TEKTRONIX®

608 MONITOR

WITH OPTIONS

OPERATORS

INSTRUCTION MANUAL

Tektronix, Inc.
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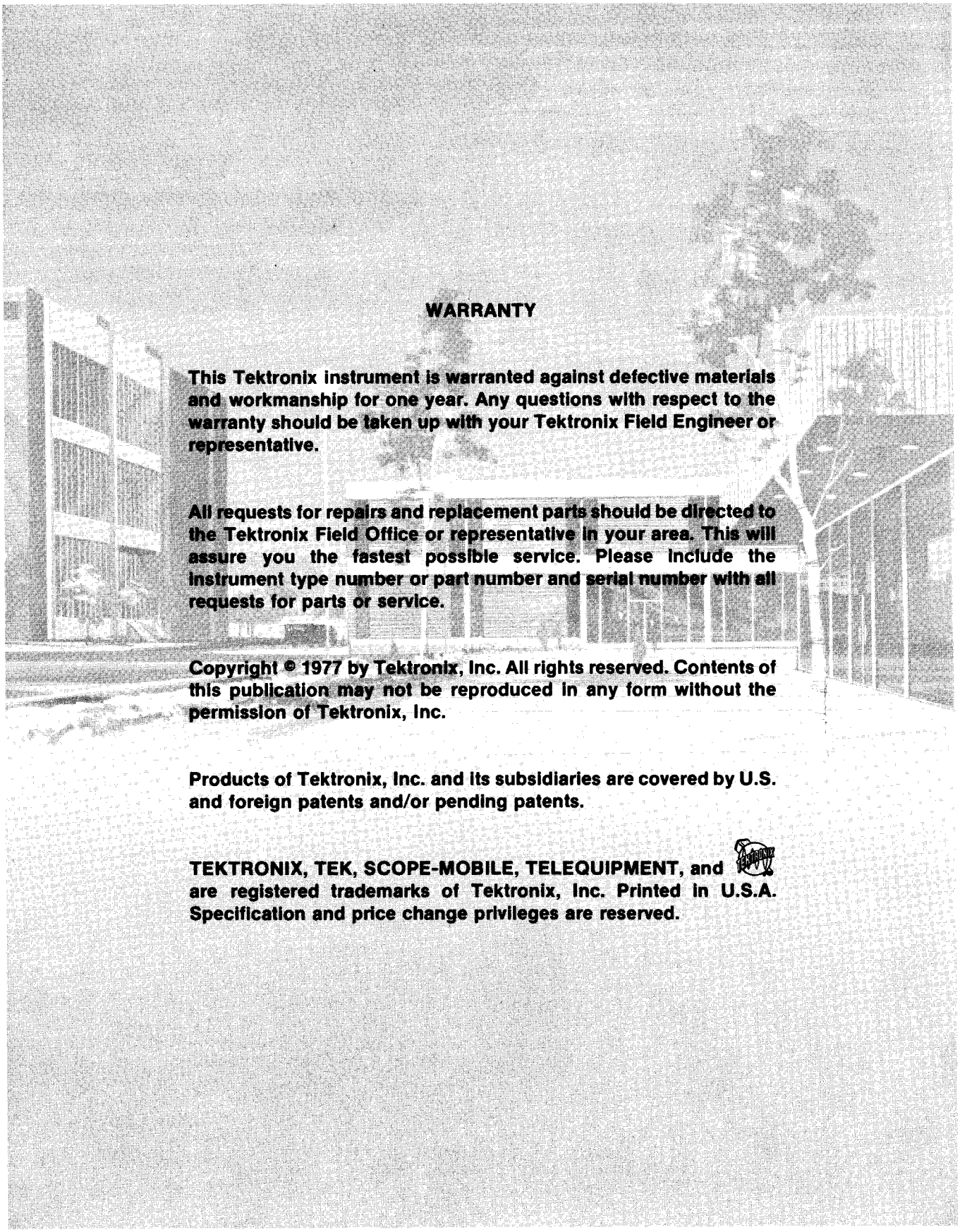

WARRANTY

This Tektronix instrument is warranted against defective materials and workmanship for one year. Any questions with respect to the warranty should be taken up with your Tektronix Field Engineer or representative.

