

INSTRUCTION MANUAL

603/604
MONITOR

Serial Number _____



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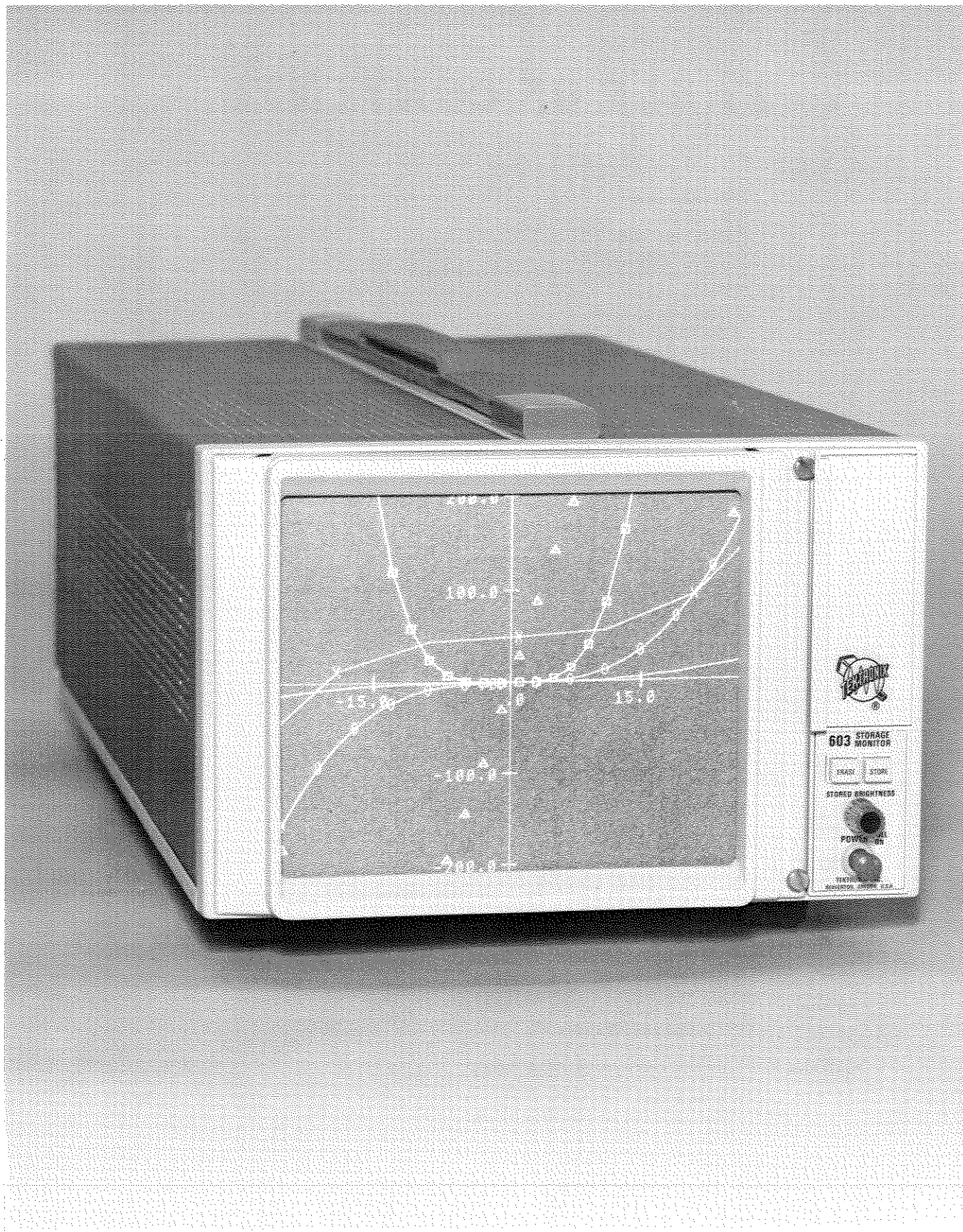
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SECTION 1

OPERATING INSTRUCTIONS

Introduction

The 603 Storage Monitor and 604 Monitor (non-storage) are general-purpose X-Y display monitors. Each provides a bright display of analog data in a large screen (6 1/2 inches) area. Resolution is excellent for most monitor uses, including alpha-numeric applications. The 603 and 604 are well suited for many display applications in ultrasonic detection systems, electron microscope systems, radiation and thermal scanning systems, speech therapy, mechanical pressure, volume, and vibration analysis, and medical and biophysical systems. The 603 is also well suited to provide stored displays of alpha-numeric and graphic information from computers and other data-transmission systems.

All display axes (vertical, horizontal and intensity) can be operated differentially as well as from a single-signal source. A remote-program connector permits the Monitor to be operated from a remote station. The 603 storage tube (CRT) allows a display to be held for up to an hour at normal stored brightness, and up to ten hours at low brightness. Both monitors can be operated from either a 120-volt or a 220-volt nominal line-voltage source.

Preparation

CAUTION

This instrument is designed for operation from a power source with its neutral at or near earth (ground) potential with a separate safety-earth conductor. It is not intended for operation from two phases of a multi-phase system, or across the legs of a single-phase, three-wire system.

NOTE

For 603 only: When first receiving the instrument, and when it has been turned OFF for two weeks or more, proceed as follows:

Turn STORED BRIGHTNESS control fully CW. Place the push-push STORE switch in the depressed position. Pull the POWER button to the ON position and note that after a short delay the screen will become fully illuminated. Leave the instrument in

this mode for 5 minutes before erasing or selecting the non-store mode. This procedure reduces the ion content in the CRT and maximizes CRT life.

CAUTION

Application of a high-amplitude Z-axis signal (within the 100 volt limit) will increase the CRT beam current and may damage the screen phosphor.

2. Apply the vertical signal to the Y INPUT and horizontal signal to the X INPUT. Apply the beam turn-on signal to the Z INPUT. All input connections are made at the rear of the monitor. Input signal requirements and remote-program connector information are given later in this section.

3. Open the access door on the front panel and check that the INTENSITY control is turned fully counterclockwise. Set the STORE button (603 only) to non-store (button out).

Basic Operation

NOTE

When changing from Sweep operation to XY operation, it is necessary to set the XY-YT switch S350 to the XY position (see Fig. 4-1. Deflection Amplifier Board, Grid 4A). The Sweep Board interconnecting plug P558 must be disconnected from the Control and Interface Board (604) or Storage Board (603), and the dummy P558 plug reinstalled, to connect pin 2 to pin 8 on the board.

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1. Pull the POWER button to the ON position and after a short delay slowly increase the INTENSITY until the spot is visible.

2. Position the spot to the desired starting location. The Position controls are located behind the access door, and arrows on the panel adjacent to the knobs indicate the positioning direction.

3. Activate the vertical, horizontal, and z-axis signals and check for proper display. If the vertical or horizontal deflection seems excessive, those input signals can be attenuated by a 5:1 ratio; see Input Attenuator information later in this section. Adjust the FOCUS control for a sharp, well-defined display.

4. To check storage operation of the 603, push in the STORE button. Press the ERASE button to remove the accumulated charge from the storage screen. A background glow should be present on the screen. Activate the input signals and check for proper storage. If the INTENSITY control is set too low, the information will not store, or will only partially store. Optimum setting of the INTENSITY control is reached when the information stores uniformly. De-activate the input signals and check that the brightness of the stored display can be controlled by the STORED BRIGHTNESS control. Press the ERASE button to remove the stored display. Maximum viewing time of a stored display at full brightness is one hour; at low brightness, it can be held for up to ten hours.

5. To check operation of the optional time-base sweep, the internal XY-YT switch must be set to YT. This switch is located on the Deflection Amplifier board at the left rear of the instrument (refer to board picture on pullout pages).

Remove the left side panel to gain access. Activate the vertical signal. Set the SEC/DIV switch to the desired sweep rate. Adjust the TRIG SLOPE/LEVEL control for a stable display. This control also determines the slope of the vertical signal at which the sweep is triggered.

Front-Panel Controls

This is a brief description of the function or operation of the front-panel controls.

POWER

Used to turn instrument power on or off.

STORE (603 only)

Button pushed in selects storage operation of the CRT. Button out selects normal operation without storage. This button must be in to enable remote control of storage operation.

ERASE (603 only)

Momentary-contact pushbutton initiates erasure of display information stored on the screen.

STORED BRIGHTNESS (603 only)

Control varies the intensity of stored information; permits extended retention of stored information. For control to function, the CRT beam must be cut off. Also see Remote Program connector data remote view-hold mode.

INTENSITY

Controls display brightness.

FOCUS

Provides adjustment to obtain a sharp display.

Position

Two controls position the writing beam or display. Arrows indicate axis controlled.

SWEEP (Optional)

SEC/DIV

Time per major graticule division (8 X 10 scribed graticule optional). Selects one of six calibrated sweep rates between 0.1 s/div and 1 μ s/div in decade steps.

VARIABLE

Screwdriver adjustment concentric with Seconds/Division switch provides uncalibrated, continuously variable sweep rate between calibrated steps. It extends the sweep rate range to 1 second/division.

TRIG SLOPE/LEVEL

Screwdriver adjustment selects the slope and level of the triggering signal at which the sweep is triggered.

Optional Time Base Sweep Characteristics

Sweep Rates. 0.1 sec/div to 1 μ sec/div in six decade steps. (Extends sweep speed to greater than 1 sec/div.)

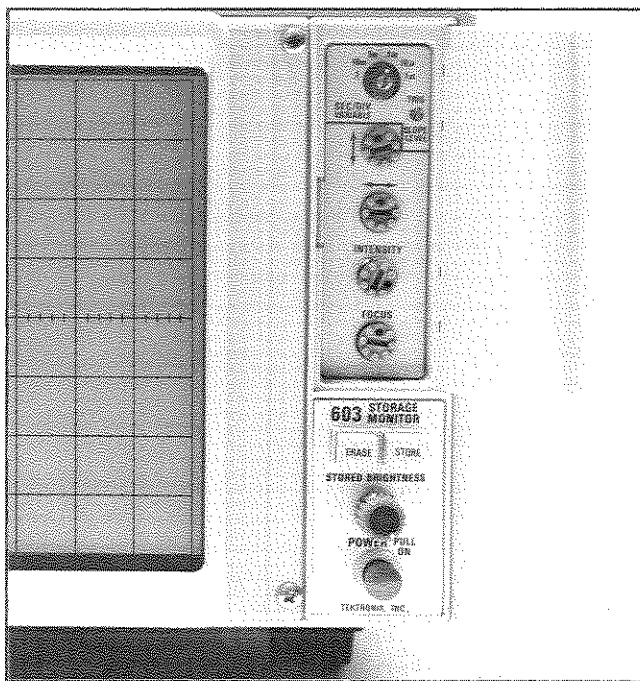


Fig. 1-1. Front panel controls.

Displayed Timing Accuracy. Within 3%.

Variable Range. At least 10:1.

Position Range. Any portion of sweep can be positioned to graticule center.

Triggering Requirements. 0.5 division or greater, DC to 2 MHz.

Level Range. About ± 6 divisions.

Sweep Length. About 10.5 divisions.

Rackmounting

The 603/604 Monitor can be operated in a standard 19-inch instrument rack. Vertical rack space required is 5 1/4 inches. Conversion kits are available to mount two monitors side by side, or to mount a single monitor. Contact your local Tektronix Field Office or representative.

Power Connection

The 603/604 can be operated from either a 120-volt or a 220-volt nominal line-voltage source. The power trans-

former is wired to permit one of six regulating ranges to be selected. The range for which the primary taps are set is marked on the rear panel of the instrument. Use the following procedure to obtain correct instrument operation from the line voltage available.

1. Disconnect the instrument from the power source.

2. Remove the right side panel of the instrument to gain access to the power rectifier circuit board. A picture of this board showing the transformer primary taps is provided on a pullout page at the rear of the manual.

3. To convert from 120 volts to 220 volts nominal line voltage, or vice versa, remove the line-selector block from the primary tap square-pin connectors and replace it with the other block. Remove the line fuse from the fuse holder located on the rear panel and replace it with one having the correct rating. The unused line-selector block can be stored on the Rectifier circuit board. Change the line cord power plug to match the power source receptacle, or use an adapter.

NOTE

The 120-volt block is color coded brown, and it connects the transformer primary windings in parallel. The 220-volt block is color coded red, and it connects the primary windings in series.

4. To change regulating ranges, place the line-selector block on the desired set of square pins. Select a range which is centered about the average line voltage to which the instrument is to be connected (see Table 1-1).

5. Change the nominal line voltage information on the rear panel of the instrument. Use a non-abrasive eraser to remove the previous data, and mark in new data with a pencil.

6. Replace the side panel and apply power to the instrument.

CAUTION

Damage to the instrument may result from incorrect placement of the line-selector block.

TABLE 1-1
Regulating Ranges

Line selector block position	Regulating Range	
	120 Volts Nominal	220 Volts Nominal
L	90 VAC to 110 VAC	180 VAC to 220 VAC
M	99 VAC to 121 VAC	198 VAC to 242 VAC
H	108 VAC to 132 VAC	216 VAC to 264 VAC

Ambient (Surrounding) Temperature Considerations

The 603/604 can be operated where the ambient air temperature is between 0°C and +50°C (between +32°F and +122°F). The instrument can be stored in ambient temperature between -40°C and +70°C (between -40°F and +158°F). After storage at a temperature beyond the operating limits, allow the chassis temperature to come within the operating limits before power is applied.

Signal Connectors

BNC connectors are provided at the rear of the instrument for application of input signal (either single-ended or differential) to the Y and X deflection amplifiers and to the Z-axis amplifier to control beam intensity. As shipped, the instrument is prepared for single-ended inputs; grounding caps are connected to the — inputs. For differential operation, the grounding cap is removed and a signal is applied to both connectors. Also, the connectors can be internally disconnected from ground, permitting a "floating" input. See Electrical Characteristics later in this section for differential capability data.

Input Requirements

The vertical and horizontal deflection factors are set by the factory to a nominal 1 volt for full scale deflection on each axis. Thus the input requirements are 0.125 volt for each division (one-half inch) of vertical deflection, and 0.1 volt for each division of horizontal deflection. An internal gain control for each deflection amplifier permits an adjustable full-scale range from 0.5 volt or less to 2.5 volts or more, and an internally selectable 5:1 attenuator extends the deflection factor range to 12.5 volts or more for full scale deflection. In any case, do not apply a signal with amplitudes exceeding 100 volts to the Y or X inputs.

With no signals applied to the Z INPUT connectors, the intensity of the display is controlled by the front-panel INTENSITY control. The intensity range provided by this control is from no visual intensity (CRT beam off) to full bright. To control the intensity with an externally applied

signal, set the INTENSITY control to about midrange. An internal gain control permits the Z input requirement for full intensity control to be adjustable from +1 volt or less to +5 volts or more, depending on the exact setting of the INTENSITY control. A zero-volt input cuts off visual intensity when the INTENSITY control is at about midrange. Exercise care in establishing the correct display intensity; a too-high amplitude Z input signal combined with a too-high INTENSITY control setting may increase the beam current above the phosphor-damaging level. In any case, do not apply a Z input signal with amplitudes exceeding 100 volts.

Input Attenuators

Each Y and X input circuit includes a selectable 1:1 - 5:1 attenuator, which is set for 1:1 operation when shipped from the factory. The switches for selecting 5:1 attenuation are located on the Deflection Amplifier circuit board at the left rear of the instrument. Remove the left side panel to gain access. Refer to the board picture given on a pullout page at the rear of this manual.

Remote Program Connector

The Remote Program connector, located on the rear panel, provides direct connections to the + inputs of the X, Y, and Z amplifiers from a remote location. Also, storage operation of the 603 can be controlled from a remote location; however, the front-panel controls of the instrument override the remote inputs. All inputs and outputs are TTL compatible. See Fig. 1-2 for details.

Remote Erase. Stored display will be erased when a remote contact is closed to ground, or logical 0 (TTL) is applied.

Remote Non-Store. Closing the remote contact to ground or applying a logical 0 (TTL) allows the storage CRT to operate in the non-store mode.

Erase Interval. During the erase interval, a negative-going pulse, logical 0 (TTL), is present at this contact. This can be used to notify associated equipment that information stored on the 603 screen is being erased.

Variable Brightness Enable/Disable. This input line permits switching stored brightness from full bright to the level established by the STORED BRIGHTNESS control when a remote contact is closed to ground or when a logical 0 (TTL) is applied.

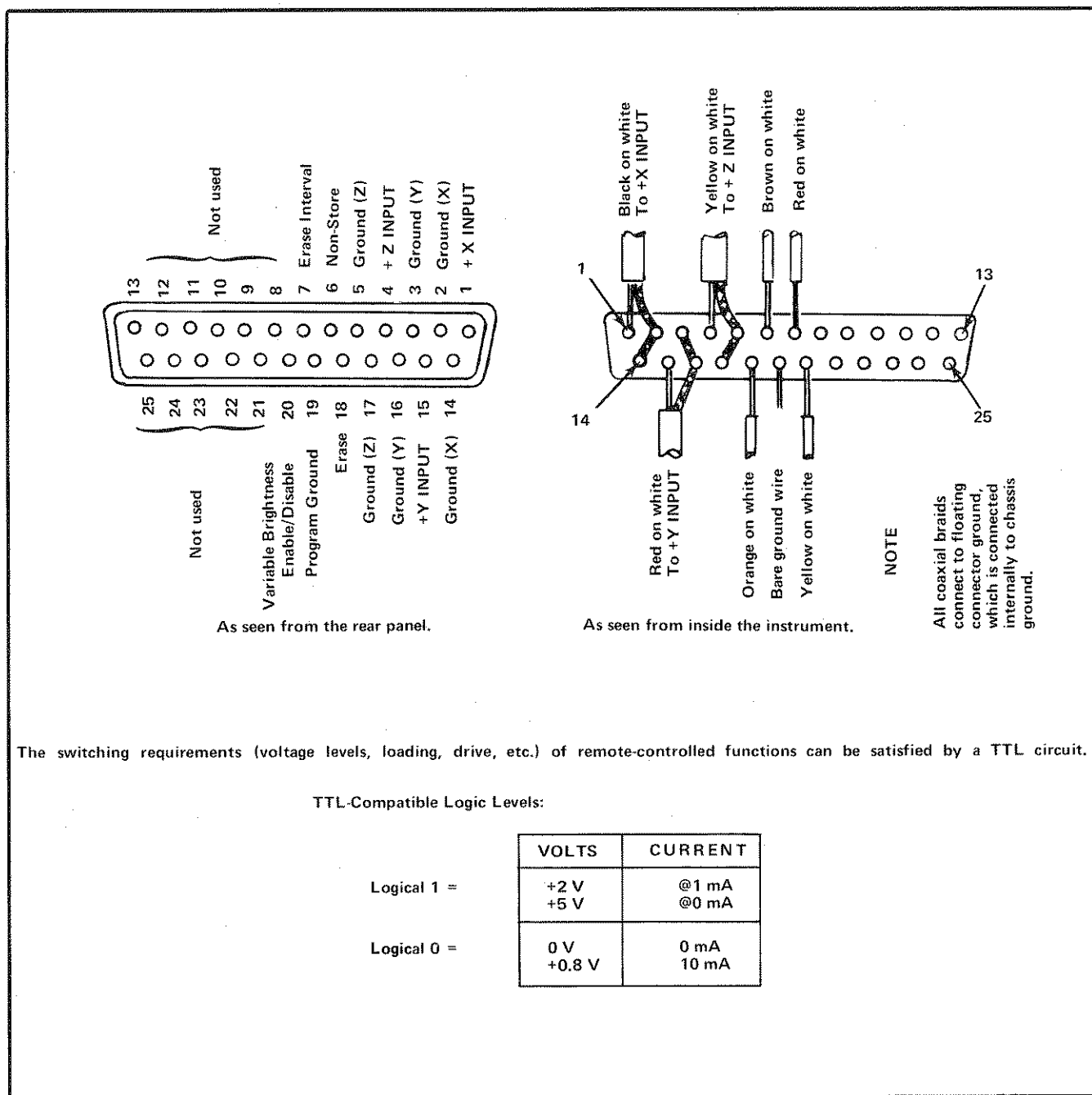


Fig. 1-2. Remote Program Connector data.

Application of a logical 1 (TTL) disables the STORED BRIGHTNESS control, even though the CRT beam is at writing intensity. This mode is useful only when the spot is stationary.

Optional Instrument Features

603. The 603 can be ordered with an internal sweep-generating circuit to provide an oscilloscope-type time base. Six calibrated sweep rates from 0.1 second/division through

1 microsecond/division in decade steps are selectable by a front-panel knob. An internal black graticule scribed with eight vertical and ten horizontal divisions (each division is one half inch square) is available as an option; a blank CRT faceplate is standard for the Storage Monitor. Also, a storage tube capable of a 200 DIV/ms writing rate is available.

Option 1—internal non-illuminated graticule 8 X 10 div.

Option 2—fast writing rate CRT (>200 div/ms).

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Option 3—instrument without handle and feet.

Option 4—Sweep

Any combination of options can be ordered. Example: fast CRT with graticule, order option 1 and 2.

604. The internal sweep-generating option described in the preceding paragraph is available for the 604. The 604 can be ordered with no graticule instead of the standard 8 X 10 division internal black graticule. Also, optional P4 and P7 phosphors are offered for the 604 (P31 is standard).

Option 1—without graticule.

Option 2—instrument without handle and feet.

Option 4—Sweep.

A 603 or 604 ordered without graticule will receive an external graticule as an accessory to aid in calibration.

ELECTRICAL CHARACTERISTICS

NOTE

In this manual the word division, graticule division, or div refer to major graticule divisions.

Vertical and Horizontal Amplifiers

Deflection Factor. Vertical: nominally set for 1 V full scale; internally adjustable from 0.5 V or less to 2.5 V or more full screen (range of at least 62.5 mV/div to 312.5 mV/div). Horizontal: nominally set for 1 V full scale; internally adjustable from 0.5 V or less to 2.5 V or more full screen (range of at least 50 mV/div to 250 mV/div). An internal 5:1 attenuator extends the deflection factor range to 12.5 V or more full screen for both axes.

Polarity (Differential Inputs). Positive signal applied to + input deflects beam up or to the right; negative signal deflects beam down or to the left. Positive signal applied to – input deflects beam down or to the left; negative signal deflects beam up or to the right.

Bandwidth and Response. Spot must reach new writing position within 1 μ s from any on-screen position. Based on 80% full-screen reference signal, the amplifier bandwidth is 2 MHz; risetime is 0.18 μ s or less.

Differential Capability. 3 V non-attenuated common mode dynamic range; at least 100:1 CMRR to 100 kHz without attenuator. 15 V common-mode dynamic range with 5X attenuator; at least 50:1 CMRR to 100 kHz with 5X attenuator.

Phase Difference. Within 1° between equal-gain X and Y to 500 kHz.

Position Stability. 0.1 division or less (0.050 inch or less) per hour after 20-minute warmup.

Input R and C. 1 M Ω paralleled by less than 47 pF.

Maximum Input Voltage. ± 100 V (DC + peak AC).

Position Range. About ± 12 divisions from screen center allows setting zero signal position anywhere on screen.

Z Axis Amplifier

Useful Input Voltage. Adjustable from +1 V or less to +5 V or more for full intensity control when the INTENSITY control is set to about midrange. Under this condition, zero-volt input cuts off visual intensity.

Useful Frequency Range. DC to 5 MHz (at –3 dB) 70 ns risetime.

Differential Capability. 5 V common mode; at least 100:1 CMRR to 100 kHz.

Input R and C. 1 M Ω paralleled by less than 47 pF (differential inputs).

Maximum Safe Input. ± 100 V (DC + peak AC) when INTENSITY control is fully counterclockwise. See Caution under Basic Operation.

CRT Display

CRT. 6 1/2-inch flat faceplate, electrostatic deflection Phosphor is similar to P1 for the 603; P31 is standard for the 604. Optional for the 604 are P4 and P7.

Display Quality Area. 8 X 10 divisions (4 X 5 inches).

Display Linearity (Vertical and Horizontal). No more than 5% difference between any two divisions.

Maximum Spot Size. 25 mils.

Geometry. 0.1 division (0.050 inch) or less.

Resolution (Non-Store). 128 line pairs vertically; 160 line pairs horizontally.

Storage Display (603 Only). Stored resolution is 80 line pairs vertically, 100 line pairs horizontally. Writing speed is at least 20 divisions/millisecond (at least 200 divisions/millisecond with optional fast-writing CRT). Storage time is 1 hour at full stored brightness; erase time is about 250 milliseconds.

Physical

Total Depth of Rack for Rackmounting. 19 inches.

SECTION 2

THEORY OF OPERATION

Introduction

This section of the manual contains an electrical description of the circuits in the 603 and 604 display monitors. An overall block diagram of these units and complete schematics are given on pullout pages at the rear of this manual.

BLOCK DIAGRAM DESCRIPTION

The Deflection Amplifiers process input signals and provide push-pull outputs suitable to drive the vertical (Y) and horizontal (X) deflection plates. Input signals can be applied either single ended or differentially.

The Z-Axis Amplifier controls the beam intensity by providing a voltage to drive the CRT control grid. Input signals can be applied either single ended or differentially.

The CRT Circuit produces the high voltage (about -3450 volts) and contains the controls necessary for operation of the cathode-ray tube.

The Storage Circuit provides the voltage levels necessary to operate the storage elements associated with the CRT in the 603. The circuit includes the erase-pulse generator for erasing stored information and a multivibrator which permits the flood-gun duty cycle to be varied.

The Power Supply circuit provides the low-voltage operating power for the 603 and 604 monitors. Electronic regulation is used to provide stable, low-ripple output voltages.

The optional Sweep Generator circuit produces a positive-going sawtooth voltage which is amplified by the horizontal Deflection Amplifier to provide sweep deflection in the CRT. A negative-going gate is produced at the same time the sawtooth is being produced to unblank the CRT.

CIRCUIT DESCRIPTION

Deflection Amplifiers

General. The Deflection Amplifiers process input signals and provide push-pull outputs suitable to drive the deflec-

tion plates. Input signals can be applied either single ended or differentially. Negative feedback is employed to insure a highly-stabilized output.

NOTE

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

Inputs. Signals can be applied to either J110 (+) or J130 (—) as single-ended inputs, or to both connectors as a differential input. Also, a signal may be applied via the Remote Program connector to the + input. An internal switch for each input (S110, S130) allows a choice of either 1:1 or 5:1 attenuation of the input signal before it is applied to the input FET gate. The input 5X attenuators are frequency-compensated voltage dividers.

Preamplifier. The preamplifier stage employs field-effect transistors to provide a high input impedance. This stage consists of two identical feedback amplifiers, Q120A-Q152 and Q120B-Q156, which can be operated as either a paraphase amplifier (with a single-ended input) or as a differential amplifier. A push-pull signal is produced at the collectors of Q152 and Q156. The FET gates are diode-clamped on negative-going overdrive signals, protecting the transistors in the amplifier. R125, Y Gain, provides an adjustable amplification factor to allow a CRT full-scale deflection range from 0.5 volt or less to 2.5 volts or more. This control is set by the factory to a nominal 1 volt for full-scale deflection on each axis.

Output Amplifier. The output amplifier stage consists of two identical non-inverting operational amplifiers connected in a differential configuration. Q172 and Q192 provide constant current for input emitter followers Q162 and Q182. Q162 and Q182 receive the push-pull signal from the preamplifier stage, and the input signal is developed across the resistance between their emitters. The signal current is forced through R165 and R185, producing the deflection-plate drive signal at the collectors of Q222 and Q226. Q202 and Q208, whose bases are diode-protected to ensure quick overdrive recovery, provide the drive for the output transistors. The Q222-Q226 collectors are diode-clamped on negative-going overdrive signals.

Display positioning is accomplished by adjustment of R175 (vertical) and R375 (horizontal). These resistors provide a shift in the constant-current source transistors, shifting the quiescent output voltage. Capacitors C168 and C368 are adjustable to provide frequency compensation.

Z-Axis Amplifier

General. The Z-Axis Amplifier controls the CRT beam intensity by providing a voltage to drive the CRT control grid. Input signals can be applied either single ended or differentially.

Inputs. Signals can be applied to either J505 (+) or J515 (—) as single-ended inputs, or to both connectors as a differential input. Also, a signal may be applied via Remote Program connector J200 to the + input. A provision is made on each input line to permit installation of attenuating resistors.

Preamplifier. The Z-axis preamplifier stage employs field-effect transistors to provide a high input impedance. This stage consists of two identical feedback amplifiers, Q520A-Q526-Q534 and Q520B-Q528-Q536, which can be operated as either a paraphase amplifier (with a single-ended input) or as a differential amplifier. A single-ended output is produced at the collector of Q534, and is opposite in polarity to a signal applied to the + input and in phase with a signal applied to the — input. Constant current for the stage is supplied by Q532. The FET gates are diode-clamped on negative-going overdrive signals, protecting the transistors in the preamplifier. R512, Z Gain, provides an adjustable amplification factor to allow a full intensity control range of from +1 volt or less or +5 volts or more to be established when the INTENSITY control in the output stage is set to about midrange. Under this condition, a zero-volt input cuts off visual intensity.

Output Amplifier. The output amplifier is a non-inverting operational amplifier consisting of Q542, Q544, Q554, and Q556. The feedback resistor is R556. Q554 and Q556 are connected as a collector-coupled complementary amplifier to provide a fast, linear output signal while consuming minimum quiescent power. The quiescent output level can be set by adjustment of the INTENSITY control, R562. The output is applied to the CRT control grid circuit.

CRT Circuit

General. The CRT circuit produces the high-voltage potential and provides the control circuits necessary for operation of the cathode-ray tube (CRT).

High-Voltage Oscillator. A class C oscillator consisting of Q580 and its associated circuitry provides the drive for the high-voltage transformer, T580. When the instrument is turned on, conduction of Q576 provides a base current path for Q580. The collector current of Q580 increases producing an increased current in the Q580 base winding and causing increased conduction of Q580. Eventually the rate of collector current increase in Q580 becomes less than that required to maintain the voltage across the collector winding, and the voltage drops as the field collapses. This turns off Q580 by way of feedback voltage to the base. Q580 remains off until the feedback voltage on the base is near the peak positive value again. The cycle repeats at a frequency of 40 to 50 kilohertz. The amplitude of sustained oscillation depends upon the average current delivered to the base of Q580, and finally, the average Q580 collector current.

High Voltage Regulation. Regulation is accomplished as follows: Feedback from the —3450-volt cathode supply is summed with a low-voltage level through the voltage divider consisting of resistors R573A, R573B, and R575 to establish the DC level at the base of Darlington transistor Q570. This sample of the output voltage is compared to the regulated +15 volts in the base circuit of Q570. Any changes in the high-voltage output are sensed by Q570 which produces an error signal to control the conduction of Q576. Q576 correspondingly produces a change in the average Q580 base current, nullifying the change in the high-voltage output and thus holding it constant. The DC level at the base of Q570 is adjusted by R575, High Voltage, to set the high-voltage output to exactly —3450 volts.

