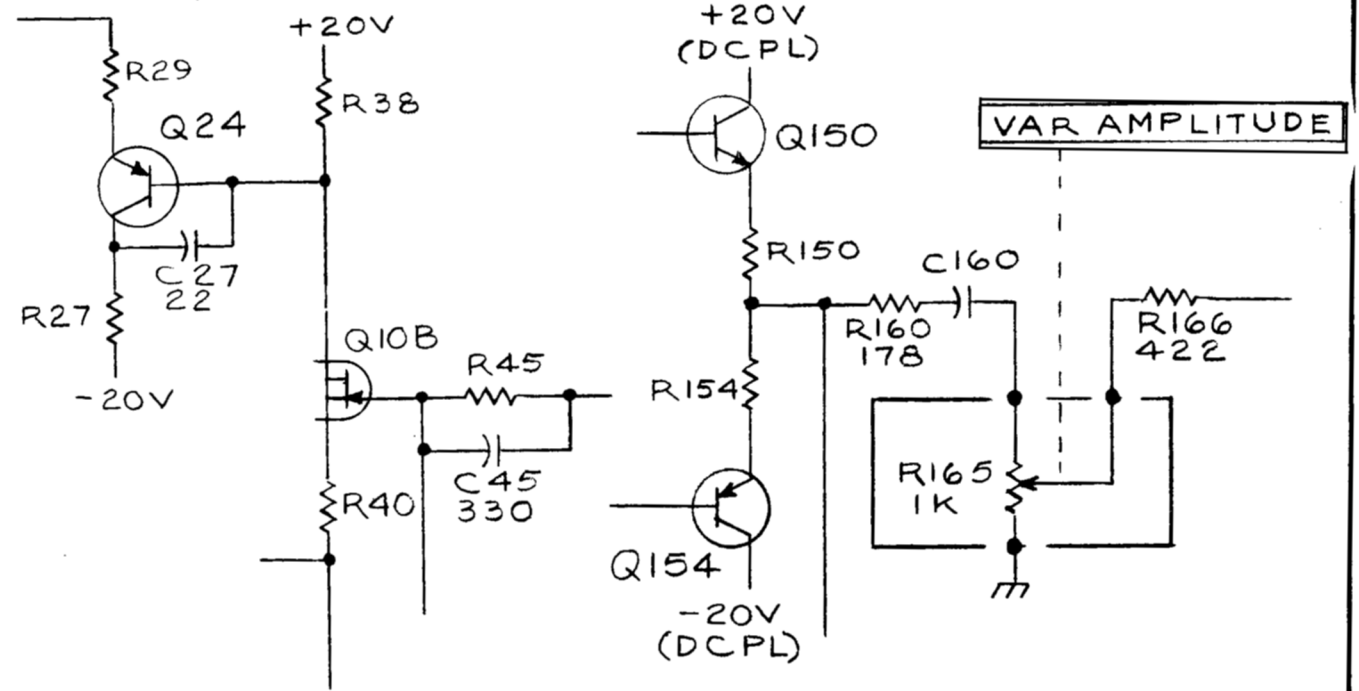
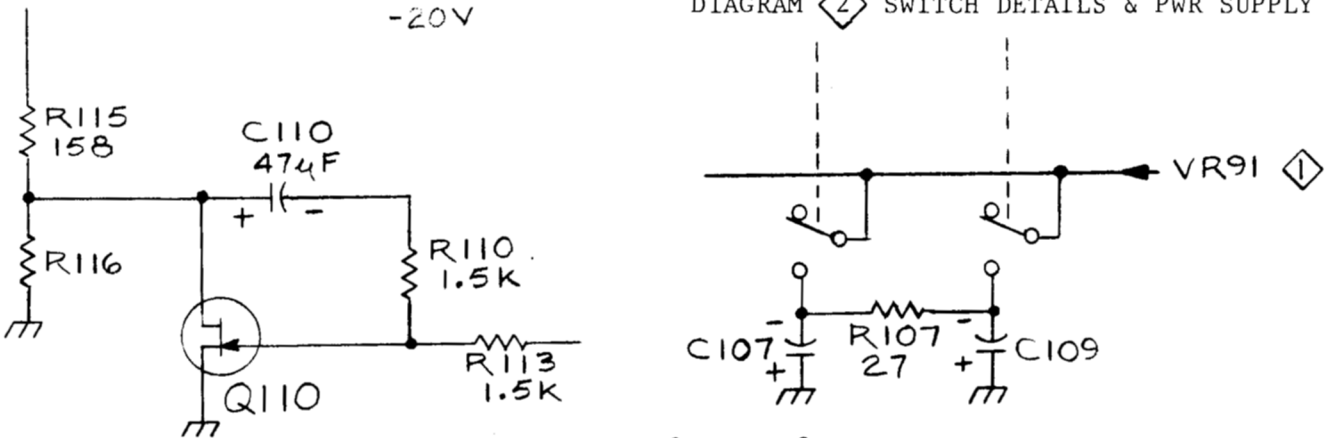


DIAGRAM 2 SWITCH DETAILS & PWR SUPPLY





| CHANGE | DESCRIPTION |
|--------|-------------|
|--------|-------------|

SCHEMATIC CORRECTIONS

DIAGRAM 2 SWITCH DETAILS & POWER SUPPLY - Partial

R346 connects to the -20 V supply NOT the +20 volts.