All requests for repairs and replacement parts should be directed to the Tektronix Field Office or representative in your area. This will assure you the fastest possible service. Please include the instrument type number or part number and serial number with all requests for parts or service.

Products of Tektronix, Inc. and its subsidiaries are covered by U.S. and foreign patents and/or pending patents.

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OPERATORS SAFETY INFORMATION

The following general safety information applies to all operators and service personnel. Specific warnings will be found throughout the manual where they apply and should be followed in each instance.

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

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

The word **DANGER** on equipment identifies areas of immediate hazard which could result in personal injury or loss of life.

The following safety symbols may appear on the equipment:


CAUTION—Refer to manual


DANGER—High voltage


Protective ground (earth) terminal

Other warning symbols where they apply.

WARNING

AC POWER SOURCE AND CONNECTION

This instrument operates from a single-phase power source and has a three-wire power cord with a two-pole, three-terminal grounding-type connector. The voltage to ground (earth) from either pole of the power source must not exceed the maximum rated operating voltage, 250 volts.

Before making connection to the power source, a qualified service person should verify that the instrument is set to match the voltage of the power source and has a suitable two-pole, three-terminal grounding-type connector.

GROUNDING THE INSTRUMENT

This instrument is safety class I *equipment (IEC* designation). All accessible conductive parts are directly connected through the grounding conductor of the power cord to the grounding contact of the power connector. Before making external connections to this instrument, always ground the instrument first.*

For electric-shock protection, the power-input plug must be inserted only into a mating receptacle with a grounding contact. Do not defeat the grounding connection. Any interruption of the grounding connection can create an electric-shock hazard. Qualified service personnel should verify proper grounding of this instrument. For medical-dental applications (to assure grounding integrity) the hospital-grade input plug must be inserted only into a mating hospital-grade receptacle with a grounding contact.

***IEC: International Electrotechnical Commission**

MEDICAL-DENTAL APPLICATIONS

Do not use the amplifier INPUTs for direct patient connection. Signal currents at these connectors, as well as leakage currents, may exceed values considered non-hazardous for direct patient connection.

Although this instrument is not to be used for direct patient connection, interconnecting this Monitor with other equipment can result in application of excessive current to the patient. It is extremely important that the equipment be interconnected in accordance with NFPA 76B-T, Tentative Standard for the Safe Use of Electricity in Patient Care Areas of Health Care Facilities, section 3038, "Signal Transmission Between Appliances".

Do not operate this instrument in the presence of flammable gases or anesthetics. Explosion can result from operation in such an environment.

USE THE PROPER FUSE

Refer fuse replacement to qualified service personnel only. To avoid electric shock and fire hazard, use only the fuse specified in the parts list for your instrument and which is identical in the following respects:

A. Type—Slow blow, fast blow, etc.

B. Voltage rating—250 V, etc.

C. Current rating.

DO NOT REMOVE INSTRUMENT COVERS

High-voltage is present inside the instrument. To avoid electric shock, operating personnel must not remove protective instrument covers. Component replacement and internal adjustments must be made by qualified service personnel only.