Electron Gun Cathode and Grid Supplies. Half-wave rectifier CR580 produces —3450 volts DC, which is filtered and applied to the CRT cathode as the accelerating potential. The cathode heater is elevated to the cathode potential through R590.

Bias voltage for the grid is supplied by a DC restorer network consisting of CR566, CR567, and R565. The DC restorer has the —3450-volt cathode potential applied to it as a reference voltage, and it is driven by a varying voltage obtained from a tap on the secondary winding of T580. R588, Cutoff, provides a fine adjustment of the quiescent grid voltage to bias the electron gun just below cutoff when the Z-Axis Amplifier output is at its minimum quiescent level (INTENSITY control counterclockwise and no signals applied). A change in the Z-Axis Amplifier output produces an almost equal change of voltage on the control grid, allowing the Z-Axis Amplifier to control the CRT beam current.

CRT Control Circuits. In addition to the INTENSITY control discussed in the Z-Axis Amplifier circuit, front-panel FOCUS and internal astigmatism controls have been incorporated for arriving at an optimum CRT display. FOCUS control R595 provides the correct voltage for the second anode of the CRT. Proper voltage for the third anode is obtained by adjusting Astig control R594. In order to obtain optimum spot size and shape, both the FOCUS and Astig controls are adjusted to provide the proper electrostatic lens configuration in the CRT.

The Geom adjustment R596 varies the positive level on the horizontal deflection plate shields to control the overall geometry of the display. The TRACE ROTATION control, R598, permits adjustment of the DC current through beam-rotation coil L598 to align the display.

Storage Circuit (603 Only)

General. The CRT used in the 603 is a direct-view bistable storage cathode-ray tube. Only those elements associated with the storage capability of the CRT are shown in the CRT symbol on the right side of the Storage Circuit diagram. The writing gun, its deflection systems and associated elements will be discussed under CRT Circuit.

Storage Operation. Four low-energy electron guns (flood guns) provide full coverage of the large screen area. The cathode heaters, which receive an unfiltered pulsating DC from full-wave rectifier CR775, are elevated to the cathode potential through R775. Quiescently Q615 is saturated, providing current to the flood-gun cathodes. The anode potential is established by VR734 and supplied via emitter follower Q735.

The collimation electrode is a metallic band around the inner wall of the CRT envelope. It produces an electrostatic field to distribute the flood-gun electrons uniformly over the storage target. R730, CE1, provides adjustment of the flood electron trajectories to cover the extreme rim of the targets and optimize uniformity of the target coverage. Emitter follower Q725 maintains a stable voltage on the collimation electrode, providing a low-impedance current path to absorb current variations.

The storage screen consists of a thin tin oxide layer called the target backplate, which is coated with an insulator material containing finely-ground phosphor particles called the target. A positive voltage potential is applied via Q680 to backplate to establish the operating level of the tube, which is the difference in potential between the backplate and the flood-gun cathodes.

The target operates in a bistable mode because of the secondary emission properties of the insulator material. The first stable state is the rest potential, at which the target has gathered low-energy flood-gun electrons, causing it to charge down to the flood-gun cathode potential. The second stable state is stored state, at which the target (or portions of it) is shifted to the backplate potential by increasing the secondary emission. While the flood guns do not have sufficient energy to shift the target to the stored state, they do supply sufficient energy to hold the target in the stored state after it has been shifted by the high-energy writing-gun beam (CRT beam). This is because the landing energy of the flood electrons has increased with the increased potential difference between the flood-gun cathode and the target. These higher energy electrons produce a visual display as long as the flood beam covers the target.

When the stored display is no longer needed, the information is erased by first shifting the entire target to the stored state, and then removing the charge. A positive-going short-duration pulse is first applied to the backplate, increasing the flood-gun electron landing energy and writing the entire target area. Next, the backplate voltage is pulled well below the rest potential of the target, which follows due to its inherent capacitive coupling. Then, as the backplate is gradually returned to its quiescent potential, the target charges to the rest potential and is ready to write again.

Backplate Supply. A regulated +360-volt DC power supply provides the storage level for the CRT and ensures a potential sufficient for the erasure process. Full-wave bridge rectifier CR820 through CR823 in the Power Supply circuit furnishes the required voltage. The regulator consists of series-pass transistor Q762, emitter follower Q760, and error amplifier Q764. The +360-volt output is compared to the -30-volt reference at the base of Q764, which supplies correction bias to Q762. Operation of this feedback amplifier system is similar to that described for the -30-volt supply (Power Supply circuit). VR763 is a protection device for the transistors, and is normally operated in a region of its characteristic curve below its Zener knee.

Backplate Control Amplifier. A high degree of control of the target backplate is maintained by a feedback amplifier system consisting of Q675, Q678, and Q680. The operational amplifier summing point is at the base of Q675 and the feedback resistor is R672. Variable resistor R670, Store Level, provides an adjustment of the current to the null point, and hence sets the backplate voltage through R672 to an optimum storage level.

Sensitivity Correction. When the 603 is operated in the store mode, the divider network in the high-voltage regulator circuit is modified to shift the high voltage slightly, correcting for the deflection sensitivity changes that occur. The backplate voltage is applied through R716 to the base of Q715, removing the ground potential from the Q715 collector. R715 permits an adjustable sensitivity correction to be applied to the high-voltage regulator.

Erase Generator. The previously discussed backplate control operational amplifier is driven by a monostable multivibrator when it is desired to erase a stored display. The multivibrator consists of Q640, which is normally on, and Q644, which is normally off. Q648 is part of the erase interval circuit and will be discussed later. All inputs of U630B are held high (+5 volts), keeping output pin 8 low. The multivibrator is switched either by pushing the front-panel ERASE button or by remote application of a TTL-compatible low level (see Fig. 1-2). When any of the U630B input lines are pulled low, pin 8 snaps positive. The positive transition is coupled through C636 and CR636 to the base of Q644, causing the multivibrator to switch states. The negative-going step produced at the Q644 collector causes a corresponding positive-going step at the output of the operational amplifier. This positive-going step is applied to the target backplate, increasing the storage level and "writing" the entire target.

After an RC-controlled time of 10 milliseconds, the multivibrator reverts to its quiescent state, producing a positive-going step at the collector of Q644 as the transistor turns off. This positive-going step is coupled through C644, and the backplate is pulled negative through the action of the operational amplifier. The target is pulled well below its rest potential. As C644 charges, the voltage at the cathode of CR664 decays from about +15 volts toward the -30 volt supply at an RC-controlled rate until it is clamped at ground by conduction of CR664. This action allows the target backplate to be raised slowly to its operating level, while the target remains at the flood-gun cathode potential. The total time from initiation of erasure to the ready-to-write condition is about 250 milliseconds.

Flood-Gun Cathode Control. As previously mentioned, Q615 provides the current for the flood-gun cathodes. It operates at saturation, establishing a cathode potential of nearly -30 volts. Q615 is controlled by two circuits: collector-coupled multivibrator Q620-Q628 and transistor switch Q610. When either Q628 or Q610 is on, Q615 is conducting flood-gun current.

Symmetry of the multivibrator is controlled by R622 and R625. R625, STORED BRIGHTNESS, is adjustable to allow Q615 to conduct anywhere from 10% to 100% (Q610 must be off to enable multivibrator control), which has the effect of varying the stored brightness.

When Q610 is turned on, it provides a control to override the multivibrator output and hold Q615 in its conduction state. A positive level either from the output of the Z-axis circuit or from the Remote Program connector turns Q606 on, providing base current for Q610. Also, during the erase interval, CR608 provides base current for Q610. Q610 can be held off by application of a TTL-compatible low level to R602, enabling the stored brightness control.

The Remote Stored Brightness Enable (Terminal 20 of J200) has two possible applications.

1. When abnormally low duty cycle Z axis signals are applied to the Q606 circuit (with J200 pin 20 open), the DC or average voltage may be insufficient to disable multivibrator Q620-Q628. If the multivibrator continues to operate in the presence of a Z axis signal, a double image may occur due to horizontal modulation of the writing beam whenever the beam is away from center screen. This double-imaging may be prevented by applying a TTL High (no more than +5 V) to J200 pin 20 during Z axis signal time. Removing the input to pin 20 will return control of the Q606 input to the Z axis amplifier. Grounding pin 20 will allow the 'Variable Brightness' circuit to operate regardless of the Z axis level.

2. J200 pin 20 may also be employed to provide a Hold-View feature for a display which is to be stored for extended periods of time. A TTL High (no more than +5 V) may be applied to provide full brightness of the display, over-riding the Stored Brightness control. Removing the voltage will return the brightness to the level determined by STORED BRIGHTNESS (R625) setting (providing the Z axis level is at or near beam cutoff).

Erase Interval. During erasure, a 250-millisecond negative pulse is made available to associated equipment via pin 7 of Remote Program Connector J200. Normally the output of U630A (pin 6) is held high by the low applied via CR652 to input pin 5. When the erase pulse is initiated, the 10-millisecond negative-going pulse at Q644 collector results in a corresponding positive-going pulse at Q648 collector. This pulls pin 5 of U630A high, producing a low level at pin 6. C652 holds pin 5 for the total erase cycle.

Non-Store Mode. In the non-store mode, the target is held below the rest potential, allowing the CRT to operate in the manner of a conventional CRT. This feature prolongs the life of the storage tube. During storage operation, Q700 is held above cutoff and Q690 conducts. If S695 is set to the non-store mode (front-panel button out), or if a TTL-compatible low level is applied via pin 6 of J200, Q700 is biased into saturation. Its collector rises to essentially ground potential, cutting off Q690 and forcing current into the operational amplifier null point (Q675 base) to pull the backplate negative. The backplate non-store level can be set by adjustment of R700.

Power Supply

General. The Power Supply circuit provides the low-voltage operating power for the 603/604 Monitor. Electronic regulation is used to provide stable, low-ripple output voltages.

Power Input. Power is applied to the primary of transformer T800 through fuse F800, thermal cutout TK800, power switch S800, and line-selector block P810. The line-selector block allows changing the primary-winding taps of T800 to fit different line requirements.

Low-Voltage Rectifiers and Unregulated Outputs. The full-wave bridge rectifiers and associated filter components in the secondaries of T800 provide filtered DC voltages for operation of the 603/604 or for regulation by the Low-Voltage Regulators. The unregulated +20-volt output to the high-voltage transformer and the regulated +215-volt output are fuse protected. In the 603, a bridge rectifier is provided to supply power to the +360-volt regulator located in the Storage circuit.

Low-Voltage Regulators. The -30-volt supply, besides providing power to circuitry throughout the instrument, provides a reference-voltage source to establish operating levels for the feedback regulators in the +15-volt, +215-volt, and the 603 +360-volt supplies. The regulator for the -30-volt supply is a feedback amplifier system which operates between ground and the unregulated -38 volts. Current to the load is delivered by the series-pass transistor, Q860, and the supply voltage is established by the drop across R877, R878, and R879. The feedback path is through R875, Q875, and Q865 to the base of Q860. Any variation in output voltage due to ripple, change of current through the load, etc., is immediately transmitted to the base of Q860 and nullified by a change in Q860 conduction, thus maintaining a steady output. The output of the supply is set to exactly -30 volts by adjustment of R878, -30 V Adjust. This control sets the conduction of Q870, which controls the bias levels of Q865 and Q860. CR865 and Q865 provide short-circuit protection by limiting the current through Q860.

The regulator for the +15-volt supply consists of series-pass transistor Q840 and error amplifier Q852. This is a feedback amplifier system similar to that just described for the -30-volt supply. Q846 protects the supply in the event the output is shorted by limiting the current demanded from the series-pass transistor under excessive load. During normal operation, Q846 is biased off.

The regulator for the +215-volt supply consists of series-pass transistor Q836 and error amplifier Q830. Operation of this feedback amplifier system is similar to that described for the -30-volt supply.

CRT Heater Windings. Two separate secondary windings are provided for the CRT writing-gun heaters and the 603 flood-gun heaters. The writing-gun heaters are elevated to -3450 volts in the CRT circuit to maintain a potential near that of the CRT cathode.

Optional Sweep Circuit Information

General. The Sweep Generator circuit produces a positive-going sawtooth voltage which is amplified by the horizontal Deflection Amplifier to provide sweep deflection in the CRT. Six sweep rates are provided, 0.1 s through 1 μ in decade steps. A negative-going gate is produced at the same time the sawtooth is being produced to unblank the CRT.

The Sweep Generator circuit is a Tektronix integrated circuit, U930, and its associated discrete circuit components. The active circuits in the IC include the trigger generator, the sweep-gating circuit, and an operational amplifier to form the basis of a Miller Integrator. Power is applied to pins 7 and 12 to establish the operating level within the device. An internal reference Zener provides 6.4 volts between pins 8 and 9 for operation of external controls; pin 8 provides a level two diode junctions above the negative level at pin 12.

The timing RC components are selected by SEC/DIV switch S930, permitting one of six nominal sweep rates to be chosen. VARIABLE potentiometer R945 provides an adjustment of the timing current to produce a continuously variable sweep rate.

Sweep Output Amplifier. Operational amplifier system Q960-Q964 provides amplification of the sweep sawtooth to a suitable amplitude to meet the sensitivity requirements of the Deflection Amplifier. R965, Sweep Cal, permits calibrating the sweep to the CRT graticule. The base of Q960 is the null point, R950 is the R_{in} element, and R955 is the feedback element. A positive-going sawtooth is produced at the emitter of Q964.

Unblanking Gate Output. The negative-going gate produced at pin 16 of U930 is amplified by Q975 and Q978. The negative going gate produced at the collector of Q978 is applied to R558 in the CRT grid circuit to turn on the CRT during the sweep.

Trigger Generator. Pins 10, 11, 13, and 14 are associated with the trigger generator portion of U930. The triggering signal is applied to an FET input at pin 13. The TRIG SLOPE/LEVEL potentiometer R918 at pin 14 controls the internal comparators that determine the level and slope at which the internal Schmitt multivibrator switches states, initiating a sweep trigger. Differentiating capacitor C912 at pin 11 determines the trigger-pulse width.

For normal triggered operation, -8.2 volts is applied to pin 10 to hold the bright baseline auto circuit inactive. In this mode, when the triggering signal is lost, a sweep cannot be produced. When internal Auto-Norm switch S909 is set to Auto, the -8.2 volts is disconnected to permit a free-running sweep, or bright baseline, to be produced. Pin 10 moves positive as C910 charges, and this positive potential replaces the incoming triggering signal. A new sweep will be initiated immediately following the sweep holdoff time. However, in the auto mode, any incoming

triggering signal will discharge C910; if the signal is occurring at a rate greater than about 20 hertz, C910 will be held below the auto-trigger level, permitting a triggered sweep to be produced.

Sweep Gate and Miller Integrator. Pins 1, 2, 3, 4, 5, 6, and 16 are associated with the sweep generator portion of U930. Upon receipt of a trigger from the trigger generator, the sweep gate turns on. While the gate is on, CR930 is turned off by a high logic level at pin 2, allowing the current through external R_T components R930-R946 to be switched into the feedback timing capacitor C930-C938. Pin 5 is the operational amplifier null point, thus the nearly constant timing current charges the capacitor linearly, producing at pin 4 a linear, negative-going sawtooth voltage. When the sawtooth reaches a level determined by R915, Sweep Length (pin 6), the sweep terminates. At this point, the sweep gate turns off, turning on CR930 and quickly discharging the timing capacitor. A short-duration trigger-lockout period to allow the sweep generator to reset and stabilize is provided by C924-C925 at pin 3.

SECTION 3

SERVICING AND ADJUSTMENTS

General

This section of the manual contains maintenance information and servicing instructions for the 603 and 604 display monitors. The adjustment procedure may also be used as a performance check for incoming inspection.

Panel Removal

WARNING

Disconnect the power before cleaning the unit or replacing parts.

The cabinet panels are held in place by slotted fasteners. To remove the panels, turn each fastener counterclockwise a quarter turn with a large screwdriver, coin, or similar device. Then the panels can be lifted away. The unit should be operated with its panels in place to protect the interior from dust, and to eliminate shock hazard.

Cleaning

Remove loose dust from the exterior with a soft cloth or a dry brush. A water and mild detergent solution may be used; however, avoid abrasive cleaners. For the interior, use low-velocity compressed air to blow off the accumulated dust.

CAUTION

Avoid the use of chemical cleaning agents which might damage plastic parts. Avoid chemicals which contain benzene, toluene, acetone, or similar solvents.

TROUBLESHOOTING

General

The following information is provided to aid in troubleshooting the display monitor. The schematic diagrams and circuit description should be used to augment this information.

Diagrams. Circuit diagrams are given on fold-out pages in the next section. The circuit number and electrical value of each component in this instrument are shown on the diagrams.

Circuit Board Pictures. Pictures of the circuit boards are provided in the fold-out pages to show the physical location of each component. The pictures are placed near their respective associated schematic diagrams to aid in cross reference between the diagrams and the component location. The circuit boards are identified by assembly numbers (A1, A2, etc.).

Component and Wiring Color Code. Colored stripes or dots on resistors and capacitors signify electrical values, tolerances, etc., according to the EIA standard color code. Components which are not color coded usually have the value printed on the body.

WARNING

This color code applies to leads within the 603/604 Monitor only. Color code of the AC power cord is

<i>Black</i>	<i>Line</i>
<i>White</i>	<i>Neutral</i>
<i>Green with a yellow stripe</i>	<i>Safety Earth (ground)</i>

Semiconductor Lead Configuration. Fig. 3-1 shows the lead configuration of the semiconductor devices used in this instrument.

Troubleshooting Equipment

The following equipment is useful for troubleshooting the 603 or 604:

1. Semiconductor tester, dynamic type, for testing the semiconductors used in this instrument. Recommended type: Tektronix 5CT1N Curve Tracer (operates with 5100-series oscilloscope listed below).

2. Multimeter, VTVM, 10-megohm input impedance and 0 to 300 volts range, AC and DC. Ohmmeter, 0 to 50 megohms; accuracy, within 3%. Test prods must be insulated to prevent accidental shorting. Multimeter is used to check voltages and for general troubleshooting in this instrument.

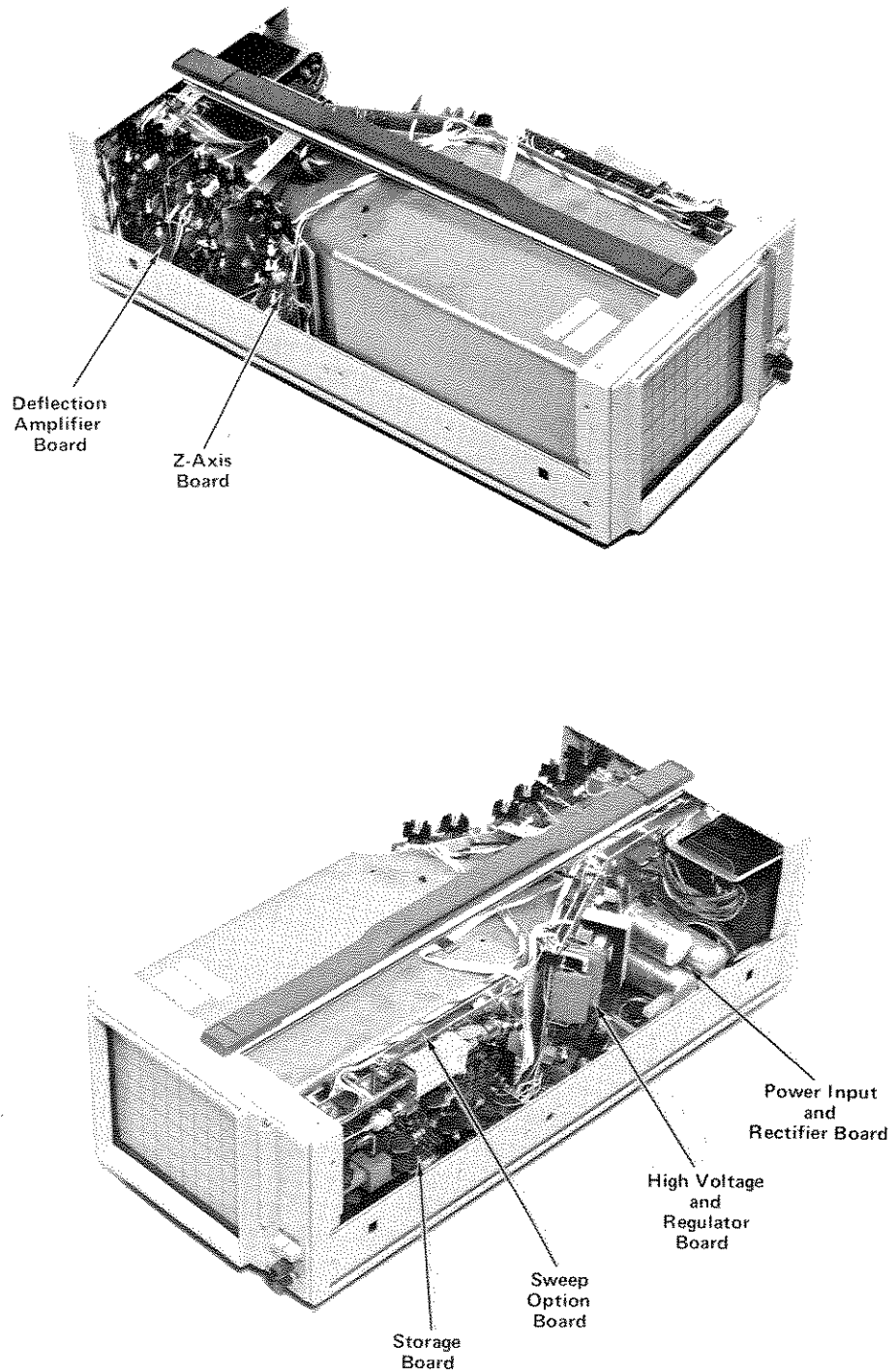


Fig. 3-1. Right and Left side views showing board locations.

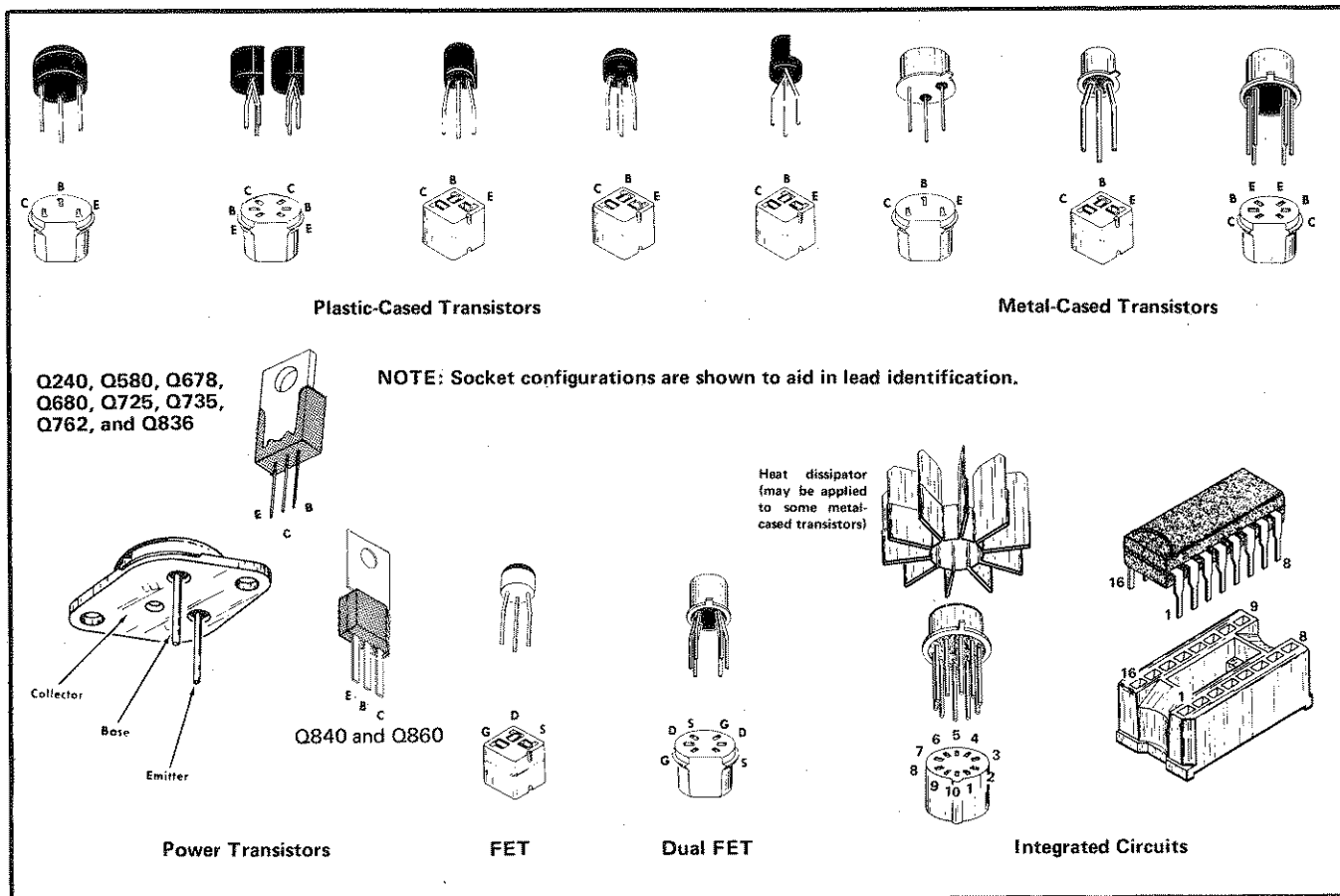


Fig. 3-2. Electrode configuration data for semiconductor devices.

NOTE

A 20,000 ohms/volt VOM can be used to check the voltages in this instrument if allowances are made for the circuit loading of the VOM at high-impedance points.

3. Test oscilloscope to check the active circuits in this instrument. Frequency response, DC to 2 megahertz minimum; deflection factor, 1 millivolt/division to 5 volts/division. Recommended type: Tektronix 5103N Oscilloscope. A 10X, 10-megohm voltage probe should be used to reduce circuit loading for voltage measurements.

Troubleshooting Guide

If the instrument is not providing the desired display or function, check control settings and associated equipment first. Be sure that all system interconnections are properly made and that each piece of equipment is operating properly.

Once it is determined that the 603/604 Monitor is defective, isolate the trouble to a circuit. Visually check the

suspected circuitry for damaged components, heat-charred circuit board, loose wires, etc. Take voltage and waveform readings to check the proper circuit operation. Turn the power off when making continuity checks. When checking individual components with an ohmmeter, unsolder one end of the component to isolate the measurement from the effects of surrounding circuitry.

Special techniques or procedures required to replace major components or assemblies in this unit are given under Component Replacement. Be sure to check the performance of any circuit that has been repaired or that has had any electrical components replaced, and if necessary, make the required adjustment.

REPLACEMENT PARTS

Standard Parts

All electrical and mechanical part replacements for the 603 or 604 can be obtained through your local Tektronix Field Office or representative. However, many of the standard electronic components can be obtained locally from any electronics supply house. Before purchasing or ordering replacement parts, check the parts list for value, tolerance, rating, and description.

Special Parts

Some parts are manufactured or selected by Tektronix to satisfy particular requirements, or are manufactured for Tektronix to our specifications. Most of the mechanical parts used in this instrument have been manufactured by Tektronix. Order all special parts directly from your local Tektronix Field Office or representative.

Ordering Parts

When ordering replacement parts from Tektronix, Inc., refer to the Parts Ordering Information and Special Notes and Symbols immediately preceding the electrical parts list. Include the following information:

1. Instrument Type (603 or 604)
2. Instrument Serial Number
3. A description of the part (if electrical, include the circuit number)
4. Tektronix Part Number

COMPONENT REPLACEMENT

General

The exploded-view drawing associated with the mechanical parts list (pull-out pages) may be helpful when disassembling or re-assembling individual components or sub-assemblies.

Circuit Board Replacement

To remove or replace a board, proceed as follows:

1. Disconnect all leads connected to the board (both soldered lead connections and solderless pin connections).

2. Remove all screws holding the board to the chassis or other mounting surface. Push the black plastic mounting clips away from the circuit board edges to free the board. Also, remove any knobs, etc., that would prevent the board from being lifted out of the instrument.

3. Lift the circuit board out of the unit. Do not force or bend the board.

4. To replace the board, reverse the order of removal. Use care when replacing pin connectors; if forced into place incorrectly positioned, the pin connectors may be damaged.

Transistor and Integrated Circuit Replacement

Transistors and IC's should not be replaced unless they are actually defective. If removed from their sockets during routine maintenance, return them to their original socket. Unnecessary replacement or switching of semiconductor devices may affect the operating parameters of a given circuit, requiring readjustment of variable components.

CAUTION

Power switch must be turned off before removing or replacing semiconductors.

Replacement semiconductors should be of the original type or a direct replacement. Fig. 3-1 shows the lead configuration of the semiconductors used in this instrument. When removing soldered-in transistors, use suction-type de-soldering tool to remove the solder from the holes in the circuit board.

An extracting tool should be used to remove through-hole-pin package integrated circuits to prevent damage to the pins. This tool is available from Tektronix, Inc. Order Tektronix Part No. 003-0619-00. If an extracting tool is not available, use care to avoid damaging the pins. Pull slowly and evenly on both ends of the IC. Try to avoid having one end of the IC disengaged from the socket before the other end.

Interconnecting Pin Replacement

NOTE

A pin replacement kit including necessary tools, instructions, and replacement pins is available from Tektronix, Inc. Order Tektronix Part No. 040-0542-00.

To replace a pin which is mounted on a circuit board, first disconnect any pin connectors. Then, unsolder the damaged pin and pull it out of the board with a pair of pliers. Be careful not to damage the wiring on the board with too much heat. Ream out the hole in the circuit board with a 0.031-inch drill. Remove the ferrule from the new interconnecting pin and press the new pin into the hole in the circuit board. Position the pin in the same manner as the old pin. If the old pin was bent at an angle to mate with a connector, bend the new pin to match the associated pins.

Pushbutton Switch Replacement

The pushbutton switches are not repairable and should be replaced as a unit if defective. Use a suction-type de-soldering tool to remove solder from the holes in the circuit board when unsoldering the switches.

Cathode-Ray Tube Replacement

WARNING

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

A. REMOVAL:

1. Remove the bezel assembly, which is held in place with two screws. (The bezel assembly includes a snap-in implosion shield.)