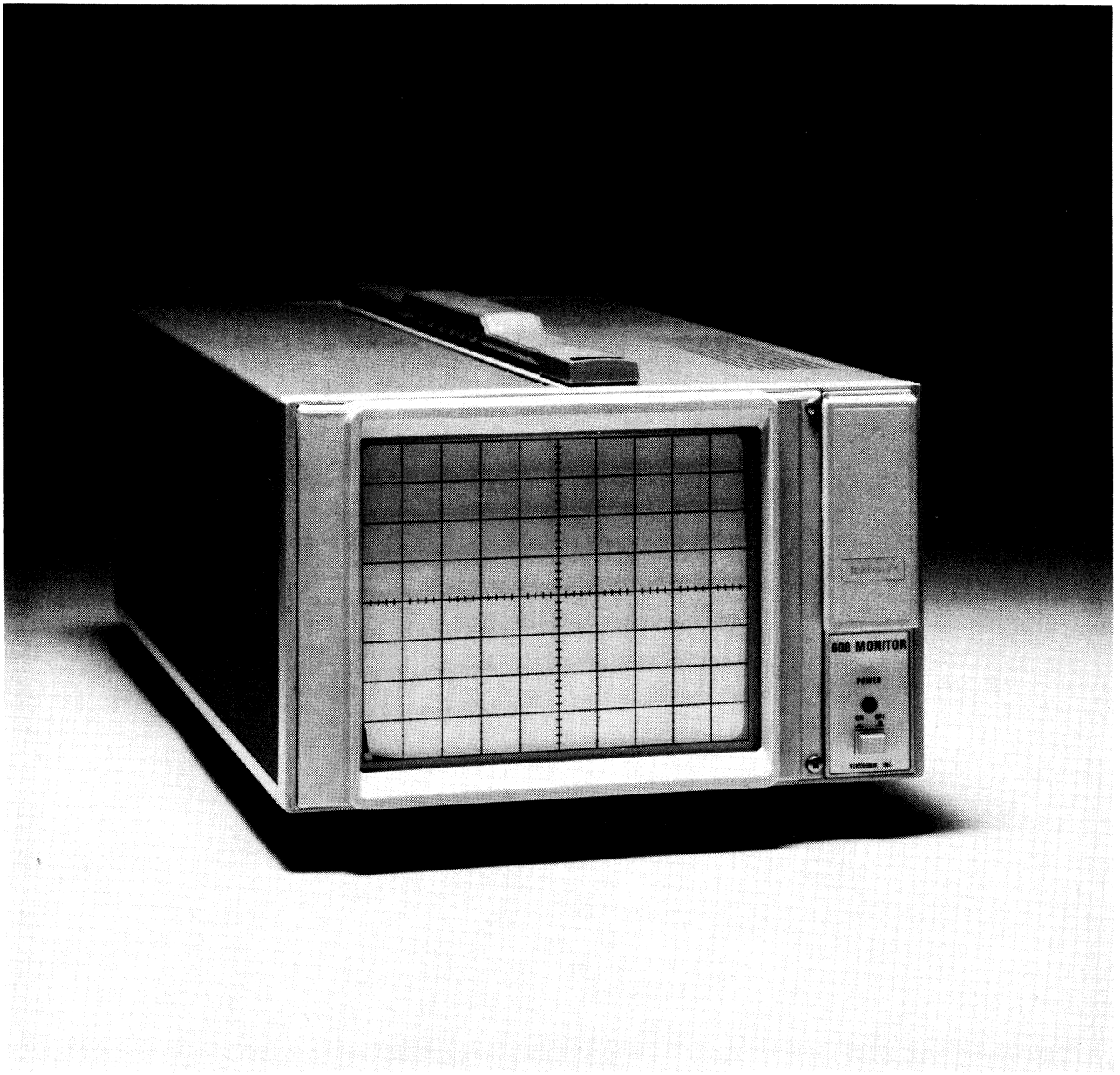
LIMIT INPUT SIGNAL VOLTAGE

To avoid electric-shock hazard, do not apply input signals of more than 25 volts (dc + peak ac). Should fault conditions occur however, the instrument is protected for application of input signals up to 100 volts (dc + peak ac).

CAUTION

EXERCISE CARE WITH INTENSITY LEVEL

Exercise care in establishing the correct display intensity; a high-amplitude Z-Axis input signal, combined with an excessively high setting of the INTENSITY control, may damage the crt phosphor. Therefore, set the INTENSITY control for just enough display intensity for good visibility.



608 FEATURES

The 608 Monitor is a general purpose, high-brightness, high-resolution, X-Y display monitor providing a clear, bright, display of analog data on a large screen area. This instrument is designed for display applications as in ultrasonic detection systems, electron microscope systems, volume and vibration analysis, auger probes, and medical biophysical systems. The 608 Monitor may also be used to provide displays of alphanumeric and graphic information from computers and other data transmission systems. Resolution of the large screen crt (cathode-ray tube) in this instrument is excellent. (Monitor is shown with Option 23.)