2. For the storage CRT (603), disconnect the storage-element cable connector from the Storage Circuit board.

NOTE

The red and black wires entering the CRT shield are connected to the display-rotation coil inside the shield. They will not hamper CRT removal and need not be unsoldered.

3. Remove the CRT base cover on the rear panel of the instrument. Remove the CRT base-pin socket.

4. With one hand on the CRT faceplate, push on the CRT base. Slide the CRT forward, and at the same time feed the storage-element cable through the slot in the main portion of the CRT shield. Pull the CRT out of the instrument from the front.

B. REPLACEMENT:

1. Make sure the soft plastic CRT faceplate supports are in place, then insert the CRT into the main shield while feeding the storage-element cable through the slot in the shield.

2. With the CRT fully inserted and loose in the shield mount the bezel assembly into place and tighten the bezel screws.

3. Place the CRT base socket onto the CRT base pins. Replace the cover. If applicable, connect the storage-element cable to the pin connectors on the Storage Circuit board, and connect the deflection leads to the CRT neck pins.

4. Replacing the CRT will require readjustment of the potentiometers in the CRT circuits. Refer to the Circuit Adjustments in this section of the manual.

Power Transformer Replacement

Replace the power transformer only with a direct replacement Tektronix transformer. After the transformer has been replaced, check the power supply output voltage as outlined in the Circuit Adjustments portion of this section. Also, check the CRT operation.

CIRCUIT ADJUSTMENTS

General

This is a procedure to return the circuits of the 603 or 604 monitor to within designed operating capabilities. Adjustments are generally required after a repair has been made, or after long time intervals in which normal aging of components may affect instrument accuracy.

Services Available

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

Test Equipment Required

General. The following test equipment and accessories or the equivalent, is required for complete circuit adjustment of the 603/604. Specifications given for the test equipment are the minimum necessary for accuracy. A test equipment is assumed to be correctly calibrated and operating within the listed specifications.

Test Equipment Alternatives. Other test equipment can be used in place of that listed here; however, portions of the procedure may need slight alteration to accommodate the substitution. Detailed operating instructions for the test equipment are not given in this procedure. Refer to the instruction manual for the test equipment if more information is needed.

Special Calibration Fixtures. Special-purpose Tektronix calibration fixtures are used in this procedure only where they facilitate checking the instrument performance or making the circuit adjustments. These special fixtures are available from Tektronix, Inc. Order by part number through your local Tektronix Field Office or representative.

Test Instruments

1. Precision DC voltmeter, to measure LV supplies. Accuracy, within 0.1%; measurement range, 0 to about 375 volts. For example, a Fairchild Model 7050 Digital Multimeter, or any DC voltmeter meeting the listed requirements.

2. DC voltmeter, to measure HV supply. Minimum sensitivity rating, 20 k Ω /volt; range of at least 4,000 volts full scale, accuracy within 3%. For example, Triplet 630 NA.

3. Test oscilloscope with compatible 1X probe, to monitor test signals and to provide a sweep-generating signal. Bandwidth, DC to 2 MHz (to 8 MHz for checking Z-axis bandwidth); deflection factor, 0.2 to 5 volts/div with 2% accuracy; sweep rates, 0.5 ms and 20 μ s/div (0.2 μ s/Div for checking Z-axis circuit). See Preparation for instrument suggestions.

4. Square-wave generator. Frequency, 1 kHz, 10 kHz, and 100 kHz; risetime, less than 50 nanoseconds; output amplitude, 1 volt. Tektronix Type 106 Square-Wave Generator recommended.

5. Constant-amplitude sine-wave generator. Frequency 350 kHz to above 5 MHz; reference frequency, 50 kHz; output amplitude, from about 0.5 volt to about 5 volts, within 3% as frequency is varied. Tektronix Type 191 Constant-Amplitude Signal Generator recommended.

6. Time-mark generator (for checking optional sweep timing). Marker outputs, 1 μ s to 0.1 s; marker accuracy, within 0.1%. Tektronix 2901 Time Mark Generator recommended.

Accessories

1. Coaxial cables (2). Impedance, 50 Ω ; length, 42 inches; connectors, BNC. Tektronix Part No. 012-0057-01.

2. T connector, BNC. Tektronix Part No. 103-0030-00.

3. 5X attenuator (optional, depending on test equipment used). Impedance, 50 Ω ; accuracy, within 2%; connectors, BNC. Tektronix Part No. 011-0060-01.

4. In-line termination. Impedance, 50 Ω ; accuracy, \pm 2%; connectors, BNC. Tektronix Part No. 011-0049-01.

Preparation

NOTE

This instrument should be adjusted at an ambient temperature between +20°C and +30°C (between +68°F and +86°F) for best overall accuracy.

Check that the CRT screen (display area) has an 8 X 10-division scribed graticule; install one if necessary. Remove the outside cabinet panels to gain access to internal controls and test points. Connect the monitor to the power source for which it is wired.

A displayed sweep is required for most of the steps in this procedure. A sweep-driving signal (i.e., a linear sawtooth voltage) should be obtained from a test oscilloscope, even if the 603/604 has the sweep option feature, because the option would require internal modification to check the horizontal deflection system. If the test oscilloscope has a front-panel access, use appropriate attenuators to reduce the sawtooth amplitude to between 1 and 3 volts. If a Tektronix 5100-series oscilloscope is used as a test instrument, a sawtooth of the proper amplitude can be obtained by attaching a 1X probe to the + input (R133) of the deflection amplifier circuit. Use the sweep rate (Seconds/Division) as indicated throughout the procedure.

Initial Control Settings

Internal Switches

NOTE

Do not preset internal potentiometers and capacitors unless they are known to be significantly out of adjustment, or unless repairs have been made in the circuit. In these instances, the particular controls can be set to midrange. For location of internal controls and test points, refer to the circuit board illustrations in the diagrams section. For instruments containing the optional sweep circuit, the sweep must be disabled while performing steps 1 through 5. To accomplish this, unplug the sweep board, install the dummy plug at P558, and set switch S350 to the XY position.

Set the internal attenuator slide switches (Deflection Amplifier board) to the 1:1 (up) position, and set the XY-YT switch to the XY (down) position.

POWER	ON (button in)
STORE (603 only)	Non-store (button out)
STORED BRIGHTNESS	
(603 only)	Clockwise
INTENSITY	Counterclockwise
FOCUS	Midrange
Vertical Position	Midrange
Horizontal Position	Midrange

1. Check/Adjust Power Supplies

LOW-VOLTAGE SUPPLIES

a. Connect the precision DC voltmeter between the -30-volt test point and ground. Refer to the Regulator circuit board illustration in the Diagrams section.

b. ADJUST—R878, -30 V Adjust, for a voltmeter reading of exactly -30 volts.

c. Connect the precision DC voltmeter between the remaining supply test points and ground, and check for the following accuracies:

+15 V Supply:	+14.7 V to +15.3 V
+215 V Supply:	+209.5 V to +221.5 V
+360 V Supply (603 only):	+342 V to +378 V

d. Disconnect the precision DC voltmeter.

HIGH-VOLTAGE SUPPLY

CAUTION

Turn off instrument power when connecting and disconnecting the DC voltmeter.

e. Connect a DC voltmeter (20 k Ω /volt VOM set to measure at least -3500 volts) between ground and the -3450-volt test point (pin 2 of the CRT base-pin socket).

f. ADJUST—R575, High Voltage, for -3450 volts. Tolerance of the high-voltage supply is -3450 V, ± 170 V.

g. Disconnect the DC voltmeter.

2. Check/Adjust CRT Operation

NOTE

Connect the positive-going sweep sawtooth (see Preparation for sweep requirements) to the +X INPUT. Set the sweep rate for 0.5 millisecond/division and check for a horizontal sweep 10 graticule divisions in length. Adjust INTENSITY, FOCUS, and positioning as needed.

CRT BIAS

a. Connect a voltmeter between ground and the collectors of Z-Axis Amplifier output transistors Q554 and Q556.

Adjust the front-panel INTENSITY control to provide a voltmeter reading of 10 volts.

b. ADJUST—R588, Cutoff, until the trace just disappears. Then adjust the INTENSITY control for a trace of normal display brightness.

ASTIGMATISM

c. Temporarily disconnect the sweep from the +X INPUT connector. Turn FOCUS control fully cw.

d. ADJUST—R594, Astigmatism, for a round spot.

e. Reconnect the sweep signal and adjust the FOCUS control for optimum trace definition.

TRACE ROTATION

f. Move the trace to the center of the graticule.

g. ADJUST—TRACE ROTATION control (located on the rear panel) to align the trace horizontally.

GEOMETRY

h. Position the trace first to the top of the graticule, then to the bottom. Bowing of the trace must not exceed 0.1 division at either position.

i. Remove the positive-going sweep sawtooth signal from the +X INPUT and connect it to the +Y INPUT.

j. Position the trace first to the left of the graticule then to the right. Bowing of the trace must not exceed 0.1 division at either position.

k. Disconnect the positive-going sweep sawtooth signal from the +Y INPUT and connect it to the +X INPUT.

l. ADJUST—R596, Geometry, for minimum curvature of the trace. Repeat steps h through k as necessary to achieve best overall geometry adjustment.

3. Check/Adjust Storage Operation (603 Only)

OPERATING LEVEL

a. Push the front-panel STORE button in.

b. Connect the DC voltmeter between the flood-gun cathodes (pin 3 of P735) and the Store Level test point (TP680). Record the voltmeter reading so that if necessary the operating level can be returned to the original setting.

NOTE

If CRT performance has been satisfactory, no adjustment of the Store Level control is necessary. Proceed to the Collimation adjustment.

For replacement CRT's, an information card is provided to show the optimum levels established by the factory for the individual CRT. All voltage levels associated with storage operation are made with respect to the flood-gun cathodes.

c. Locate the Writing Threshold (minimum store level) as follows:

1. Turn the INTENSITY control clockwise until the trace starts to defocus rapidly. Press the ERASE button to prepare the target area for storage.
2. Write about 3 lines per division across the screen by slewing the free-running trace vertically with the vertical position control.
3. Carefully check the written lines for breaks or gaps of 0.025 inch or more. If no breaks or gaps are evident after 10 seconds, adjust R670, Store Level, to reduce the operating level by 5 volts.
4. Erase twice, wait 10 seconds, then write again and check for breaks or gaps.
5. Repeat this procedure of decreasing the operating voltage level in 5-volt steps until breaks of about 0.025 inch occur. This is the Writing Threshold. Note the voltage and rotate the Store Level control until the original level noted in step b is reached.

NOTE

Do not change the INTENSITY or FOCUS control settings.

d. Locate the Upper Writing Limit (maximum store level) as follows:

1. Again write about 3 lines per division. Carefully check the stored lines and background for trace spreading or background fade-up. If no trace spreading or background fade-up is evident after 10 seconds, adjust R670, Store Level, to increase the operating level by 5 volts.

2. Erase twice, wait 10 seconds, then write again and check for spreading or fade-up.

3. Repeat this procedure until trace spreading of about 0.025 inch (or background fade-up) occurs. This is the Upper Writing Limit. Note this voltage.

e. Adjust R670 for an operating point midway between the Upper Writing Limit and the Writing Threshold.

f. INTERACTION—Collimation and gain are affected if the change in operating level is significant.

COLLIMATION

g. Move the positive lead of the DC voltmeter from TP680 to CE1 test point TP725.

h. Write the entire screen by slowly positioning the trace vertically. If the screen fails to write, adjust the INTENSITY control slightly clockwise and repeat the process until the screen is fully written. Then turn the INTENSITY control fully counterclockwise.

i. Record the voltmeter reading before an adjustment is made, so that if necessary the collimation voltage can be returned to its original setting.

j. With the screen fully written, turn R730, CE1, fully counterclockwise, noting that the screen edges are brightened and pulled in. Slowly turn R730 clockwise to the point where the bright area just covers the graticule area.

k. Erase the screen and disconnect the DC voltmeter.

l. INTERACTION—Storage capabilities and display geometry should be rechecked if a significant change was made in the collimation voltage.

NON-STORE

m. Fully write the entire screen by slowly positioning the trace vertically.

n. ADJUST—R700, Non-Store, so the background glow quickly (less than 1 second) disappears when the screen is placed in the non-store mode (STORE button out). Repeat the step as necessary to achieve correct adjustment of R700.

4. Check/Adjust Vertical (Y) and Horizontal (X) Deflection Systems

NOTE

The X and Y Gains should be adjusted for full-scale deflection, depending upon the input signals used. As an example, the following procedure shows the proper adjustment for one volt full-scale deflection on both axes. Be sure to place grounding caps on unused inputs.

VERTICAL AXIS GAIN AND COMPENSATION

a. While applying the 0.5-millisecond/division sweep signal to the +X INPUT, apply a 1-kilohertz square-wave signal from the square-wave generator to the +Y INPUT through a coaxial cable and a T connector. Connect another coaxial cable between the T connector and the input to the test oscilloscope to monitor the square-wave signal. Set the test oscilloscope vertical deflection factor to 0.2 volt/division and adjust the square-wave generator for a 1-volt display amplitude (5 displayed divisions on the test oscilloscope). Use an attenuator if necessary.

b. ADJUST—R125, Y Gain, for eight vertical divisions of square-wave display. Push in the STORE button (603 only) and adjust R715, Sensitivity Correction, to match non-store display. Return to non-store mode.

c. Set slide switch S110 (Deflection Amplifier board) to X5.

d. ADJUST—C110, +Y Attenuator Compensation, for minimum roll-off or overshoot of the leading corner of the square-wave display.

e. Set S110 back to the X1 position and move the square-wave signal to the -Y INPUT. Set slide switch S130 to X5.

f. ADJUST—C130, -Y Attenuator Compensation, for optimum square wave bottom.

g. Set S130 back to the X1 position. Change the test oscilloscope sweep rate to 50 microseconds/division. Set the square-wave generator for a 1-volt, 10-kilohertz output and move the square-wave signal to the +Y INPUT.

h. ADJUST—C168, HF Comp, for optimum square wave bottom.

HORIZONTAL AXIS GAIN AND COMPENSATION

i. Move the sweep signal to the +Y INPUT and the square-wave signal to the +X INPUT. Using the signals and conditions given in steps a through h, adjust the following controls:

R325, X Gain
C310, +X Attenuator Compensation (set S310 to X5)
C330, -X Attenuator Compensation (set S330 to X5)
C368, HF Comp

BANDWIDTH

j. Set the test oscilloscope sweep rate to 0.5 millisecond/division and replace the square-wave generator with the sine-wave generator. Adjust the sine-wave generator for eight vertical divisions of 50-kilohertz display as a reference. Then slowly increase the frequency until the display amplitude is 5.66 divisions. This is the upper -3 dB point.

k. CHECK—Frequency at the upper -3 dB point is at least two megahertz.

l. Move the sweep signal to the +X INPUT and the sine-wave signal to the +Y INPUT. Repeat steps j and k to verify horizontal bandwidth.

PHASE DIFFERENCE

m. Remove the sweep signal and apply the sine-wave signal to both the +Y and +X inputs. Adjust the sine-wave generator and positioning controls so that the display is a diagonal line running from the lower left-hand corner of the graticule to the upper right-hand corner. Adjust R325, X Gain, so the horizontal display width is 8 divisions, then set the sine-wave generator frequency to 500 kilohertz.

n. CHECK—Any opening of the loop indicates a phase shift. The vertical height of the opening at the center of the graticule should not exceed 0.1 division. If necessary, slightly adjust C168 and C368 to reduce phase shift. These adjustments will affect frequency response, if adjustment is necessary, repeat steps h through o to obtain minimum phase shift with best frequency response.

o. Adjust R325, X Gain, so the horizontal display width is 10 divisions, as it was before making the X-Y phasing check.

p. Remove the sine-wave signal from the X and Y inputs.

5. Check/Adjust Z Axis Amplifier

NOTE

The test oscilloscope should have a bandwidth of at least 8 MHz to permit checking the Z-Axis Amplifier bandwidth and making the HF compensation adjustment.

a. Apply a 20-microsecond/division sweep signal to the +X INPUT. Apply a 50-kilohertz sine-wave signal simultaneously to the +Z INPUT and to the test oscilloscope. Adjust the sine-wave amplitude for one volt peak to peak.

- b. Set the INTENSITY control fully clockwise.
- c. ADJUST—R512, Z Gain, so the 603/604 display appears as full-bright line segments that are completely blanked between segments. This indicates a full intensity control range of one volt. This procedure can be repeated using any voltage up to 5 volts to provide the intensity control range. Remove the 50 kHz signal from the +Z INPUT.
- d. Disconnect the 1X probe from the horizontal deflection circuit of the test oscilloscope and the X INPUT, and connect a 10X probe between the collectors of Z-Axis Amplifier output transistors Q554 and Q556 and the test oscilloscope vertical input. Set the test oscilloscope vertical deflection factor to 0.5 volt/division and the sweep rate to 0.2 microsecond/division. Adjust the INTENSITY control for a 10-volt DC level at the Z-axis output. With a square-wave generator, apply a 100-kilohertz symmetrical square wave to the +Z INPUT. Adjust the square wave amplitude for 4 vertical divisions of test oscilloscope display.
- e. ADJUST—C560, Z HF Comp, for minimum roll-off or overshoot of leading edge of square-wave signal.
- f. Replace the square-wave generator with the sine-wave generator to check the Z-axis bandwidth. Apply a 500-kilohertz sine-wave to the +Z INPUT. Adjust the INTENSITY control for a 30-volt DC level at the Z-axis output. Adjust the sine-wave amplitude for a test oscilloscope display of 8 vertical divisions. Then increase the frequency until the display amplitude is 5.66 divisions. This is the upper -3 dB point of the bandwidth.
- g. CHECK—Frequency at the upper -3 dB point is at least 5 megahertz.
- h. Disconnect all test equipment.

6. Check/Adjust Optional Sweep Generator

NOTE

If sweep was disconnected for steps 1 through 5, reconnect by reversing order of the disconnect procedure outlined in the note under Initial Control Settings.

a. Set the internal XY-YT switch on the Deflection Amplifier board to the YT (up) position. Set the Norm Auto switch on the Sweep board to Auto (rear position). Set the front-panel SEC/DIV switch to 1 μ .

b. Apply a 2-megahertz signal from the sine-wave generator to the +Y INPUT. Adjust the sine-wave generator for 0.5 division of vertical deflection. Check that a stable display can be obtained by rotating the TRIG SLOPE LEVEL control.

c. Disconnect the sine-wave generator. Set the SEC/DIV switch to 1 m, and VARIABLE screwdriver control fully clockwise.

d. Apply one-millisecond markers from the time-mark generator via a coaxial cable and 50 Ω termination to the +Y INPUT. The displayed time markers should be between 2 and 6 divisions in amplitude; use attenuators if necessary. Position the first marker to the left edge of the graticule. Check for one 1 ms marker per major graticule division.

e. ADJUST—R915, Sweep Length, so the sweep is about 10.5 divisions in length.

f. CHECK—Sweep timing over middle eight divisions. The distance between the second and tenth markers must be 8 divisions, ± 0.24 division ($\pm 3\%$).

g. ADJUST—R965, Sweep Cal, so the second and tenth markers are exactly 8 divisions apart.

h. Check the timing accuracy of the other five positions of the SEC/DIV switch using time markers that correspond to each switch position. Accuracy is 3% as stated in step f.

i. Disconnect all test equipment

NOTE

When changing from Sweep operation to XY operation, it is necessary to set the XY-YT switch S350 to the XY position (see Fig. 4-1, Deflection Amplifier Board, Grid 4A). The Sweep Board interconnecting plug P558 must be disconnected from the Control and Interface Board (604) or Storage Board (603), and the dummy P558 plug reinstalled, to connect pin 2 to pin 8 on the board.

SECTION 4

PARTS LISTS AND DIAGRAMS

Symbols and Reference Designators

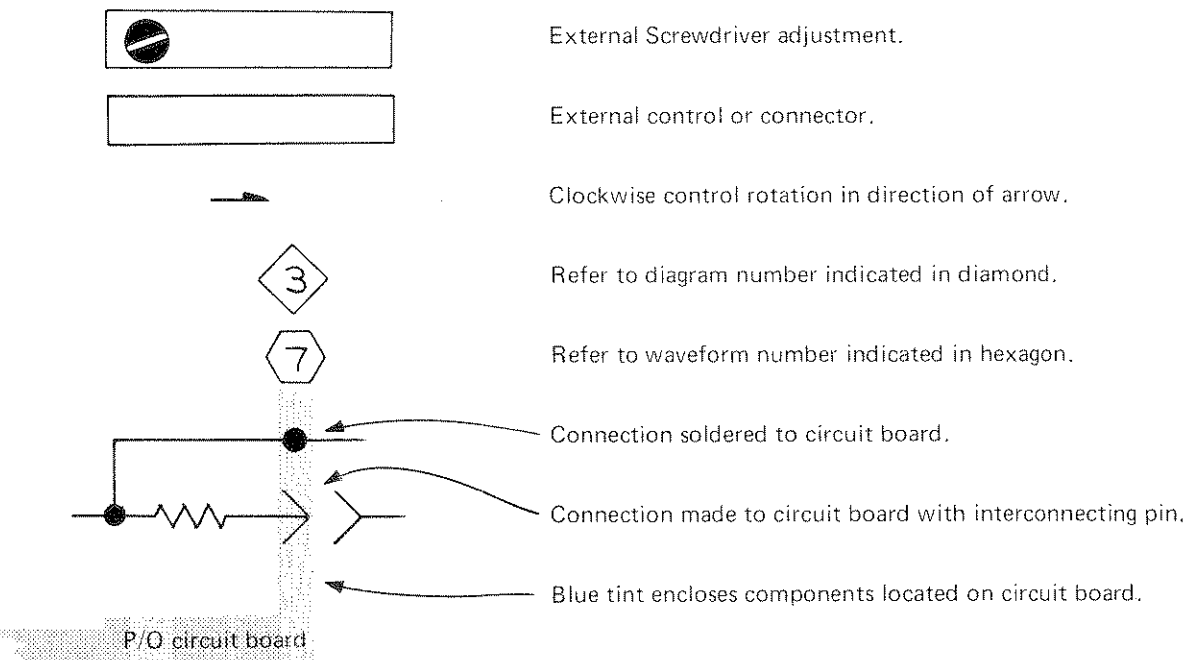
Electrical components shown on the diagrams are in the following units unless noted otherwise:

- 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 USA Standard Y32.2-1967.

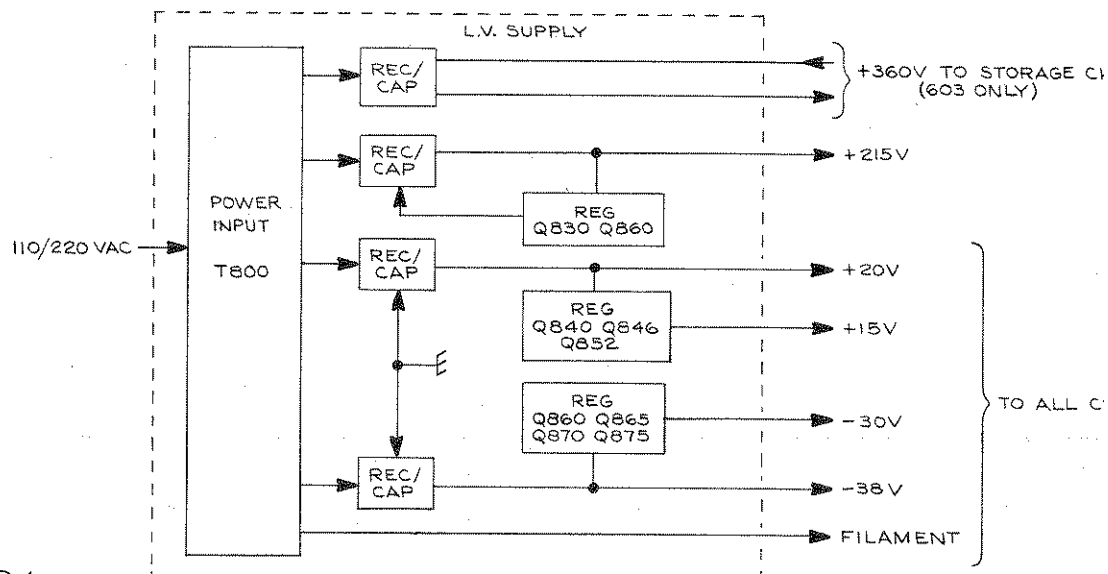
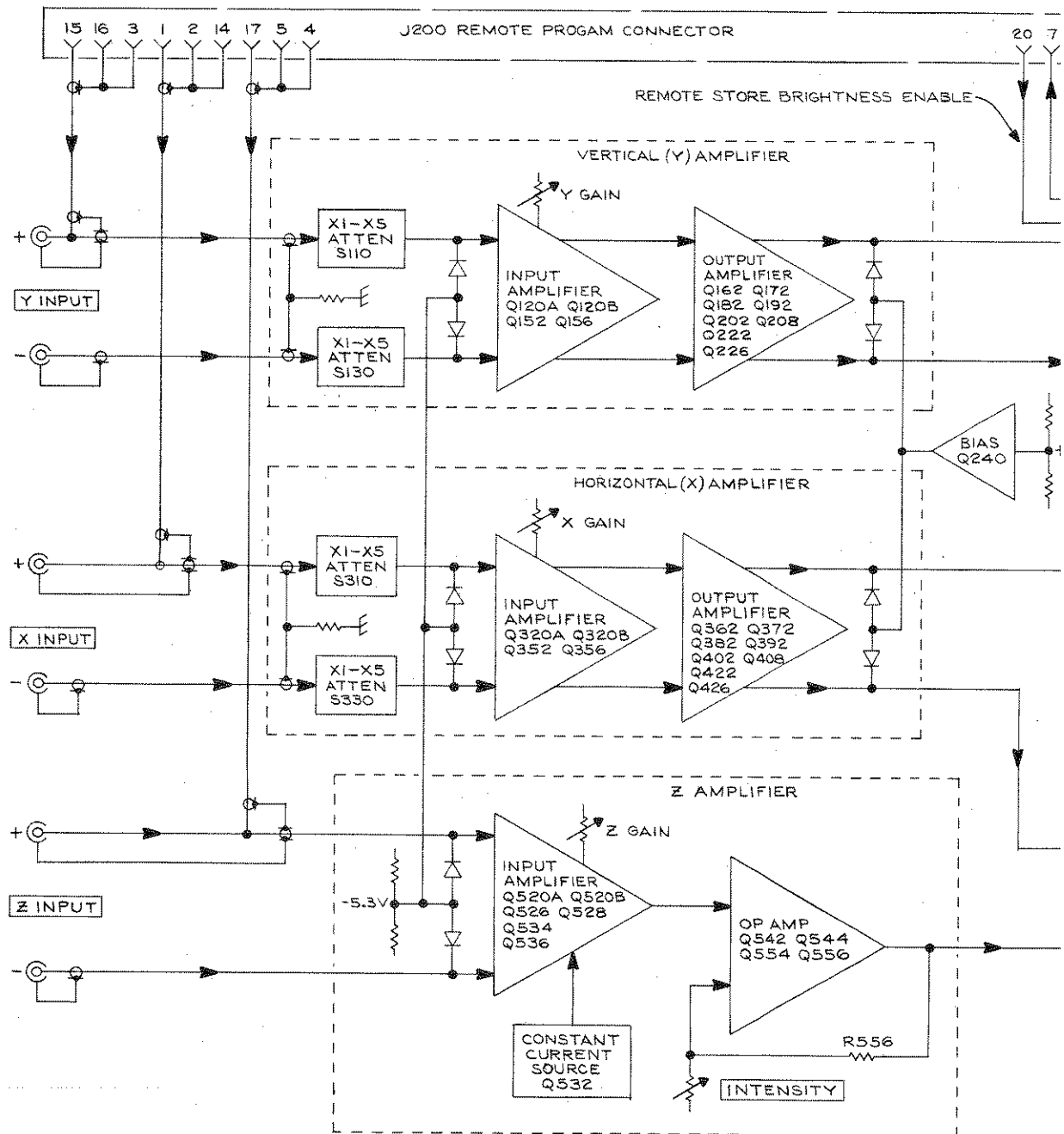
Logic symbology is based on MIL-STD-806B in terms of positive logic. Logic symbols depict the logic function p and may differ from the manufacturer's data.

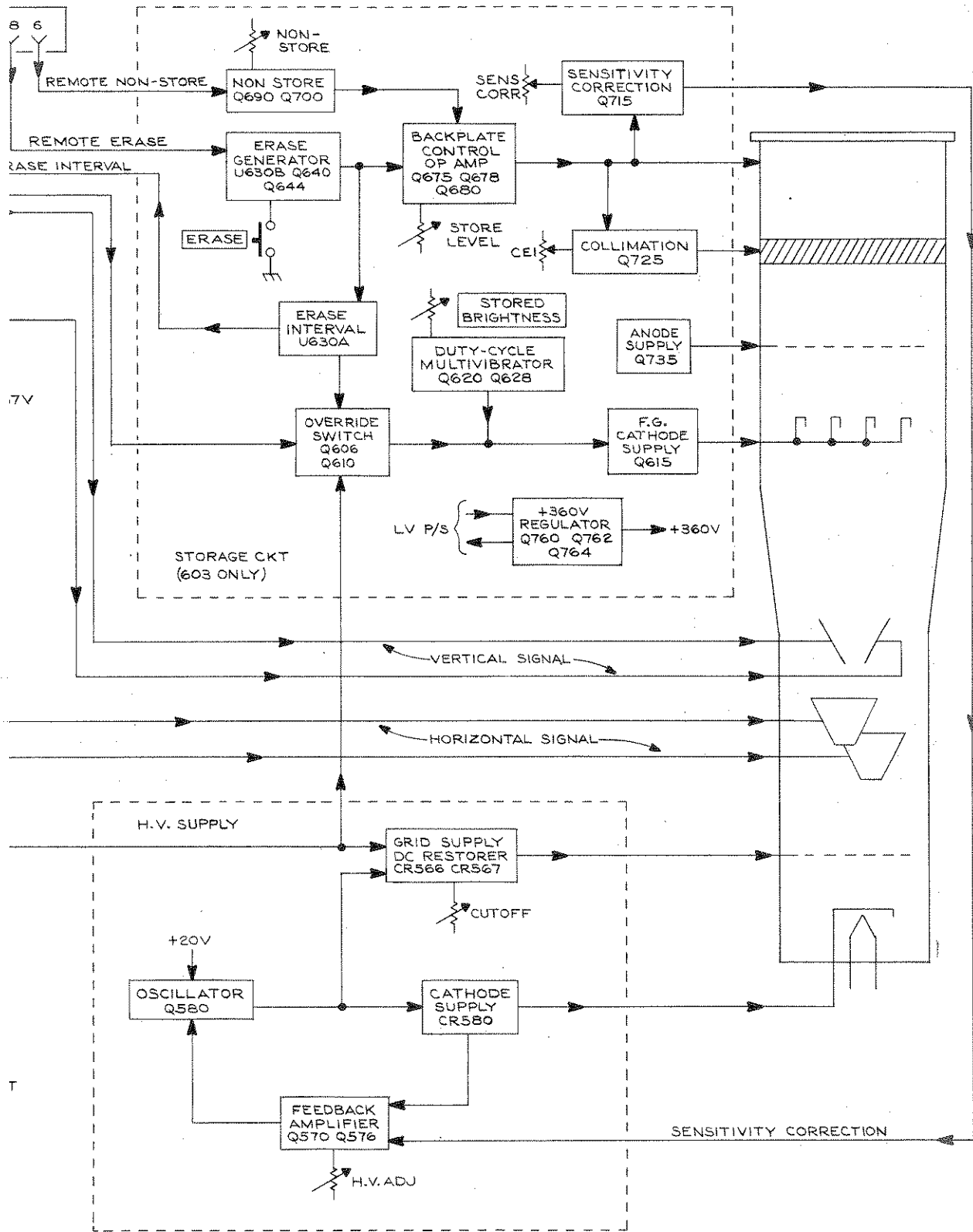
The following special symbols are used on the diagrams:



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

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





RCUITS

603/604 ASSEMBLY A-1

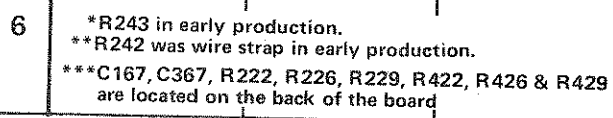


Fig. 4-1. 603/604 Deflection Amplifier component location grid.