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GENERAL INFORMATION

INTRODUCTION

OPERATORS MANUAL

The Operators Manual contains information necessary to effectively operate the 608 Monitor and is divided into three sections: Section 1 provides a basic description of the 608 with instrument specifications and accessories. Section 2 contains operating information for the instrument. Information on the options available for the 608 Monitor is located in section 3 of the manual.

INSTRUCTION MANUAL

The Instruction Manual provides both operating and servicing information for the 608 Monitor. The Instruction Manual is divided into ten sections. Operating information is covered in the first two sections; servicing information for use by qualified service personnel is contained in the remaining eight sections of the manual. Schematic diagrams are located at the rear of the manual and can be unfolded for reference while reading other parts of the manual. The reference designators and symbols used on the schematics are defined on the first page of the Diagrams and Circuit Board Illustrations section. All abbreviations used in this manual, with the exception of the parts lists and schematic diagrams, comply with the American National Institute Y1.1-1972 publication. The parts lists are computer printouts and use computer-supplied abbreviations. Information on the options available for the 608 Monitor is located in section 9 of the Instruction Manual.

INSTRUMENT DESCRIPTION

The 608 Monitor is a compact, solid-state instrument with excellent resolution, providing accurate displays of information from the X, Y, and Z signal inputs.

WARNING

High voltage is present inside the instrument. To avoid electric shock, operating personnel must not remove protective instrument covers. Component replacement and internal adjustments must be made by qualified service personnel only.

Vertical and horizontal signals to be displayed on the crt are supplied to the Deflection Amplifiers through the appropriate X and Y INPUT connectors. The Deflection Amplifiers process the input signals and provide push-pull outputs to drive the deflection plates of the crt. Both Deflection Amplifiers contain position and gain controls.

The Z-Axis Amplifier controls the display intensity by providing a voltage to drive the crt control grid. Input signals are applied to the Z INPUT connector.

The Dynamic Focus circuit provides focus correction for the display when the crt beam is deflected from the crt center. Thus, by varying the voltage to the crt focus element, the Dynamic Focus circuit compensates for geometric defocusing.

The High-Voltage and Low-Voltage Power Supplies provide all the voltages necessary for operation of this instrument.

SPECIFICATION

The electrical specifications listed in Table 1-1 apply when the following conditions are met: (1) The instrument must have been adjusted at an ambient temperature between +15° and +25° C (+59° and +77° F), (2) the instrument must be operating in an ambient temperature between 0° and +50° C (+32° and +122° F) and (3) the instrument must have been operating for at least 20 minutes.

NOTE

Electrical specifications for the available options are located in the Instrument Options section of this manual.

TABLE 1-1

Electrical Characteristics

Characteristic	Performance Requirement
VERTICAL AND HORIZONTAL AMPLIFIERS	
Deflection Factor	
Vertical (Y)	Adjustable from 0.5 V, or less, to at least 2.5 V full scale.
Horizontal (X)	Adjustable from 0.5 V, or less, to at least 2.5 V full scale.
Polarity	
+Y INPUT	Positive signal applied deflects beam up; negative signal deflects beam down.
+X INPUT	Positive signal applied deflects beam to the right; negative signal deflects beam to the left.
Settling Time	Spot must reach new writing position, within 0.05 cm (0.02 in), within 300 ns of deflection from any on-screen position.
Bandwidth (With 80% Full-Screen Reference Signal)	Dc to at least 5 MHz at -3 dB point.
Rise Time	70 ns or less.
Phase Difference (DC to 1.5 MHz)	1° or less between X and Y amplifiers. X and Y amplifier gain (V/div) must be set for the same deflection factor.
Position Stability	0.5 mm or less of drift per hour (after 20 minute warm-up).
Gain Stability	1% or less of drift (after 20 minute warm-up).
Displayed Noise (Tangentially Measured)	0.05 mm, or less, with all inputs terminated into 1 kΩ or less.
Input RC (Both Inputs)	1 MΩ, within 1%, paralleled by 60 pF or less.
Maximum Nondestructive Input Voltage (Fault Condition Only)	+100 V or -100 V (dc + peak ac).
Position Range (With No Input Signals Applied)	Front panel controls allow spot to be set anywhere within the viewing area.
Dynamic Range	At least 1.5 screen diameters from center screen.

TABLE 1-1 (CONT.)
Electrical Characteristics

Characteristic	Performance Requirement
Crosstalk Between X and Y Amplifiers	
At 500 kHz	0.25 mm, or less, of deflection on the grounded channel (X or Y) with a 1 V signal applied on the other channel (Y or X).
At 5 MHz	0.38 mm, or less, of deflection on the grounded channel (X or Y) with a 1 V signal applied on the other channel (Y or X).
Z-AXIS AMPLIFIER	
Useful Input Voltage Range (+Z INPUT)	Adjustable. With Z Gain at maximum, no more than +1 V will provide full intensity. With Z Gain at minimum, at least +5 V is required to produce full intensity. (-1 V input signal cuts off visible intensity.)
Useful Frequency Range	Dc to at least 10 MHz at -3 dB point.
Rise Time	35 ns or less.
Noise	No visible intensity modulation with Z INPUT terminated into 1 kΩ or less.
Input RC	1 MΩ, within 1%, paralleled by 60 pF or less.
Maximum Nondestructive Input Voltage (Fault Condition Only)	+100 V or -100 V (dc + peak ac) with crt beam positioned off the viewing area.
Crosstalk Between Z-Axis Amplifier and X or Y Amplifier	
0 to 500 kHz	0.25 mm or less, with X and Y INPUTS grounded and a 1 V signal applied to the Z-Axis Amplifier. (Z-Axis Gain set for maximum.)
500 kHz to 5 MHz	0.38 mm or less, with X and Y INPUTS grounded and a 1 V signal applied to the Z-Axis Amplifier. (Z-Axis Gain set at minimum.)
CATHODE-RAY TUBE DISPLAY	
Usable Screen Area	9.8 X 12.2 centimeters.
Quality Area	9 X 11 centimeters.
Geometry (Within Graticule Area)	Bowing or tilt is 0.1 division or less.
Orthogonality (Within Graticule Area)	90° within 0.7°.
Accelerating Potential	22.5 kV.
Phosphor	P31 standard.
Deflection	Electrostatic.
Brightness	Light output is at least 240 cd/m^2 (70 fL) with a 0.33 mm, or less, centered spot size. Measured with the crt screen area flooded by a raster, 60 Hz refresh rate, 308 horizontal lines.

TABLE 1-1 (CONT.)
Electrical Characteristics

Characteristic	Performance Requirement
Uniformity	Light output does not vary more than 20% in the crt quality area, at moderate intensity 34 cd/m^2 (10 fL). Measured with the quality area flooded by a raster, 60 Hz refresh rate, 320 horizontal lines.
Spot Size	
#1	0.031 cm (0.012 in) or less, anywhere inside the quality area, with the intensity set to produce 170 cd/m^2 (50 fL) brightness, with a full screen raster refreshed at a 60 Hz rate. Measured with the shrinking raster method.
#2	0.026 cm (0.010 in) or less, at 0.5 μA beam current. Measured with the shrinking raster method.
Resolution	Spot size does not vary more than 10% in the quality area at a constant intensity.
POWER SOURCE	
Line Voltage (ac, rms)	
Low Range, P951	
Low (100 V ac)	90 to 110 V ac.
Medium (110 V ac)	99 to 121 V ac.
High (120 V ac)	108 to 132 V ac.
High Range, P952	
Low (200 V ac)	180 to 220 V ac.
Medium (220 V ac)	198 to 242 V ac.
High (240 V ac)	216 to 250 V ac.
Line Frequency	48 to 440 Hz.
Maximum Power Consumption (120 V ac, 60 Hz)	61 watts; 0.7 ampere.