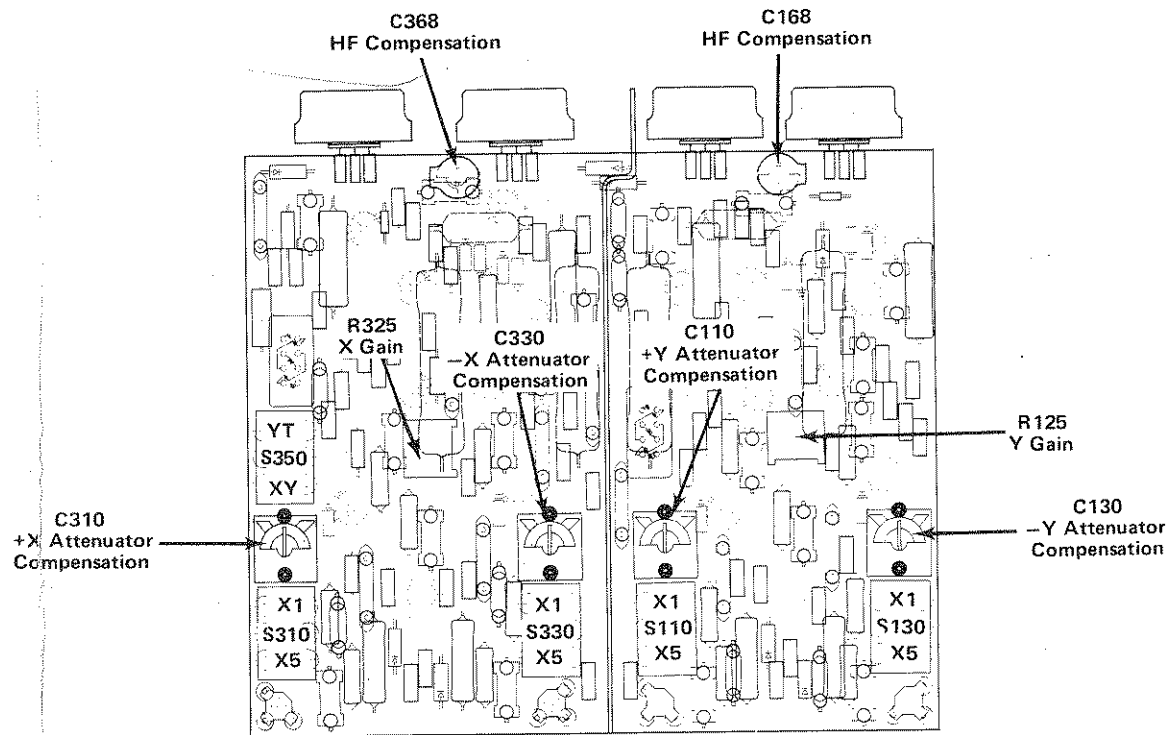
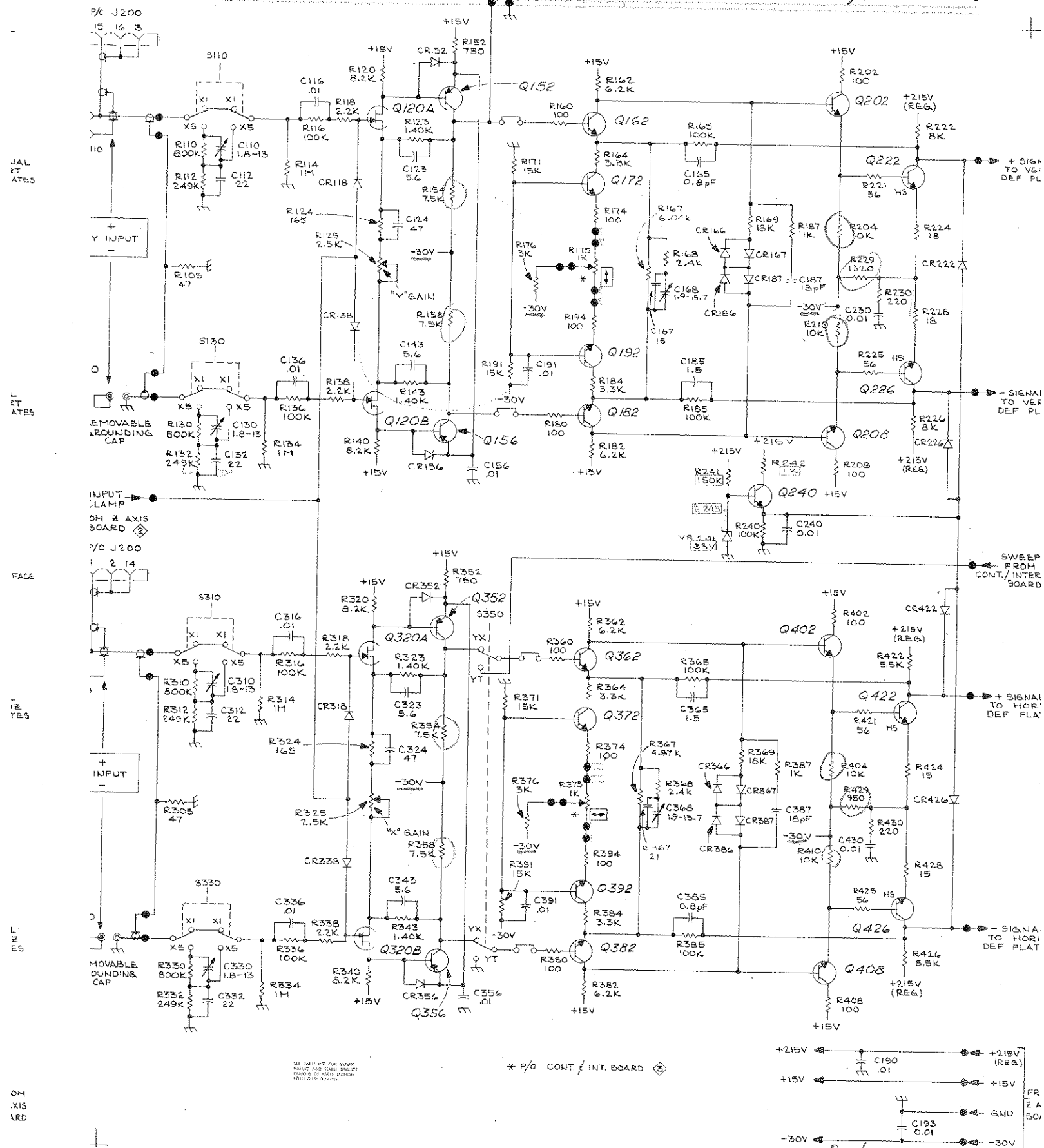


Fig. 4-2. Deflection Amplifier, adjustments and test point locations.

X & Y shell
502 to GRN



A1 DEFLECTION AMPLIFIER BOARD

603/604

©

DEFLECTION AMPLIFIERS \triangle

572
RHL



603/604 ASSEMBLY A-2

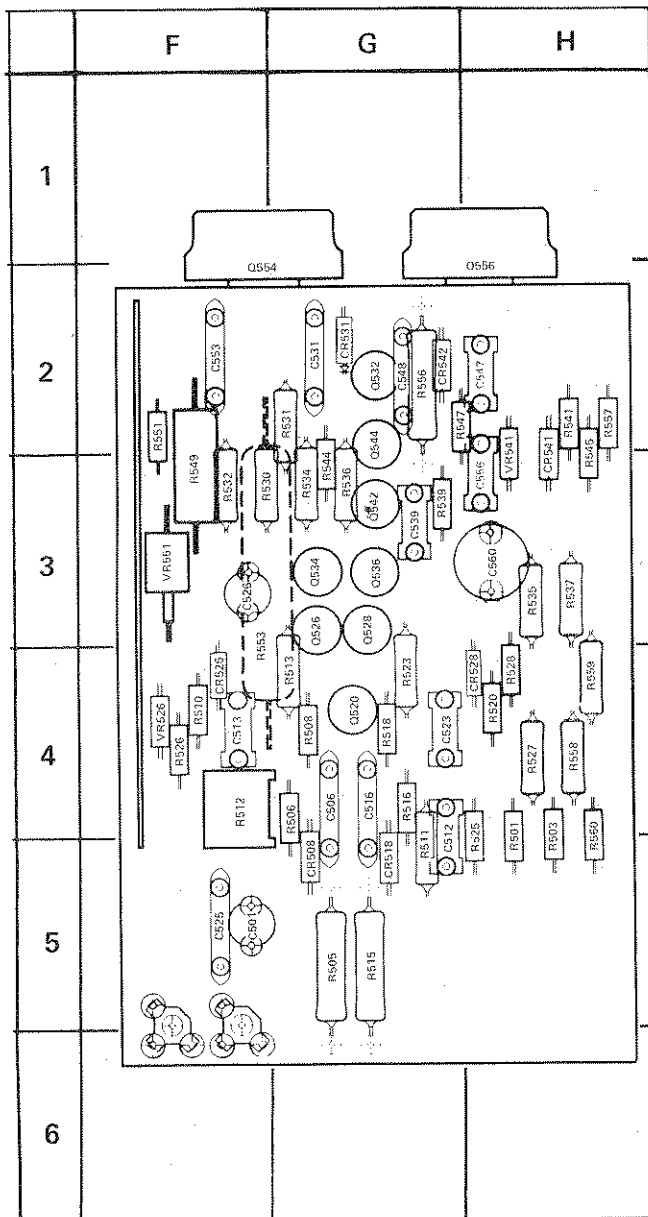


Fig. 4-3. 603/604 Z-Axis Board component location grid.

PARTS LOCATION GRID

ELECTRICAL PARTS LIST

Replacement parts should be ordered from the Tektronix Field Office or Representative in your area. Changes to Tektronix products give you the benefit of improved circuits and components. Please include the instrument type number and serial number with each order for parts or service.

ABBREVIATIONS AND REFERENCE DESIGNATORS

A	Assembly, separable or repairable	FL	Filter	PTM	paper or plastic, tubular molded
AT	Attenuator, fixed or variable	H	Heat dissipating device (heat sink, etc.)	R	Resistor, fixed or variable
B	Motor	HR	Heater	RT	Thermistor
BT	Battery	J	Connector, stationary portion	S	Switch
C	Capacitor, fixed or variable	K	Relay	T	Transformer
Cer	Ceramic	L	Inductor, fixed or variable	TP	Test point
CR	Diode, signal or rectifier	LR	Inductor/resistor combination	U	Assembly, inseparable or non-repairable
CRT	cathode-ray tube	M	Meter	V	Electron tube
DL	Delay line	Q	Transistor or silicon-controlled rectifier	Var	Variable
DS	Indicating device (lamp)	P	Connector, movable portion	VR	Voltage regulator (zener diode, etc.)
Elect.	Electrolytic	PMC	Paper, metal cased	WW	wire-wound
EMC	electrolytic, metal cased	PT	paper, tubular	Y	Crystal
EMT	electrolytic, metal tubular				
F	Fuse				

Ckt No.	Grid Loc	Tektronix Part No.	Serial/Model No. Eff	No. Disc	Description
ASSEMBLIES					
A1		670-1811-00			DEFLECTION AMPLIFIER Circuit Board Assembly 603/604
A4		670-1816-00			CONTROL & INTERFACE Circuit Board Assembly 604 (part of)
CAPACITORS					
C110	D4	281-0081-00			1.8-13 pF, Var, Air
C112	D5	283-0601-00			22 pF, Mica, 300 V, 10%
C116	D5	283-0002-00			0.01 pF, Cer, 500 V
C123	D4	281-0544-00			5.6 pF, Cer, 500 V, 10%
C124	D4	281-0519-00			47 pF, Cer, 500 V, 10%
C130	E4	281-0081-00			1.8-13 pF, Var, Air
C132	E5	283-0601-00			22 pF, Mica, 300 V, 10%
C136	E4	283-0002-00			0.01 pF, Cer, 500 V
C143	E4	281-0544-00			5.6 pF, Cer 500 V, 10%
C156	C4	283-0002-00			0.01 pF, Cer, 500 V
C165	E3	281-0661-00			0.8 pF, Cer, 500 V, ± 0.1 pF
C167	D2	281-0628-00			15 pF, Cer, 600 V, 5%
C168	D2	281-0166-00			1.9-15.7 pF, Var, Air, 250 V
C185	D2	281-0526-00			1.5 pF, Cer, 500 V, ± 0.5 pF
C187	E3	281-0542-00			18 pF, Cer, 500 V, 10%
C190	C3	283-0002-00			0.01 pF, Cer, 500 V
C191	D3	283-0002-00			0.01 pF, Cer, 500 V
C193	C3	283-0002-00			0.01 pF, Cer, 500 V
C230	C2	283-0002-00			0.01 pF, Cer, 500 V
C240	A2	283-0002-00			0.01 pF, Cer, 500 V
C310	A4	281-0081-00			1.8-13 pF, Var, Air
C312	A5	283-0601-00			22 pF, Mica, 300 V, 10%
C316	A5	283-0002-00			0.01 pF, Cer, 500 V

ELECTRICAL PARTS LIST (cont)

Ckt No.	Grid Loc	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
CAPACITORS (cont)					
C323	B4	281-0544-00			5.6 pF, Cer, 500 V, 10%
C324	B4	281-0519-00			47 pF, Cer, 500 V, 10%
C330	C4	281-0081-00			1.8-13 pF, Var, Air
C332	B5	283-0601-00			22 pF, Mica, 300 V, 10%
C336	B4	283-0002-00			0.01 μ F, Cer, 500 V
C343	B4	281-0544-00			5.6 pF, Cer, 500 V, 10%
C356	C4	283-0002-00			0.01 μ F, Cer, 500 V
C365	A2	281-0526-00			1.5 pF, Cer, 500 V, ± 0.5 pF
C367	B2	281-0579-00			21 pF, Cer, 500 V
C368	B2	281-0166-00			1.9-15.7 pF, Var, Air, 250 V
C385	C3	281-0661-00			0.8 pF, Cer, 500 V, ± 0.1 pF
C387	C3	281-0542-00			18 pF, Cer, 500 V, 10%
C391	B3	283-0002-00			0.01 μ F, Cer, 500 V
C430	A3	283-0002-00			0.01 μ F, Cer, 500 V
SCD, DIODES					
CR118	D5	152-0246-00			Silicon, replaceable by CD12676 or FD3375
CR138	D5	152-0246-00			Silicon, replaceable by CD12676 or FD3375
CR152	D4	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR156	E4	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR166	E2	152-0333-00			Silicon, replaceable by FDH6012
CR167	E2	152-0333-00			Silicon, replaceable by FDH6012
CR186	D3	152-0333-00			Silicon, replaceable by FDH6012
CR187	D3	152-0333-00			Silicon, replaceable by FDH6012
CR222	E2	152-0061-00			Silicon, replaceable by CD8893 or FDH2161
CR226	C2	152-0061-00			Silicon, replaceable by CD8893 or FDH2161
CR318	B5	152-0246-00			Silicon, replaceable by CD12676 or FD3375
CR338	B5	152-0246-00			Silicon, replaceable by CD12676 or FD3375
CR352	A4	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR356	B4	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR366	B2	152-0333-00			Silicon, replaceable by FDH6012
CR367	B2	152-0333-00			Silicon, replaceable by FDH6012
CR386	B2	152-0333-00			Silicon, replaceable by FDH6012
CR387	B2	152-0333-00			Silicon, replaceable by FDH6012
CR422	A2	152-0061-00			Silicon, replaceable by CD8393 or FDH2161
CR426	C2	152-0061-00			Silicon, replaceable by CD8393 or FDH2161
VR241	A2	152-0241-00	XB040000		Zener, replaceable by 1N9753B, 0.4 W, 33 V, 5%
CONNECTORS					
J110	C6	131-0955-00			Receptacle, electrical, BNC, female
J130	E6	131-0955-00			Receptacle, electrical, BNC, female
J200		131-0569-00			Receptacle, electrical, male (part of)
J310	A6	131-0955-00			Receptacle, electrical, BNC, female
J330	C6	131-0955-00			Receptacle, electrical, BNC, female
TRANSISTORS					
Q120A, B	D5	151-1054-00			Silicon, JFET, N channel
Q152	D4	151-0342-00			Silicon, PNP, replaceable by 2N4249
Q156	E4	151-0342-00			Silicon, PNP, replaceable by 2N4249
Q162	E3	151-0341-00			Silicon, NPN, replaceable by 2N3565
Q172	E3	151-0341-00			Silicon, NPN, replaceable by 2N3565
Q182	D3	151-0341-00			Silicon, NPN, replaceable by 2N3565
Q192	D3	151-0341-00			Silicon, NPN, replaceable by 2N3565
Q202	E2	151-0341-00			Silicon, NPN, replaceable by 2N3565
Q208	D3	151-0341-00			Silicon, NPN, replaceable by 2N3565
Q222	E1	151-0279-00			Silicon, NPN, replaceable by SE7056

ELECTRICAL PARTS LIST (cont)

Ckt No.	Grid Loc	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
TRANSISTORS (cont)					
Q226	D1	151-0279-00			Silicon, NPN, replaceable by SE7056
Q240		151-0358-00			Silicon, NPN, replaceable by D44R4
Q320A,B	B5	151-1054-00			Silicon, JFET, N channel
Q352	A4	151-0342-00			Silicon, PNP, replaceable by 2N4249
Q356	C4	151-0342-00			Silicon, PNP, replaceable by 2N4249
Q362	B3	151-0341-00			Silicon, NPN, replaceable by 2N3565
Q372	B3	151-0341-00			Silicon, NPN, replaceable by 2N3565
Q382	C3	151-0341-00			Silicon, NPN, replaceable by 2N3565
Q392	B3	151-0341-00			Silicon, NPN, replaceable by 2N3565
Q402	A2	151-0341-00			Silicon, NPN, replaceable by 2N3565
Q408	B2	151-0341-00			Silicon, NPN, replaceable by 2N3565
Q422	A1	151-0279-00			Silicon, NPN, replaceable by SE7056
Q426	B1	151-0279-00			Silicon, NPN, replaceable by SE7056
RESISTORS					
R105	C5	316-0470-00			47 Ω , 1/4 W, 10%
R110	D5	321-0891-00			800 k Ω , 1/8 W, 1%
R112	D5	321-0423-00			249 k Ω , 1/8 W, 1%
R114	D5	322-0481-00			1 M Ω , 1/8 W, 1%
R116	D5	315-0104-00			100 k Ω , 1/8 W, 5%
R118	D5	316-0222-00			2.2 k Ω , 1/8 W, 10%
R120	D5	315-0822-00			8.2 k Ω , 1/8 W, 5%
R123	D4	321-0207-00			1.4 k Ω , 1/8 W, 1%
R124	D4	321-0118-00			165 Ω , 1/8 W, 1%
R125	D4	311-1226-00			2.5 k Ω , Var
R130	E5	321-0891-00			800 k Ω , 1/8 W, 1%
R132	E5	321-0423-00			249 k Ω , 1/8 W, 1%
R134	E5	322-0481-00			1 M Ω , 1/4 W, 1%
R136	E4	315-0104-00			100 k Ω , 1/4 W, 5%
R138	E5	316-0222-00			2.2 k Ω , 1/4 W, 10%
R140	D5	315-0822-00			8.2 k Ω , 1/4 W, 5%
R143	E4	321-0207-00			1.4 k Ω , 1/8 W, 1%
R152	D4	315-0751-00			750 Ω , 1/4 W, 5%
R154	D4	315-0752-00			7.5 k Ω , 1/4 W, 5%
R158	E4	315-0752-00			7.5 k Ω , 1/4 W, 5%
R160	C3	316-0101-00			100 Ω , 1/4 W, 10%
R162	D3	315-0622-00			6.2 k Ω , 1/4 W, 5%
R164	E3	315-0332-00			3.3 k Ω , 1/4 W, 5%
R165	E3	323-0385-00			100 k Ω , 1/2 W, 1%
R167	D2	321-0268-00			6.04 k Ω , 1/8 W, 1%
R168	E3	315-0242-00			2.4 k Ω , 1/4 W, 5%
R169	D2	315-0183-00			18 k Ω , 1/4 W, 5%
R171	E3	315-0153-00			15 k Ω , 1/4 W, 5%
R174 ¹	E3	316-0101-00			100 Ω , 1/4 W, 10%
R175 ¹	P2	311-1311-00			1 k Ω , Var

¹ 604 only.

ELECTRICAL PARTS LIST (cont)

Ckt No.	Grid Loc	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)					
R176	E4	315-0302-00			3 k Ω , 1/4 W, 5%
R180	D3	316-0101-00			100 Ω , 1/4 W, 10%
R182	D3	315-0622-00			6.2 k Ω , 1/4 W, 5%
R184	D3	315-0332-00			3.3 k Ω , 1/4 W, 5%
R185	D2	323-0385-00			100 k Ω , 1/2 W, 1%
R187	E3	316-0102-00			1 k Ω , 1/4 W, 10%
R191	D3	315-0153-00			15 k Ω , 1/4 W, 5%
R194	E4	316-0101-00			100 Ω , 1/4 W, 10%
R202	E3	316-0101-00			100 Ω , 1/4 W, 10%
R204	E3	316-0103-00			10 k Ω , 1/4 W, 10%
R208	D4	316-0101-00			100 Ω , 1/4 W, 10%
R210	C3	316-0103-00			10 k Ω , 1/4 W, 10%
R221	E2	317-0560-00	B010100	B049999	56 Ω , 1/8 W, 5%
R221	E2	315-0560-00	B050000		56 Ω , 1/4 W, 5%
R222	E3	308-0709-00			8 k Ω , 7 W, WW, 3%
R224	D2	316-0180-00			18 Ω , 1/4 W, 10%
R225	D2	315-0560-00			56 Ω , 1/4 W, 5%
R226	C3	308-0709-00			8 k Ω , 7 W, WW, 3%
R228	D2	316-0180-00			18 Ω , 1/4 W, 10%
R229	D2	308-0253-00			1.32 k Ω , 3 W, WW, 5%
R230	C2	316-0221-00			220 Ω , 1/4 W, 10%
R240	A2	315-0104-00			100 k Ω , 1/4 W, 5%
R241	A2	315-0154-00	B010100	B039999	150 k Ω , 1/4 W, 5%
R241	A2	316-0184-00	B040000		180 k Ω , 1/4 W, 10%
R242 ¹		302-0102-00	XB010260		1 k Ω , 1/2 W, 10%
R242 ²		302-0102-00	XB010300		1 k Ω , 1/2 W, 10%
R243	A2	315-0333-00	B010100	B029999X	33 k Ω , 1/4 W, 5%
R305	C5	316-0470-00			47 Ω , 1/4 W, 10%
R310	A5	321-0891-00			800 k Ω , 1/8 W, 1%
R312	A5	321-0423-00			249 k Ω , 1/8 W, 1%
R314	A5	322-0481-00			1 M Ω , 1/4 W, 1%
R316	A5	315-0104-00			100 k Ω , 1/4 W, 5%
R318	B5	316-0222-00			2.2 k Ω , 1/4 W, 10%
R320	B5	315-0822-00			8.2 k Ω , 1/4 W, 5%
R323	B4	321-0207-00			1.4 k Ω , 1/8 W, 1%
R324	B4	321-0118-00			165 Ω , 1/8 W, 1%
R325	B4	311-1226-00			2.5 k Ω , Var
R330	B5	321-0891-00			800 k Ω , 1/8 W, 1%
R332	B5	321-0423-00			249 k Ω , 1/8 W, 1%
R334	B5	322-0481-00			1 M Ω , 1/4 W, 1%
R336	B5	315-0104-00			100 k Ω , 1/4 W, 5%
R338	B5	316-0222-00			2.2 k Ω , 1/4 W, 10%
R340	B5	315-0822-00			8.2 k Ω , 1/4 W, 5%
R343	B4	321-0207-00			1.4 k Ω , 1/8 W, 1%
R352	C4	315-0751-00			750 Ω , 1/4 W, 5%
R354	A4	315-0752-00			7.5 k Ω , 1/4 W, 5%
R358	C3	315-0752-00			7.5 k Ω , 1/4 W, 5%
R360	A3	315-0101-00			100 Ω , 1/4 W, 10%
R362	B3	315-0622-00			6.2 k Ω , 1/4 W, 5%
R364	B3	315-0332-00			3.3 k Ω , 1/4 W, 5%
R365	A2	323-0385-00			100 k Ω , 1/2 W, 1%
R367	B3	321-0259-00			4.87 k Ω , 1/8 W, 1%
R368	B2	315-0242-00			2.4 k Ω , 1/4 W, 5%
R369	B2	315-0183-00			18 k Ω , 1/4 W, 5%

¹ 603 only. (Below S/N B010260 a wire strap was used.)² 604 only. (Below S/N B010300 a wire strap was used.)

ELECTRICAL PARTS LIST (cont)

Ckt No.	Grid Loc	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)					
R371	B3	315-0153-00			15 kΩ, 1/4 W, 5%
R374	B4	316-0101-00			100 Ω, 1/4 W, 10%
R375 ¹	Q3	311-1311-00			1 kΩ, Var
R376	C4	315-0302-00			3 kΩ, 1/4 W, 5%
R380	A3	316-0101-00			100 Ω, 1/4 W, 10%
R382	C3	315-0622-00			6.2 kΩ, 1/4 W, 5%
R384	B3	315-0332-00			3.3 kΩ, 1/4 W, 5%
R385	C2	323-0385-00			100 kΩ, 1/2 W, 1%
R387	B3	316-0102-00			1 kΩ, 1/4 W, 10%
R391	B3	315-0153-00			15 kΩ, 1/4 W, 5%
R394	C3	316-0101-00			100 Ω, 1/4 W, 10%
R402	A3	316-0101-00			100 Ω, 1/4 W, 10%
R404	A3	316-0103-00			10 kΩ, 1/4 W, 10%
R408	C2	316-0101-00			100 Ω, 1/4 W, 10%
R410	C2	316-0103-00			10 kΩ, 1/4 W, 10%
R421	B2	315-0560-00			56 Ω, 1/4 W, 5%
R422	B3	308-0708-00			5.5 kΩ, 7 W, WW, 3%
R424	B2	316-0150-00			15 Ω, 1/4 W, 10%
R425	C2	317-0560-00	B010100	B049999	56 Ω, 1/8 W, 5%
R425	C2	315-0560-00	B050000		56 Ω, 1/4 W, 5%
R426	C3	308-0708-00			5.5 kΩ, 7 W, WW, 3%
R428	B2	316-0150-00			15 Ω, 1/4 W, 10%
R429	B2	308-0707-00			950 Ω, 3 W, WW, 1%
R430	A3	316-0221-00			220, 1/4 W, 5%
SWITCHES					
S110	D5	260-0723-00			Slide, DPDT, Attenuator Selector
S130	E5	260-0723-00			Slide, DPDT, Attenuator Selector
S310	A5	260-0723-00			Slide, DPDT, Attenuator Selector
S330	C5	260-0723-00			Slide, DPDT, Attenuator Selector
S350	A4	260-0723-00			Slide, DPDT, XY/YT Selector

¹ 604 only.