TABLE 1-2
Environmental Characteristics

Characteristic	Information
NOTE *This instrument will meet the electrical characteristics given in the Performance Requirement column of Table 1-1 over the following environmental limits.*	
Temperature	
Operating	0° to +50° C (+32° to +122° F).
Nonoperating	-40° to +70° C (-40° to +158° F).
Altitude	
Operating	To 4.6 km (15,000 ft.).
Nonoperating	To 12.6 km (50,000 ft.).
Humidity	To 95% at 40° C.
Transportation	Qualified under National Safe Transit Committee Test Procedure 1A, Category II.

TABLE 1-3
Physical Characteristics

Characteristic	Information
Net Weight	About 8.2 kg (18 pounds).
Overall Dimensions	See Figure 1-1.

STANDARD ACCESSORIES

1 ea ..... Operators Manual

1 ea ..... Instruction Manual

1 ea ..... Lined Crt Implosion Shield (8 X 10 division graticule)

For more detailed information, refer to tabbed Accessories page in the 608 Instruction Manual.

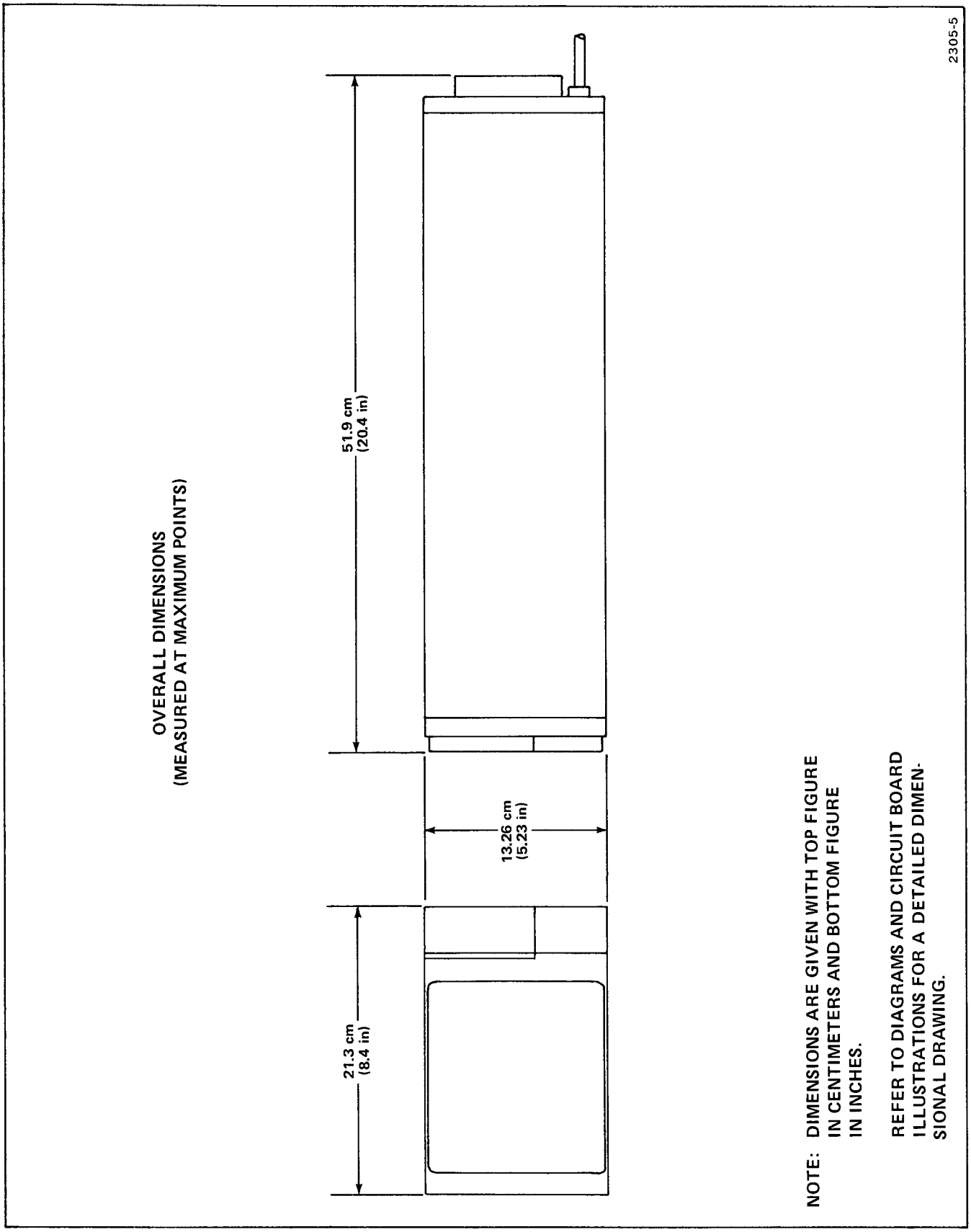


Figure 1-1. 608 Overall dimensional drawing.

INSTRUMENT PACKAGING

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

Save and re-use the package in which your 608 Monitor was shipped to you. If the original packaging is unfit for use or is not available, repackage the instrument as follows:

1. Obtain a carton of corrugated cardboard with a 275 pound test strength, and having inside dimensions of no less than six inches more than the instrument dimensions; this allows for cushioning.

2. Surround the instrument with polyethylene sheeting to protect the finish.

3. Cushion the instrument on all sides by tightly packing dunnage or urethane foam between the carton and the instrument, allowing three inches on all sides.

4. Seal the carton with shipping tape or with an industrial stapler.

OPERATING INSTRUCTIONS

AMBIENT TEMPERATURE CONSIDERATIONS

This instrument can be operated where the ambient air temperature is between 0° and +50° C (+32° and +122° F), and can be stored in ambient temperatures between -40° and +70° C (-40° and +158° F). After being stored in temperatures beyond the above operating limits, allow the chassis temperature to return to within the operating limits before applying power. Allowing the Monitor to operate at an ambient temperature substantially higher than that specified may result in poor reliability as well as inaccurate performance.

When the 608 is mounted in a rack with other equipment, it is important that the ambient temperature surrounding the Monitor does not exceed +50° C (+122° F). Additional clearance or forced ventilation methods (fan) may be needed to maintain ambient temperatures below +50° C (+122° F). Reliability and performance of the 608 will be affected if the ventilation holes in the protective panels are obstructed, or if the 608 is operated at an ambient temperature higher than +50° C (+122° F). Other environments and mounting configurations may require additional cooling measures.

CONTROLS AND CONNECTORS

Controls and connectors necessary for operation of the 608 Monitor are located on the front and rear panels of the instrument. To make full use of the capabilities of this instrument, the operator should be familiar with the function and use of each external control and connector. The front-panel controls are shown and described in Figure 2-1. Brief descriptions of the rear-panel controls and connectors are given in Figure 2-2.

NOTE

Information on controls and connectors for the available options is located in the Instrument Options section of this manual.

DETAILED OPERATING INFORMATION

INPUT SIGNAL REQUIREMENTS

The horizontal (X) and vertical (Y) deflection factors are set at the factory to one volt for eight divisions of deflection on each axis. Thus, as shipped, the input signal required for each division of deflection is 0.125 volt.

NOTE

The Functional Check procedure may be used to determine if the horizontal and vertical deflection factors of your particular instrument meet those set at the factory, as stated above.

The best transient response from the 608 Monitor is achieved when the input signal amplitude to the vertical or horizontal INPUT is no greater than that sufficient to provide full-screen deflection.

WARNING

To avoid electric shock, do not apply input signals of more than 25 volts (dc plus peak ac). Should fault conditions occur however, the instrument is protected for application of input signals up to 100 volts (dc plus peak ac).

With no signals applied to the +Z INPUT connector, the intensity of the display is controlled only by the front-panel INTENSITY control. To control the display intensity with an externally applied signal, set the INTENSITY control to about midrange, and apply the input signal to the +Z INPUT connector.