ELECTRICAL PARTS LIST (cont)

Ckt No.	Grid Loc	Tektronix Part No.	Serial/Model Eff	No. Disc	Description
ASSEMBLIES					
assembly y 604	A2	670-1812-00			Z-AXIS Circuit Board Assembly 603/604
	A3	670-1813-00			HIGH VOLTAGE & REGULATORS Circuit Board A 603/604 (part of)
	A4	670-1816-00			CONTROL & INTERFACE Circuit Board Assembly (part of)
CAPACITORS					
C501	F5	290-0534-00			1 μ F, Elect., 35 V, 20%
C506	G4	283-0002-00			0.01 μ F, Cer, 500 V
C512	G5	281-0549-00			68 pF, Cer, 500 V, 10%
C513	F4	281-0621-00			12 pF, Cer, 500 V, 1%
C516	G4	283-0002-00			0.01 μ F, Cer, 500 V
C523	G4	281-0621-00			12 pF, Cer, 500 V, 1%
C525	F5	283-0178-00			0.1 μ F, Cer, 100 V, +80%-20%
C526	F3	290-0534-00			1 μ F, Elect., 35 V, 20%
C531	G2	283-0002-00			0.01 μ F, Cer, 500 V
C539	G3	281-0534-00			3.3 pF, Cer, 500 V, ± 0.25 pF
C547	H2	281-0629-00			33 pF, Cer, 600 V, 5%
C548	G2	283-0002-00			0.01 μ F, Cer, 500 V
C553	F2	283-0178-00			0.1 μ F, Cer, 100 V, +80%-20%
C556	H3	281-0526-00			1.5 pF, Cer, 500 V, ± 0.5 pF
C560	H3	281-0160-00			7-25 pF, Var, Cer, 350 V
C565	I2	283-0162-00			0.01 μ F, Cer, 5000 V, +80%-30%
C566	J3	283-0021-00			0.001 μ F, Cer, 5000 V, 20%
C571	M2	283-0010-00	B010100	B069999	0.05 μ F, Cer, 50 V
C571	M2	283-0178-00	B070000		0.1 μ F, Cer, 100 V, +80%-20%
C578	M2	283-0026-00			0.2 μ F, Cer, 20 V, +80%-20%
C580	K2	283-0162-00			0.01 μ F, Cer, 5000 V, +80%-20%
C581	J2	283-0162-00			0.01 μ F, Cer, 5000 V, +80%-20%
C582	M2	290-0512-00			22 μ F, Elect., 15 V, 20%
C583	J2	283-0021-00			0.001 μ F, Cer, 5000 V, 20%
C584	M1	283-0001-00	XB050000		0.005 μ F, Cer, 500 V
C585	L4	283-0026-00			0.2 μ F, Cer, 25 V, +80%-20%
C586	L1	281-0512-00			27 pF, Cer, 500 V, 10%
C587	J3	290-0305-01			3 μ F, Elect., 150 V, 10%
C595	Q4	283-0021-00			0.001 μ F, Cer, 5000 V, 20%
SCD, DIODES					
CR508	G5	152-0246-00			Silicon, replaceable by CD12676 or FD3375
CR518	G5	152-0246-00			Silicon, replaceable by CD12676 or FD3375
CR526	F4	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR528	H4	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR531	G2	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR541	H3	152-0233-00			Silicon, replaceable by CD61128
CR542	G2	152-0153-00			Silicon, replaceable by FD7003 or CD5574
CR565	J3	152-0061-00	B010100	B039999	Silicon, replaceable by CD8393 or FDH2161

ELECTRICAL PARTS LIST (cont)

Ckt. No.		Tektronix Part No.	Serial/Model No. Eff	Disc	Description
SCD, DIODES (cont)					
CR565	J3	152-0242-00	B040000		Silicon, selected from 1N486A
CR566	I2	152-0061-00	B010100	B039999	Silicon, replaceable by CD893 or FDH2161
CR566	I2	152-0242-00	B040000		Silicon, selected from 1N486A
CR567	I2	152-0061-00	B010100	B039999	Silicon, replaceable by CD8393 or FDH2161
CR567	I2	152-0242-00	B040000		Silicon, selected from 1N486A
CR569	M3	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR570	M3	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR578	M2	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR580	K2	152-0409-00			Silicon, replaceable by VG-12X
CR586	J3	152-0061-00	B010100	B039999	Silicon, replaceable by CD8394 or FDH2161
CR586	J3	152-0242-00	B040000		Silicon, selected from 1N486A
VR526	F4	152-0149-00			Zener, replaceable by 1N961B, 0.4 W, 10 V, 10%
VR541	H3	152-0166-00			Zener, selected from 1N753A, 0.4 W, 6.2 V, 5%
VR551	F3	152-0101-00			Zener, replaceable by 1N3014B, 1 W, 75 V, 5%
VR591	N4	152-0255-00			Zener, replaceable by 1N978B, 0.4 W, 51 V, 5%
BULBS					
DS565		150-0111-00	XB040000		Neon, A1C-T
DS566		150-0111-00	XB040000	B049999X	Neon, A1C-T
DS567		150-0111-00	XB040000		Neon, A1C-T
CONNECTORS					
J200		131-0569-00			Receptacle, electrical, male (part of)
J505	F6	131-0955-00			Receptacle, electrical, BNC, female
J515	F6	131-0955-00			Receptacle, electrical, BNC, female
INDUCTOR					
L598		108-0644-00			Trace rotation
TRANSISTORS					
Q520A, B ^{G4}		151-1054-00			Silicon, JFET, N channel
Q526	G3	151-0342-00			Silicon, PNP, replaceable by 2N4249
Q528	G3	151-0342-00			Silicon, PNP, replaceable by 2N4249
Q532	G3	151-0301-00			Silicon, PNP, replaceable by 2N2907
Q534	G3	151-0342-00			Silicon, PNP, replaceable by 2N4249
Q536	G3	151-0342-00			Silicon, PNP, replaceable by 2N4246
Q542	G3	151-0341-00			Silicon, NPN, replaceable by 2N3565
Q544	G2	151-0341-00			Silicon, NPN, replaceable by 2N3565
Q554	F2	151-0270-00			Silicon, PNP, selected from 2N3495
Q556	H2	151-0279-00			Silicon, NPN, replaceable by SE7056
Q570	M3	151-0254-00			Silicon, NPN, replaceable by 2N5308
Q576	M2	151-0134-00			Silicon, PNP, selected from 2N2905
Q580	M1	151-0352-00			Silicon, NPN, replaceable by D44C6

ELECTRICAL PARTS LIST (cont)

Ckt. No.		Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS					
R501	H5	315-0392-00			3.9 k Ω , 1/4 W, 5%
R503	H5	315-0183-00			18 k Ω , 1/4 W, 5%
R505	G5	322-0481-00			1 M Ω , 1/4 W, 1%
R506	G4	315-0104-00			100 k Ω , 1/4 W, 5%
R508	G4	316-0102-00			1 k Ω , 1/4 W, 10%
R510	F4	315-0682-00			6.8 k Ω , 1/4 W, 5%
R511	G5	321-0142-00			294 Ω , 1/8 W, 1%
R512	F4	311-1226-00			2.5 k Ω , Var
R513	G4	321-0210-00			1.5 k Ω , 1/8 W, 1%
R515	G5	322-0481-00			1 M Ω , 1/4 W, 1%
R516	G4	315-0104-00			100 k Ω , 1/4 W, 5%
R518	G4	316-0102-00			1 k Ω , 1/8 W, 10%
R520	H4	315-0682-00			6.8 k Ω , 1/4 W, 5%
R523	G4	321-0210-00			1.5 k Ω , 1/8 W, 1%
R525	H5	315-0751-00			750 Ω , 1/4 W, 5%
R526	F4	315-0183-00			18 k Ω , 1/4 W, 5%
R527	H4	321-0158-00			432 Ω , 1/8 W, 1%
R528	H4	315-0183-00			18 k Ω , 1/4 W, 5%
R530	F3	321-0321-00			21.5 k Ω , 1/8 W, 1%
R531	G2	321-0208-00			1.43 k Ω , 1/8 W, 1%
R532	F3	321-0127-00			205 Ω , 1/8 W, 1%
R534	G3	321-0198-00			1.13 k Ω , 1/8 W, 1%
R535	H3	321-0193-00			1 k Ω , 1/8 W, 1%
R536	G3	321-0198-00			1.13 k Ω , 1/8 W, 1%
R537	H3	321-0193-00			1 k Ω , 1/8 W, 1%
R539	G3	316-0101-00			100 Ω , 1/4 W, 10%
R541	H2	315-0392-00			3.9 k Ω , 1/4 W, 5%
R544	G3	316-0101-00			100 Ω , 1/4 W, 10%
R545	H3	316-0472-00			4.7 k Ω , 1/4 W, 10%
R547	G2	316-0181-00			180 Ω , 1/4 W, 10%
R549	F3	303-0563-00			56 k Ω , 1 W, 5%
R551	F2	316-0101-00			100 Ω , 1/4 W, 10%
R553	F3	308-0206-00			7.5 k Ω , 5 W, WW, 5%
R556	G2	322-0613-00			20.4 k Ω , 1/4 W, 1%
R557	H2	316-0100-00			10 Ω , 1/4 W, 10%
R558	H4	321-0254-00			4.32 k Ω , 1/8 W, 1%
R559	H4	321-0253-00			4.22 k Ω , 1/8 W, 1%
R560	H5	315-0202-00			2 k Ω , 1/4 W, 5%
R562 ¹	P3	311-1313-00			2 k Ω , Var
R564		316-0101-00	XB040000		100 Ω , 1/4 W, 10%

¹604 only.

ELECTRICAL PARTS LIST (cont)

Ckt. No.		Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)					
R565	J2	315-0106-00			10 MΩ, 1/4 W, 5%
R566		316-0471-00	XBO40000		470 Ω, 1/4 W, 5%
R567	J2	316-0102-00			1 kΩ, 1/4 W, 10%
R569	M3	316-0153-00			15 kΩ, 1/4 W, 10%
R570	M2	316-0154-00			150 kΩ, 1/4 W, 10%
R571	M2	315-0182-00	BO10100	BO69999	1.8 kΩ, 1/4 W, 5%
R571	M2	315-0222-00	BO70000		2.2 kΩ, 1/4 W, 5%
R572	L4	316-0102-00			1 kΩ, 1/4 W, 10%
R573A	J2	307-0333-00			228 kΩ,
R573B					60 MΩ,
R753C					3.67 MΩ, Thick film
R753D					23.6 MΩ,
R575	J3	311-1232-00			50 kΩ, Var
R576	M2	316-0100-00			10 Ω, 1/4 W, 10%
R577	M3	316-0153-00			15 kΩ, 1/4 W, 10%
R578	M3	301-0181-00			180 Ω, 1/2 W, 5%
R579	M2	316-0150-00			15 Ω, 1/4 W, 10%
R581	K2	315-0223-00			22 kΩ, 1/4 W, 5%
R582	N2	307-0093-00	BO10100	BO59999	1.2 Ω, 1/2 W, 5%
R582	N2	308-0459-00	BO60000		1.1 Ω, 3 W, WW, 5%
R585	I4	315-0125-00			1.2 MΩ, 1/4 W, 5%
R586	L1	316-0564-00			560 kΩ, 1/4 W, 10%
R587	J4	321-0410-00			182 kΩ, 1/8 W, 1%
R588	J4	311-1235-00			100 kΩ, Var
R589	J4	321-0371-00			71.5 kΩ, 1/8 W, 1%
R590	K2	316-0104-00			100 kΩ, 1/4 W, 10%
R591	M4	315-0223-00			22 kΩ, 1/4 W, 5%
R592	M4	315-0223-00			22 kΩ, 1/4 W, 5%
R593	M4	301-0682-00			6.8 kΩ, 1/2 W, 5%
R594	M3	311-1136-00			100 kΩ, Var
R595 ¹	Q4	311-1312-00			5 MΩ, Var
R596	N4	311-1136-00			100 kΩ, Var
R598		311-1332-00			5 kΩ, Var
TRANSFORMER					
T580	L2	120-0750-00			H.V. Power
ELECTRON TUBE					
V735 ²		154-0634-01			CRT, P31, standard phosphor
V735 ¹		154-0633-00	BO10100	BO59999	CRT, similar to P1, standard phosphor
V735 ¹		154-0633-05	BO60000		CRT, similar to P1, standard phosphor

¹604 only.
²603 only.

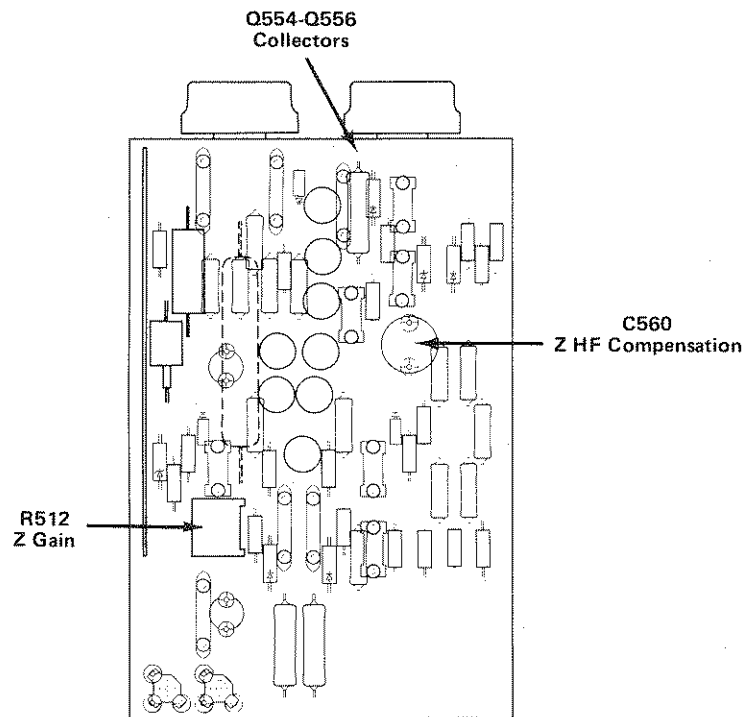


Fig. 4-5. Z-Axis Amplifier adjustments and test point locations.

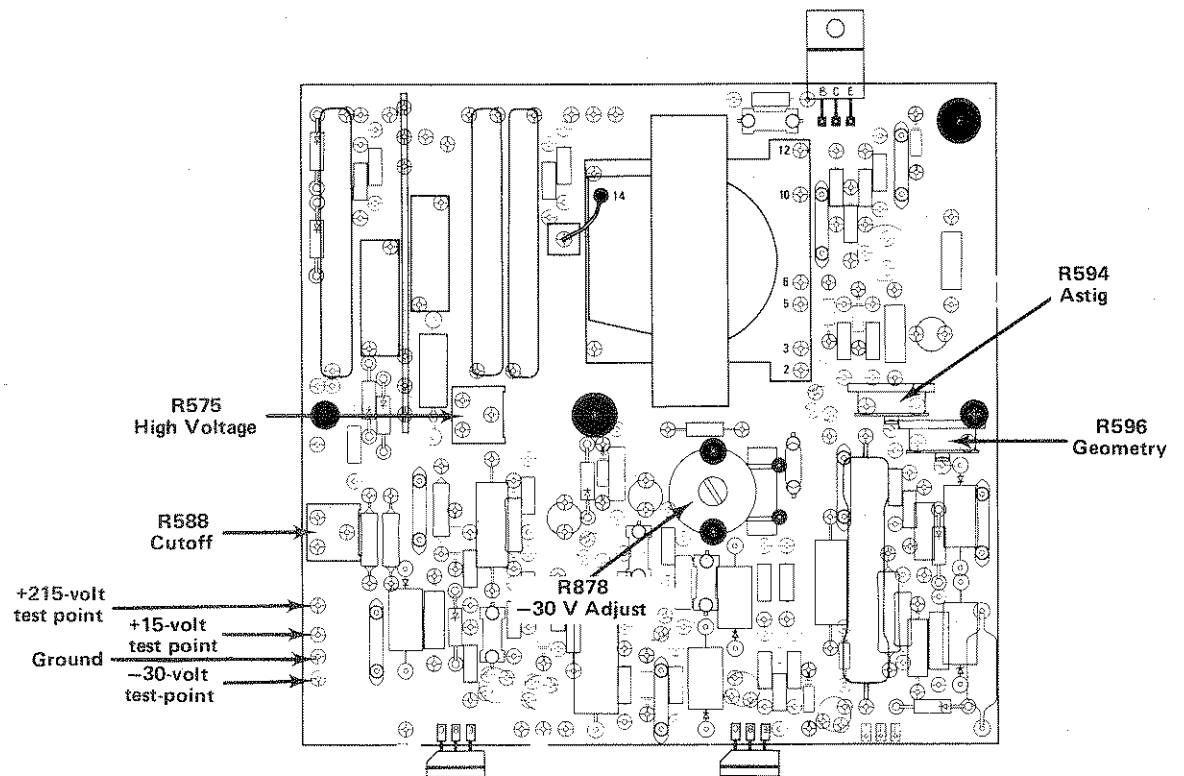
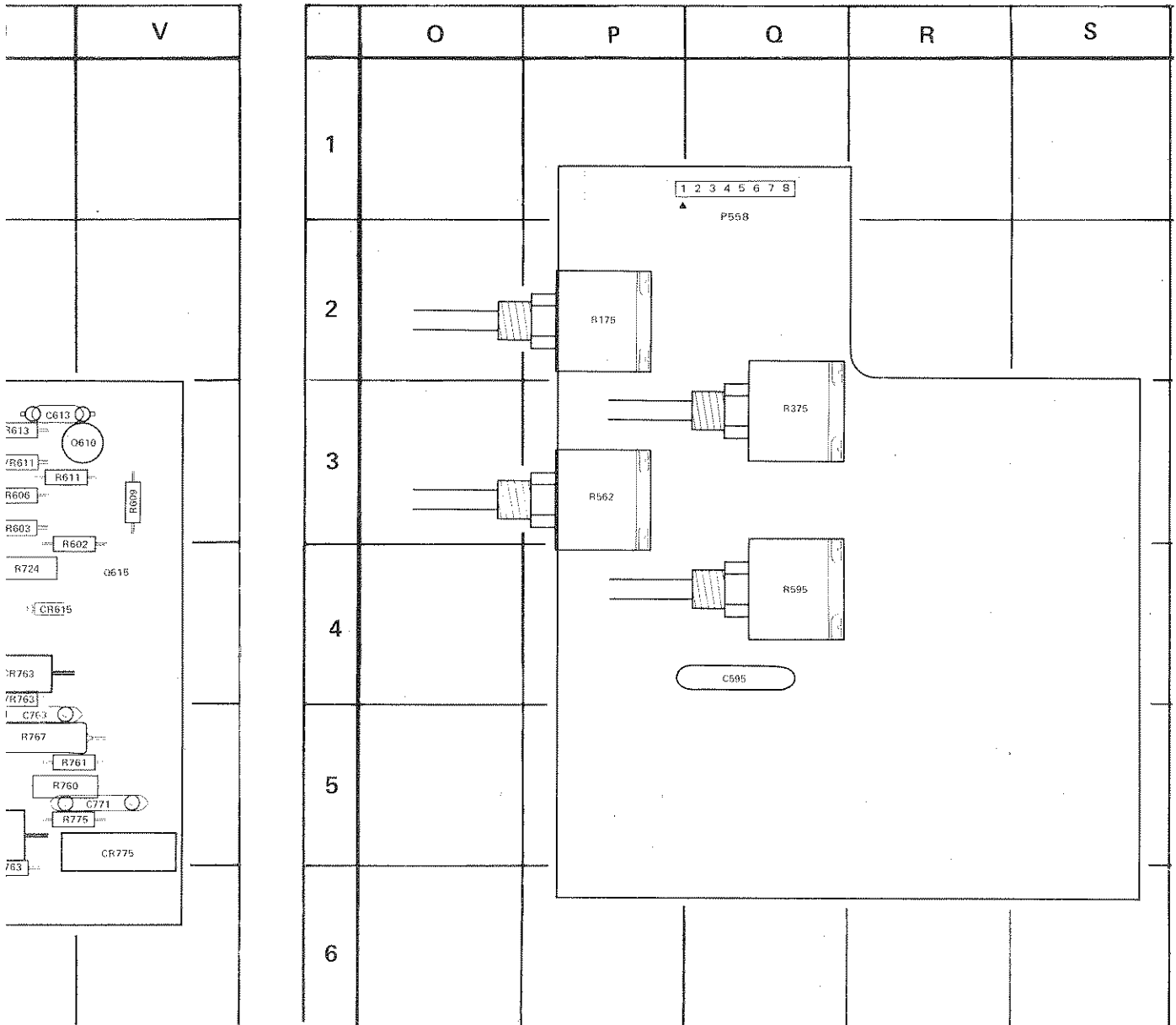
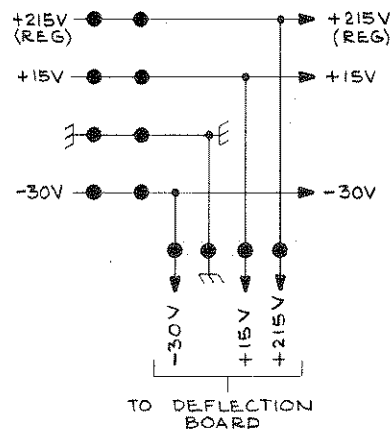
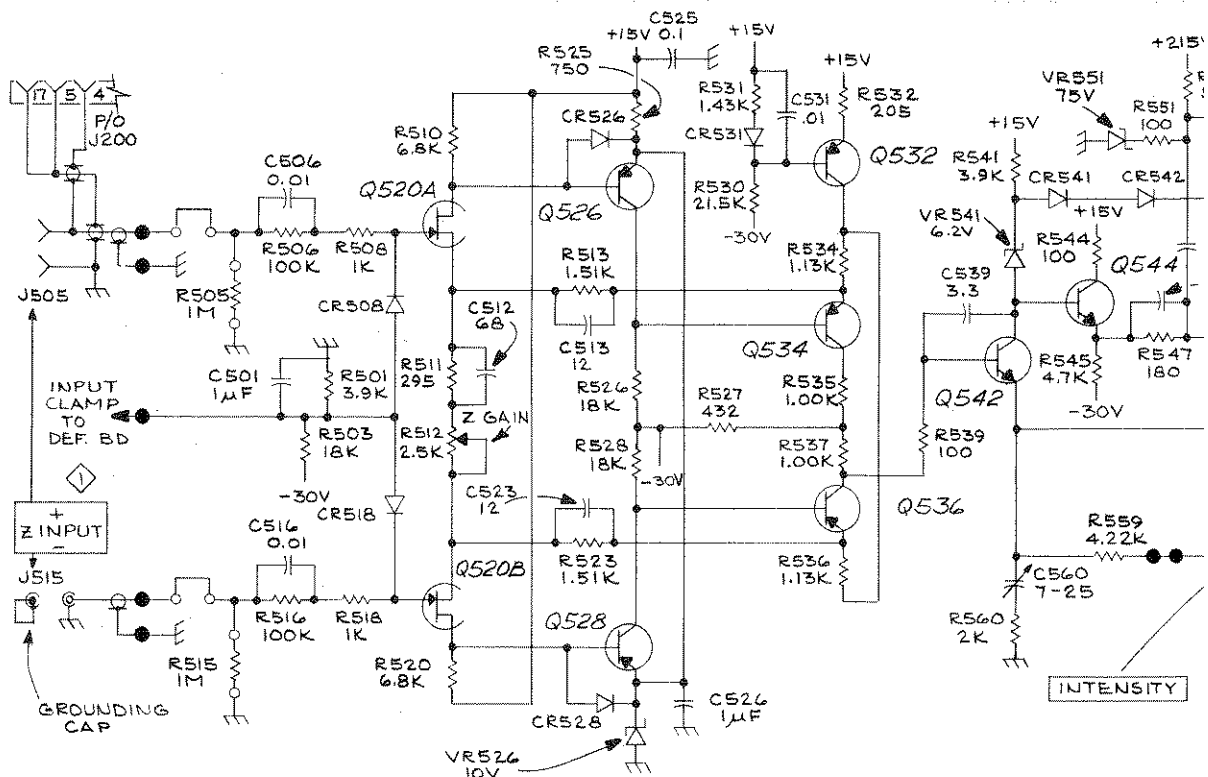


Fig. 4-6. CRT Circuit and Power Supply adjustments and test point locations.

604 ASSEMBLY A-4



Control & Interface Board (604) component location grid.



A2 Z AXIS BOARD

P/O A3 HIGH VOLTAGE & REGULATOR BOARD

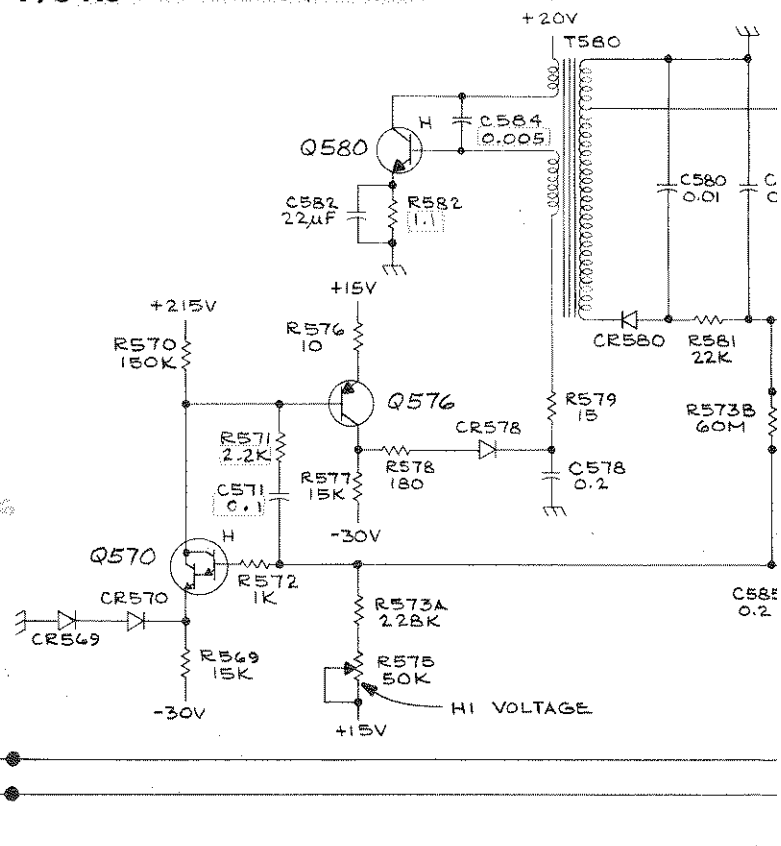
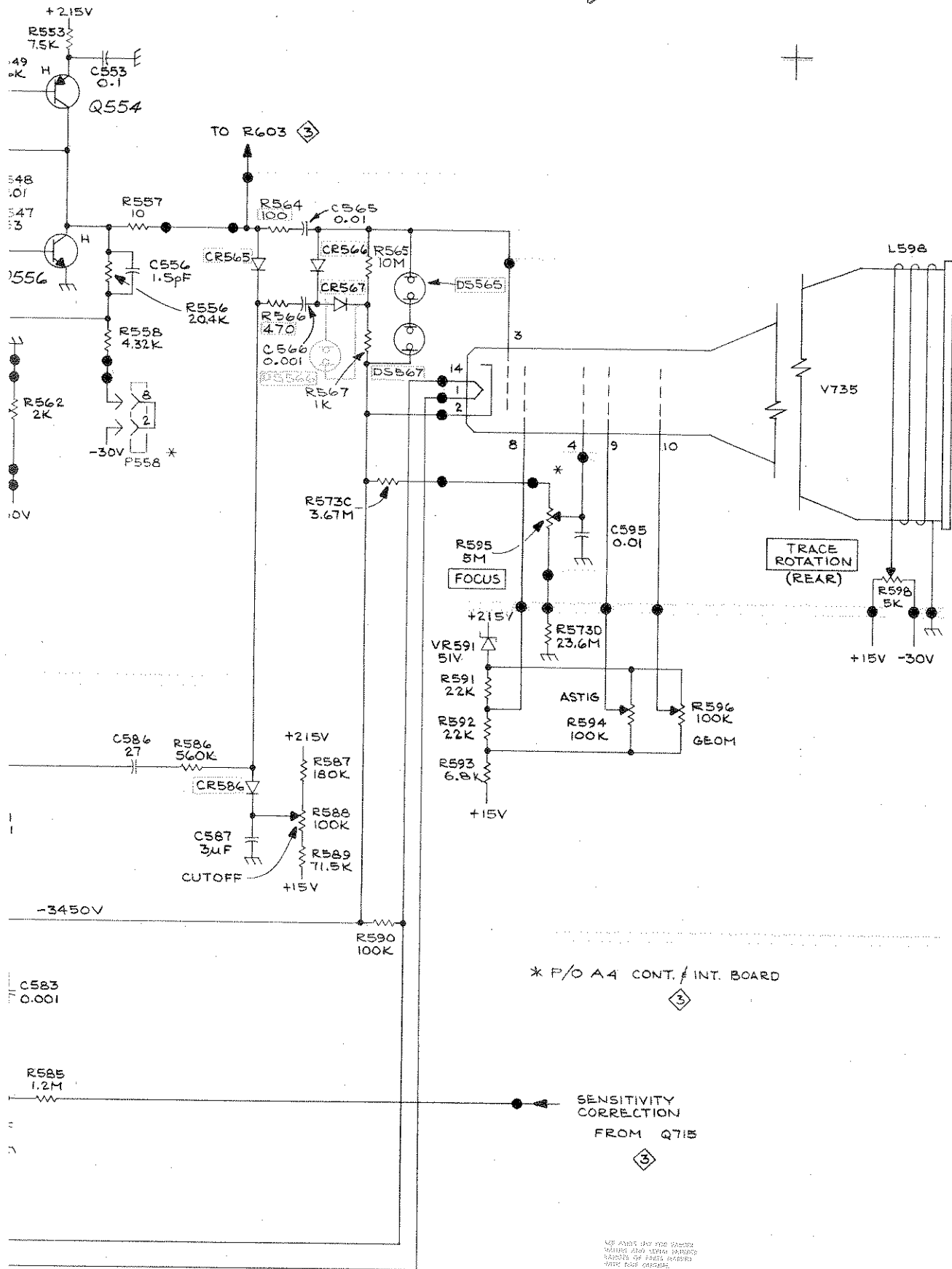


FIG 4-5 & 4-6

It still goes to GND



* P/O A4 CONT. / INT. BOARD

SENSITIVITY
CORRECTION
FROM Q715

CRT CIRCUIT 2 ²⁷³ RL

ELECTRICAL PARTS LIST (cont)

Ckt No.	Grid Loc	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
ASSEMBLY					
A4		670-1815-00			STORAGE Circuit Board Assembly 603
CAPACITORS					
C608 ¹	T3	283-0067-00			0.001 μ F, Cer, 200 V, 10%
C613 ¹	U3	283-0067-00			0.001 μ F, Cer, 200 V, 10%
C621 ¹	T3	281-0604-00			2.2 pF, Cer, 500 V, ± 0.25 pF
C625 ¹	T3	283-0026-00			0.2 μ F, Cer, 25 V, +80%-20%
C629 ¹	T3	281-0604-00			2.2 pF, Cer, 500 V, ± 0.25 pF
C631 ¹	Q4	283-0002-00			0.01 μ F, Cer, 500 V
C636 ¹	R4	283-0002-00			0.01 μ F, Cer, 500 V
C642 ¹	S4	290-0534-00			1 μ F, Elect., 35 V, 20%
C644 ¹	R3	290-0512-00			22 pF, Elect., 15 V, 20%
C652 ¹	R4	290-0529-00			47 μ F, Elect., 20 V, 20%
C715 ¹	T4	290-0512-00			22 μ F, Elect., 15 V, 20%
C721 ¹	T5	290-0000-00			6.25 μ F, Elect., 300 V
C722 ¹	Q5	290-0000-00			6.25 μ F, Elect., 300 V
C763 ¹	U5	283-0008-00			0.1 μ F, Cer, 500 V
C764 ¹	T5	281-0543-00			270 pF, Cer, 500 V, 10%
C770 ¹	P5	290-0530-00			68 μ F, Elect., 6 V, 20%
C771 ¹	V5	283-0002-00			0.01 μ F, Cer, 500 V
SCD, DIODES					
CR603 ¹	U3	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR606 ¹	U3	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR608 ¹	U3	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR615 ¹	U4	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR636 ¹	R4	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR641 ¹	S3	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR652 ¹	Q5	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR664 ¹	S3	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR680 ¹	R6	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR682 ¹	R5	152-0107-00			Silicon, replaceable by TI60 or 1N647
CR724 ¹	T6	152-0107-00			Silicon, replaceable by TI60 or 1N647
CR725 ¹	S6	152-0107-00			Silicon, replaceable by TI60 or 1N647
CR760 ¹	U4	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR762 ¹		152-0107-00			Silicon, replaceable by TI60 or 1N647
CR763 ¹	U4	152-0066-00			Silicon, selected from 1N3194
CR764 ¹	U6	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR775 ¹	V5	152-0488-00			Silicon, rectifier bridge, 200 V, 1.5 A
VR611 ¹	U3	152-0168-00			Zener, replaceable by 1N963B, 0.4 W, 12 V, 5%
VR734 ¹	S6	152-0288-00			Zener, selected from 1N988, 0.4 W, 140 V, 5%
VR763 ¹	U4	152-0166-00			Zener, selected from 1N753A, 0.4 W, 6.2 V, 5%
VR770 ¹	P6	152-0279-00			Zener, replaceable by 1N751A, 0.4 W, 5.1 V, 5%

¹603 only

ELECTRICAL PARTS LIST (cont)

Ckt No.	Grid Loc	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
TRANSISTORS					
Q606 ¹	T3	151-0341-00			Silicon, NPN, replaceable by 2N3565
Q610 ¹	V3	151-0342-00			Silicon, PNP, replaceable by 2N4249
Q615 ¹	V4	151-0279-00			Silicon, NPN, replaceable by SE7056
Q620 ¹	T3	151-0342-00			Silicon, PNP, replaceable by 2N4249
Q628 ¹	T3	151-0342-00			Silicon, PNP, replaceable by 2N4249
Q640 ¹	S3	151-0341-00			Silicon, NPN, replaceable by 2N3565
Q644 ¹	R4	151-0302-00			Silicon, NPN, replaceable by 2N2222A
Q648 ¹	R4	151-0342-00			Silicon, PNP, replaceable by 2N4249
Q675 ¹	S4	151-0341-00			Silicon, NPN, replaceable by 2N3565
Q678 ¹	Q6	151-0358-00			Silicon, NPN, replaceable by D44R4
Q680 ¹	R6	151-0358-00			Silicon, NPN, replaceable by D44R4
Q690 ¹	R3	151-0342-00			Silicon, PNP, replaceable by 2N4249
Q700 ¹	S3	151-0342-00			Silicon, PNP, replaceable by 2N4249
Q715 ¹	U4	151-0342-00			Silicon, PNP, replaceable by 2N4249
Q725 ¹	T6	151-0358-00			Silicon, NPN, replaceable by D44R4
Q735 ¹	S6	151-0358-00			Silicon, NPN, replaceable by D44R4
Q760 ¹	U5	151-0342-00			Silicon, PNP, replaceable by 2N4249
Q762 ¹	U6	151-0358-00			Silicon, NPN, replaceable by D44R4
Q764 ¹	U5	151-0347-00			Silicon, NPN, replaceable by 2N5551
RESISTORS					
R175 ¹	P2	311-1311-00			1 k Ω , Var
R375 ¹	Q3	311-1311-00			1 k Ω , Var
R562 ¹	P3	311-1313-00			2 k Ω , Var
R595 ¹	Q4	311-1312-00			5 M Ω , Var
R602 ¹	V3	315-0202-00			2 k Ω , 1/4 W, 5%
R603 ¹	U3	316-0274-00			270 k Ω , 1/4 W, 10%
R606 ¹	U3	316-0105-00			1 M Ω , 1/4 W, 10%
R608 ¹	U3	316-0472-00			4.7 k Ω , 1/4 W, 10%
R609 ¹	V3	316-0471-00			470 Ω , 1/4 W, 10%
R610 ¹	U3	315-0103-00			10 k Ω , 1/4 W, 5%
R611 ¹	U3	316-0393-00			39 k Ω , 1/4 W, 10%
R613 ¹	U3	316-0223-00			22 k Ω , 1/4 W, 10%
R614 ¹	U3	315-0103-00			10 k Ω , 1/4 W, 5%
R620 ¹	T4	316-0223-00			22 k Ω , 1/4 W, 10%
R621 ¹	T4	315-0125-00			1.2 M Ω , 1/4 W, 5%
R622 ¹	T3	315-0202-00			2 k Ω , 1/4 W, 5%
R623 ¹	T3	316-0104-00			100 k Ω , 1/4 W, 10%
R625 ¹		311-1316-00			20 k Ω , Var
R626 ¹	P4	315-0123-00			12 k Ω , 1/4 W, 5%
R628 ¹	T3	316-0104-00			100 k Ω , 1/4 W, 10%
R629 ¹	U3	315-0125-00			1.2 M Ω , 1/4 W, 5%
R631 ¹	P4	316-0471-00			470 Ω , 1/4 W, 10%
R633 ¹	P5	316-0393-00			39 k Ω , 1/4 W, 10%
R634 ¹	R5	316-0393-00			39 k Ω , 1/4 W, 10%
R636 ¹	R5	316-0102-00			1 k Ω , 1/4 W, 10%
R637 ¹	S4	315-0103-00			10 k Ω , 1/4 W, 5%
R638 ¹	S4	316-0102-00			1 k Ω , 1/4 W, 10%
R639 ¹	S4	315-0392-00			3.9 k Ω , 1/4 W, 5%
R641 ¹	S3	315-0103-00			10 k Ω , 1/4 W, 5%

¹603 only.

ELECTRICAL PARTS LIST (cont)

Ckt No.	Grid Loc	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
RESISTORS (cont)					
R642 ¹	S4	316-0682-00	B010100 B019999		6.8 kΩ, 1/4 W, 10%
R642 ¹	S4	316-0153-00	B020000		15 kΩ, 1/4 W, 10%
R644 ¹	R3	316-0121-00			120 kΩ, 1/2 W, 5%
R647 ¹	Q3	301-0122-00			1.2 kΩ, 1/2 W, 5%
R648 ¹	Q3	316-0331-00			330 Ω, 1/4 W, 10%
R650 ¹	R5	316-0393-00			39 kΩ, 1/4 W, 10%
R651 ¹	R4	315-0183-00			18 kΩ, 1/4 W, 5%
R652 ¹	S4	316-0101-00			100 Ω, 1/4 W, 10%
R661 ¹	R3	321-0365-00			61.9 kΩ, 1/8 W, 1%
R663 ¹	S4	315-0124-00			120 kΩ, 1/4 W, 5%
R664 ¹	S4	315-0473-00			47 kΩ, 1/4 W, 5%
R666 ¹	S3	321-0304-00			14.3 kΩ, 1/8 W, 1%
R667 ¹	S3	321-0350-00			43.2 kΩ, 1/8 W, 1%
R670 ¹	R4	311-1314-00			5 kΩ, Var
R671 ¹	R3	316-0331-00			330 Ω, 1/4 W, 10%
R672 ¹	S4	323-0452-00			499 kΩ, 1/2 W, 1%
R675 ¹	S3	321-0410-00			182 kΩ, 1/8 W, 1%
R676 ¹	Q5	316-0101-00			100 Ω, 1/4 W, 10%
R600 ¹	Q6	316-0101-00			100 Ω, 1/4 W, 10%
R680 ¹	R5	316-0101-00			100 Ω, 1/4 W, 10%
R681 ¹	R5	303-0823-00			82 kΩ, 1 W, 5%
R682 ¹	Q5	303-0823-00			82 kΩ, 1 W, 5%
R691 ¹	R3	315-0323-00			3.3 kΩ, 1/4 W, 5%
R692 ¹	R3	315-0392-00			3.9 kΩ, 1/4 W, 5%
R693 ¹	R3	315-0683-00			68 kΩ, 1/4 W, 5%
R694 ¹	R5	316-0471-00			470 Ω, 1/4 W, 10%
R695 ¹	S5	315-0103-00			10 kΩ, 1/4 W, 5%
R696 ¹	T4	315-0163-00			16 kΩ, 1/4 W, 5%
R700 ¹	S3	311-1315-00			25 kΩ, Var
R701 ¹	T3	315-0103-00			10 kΩ, 1/4 W, 5%
R703 ¹	R3	316-0334-00			330 kΩ, 1/4 W, 10%
R704 ¹	Q2	316-0334-00			330 kΩ, 1/4 W, 10%
R715 ¹	T4	311-1314-00			5 kΩ, Var
R716 ¹	U3	315-0154-00			150 kΩ, 1/4 W, 5%
R718 ¹	T4	315-0123-00			12 kΩ, 1/4 W, 5%
R723 ¹	T5	315-0473-00			47 kΩ, 1/4 W, 5%
R724 ¹	U4	301-0823-00			82 kΩ, 1/2 W, 5%
R725 ¹	T5	316-0101-00			100 Ω, 1/4 W, 10%
R728 ¹	T4	301-0134-00			130 kΩ, 1/2 W, 5%
R729 ¹	T4	316-0273-00			27 kΩ, 1/4 W, 10%
R730 ¹	T4	311-1136-00			100 kΩ, Var
R734 ¹	S5	315-0623-00			62 kΩ, 1/4 W, 5%
R735 ¹	S6	316-0101-00			100 Ω, 1/4 W, 10%
R760 ¹	U5	301-0224-00			220 kΩ, 1/2 W, 5%
R761 ¹	U5	316-0474-00			470 kΩ, 1/4 W, 10%
R762 ¹	U5	305-0183-00			18 kΩ, 2 W, 5%
R763 ¹	U6	315-0161-00			160 Ω, 1/4 W, 5%
R764 ¹	T5	315-0753-00			75 kΩ, 1/4 W, 5%
R765 ¹	U5	316-0472-00			4.7 kΩ, 1/4 W, 10%
R766 ¹	T5	316-0471-00			470 Ω, 1/4 W, 10%
R767 ¹	U5	323-0437-00			348 kΩ, 1/2 W, 1%
R768 ¹	U5	321-0352-00			45.3 kΩ, 1/8 W, 1%
R770 ¹	R4	303-0271-00			270 Ω, 1 W, 5%
R775 ¹	U5	316-0104-00			100 kΩ, 1/4 W, 10%

¹603 only.

ELECTRICAL PARTS LIST (cont)

Ckt No.	Grid Loc	Tektronix Part No.	Serial/Model No. Eff Disc	Description
SWITCHES				
S630 ¹	P5	260-1308-00		Push, ERASE
S695 ¹	S5	260-1211-00		Push-push, STORE/NON STORE
INTEGRATED CIRCUIT				
U630 ¹	R5	156-0149-00		Dual 4-input nand Schmitt trig., replaceable by SN7413N

¹603 only.

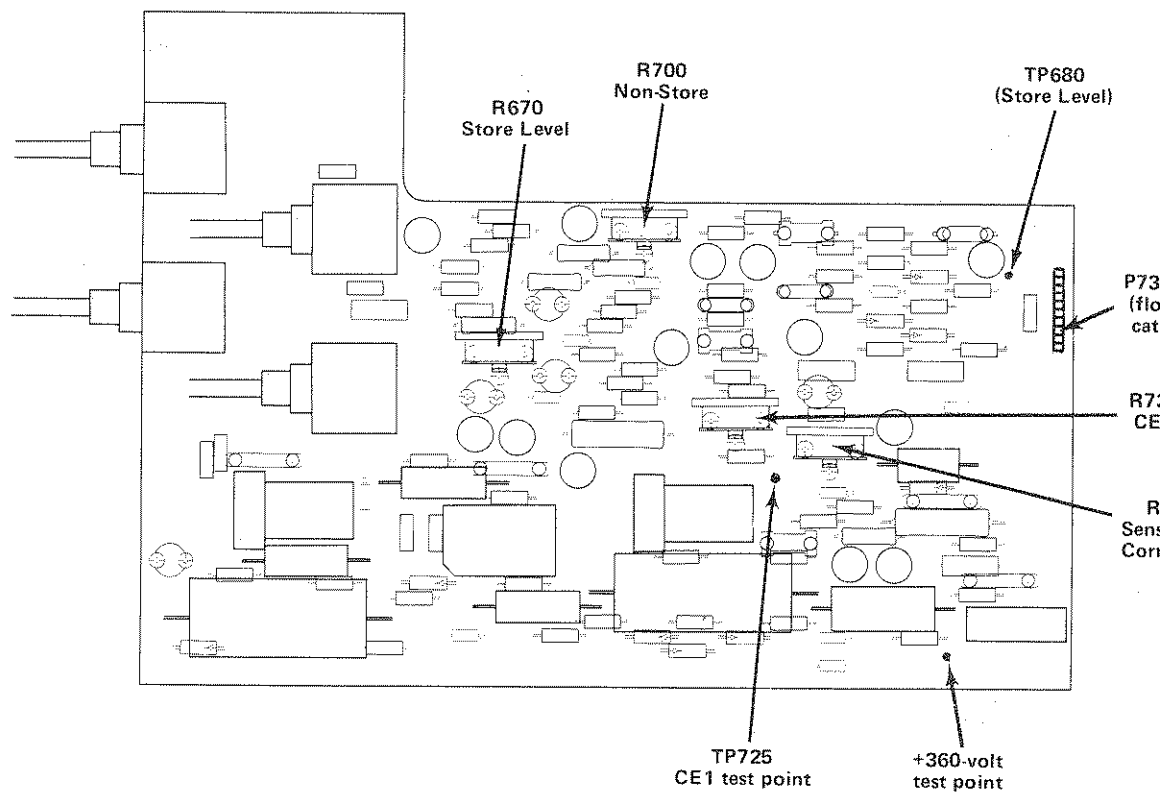
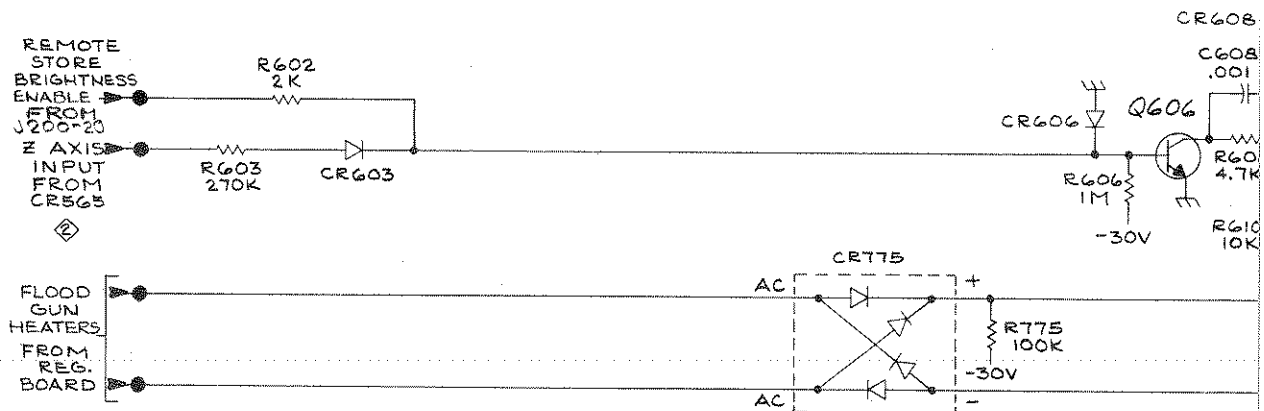
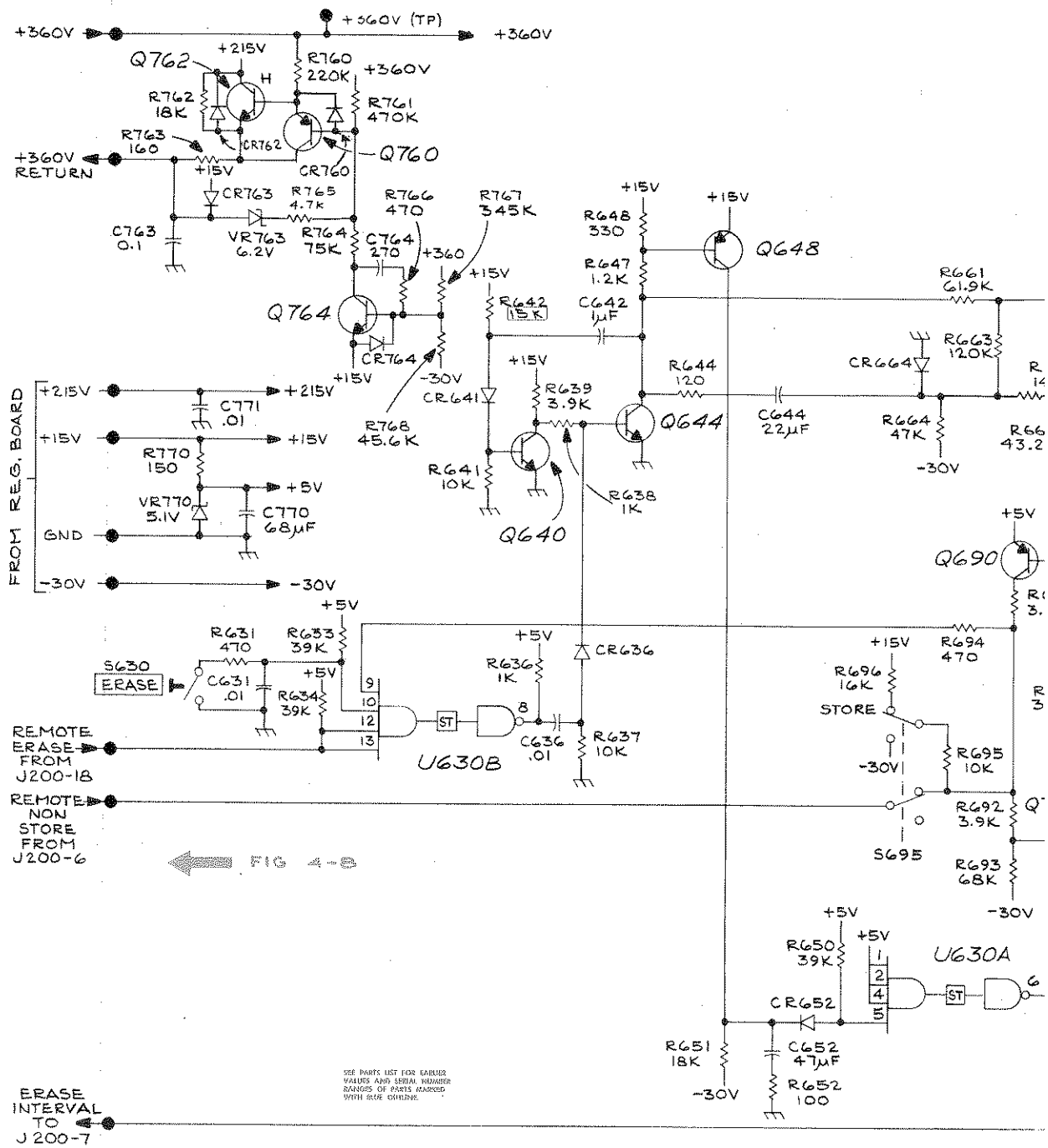
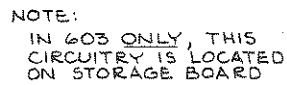
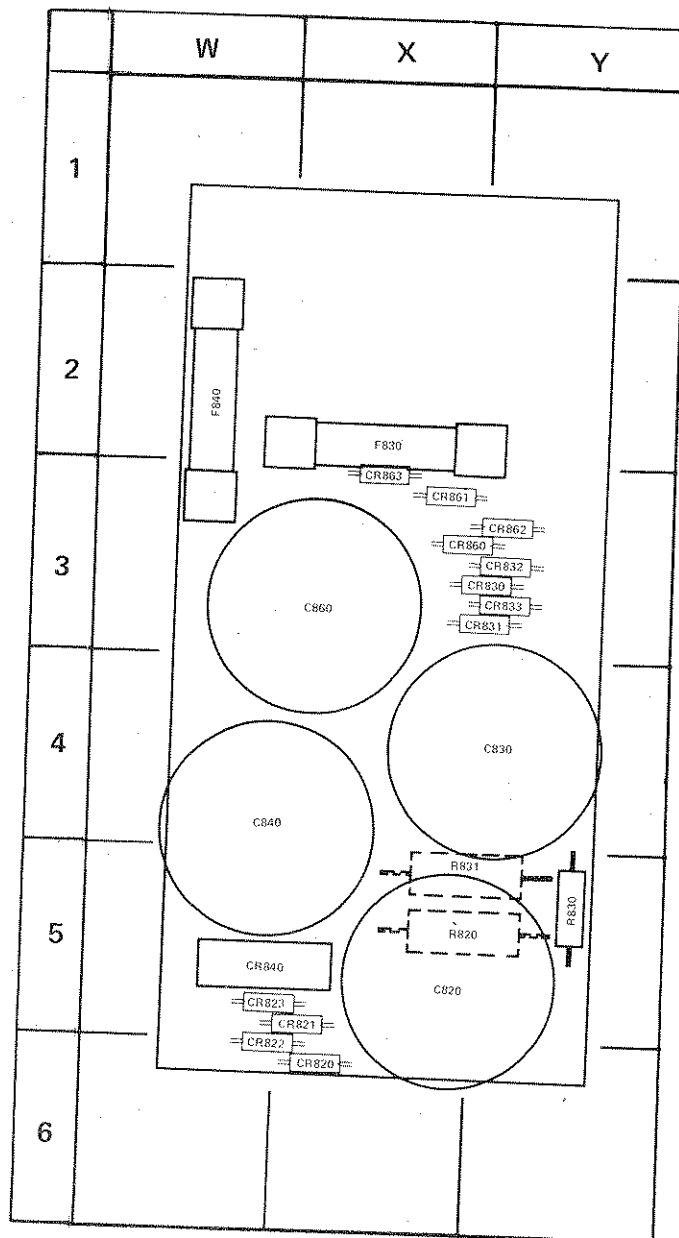


Fig. 4-8. Storage Circuit adjustments and test point locations.





603/604 ASSEMBLY A-5



NOTE

See Fig. 4-4 (Assembly A-3) for location of components on L.V. Regulator board.

Fig. 4-9. Power Input and Rectifiers Board component location grid.

ELECTRICAL PARTS LIST (cont)

Ckt. No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Description
ASSEMBLIES				
ly A3	670-1813-00			HIGH VOLTAGE & REGULATORS Circuit Board Assembl
y 603 A5	670-1814-00	BO10100	BO59999	603/604 (part of)
y 603 A5	670-1814-01	BO60000		POWER INPUT & RECTIFIERS Circuit Board Assembl
y 604 A5	670-1859-00	BO10100	BO59999	POWER INPUT & RECTIFIERS Circuit Board Assembl
y 604 A5	670-1859-01	BO60000		POWER INPUT & RECTIFIERS Circuit Board Assembl
CAPACITORS				
C820 X5	290-0569-00			50 μ F, Elect., 250 V, +50%-10%
C830 Y4	290-0587-00			165 μ F, Elect., 275 V, +50%-10%
C836 N4	283-0178-00			0.1 μ F, Cer, 100 V, +80%-20%
C840 W4	290-0571-00			5000 μ F, Elect., 25 V, +100%-10%
C841 J5	283-0081-00			0.1 μ F, Cer, 25 V, +80%-20%
C842 K4	290-0536-00			10 μ F, Elect., 25 V, 20%
C852 J5	281-0550-00			120 pF, Cer, 500 V, 10%
C857 J4	283-0002-00			0.01 μ F, Cer, 500 V
C860 X3	290-0570-00			500 μ F, Elect., 50 V, +75%-10%
C862 M4	283-0111-00			0.1 μ F, Cer, 500 V
C864 K5	290-0175-00			10 μ F, Elect., 35 V, 20%
C865 L5	281-0543-00			270 pF, Cer, 500 V, 10%
C870 K4	290-0512-00			22 μ F, Elect., 15 V, 20%
C872 K4	281-0504-00			10 pF, Cer, 500 V, 10%
C876 L6	283-0002-00			0.01 μ F, Cer, 500 V
SCD, DIODES				
CR820 X6	152-0107-00			Silicon, replaceable by TL60 or 1N647
CR821 X5	152-0107-00			Silicon, replaceable by TL60 or 1N647
CR822 W6	152-0107-00			Silicon, replaceable by TL60 or 1N647
CR823 W5	152-0107-00			Silicon, replaceable by TL60 or 1N647
CR830 Y3	152-0107-00			Silicon, replaceable by TL60 or 1N647
CR831 Y3	152-0107-00			Silicon, replaceable by TL60 or 1N647
CR832 Y3	152-0107-00			Silicon, replaceable by TL60 or 1N647
CR833 Y3	152-0107-00			Silicon, replaceable by TL60 or 1N647
CR835 M5	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR836 N4	152-0066-00			Silicon, selected from 1N3194
CR840 W5	152-0488-00			Silicon, rectifier bridge, 200 V, 1.5 A
CR841 J5	152-0066-00			Silicon, selected from 1N3194
CR842 L5	152-0066-00			Silicon, selected from 1N3194
CR850 K5	152-0141-02			Silicon, replaceable by 1N4152
CR851 J4	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR860 ¹ X3	152-0107-00			Silicon, replaceable by TL60 or 1N647
CR861 ¹ X3	152-0107-00			Silicon, replaceable by TL60 or 1N647
CR862 ¹ Y3	152-0107-00			Silicon, replaceable by TL60 or 1N647
CR863 ¹ X3	152-0107-00			Silicon, replaceable by TL60 or 1N647
CR864 L5	152-0066-00			Silicon, selected from 1N3194
CR865 M5	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR870 K4	152-0185-00			Silicon, selected from 1N4152 or 1N3605
CR875 K5	152-0185-00			Silicon, selected from 1N4152 or 1N3605
VR835 M6	152-0166-00			Zener, selected from 1N735A, 0.4 W, 6.2 V, 5%
VR836 N5	152-0291-00			Zener, replaceable by 1N3027P, 1 W, 20 V, 5%
VR850 J5	152-0357-00			Zener, replaceable by 1N983B, 0.4 W, 82 V, 5%
VR870 K4	152-0227-00			Zener, selected from 1N753A, 0.4 W, 6.2 V, 5%

¹603 only.

ELECTRICAL PARTS LIST (cont)

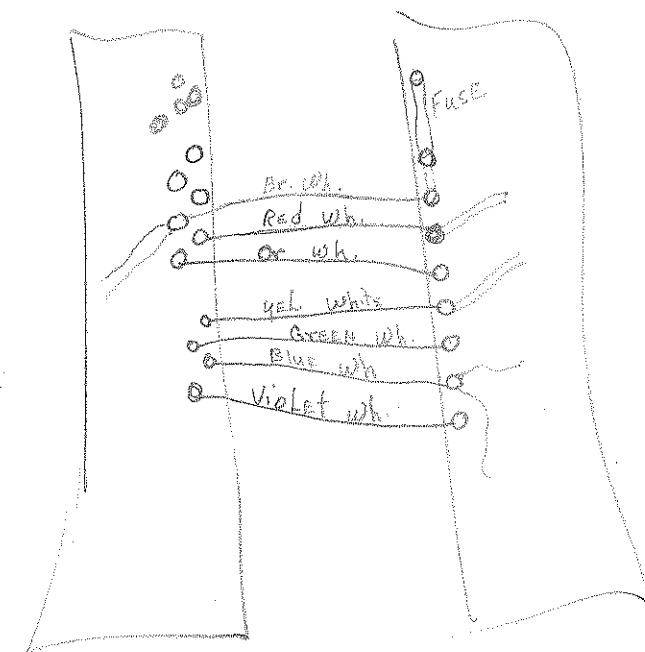
Ckt. No.		Tektronix Part No.	Serial/Model No. Eff	Disc	Description
FUSES					
		F800	159-0003-00		Cartridge, 1.6 A, 3 AG, slo-blo
		F830	159-0028-00		Cartridge, 1/4 A, 3 AG, fast-blo
	X2	F840	159-0019-00	B010100 B039999	Cartridge, 1 A, 3 AG, slo-blo
	W2	F840	159-0032-00	B040000 B059999	Cartridge, 1/2 A, 3 AG, slo-blo
	W2	F840	159-0019-00	B060000	Cartridge, 1 A, 3 AG, slo-blo
TRANSISTORS					
	M6	Q830	151-0228-00		Silicon, PNP, selected from 2N4888
	M6	Q836	151-0358-00		Silicon, NPN, replaceable by D44R4
	J6	Q840	151-0331-00		Silicon, NPN, replaceable by D40C8 or selected from D40C5
	K5	Q846	151-0341-00		Silicon, NPN, replaceable by 2N3565
	J5	Q852	151-0341-00		Silicon, NPN, replaceable by 2N3565
	L6	Q860	151-0331-00		Silicon, NPN, replaceable by D40C8 or selected from D40C5
	L5	Q865	151-0341-00		Silicon, NPN, replaceable by 2N3565
	K4	Q870	151-0342-00		Silicon, PNP, replaceable by 2N4249
	L5	Q875	151-0342-00		Silicon, PNP, replaceable by 2N4249
RESISTORS					
	X5	R820 ¹	304-0683-00		68 k Ω , 1 W, 10%
	Y5	R830	302-0150-00		15 Ω , 1/2 W, 10%
	X5	R831	304-0823-00		82 k Ω , 1 W, 10%
	M5	R832	322-0414-00		200 k Ω , 1/4 W, 1%
	M5	R834	321-0351-00		44.2 k Ω , 1/8 W, 1%
	N5	R836	301-0102-00		1 k Ω , 1/2 W, 5%
	N5	R837	308-0281-00		1.8 k Ω , 3 W, WW, 5%
	M5	R838	301-0300-00		30 Ω , 1/2 W, 5%
	J4	R842	307-0007-00		2.7 Ω , 1 W, 10%
	K5	R846	315-0561-00		560 Ω , 1/4 W, 5%
	K5	R847	316-0153-00		15 k Ω , 1/4 W, 10%
	J5	R850	316-0823-00		82 k Ω , 1/4, 10%
	J5	R851	301-0683-00		68 k Ω , 1/2 W, 5%
	J5	R852	316-0471-00		470 Ω , 1/4 W, 10%
	K4	R853	316-0103-00		10 k Ω , 1/4 W, 10%
	J4	R857	321-0260-00		4.99 k Ω , 1/8 W, 1%
	K4	R858	321-0289-00		10 k Ω , 1/8 W, 1%
	K5	R859	316-0101-00		100 Ω , 1/4 W, 10%
	M5	R860	307-0015-00		3.3 Ω , 1 W, 5%
	L5	R861	316-0471-00		470 Ω , 1/4 W, 10%
	M5	R862	307-0335-00		150 Ω , 0.4 W, 5%
	L5	R863	316-0273-00		27 k Ω , 1/4 W, 10%
	L5	R865	316-0331-00		330 Ω , 1/4 W, 10%
	L5	R867	315-0621-00		620 Ω , 1/4 W, 5%
	L5	R868	316-0101-00		100 Ω , 1/4 W, 10%
	K5	R870	315-0562-00		5.6 k Ω , 1/4 W, 5%
	L4	R872	316-0221-00		220 Ω , 1/4 W, 10%
	K5	R873	316-0102-00		1 k Ω , 1/4 W, 10%
	L5	R875	316-0101-00		100 Ω , 1/4 W, 10%
	K5	R876	316-0101-00		100 Ω , 1/4 W, 10%
	L5	R877	321-0256-00		4.53 k Ω , 1/8 W, 1%
	L4	R878	311-1124-00		250 Ω , Var
	K4	R879	321-0202-00		1.24 k Ω , 1/8 W, 1%

¹603 only.

ELECTRICAL PARTS LIST (cont)

Ckt No.	Grid Loc	Tektronix Part No.	Serial/Model No. Eff Disc	Description
SWITCHES				
S800		260-1222-00		Push-pull DPDT, POWER PULL ON
S801		260-0551-00		Thermostatic, open 86.1° C, close 73.9° C
TRANSFORMERS				
T800 ¹		120-0748-00		Power
T800 ²		120-0749-00		Power

¹603 only.
²604 only.



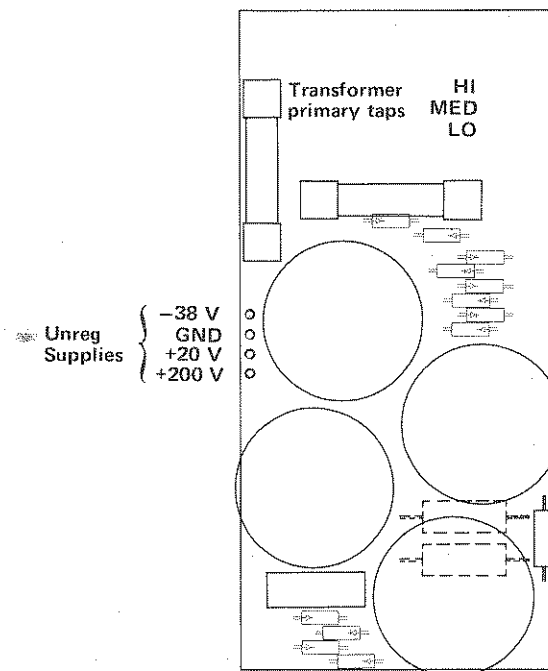


Fig. 4-10. Transformer primary taps and power supply test points.

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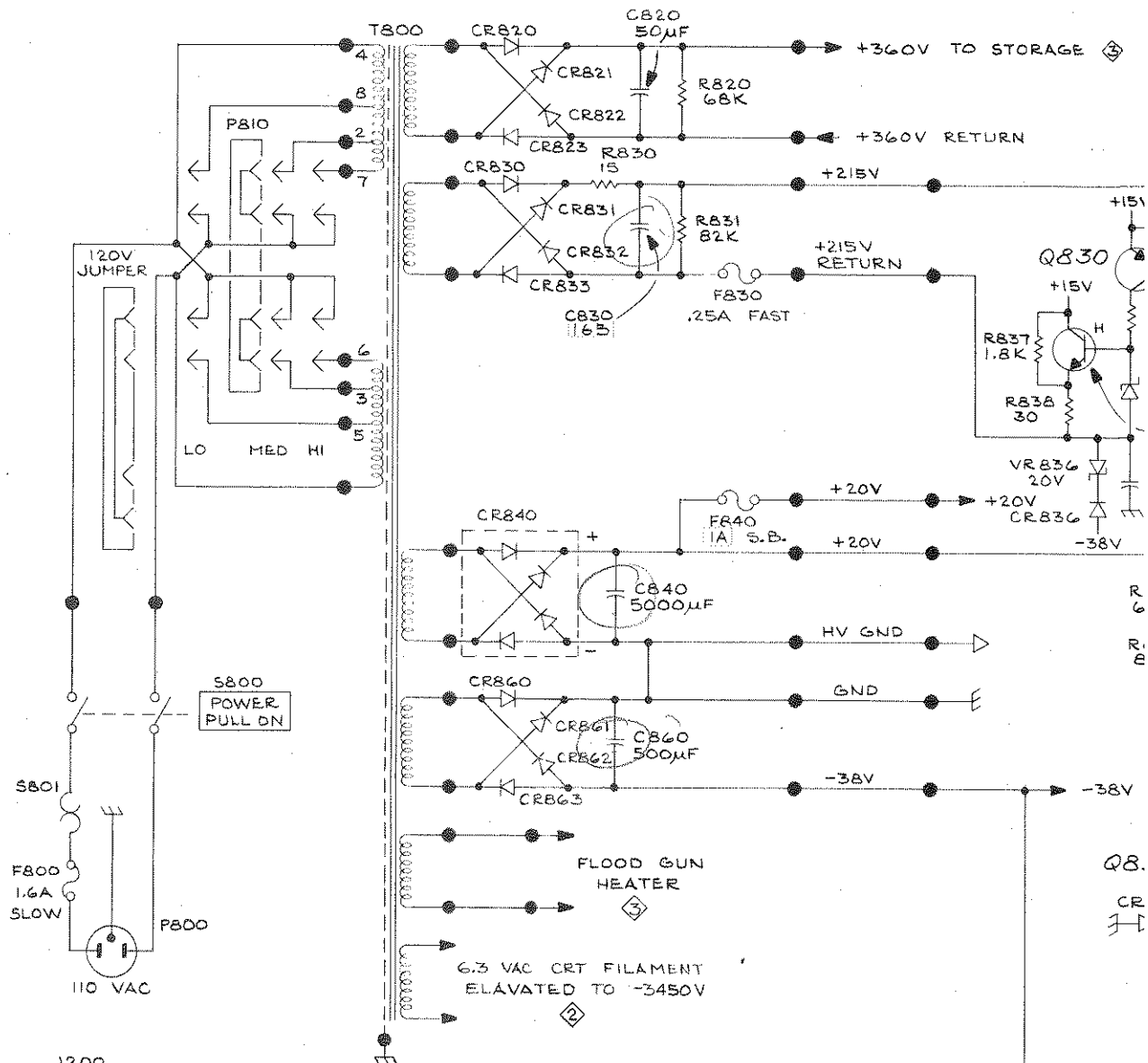
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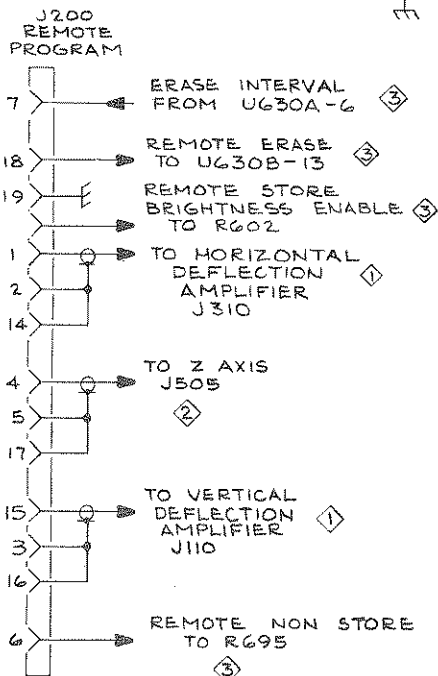
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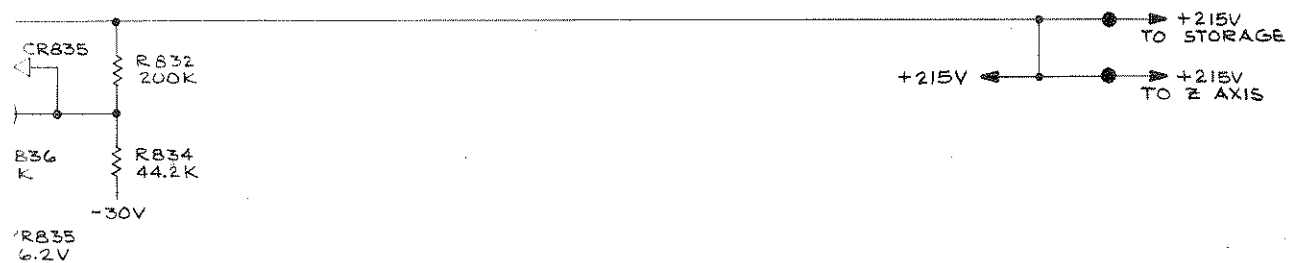
RECTIFIER BOARD



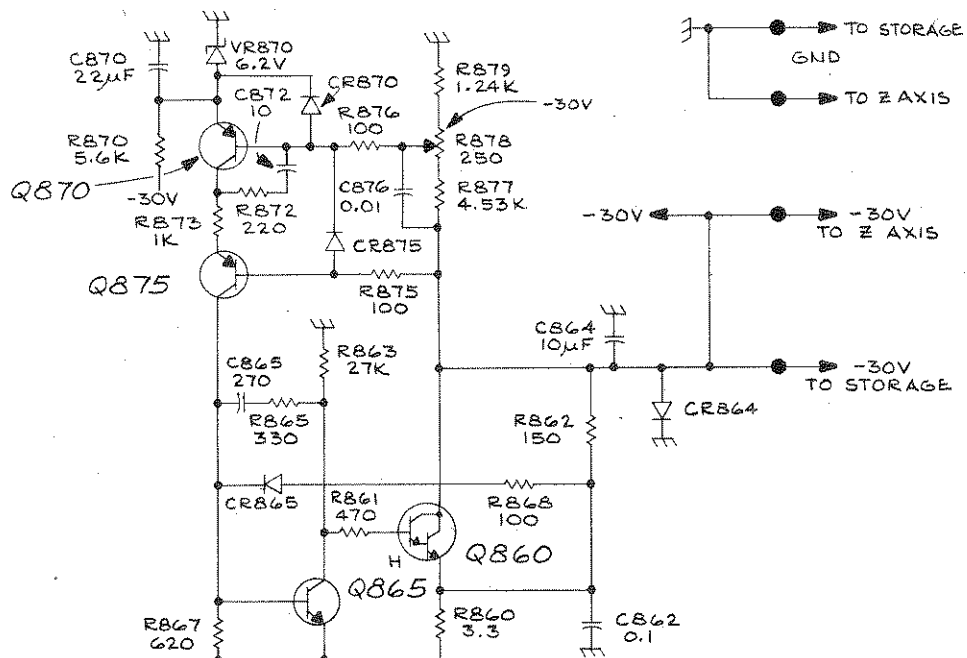
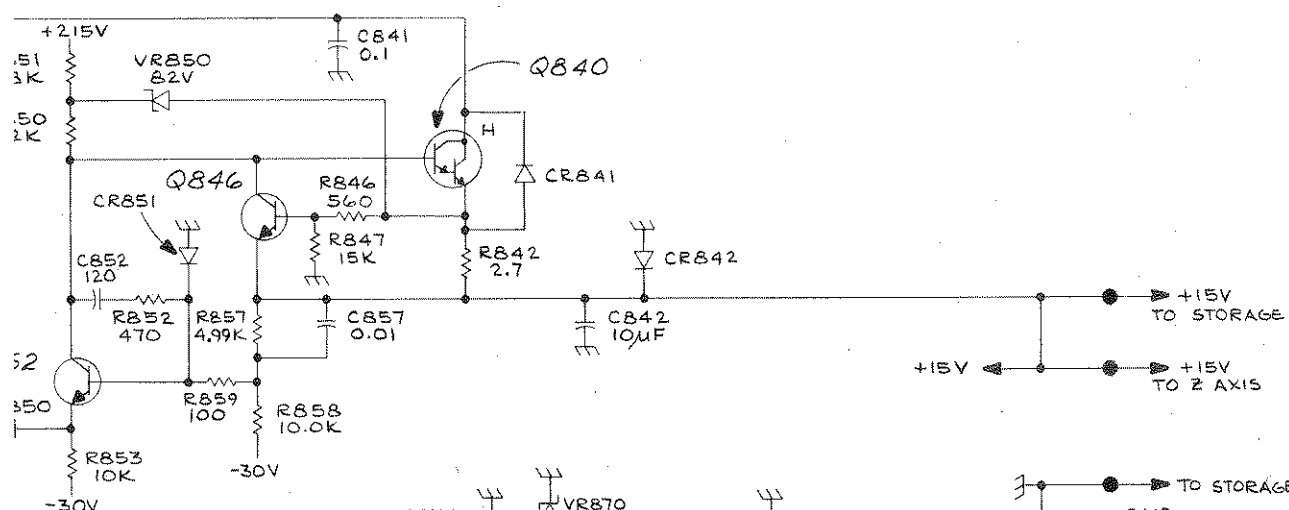
REGULATOR BOARD

+ 603/604

(E)



Q836

C836
0.1

D

603/604 ASSEMBLY A-6

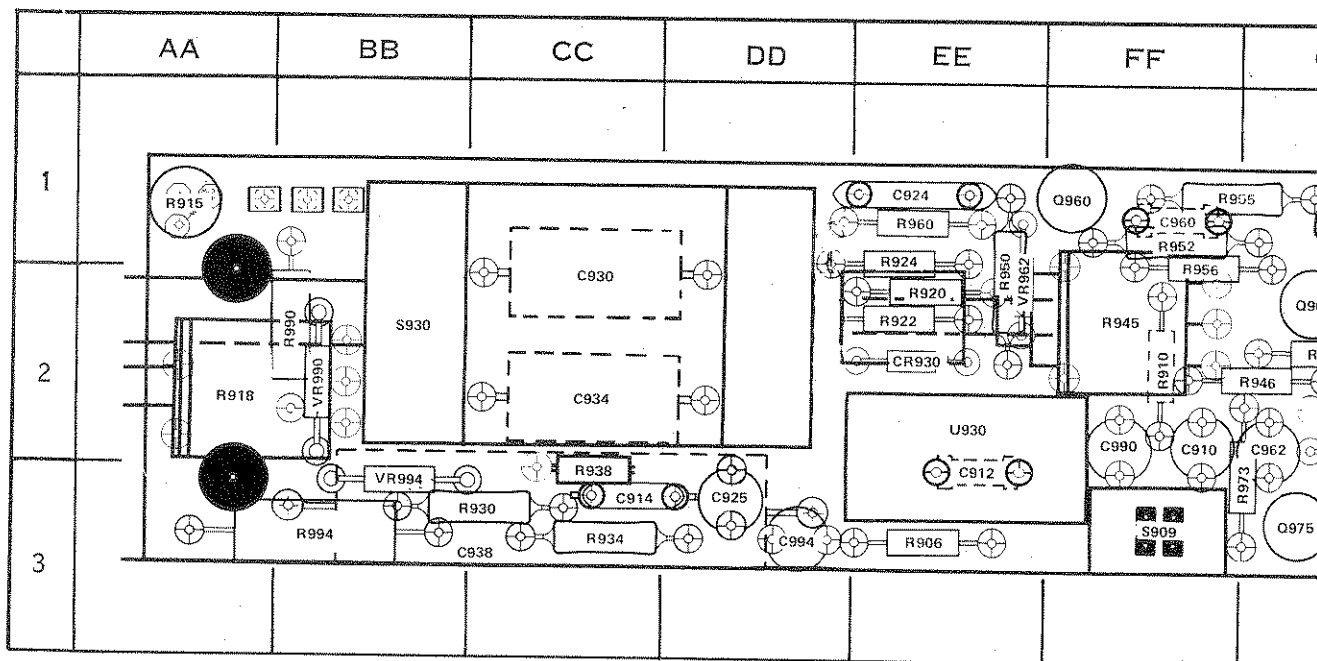
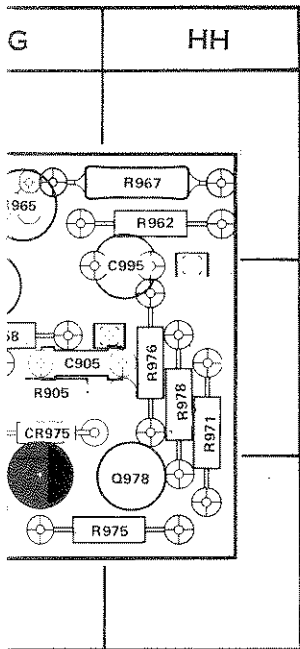


Fig. 4-11. 603/604 Optional Sweep Board component location.



ELECTRICAL PARTS LIST (cont)

Ckt. No.		Tektronix Part No.	Serial/Model No. Eff	Disc	Description
ASSEMBLY					
A6		670-2278-00			SWEEP Circuit Board Assembly (Optional) 603/61
CAPACITORS					
C905	GG2	281-0503-00			8 pF, Cer, 500 V, ± 0.5 pF
C910	FF2	290-0534-00			1 μ F, Elect., 35 V, 20%
C912	EE3	281-0629-00			33 pF, Cer, 600 V, 5%
C914	CC3	283-0004-00			0.02 μ F, Cer, 150 V
C924	EE1	283-0041-00			0.0033 μ F, Cer, 500 V, 5%
C925	DD3	290-0534-00			1 μ F, Elect., 35 V, 20%
C930	CC1				0.001 μ F,
C934	CC2	295-0159-00			0.01 μ F, Timing Capacitor, matched
C938	CC3				1 μ F,
C960	FF1	281-0604-00			2.2 pF, Cer, 500 V
C962	GG2	290-0572-00			0.1 μ F, Elect., 50 V
C990	FF2	290-0534-00			1 μ F, Elect., 35 V, 20%
C994	DD3	290-0534-00			1 μ F, Elect., 35 V, 20%
C995	HH2	290-0572-00			0.1 μ F, Elect., 50 V
DIODES					
CR930	EE2	152-0141-02			Silicon, replaceable by 1N4152
CR975	GG2	152-0141-02			Silicon, replaceable by 1N4152
VR962	EE2	152-0166-00			Zener, selected from 1N753A, 0.4 W, 6.2 V, 5%
VR990	BB2	152-0217-00			Zener, selected from 1N7562A, 0.4 W, 8.2 V, 5%
VR994	BB3	152-0217-00			Zener, selected from 1N7562A, 0.4 W, 8.2 V, 5%
TRANSISTORS					
Q960	FF1	151-0342-00			Silicon, PNP, replaceable by 2N4249
Q964	GG2	151-0341-00			Silicon, NPN, replaceable by 2N3565
Q975	GG3	151-0342-00			Silicon, PNP, replaceable by 2N4249
Q978	HH3	151-0190-00			Silicon, NPN, replaceable by 2N3904 or TE3904
RESISTORS					
R905	GG2	315-0363-00			36 k Ω , 1/4 W, 5%
R906	EE3	315-0223-00			22 k Ω , 1/4 W, 5%
R910	FF2	316-0332-00			3.3 k Ω , 1/4 W, 10%
R915	AA1	311-0607-00			10 Ω , Var
R918	AA2	311-0949-00			2 k Ω , Var
R920	EE2	316-0333-00			33 k Ω , 1/4 W, 10%
R922	EE2	316-0122-00			1.2 k Ω , 1/4 W, 10%
R924	EE1	315-0223-00			22 k Ω , 1/4 W, 5%
R930	CC3	321-0356-00			49.9 k Ω , 1/8 W, 1%
R934	CC3	321-0452-00			499 k Ω , 1/8 W, 1%
R938	CC3	307-0381-00			4.99 M Ω , 1/2 W, 1%
R945	FF2	311-0443-00			2.5 k Ω , Var
R946	GG2	315-0221-00			220 Ω , 1/4 W, 5%
R950	EE1	321-0327-00			24.9 k Ω , 1/8 W, 1%
R952	FF1	321-0311-00			16.9 k Ω , 1/8 W, 1%
R955	FF1	321-0369-00			68.1 k Ω , 1/8 W, 1%
R956	FF1	315-0822-00			8.2 k Ω , 1/4 W, 5%

¹ Individual timing capacitors in this assembly must be ordered by the 9 digit part number, letter suffix and tolerance printed on the timing capacitor to be replaced. Example:

285-XXXX-XX F-

The letter suffix and the tolerance should be the same for all of the timing capacitors in the assembly.

ELECTRICAL PARTS LIST (cont)

Ckt. No.		Tektronix Part No.	Serial/Model No. Eff Disc	Description
RESISTORS (cont)				
R958	GG2	316-0222-00		2.2 k Ω , 1/4 W, 10%
R960	EE1	316-0333-00		33 k Ω , 1/4 W, 10%
R962	HH1	316-0101-00		100 Ω , 1/4 W, 10%
R965	GG1	311-0635-00		1 k Ω , Var
R967	HH1	321-0230-00		2.43 k Ω , 1/8 W, 1%
R971	HH2	315-0273-00		27 k Ω , 1/4 W, 5%
R973	GG3	316-0102-00		1 k Ω , 1/4 W, 10%
R975	HH3	316-0102-00		1 k Ω , 1/4 W, 10%
R976	HH2	316-0471-00		470 Ω , 1/4 W, 10%
R978	HH2	315-0133-00		13 k Ω , 1/4 W, 5%
R990	BB2	301-0241-00		240 Ω , 1/2 W, 5%
R994	BB3	303-0821-00		820 Ω , 1 W, 5%
SWITCHES				
S909	FF3	260-0960-01		Slide
S930 ¹	BB2	105-0389-00		Actuator Assembly
INTEGRATED CIRCUIT				
U930	EE2	155-0055-00		Trigger and sweep generator

¹See Mechanical Parts List for replacement parts.

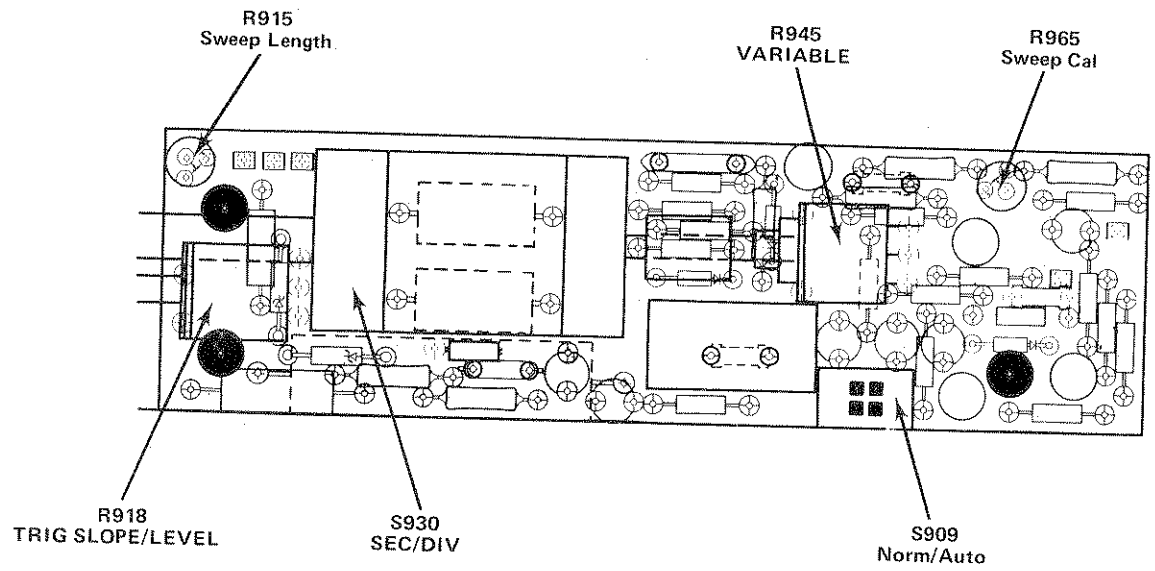
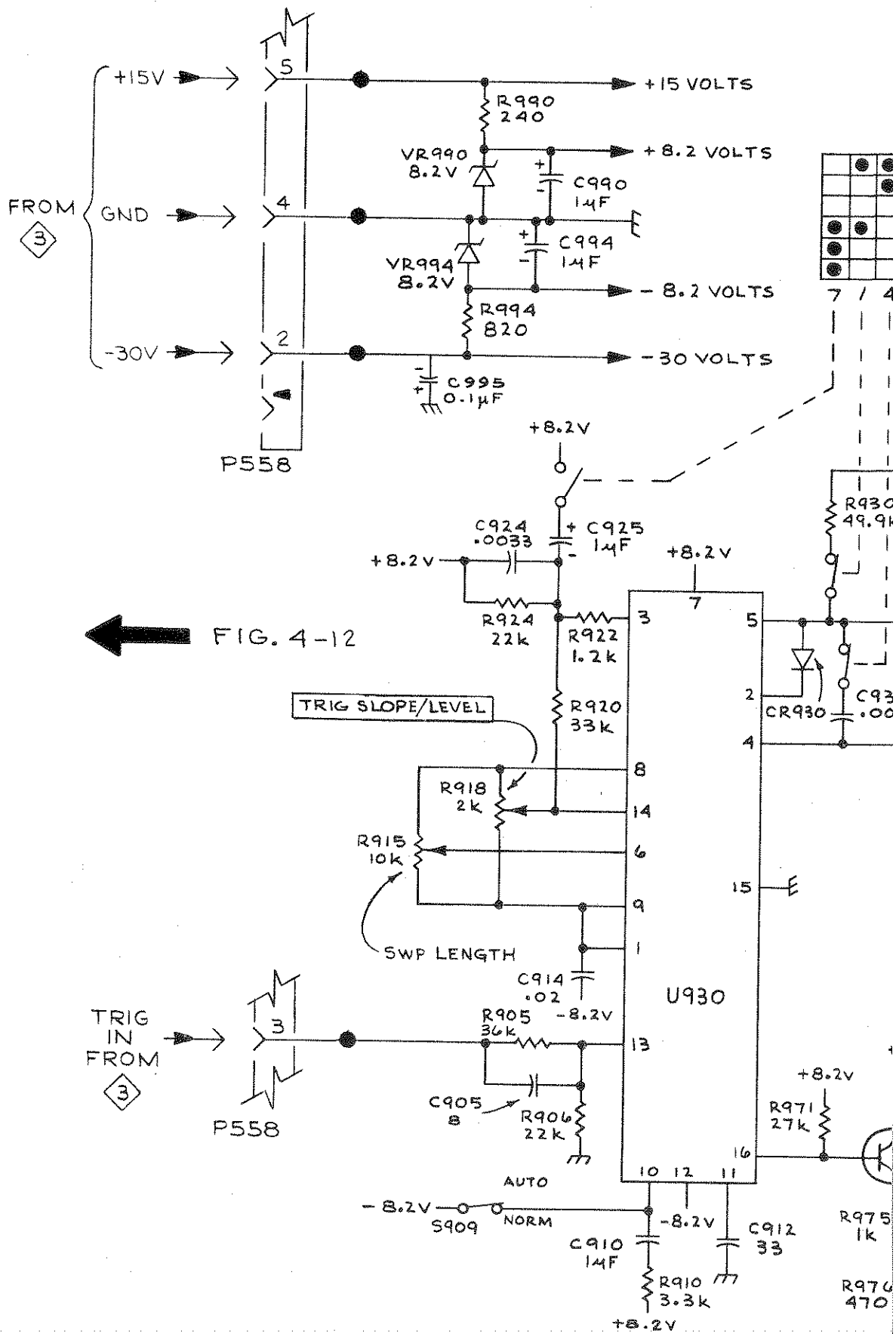


Fig. 4-12. Sweep circuit adjustments and text point location.

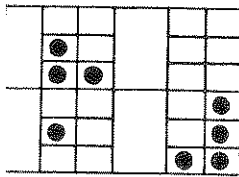


A6 SWEEP BOARD

603/604 SWEEP OPTION

S930

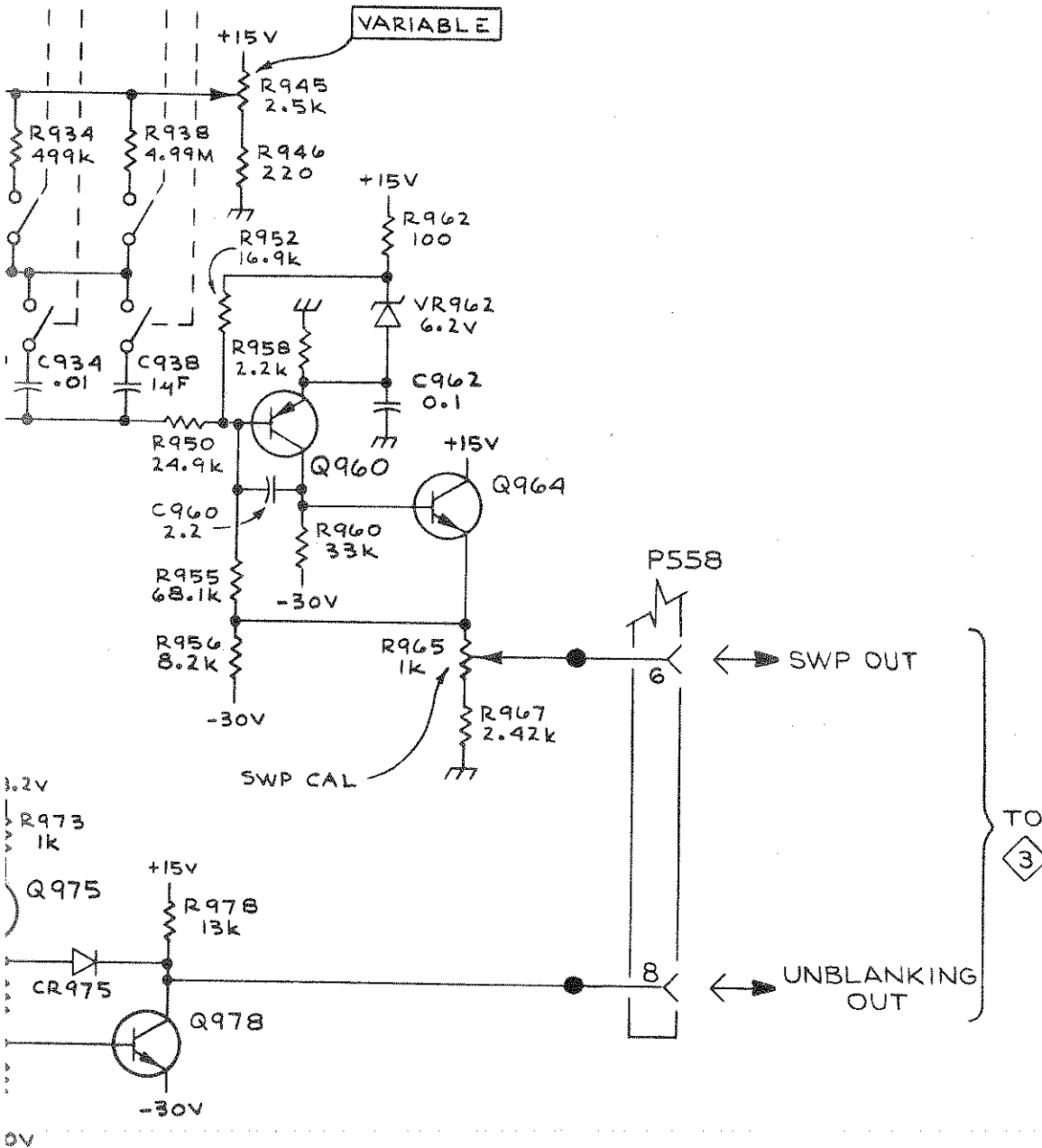
SEC/DIV



CW

1 μ SEC
10 μ SEC
100 μ SEC
1 m SEC
10 m SEC
100 m SEC

CCW



OPTIONAL SWEEP CIRCUIT

& ADJUSTMENT LOCATION

MECHANICAL PARTS LIST

Replacement parts should be ordered from the Tektronix Field Office or Representative in your area. Changes to Tektronix products give you the benefit of improved circuits and components. Please include the instrument type number and serial number with each order for parts or service.

ABBREVIATIONS

BHB	binding head brass	h	height or high	OHB	oval head brass
BHS	binding head steel	hex.	hexagonal	OHS	oval head steel
CRT	cathode-ray tube	HHB	hex head brass	PHB	pan head brass
csk	countersunk	HHS	hex head steel	PHS	pan head steel
DE	double end	HSB	hex socket brass	RHS	round head steel
FHB	flat head brass	HSS	hex socket steel	SE	single end
FHS	flat head steel	ID	inside diameter	THB	truss head brass
Fil HB	fillister head brass	lg	length or long	THS	truss head steel
Fil HS	fillister head steel	OD	outside diameter	w	wide or width

Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Q † y	Description
		Eff	Disc		1 2 3 4 5
1-1	390-0270-00			1	CABINET SIDE, right
	390-0244-00			1	CABINET SIDE, left
	- - - - -			-	each cabinet side includes:
	214-0812-00			2	LATCH ASSEMBLY
	- - - - -			-	each latch assembly includes:
-2	386-0226-00			1	PLATE, locking
-3	386-0227-00			1	PLATE, index
-4	214-0604-00			1	SPRING, latch
-5	214-0603-01			1	PIN, securing
-6	390-0280-00			1	CABINET BOTTOM
	- - - - -			-	cabinet bottom includes:
	214-0812-00			4	LATCH ASSEMBLY
	- - - - -			-	each latch assembly includes:
-7	386-0226-00			1	PLATE, locking
-8	386-0227-00			1	PLATE, index
-9	214-0604-00			1	SPRING, latch
-10	214-0603-01			1	PIN, securing
-11	348-0074-00			2	FOOT, bail limiting, right front and left rear
	- - - - -			-	mounting hardware for each: (not included w/foot)
-12	211-0532-00			2	SCREW, 6-32 x 0.75 inch, Fil HS
-13	210-0457-00			2	NUT, keps, 6-32 x 0.312 inch
-14	348-0207-00			2	FOOT, cabinet, right front and left rear
-15	348-0073-00			2	FOOT, bail limiting, left front and right rear
	- - - - -			-	mounting hardware for each: (not included w/foot)
	211-0532-00			2	SCREW, 6-32 x 0.75 inch, Fil HS
-16	210-0457-00			2	NUT, keps, 6-32 x 0.312 inch
-17	348-0208-00			2	FOOT, cabinet, left front and right rear
-18	200-0728-00			2	COVER, handle end
-19	367-0116-00			1	HANDLE, carrying
	- - - - -			-	mounting hardware: (not included w/handle)
-20	212-0597-00			4	SCREW, shouldered, 10-32 x 0.355 inch
-21	386-1624-00			2	PLATE, retaining
-22	386-1283-00			2	PLATE, handle mounting, plastic
-23	348-0275-00			1	FLIPSTAND
-24	200-1218-00			1	BEZEL
	- - - - -			-	mounting hardware: (not included w/bezel)
-25	211-0188-00			2	SCREW, 4-40 x 0.70 inch
-26	354-0223-00	B010100	B030000X	2	RING, retaining

FIGURE 1 EXPLODED (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Q t y						Description
		Eff	Disc		1	2	3	4	5	
1-27	337-1440-01 ¹			1						SHIELD, implosion, green
	337-1440-00 ²			1						SHIELD, implosion
-28	386-1946-00			1						SUPPORT, CRT front
-29	384-1128-00			1						SHAFT, extension, power switch
-30	358-0216-00			1						BUSHING, 0.257 ID x 0.412 inch OD
-31	376-0127-00			1						COUPLER, shaft, plastic
-32	385-0033-00			1						ROD, plastic, 6-32 x 0.625 inch long
	- - - - -			-						mounting hardware: (not included w/rod)
-33	211-0538-00			1						SCREW, 6-32 x 0.312 inch, 100° csk, FHS
-34	260-1222-00			1						SWITCH, push-pull--POWER
-35	407-0895-00			1						BRACKET, push switch
	- - - - -			-						mounting hardware: (not included w/bracket)
-36	211-0101-00			2						SCREW, 4-40 x 0.25 inch, 100° csk, FHS
-37	210-0586-00			2						NUT, keps, 4-40 x 0.25 inch
-38	200-1282-00			1						DOOR, access
-39	333-1514-00			1						PANEL, front, upper
	- - - - -			-						mounting hardware: (not included w/panel)
-40	210-0406-00			3						NUT, hex., x 4-40 x 0.188 inch
	210-0004-00			3						WASHER, lock, internal, 0.12 ID, 0.26 inch OD
-41	366-1023-01 ¹			1						KNOB, gray--STORED BRIGHTNESS
	- - - - -			-						knob includes
	213-0153-00			1						SETSCREW, 5-40 x 0.125 inch, HSS
-42	366-1257-84 ¹			1						PUSHBUTTON--ERASE
	366-1257-85 ¹			1						PUSHBUTTON--STORE
-43	426-0681-00 ¹			2						FRAME, pushbutton
-44	- - - - -			1						RESISTOR, variable
	- - - - -			-						mounting hardware: (not included w/resistor)
-45	210-0583-00			1						NUT, hex., 0.25-32 x 0.312 inch
	210-0940-00			1						WASHER, flat, 0.25 ID x 0.375 inch OD
-46	210-0046-00			1						WASHER, lock, internal, 0.261 ID x 0.40 inch OD
-47	333-1511-00 ¹			1						PANEL, front, lower
-48	333-1512-00 ²			1						PANEL, front, lower
-49	386-2067-00			1						SUBPANEL, front
-50	334-1379-00			1						LABEL, CRT, 0.75 x 1.75 inches
-51	348-0279-00			2						PAD, cushioning, CRT
-52	348-0145-00			2						GROMMET, plastic, U-shape, 1 inch
-53	348-0070-01			3						CUSHION, CRT, 0.69 x 2.03 inches long
-54	337-1419-00	B010100	B029999	1						SHIELD, CRT, front
	337-1419-05	B030000		1						SHIELD, CRT
	- - - - -			-						mounting hardware: (not included w/shield)
-55	211-0587-00			1						SCREW, 6-32 x 0.188 inch, HHB

¹603 only.²604 only.

FIGURE 1 EXPLODED (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Q ↑ y						Description
		Eff	Disc		1	2	3	4	5	
1-56	344-0226-00 ¹			1						CLIP, cable, for 8 wire ribbon
-57	337-1535-00			1						SHIELD, CRT, rear
-58	354-0409-00			1						RING, clamp, CRT shield
	- - - - -			-						mounting hardware: (not included w/ring)
-59	211-0632-00			1						SCREW, 6-32 x 2.25 inches, Fil HS
-60	343-0123-01			2						CLAMP, CRT retainer
-61	210-0407-00			1						NUT, hex., 6-32 x 0.25 inch
-62	211-0507-00			2						SCREW, 6-32 x 0.312 inch, PHS
-63	407-0922-00			1						BRACKET, CRT clamp
-64	161-0033-11			1						CABLE ASSEMBLY, power, w/terminal
-65	200-1004-00			1						CABLE NIPPLE, 1.30 inches long
-66	358-0366-00			1						BUSHING, strain relief, bottom
	358-0365-00			1						BUSHING, strain relief, top
-67	352-0076-00			1						FUSEHOLDER, w/hardware
	- - - - -			-						mounting hardware: (not included w/fuseholder)
-68	210-0873-00			1						WASHER, rubber, 0.50 ID x 0.688 inch OD
-69	200-1308-00			1						COVER, CRT, rear
	- - - - -			-						mounting hardware: (not included w/cover)
-70	211-0097-00			5						SCREW, 4-40 x 0.312 inch, PHS
-71	210-0201-00			2						LUG, solder, SE #4
	- - - - -			-						mounting hardware for each: (not included w/lug)
-72	211-0007-00			1						SCREW, 4-40 x 0.188 inch, PHS
-73	200-0616-01			1						COVER, CRT socket
-74	136-0485-00			1						WIRING HARNESS, CRT
	- - - - -			-						wiring harness includes:
-75	136-0301-01			1						SOCKET, CRT, w/connectors
	195-0102-00			1						LEAD SET, CRT deflection
-76	346-0045-00			3						STRAP, connector cover
-77	200-0991-00			3						COVER, connector, BNC, w/center ground
-78	131-0955-00			6						CONNECTOR, receptacle, female, BNC, w/hardware
	- - - - -			-						mounting hardware for each: (not included w/connect
-79	210-0255-00			1						LUG, solder, 0.375 inch, SE
-80	342-0117-00			2						INSULATOR, bushing, BNC
-81	- - - - -			1						RESISTOR, variable
	- - - - -			-						mounting hardware: (not included w/resistor)
-82	210-0583-00			1						NUT, hex., 0.25-32 x 0.312 inch
-83	210-0940-00			1						WASHER, flat, 0.25 ID x 0.375 inch OD
	210-0046-00			1						WASHER, lock, internal, 0.261 ID x 0.40 inch OD
-84	333-1515-00 ¹			1						PANEL, rear
	333-1534-00 ²			1						PANEL, rear

¹603 only.
²604 only.

FIGURE 1 EXPLODED (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Q † y	Description
		Eff	Disc		1 2 3 4 5
1-85	- - - - -			1	TRANSFORMER
	- - - - -			-	mounting hardware: (not included w/transformer)
-86	212-0100-00			4	SCREW, 8-32 x 0.625 inch, HHS
-87	343-0267-00			2	HOLD-DOWN, bracket
-88	210-0458-00			4	NUT, keps, 8-32 x 0.344 inch
-89	342-0028-00			4	INSULATOR, plate, transformer
-90	210-0201-00			1	LUG, solder, SE #4
	- - - - -			-	mounting hardware: (not included w/lug)
-91	210-0586-00			1	NUT, keps, 4-40 x 0.25 inch
-92	131-0569-00			1	CONNECTOR, receptacle, 25 pin
	- - - - -			-	mounting hardware: (not included w/connector)
-93	211-0101-00			2	SCREW, 4-40 x 0.25 inch, 100° csk, FHS
-94	210-0406-00			2	NUT, hex., 4-40 x 0.188 inch
-95	210-0004-00			2	WASHER, lock, internal, 0.12 ID x 0.26 inch OD
	252-0562-00			ft	PLASTIC CHANNEL, 2.104 inches long
	342-0128-00	XB030000		1	INSULATOR
-96	337-1541-00			1	SHIELD, high voltage
	- - - - -			-	mounting hardware: (not included w/shield)
-97	211-0008-00			2	SCREW, 4-40 x 0.25 inch, PHS
-98	670-1816-00 ¹			1	CIRCUIT BOARD ASSEMBLY--CONTROL A4
	- - - - -			-	circuit board assembly includes:
	388-2381-00			1	CIRCUIT BOARD
-99	131-0608-00			7	TERMINAL, pin, 0.365 inch long
-100	200-1327-00			1	COVER, variable resistor
-101	384-1121-00			2	SHAFT, extension, 1.41 inches long
-102	175-0826-00			ft	WIRE, electrical, 3 wire ribbon, 20.50 inches long
-103	175-0829-00			ft	WIRE, electrical, 6 wire ribbon, 24 inches long
-104	- - - - -			4	RESISTOR, variable
	- - - - -			-	mounting hardware: (not included w/circuit board assy)
-105	211-0008-00			4	SCREW, 4-40 x 0.25 inch, PHS
-106	670-1815-00 ²			1	CIRCUIT BOARD ASSEMBLY--STORAGE & CONTROL A4
	- - - - -			-	circuit board assembly includes:
	388-2380-00			1	CIRCUIT BOARD
-107	131-0608-00			29	TERMINAL, pin, 0.365 inch long
-108	136-0252-04	B010100 B019999		6	SOCKET, pin connector
	136-0220-00	B020000		2	SOCKET, transistor, 3 pin, square
	136-0269-00			1	SOCKET, integrated circuit, 14 pin
-109	214-0579-00			3	PIN, test point
-110	200-1327-00			1	COVER, variable resistor
-111	- - - - -			4	RESISTOR, variable
-112	384-1121-00			2	SHAFT, extension, 1.41 inches long
-113	260-1308-00			1	SWITCH, push--ERASE
-114	384-1061-00			1	SHAFT, extension, 3.981 inches long
-115	260-1211-00			1	SWITCH, push--STORE
-116	384-1099-00			1	SHAFT, extension, 1.54 inches long

¹ 604 only.

² 603 only.

FIG. 1 EXPLODED (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Q t y	1 2 3 4 5					Description
		Eff	Disc							
mbly)	1-117	175-0826-00			ft					WIRE, electrical, 3 wire ribbon. 20.50 inches long
	-118	175-0829-00			ft					WIRE, electrical, 6 wire ribbon, 24 inches long
	-119	211-0008-00			5					mounting hardware: (not included w/circuit board asse
										SCREW, 4-40 x 0.25 inch, PHS
	-120	366-0261-00			4					KNOB, gray, w/spring
mbly)	-121	670-1813-00			1					CIRCUIT BOARD ASSEMBLY--HIGH VOLTAGE A3
		- - - - -			-					circuit board assembly includes:
		388-2378-00			1					CIRCUIT BOARD
		136-0252-04	B010100	B019999X	3					SOCKET, pin connector
	-122	131-0608-00			6					TERMINAL, pin, 0.365 inch long
	-123	214-0579-00			4					PIN, test point
	-124	175-0827-00			ft					WIRE, electrical, 4 wire ribbon, 18 inches long
		- - - - -			-					mounting hardware: (not included w/circuit board asse
	-125	211-0008-00			1					SCREW, 4-40 x 0.25 inch, PHS
	-126	670-1814-00 ¹	B010100	B059999	1					CIRCUIT BOARD ASSEMBLY--RECTIFIER A5
		670-1814-01 ¹	B060000		1					CIRCUIT BOARD ASSEMBLY--RECTIFIER A5
		670-1859-00 ²	B010100	B059999	1					CIRCUIT BOARD ASSEMBLY--RECTIFIER A5
		670-1859-01 ²	B060000		1					CIRCUIT BOARD ASSEMBLY--RECTIFIER A5
		- - - - -			-					circuit board assemblies include:
		388-2379-00			1					CIRCUIT BOARD
ong ong	-127	131-0608-00			14					TERMINAL, pin, 0.365 inch long
	-128	131-0707-00			6					CONNECTOR, terminal
	-129	200-0256-00			1					COVER, capacitor, 1.0 inch diameter x 2.031 inches 1
	-130	200-0257-00			1					COVER, capacitor, 1.0 inch diameter x 2.531 inches 1
		200-0532-00 ¹			1					COVER, capacitor, 0.99 ID x 1.594 inches long
	-131	344-0154-00			4					CLIP, electrical, fuse
	-132	352-0166-01			1					HOLDER, terminal connector, 8 wire (brown)
		352-0166-02 ¹			1					HOLDER, terminal connector, 8 wore (red)
	-133	175-0827-00			ft					WIRE, electrical, 4 wire ribbon, 9 inches long
	-134	175-0830-00			ft					WIRE, electorcal, 7 wire ribbon, 3 inches long
		- - - - -			-					mounting hardware: (not included w/circuit board asse
	-135	211-0008-00			2					SCREW, 4-40 x 0.25 inch, PHS
	-136	670-1812-00	B010100	B079999	1					CIRCUIT BOARD ASSEMBLY--Z AXIS A2
		670-1812-01	B080000		1					CIRCUIT BOARD ASSEMBLY--Z AXIS A2
		- - - - -			-					circuit board assembly includes:
	388-2377-00			1					CIRCUIT BOARD	
mblyes)	-137	131-1003-00	B010100	B079999X	2					RECEPTACLE, coaxial cable
	-138	136-0252-04 ²	B010100	B079999	8					SOCKET, pin connector
		136-0252-04 ²			6					SOCKET, pin connector
	-139	214-0579-00			8					PIN, test point
	-140	214-1254-00			2					HEATSINK, transistor
	-141	337-1179-00			1					SHIELD, electrical
		- - - - -			-					mounting hardware: (not included w/circuit board asse
	-142	211-0008-00			2					SCREW, 4-40 x 0.25 inch, PHS

¹603 only.

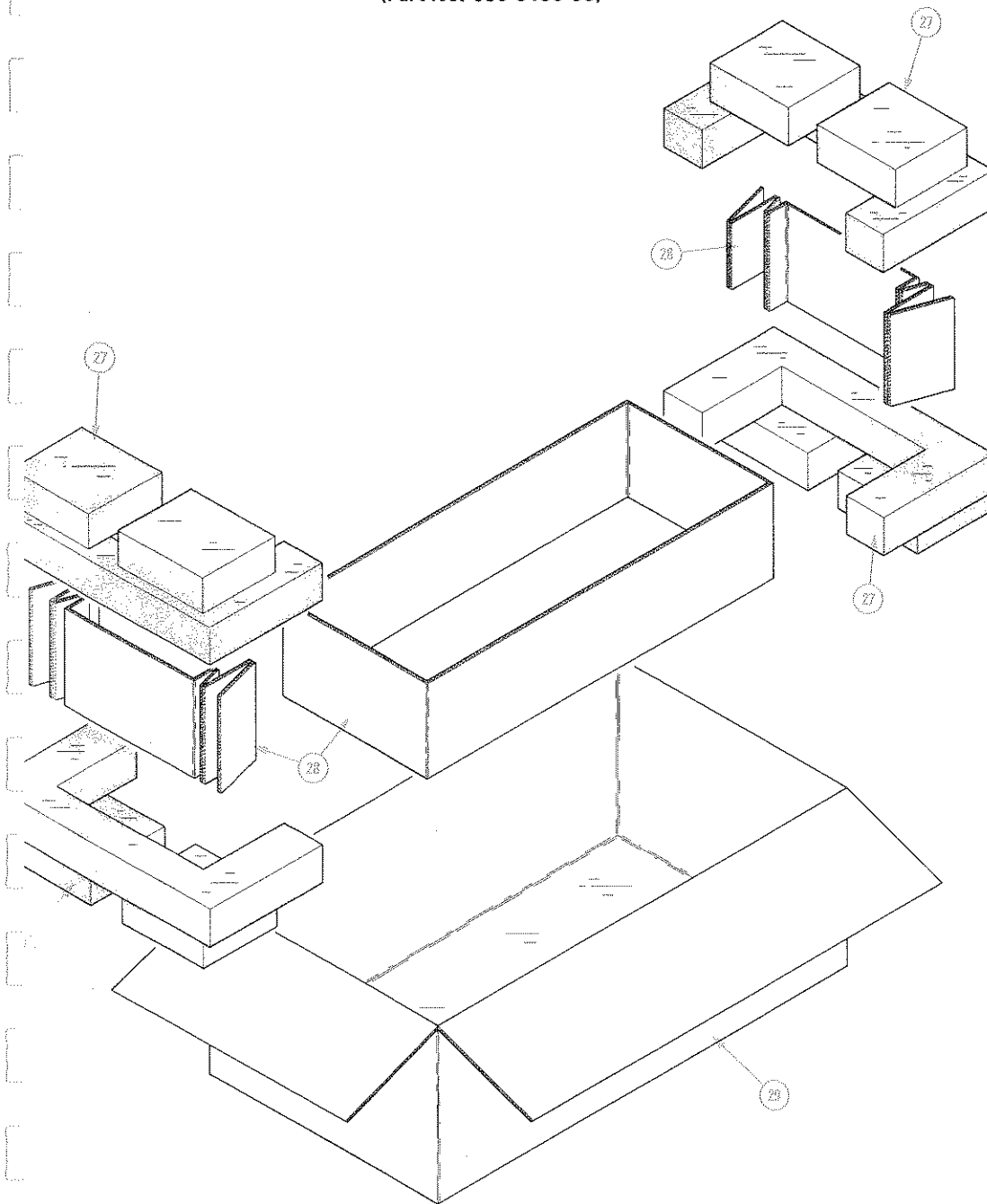
²604 only.

FIG. 1 EXPLODED (cont)

Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Q t y	Description
		Eff	Disc		
1-143	670-1811-00	B010100	B079999	1	CIRCUIT BOARD ASSEMBLY--DEFLECTION A1
	670-1811-01	B080000		1	CIRCUIT BOARD ASSEMBLY--DEFLECTION A1
	- - - - -			-	circuit board assembly includes:
	388-2376-00			1	CIRCUIT BOARD
-144	131-0566-00			4	LINK, terminal connector
-145	131-1003-00	B010100	B080000X	4	RECEPTACLE, coaxial cable
-146	136-0252-04	B010100	B079999	16	SOCKET, pin connector
	136-0252-04	B080000		12	SOCKET, pin connector
-147	260-0723-00			5	SWITCH, slide
-148	337-1626-00			1	SHIELD, electrical, front
-149	337-1627-00			1	SHIELD, electrical, rear
-150	214-1291-00			2	HEATSINK, transistor
	214-1254-00			2	HEATSINK, transistor
-151	175-0827-00			ft	WIRE, electrical, 4 wire ribbon, 6.50 inches long
	- - - - -			-	mounting hardware: (not included w/circuit board assem
	211-0008-00			2	SCREW, 4-40 x 0.25 inch, PHS
-152	441-1041-00			1	CHASSIS, deflection
	- - - - -			-	chassis includes:
	344-0133-00			4	CLIP, circuit board
	210-0659-01			4	EYELET, 0.121 OD x 0.156 inch long
	- - - - -			-	mounting hardware: (not included w/chassis)
-153	211-0025-00			2	SCREW, 4-40 x 0.375 inch, 100° csk, FHS
-154	211-0101-00			3	SCREW, 4-40 x 0.25 inch, 100° csk, FHS
-155	344-0225-00			1	CLIP, cable, for 4 wire ribbon
-156	441-1042-00			1	CHASSIS, power supply
	- - - - -			-	chassis includes:
-157	344-0133-00			5	CLIP, circuit board
-158	210-0659-01			5	EYELET, 0.121 OD x 0.156 inch long
	- - - - -			-	mounting hardware: (not included w/chassis)
-159	211-0541-00			2	SCREW, 6-32 x 0.25 inch, 100° csk, FHS
-160	210-0949-00			4	WASHER, flat, 0.141 ID x 0.50 inch OD
-161	211-0538-00			2	SCREW, 6-32 x 0.312 inch, 100° csk, FHS
-162	210-0457-00			2	NUT, keps, 6-32 x 0.312 inch
-163	211-0101-00			3	SCREW, 4-40 x 0.25 inch, 100° csk, FHS
-164	343-0315-00			1	CLAMP, transistor
	- - - - -			-	mounting hardware: (not included w/clamp)
-165	210-0407-00			3	NUT, hex., 6-32 x 0.25 inch
-166	342-0082-00			9	INSULATOR, plate, 0.52 inch square
-167	344-0236-00			2	CLIP, spring tension
-168	- - - - -			1	SWITCH, thermostatic (See S801 Electrical list)
	- - - - -			-	mounting hardware: (not included w/switch)
-169	210-0586-00			2	NUT, keps, 4-40 x 0.25 inch

Fig. & Index		Tektronix Part No.		Serial/Model No. Eff Disc		FIG. 1 EXPLODED (cont)					Description			
No.		No.				Q	f	y	1	2	3	4	5	
1-170		343-0337-00					1		CLAMP, transistor					
		- - - - -					-		mounting hardware: (not included w/clamp)					
-171		211-0538-00					4		SCREW, 6-32 x 0.312 inch, 100° csk, FHS					
-172		441-1043-00					1		CHASSIS, storage and control					
-173		131-0861-00					3		TERMINAL, quick disconnect					
-174		200-1075-00					4		COVER, terminal					
-175		195-0102-00					1		LEAD-SET, CRT deflection					
-176		426-0841-00					1		FRAME ASSEMBLY					
-177		210-0775-00	B010100	B079999X			6		EYELET, 0.125 OD x 0.145 inch long					
-178		210-0774-00	B010100	B079999X			6		EYELET, 0.152 OD x 0.245 inch long					
-179		175-0826-00					ft		WIRE, electrical, 3 wire ribbon, 5 inches long					
-180		175-0827-00					ft		WIRE, electrical, 4 wire ribbon, 17 inches long					

CARTON ASSEMBLY
(Part No. 065-0150-00)



. & ex o.	Tektronix Part No.	Serial/Model No.		Q t y						Description
		Eff	Disc		1	2	3	4	5	
-	065-0150-00			1	CARTON ASSEMBLY					
	-			-	carton assembly includes:					
27	004-0281-00			2	FRAME, top & bottom					
28	004-1097-00			1	PAD SET, 3 piece					
29	004-0791-00			1	CARTON					

Option 4 (cont)

g. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Disc	Q t y					Description
				1	2	3	4	5	
-10	376-0051-00			2					COUPLING, shaft
	-----			-					each coupling includes:
	213-0022-00			4					SETSCREW, 4-40 X 0.188 inch, HSS
	354-0251-00			2					RING, coupling
	376-0049-00			1					COUPLING, plastic
-11	384-0284-00			1					SHAFT, extension, 5.65 inches long
-12	384-1156-00			1					SHAFT, extension, 2.20 inches long
-13	-----			1					RESISTOR, variable (See R945 electrical list)
	-----			-					mounting hardware: (not included w/resistor)
-14	210-0583-00			1					NUT, hex., 0.25-32 X 0.312 inch
-15	387-0794-00			1					PLATE, mounting
-16	-----			1					RESISTOR, variable (See R918 electrical list)
	-----			-					mounting hardware: (not included w/resistor)
-17	210-0583-00			1					NUT, hex., 0.25-32 X 0.312 inch
-18	386-2351-00			1					PLATE, mounting
	105-0389-00			1					ACTUATOR ASSEMBLY (S930)
	-----			-					actuator assembly includes:
-19	200-1441-00			1					COVER
-20	354-0219-00			1					RING, retaining
-21	401-0155-00			1					BEARING, front
-22	214-1704-00 ¹			-					SPRING, flat, gold
	214-1704-01 ¹			-					SPRING, flat, green
	214-1704-02 ¹			-					SPRING, flat, red
-23	214-1127-00			1					ROLLER, detent
-24	105-0388-00			1					DRUM ASSEMBLY
-25	401-0156-00			1					BEARING, rear
	-----			-					mounting hardware: (not included w/actuator assembly)
-26	211-0116-00			4					SCREW, sems, 4-40 X 0.312 inch, PHB
	-----			-					mounting hardware: (not included w/circuit board assembly)
	211-0008-00			4					SCREW, 4-40 X 0.25 inch, PHS (not shown)

¹ Replace only with part bearing the same color code as the original part in your instrument.



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STANDARD ACCESSORIES

Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Q t y						Description
		Eff	Disc		1	2	3	4	5	
	131-0570-00			1						CONNECTOR
	200-0821-00			1						COVER, connector
	331-0303-00			1						GRATICULE, CRT (603 only)
	070-1259-01			1						MANUAL, instruction (not shown)

OPTION 4

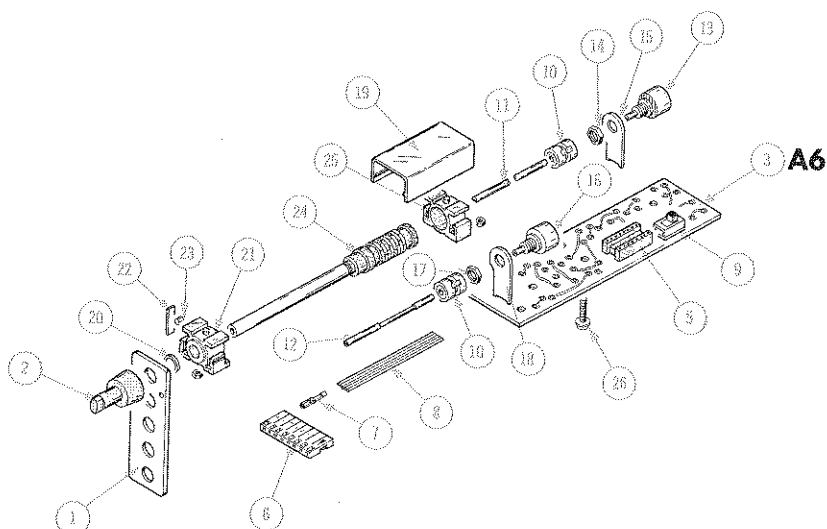


Fig. & Index No.	Tektronix Part No.	Serial/Model No.		Q t y						Description
		Eff	Disc		1	2	3	4	5	
-1	333-1513-00			1						PANEL, front
-2	366-1360-00			1						KNOB, gray
-3	-----			1						CIRCUIT BOARD ASSEMBLY—SWEEP (See A6 electrical list)
-4	131-0604-00			-						circuit board assembly includes:
-5	136-0260-01			7						CONTACT, electrical
-6	352-0166-05			1						SOCKET, integrated circuit, 16 pin
-7	131-0707-00			1						HOLDER, terminal connector, 8 wire (green)
-8	175-0828-00			6						CONNECTOR, terminal
-9	260-0960-01			in						WIRE, electrical, 5 wire ribbon, 8 inches long
				1						SWITCH, slide (S909)

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. Sections of the manual are often printed at different times, so some of the information on the change pages may already be in your manual. 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 in this section, your manual is correct as printed.

603/604 EFF SN B080000-up

ELECTRICAL PARTS LIST CORRECTION

CHANGE TO:

ASSEMBLIES

A1	670-1811-01	DEFLECTION AMPLIFIER Circuit Board Asser
A2	670-1812-01	Z-AXIS Circuit Board Assembly

MECHANICAL PARTS LIST CORRECTION

Page 4-24

CHANGE TO:

Fig. 1-136	670-1812-01	1 CIRCUIT BOARD ASSEMBLY--Z AXIS A2
Fig. 1-138	136-0252-04	6 SOCKET, pin connector

REMOVE:

Fig. 1-137	131-1003-00	2 RECEPTACLE, coaxial cable
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Page 4-25

CHANGE TO:

Fig. 1-143	670-1811-01	1 CIRCUIT BOARD ASSEMBLY--DEFLECTION A1
Fig. 1-146	136-0252-04	12 SOCKET, pin connector

REMOVE:

Fig. 1-145	131-1003-00	4 RECEPTACLE, coaxial cable
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