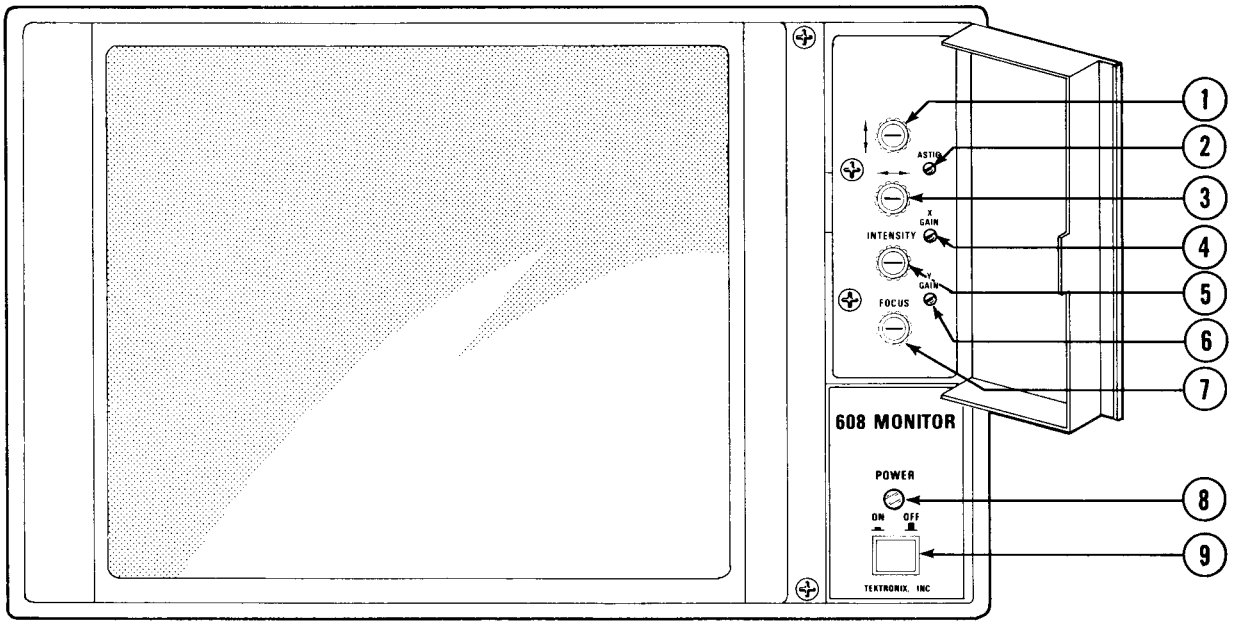
CAUTION

Exercise care in establishing the correct display intensity; a high-amplitude Z-Axis input signal, combined with an excessively high setting of the INTENSITY control, may damage the crt phosphor.

The input signal required for maximum display intensity, through the +Z INPUT connector, is set at the factory for +1 volt, or less. The input signal required to visually cut off the display intensity is set at the factory for -1 volt, or less. The best transient response of the Z-Axis Amplifier is achieved when the input signal is the minimum required to provide the desired intensity change.

NOTE

Detailed Operating Information for the available options is located in the Instrument Options section of this manual.



(1) **Vertical (Y) Position**—Positions the crt beam in the Y axis.

(2) **ASTIG**—Screwdriver adjustment to be used in conjunction with the FOCUS control to provide a well-defined display.

(3) **Horizontal (X) Position**—Positions the crt beam in the X axis.

(4) **X GAIN**—Provides an adjustable amplification factor for crt full-screen deflection of at least 0.5 volt to 2.5 volts.

(5) **INTENSITY**—Controls brightness of the crt display and is the offset control for the Z-Axis INPUTS.

(6) **Y GAIN**—Provides an adjustable amplification factor for crt full-screen deflection of at least 0.5 volt to 2.5 volts.

(7) **FOCUS**—Provides adjustment to obtain a well-defined display.

(8) **POWER (Indicator)**—Illuminates when instrument is on.

(9) **ON/OFF**—Controls power to the Monitor. Instrument is on when pushbutton is in.

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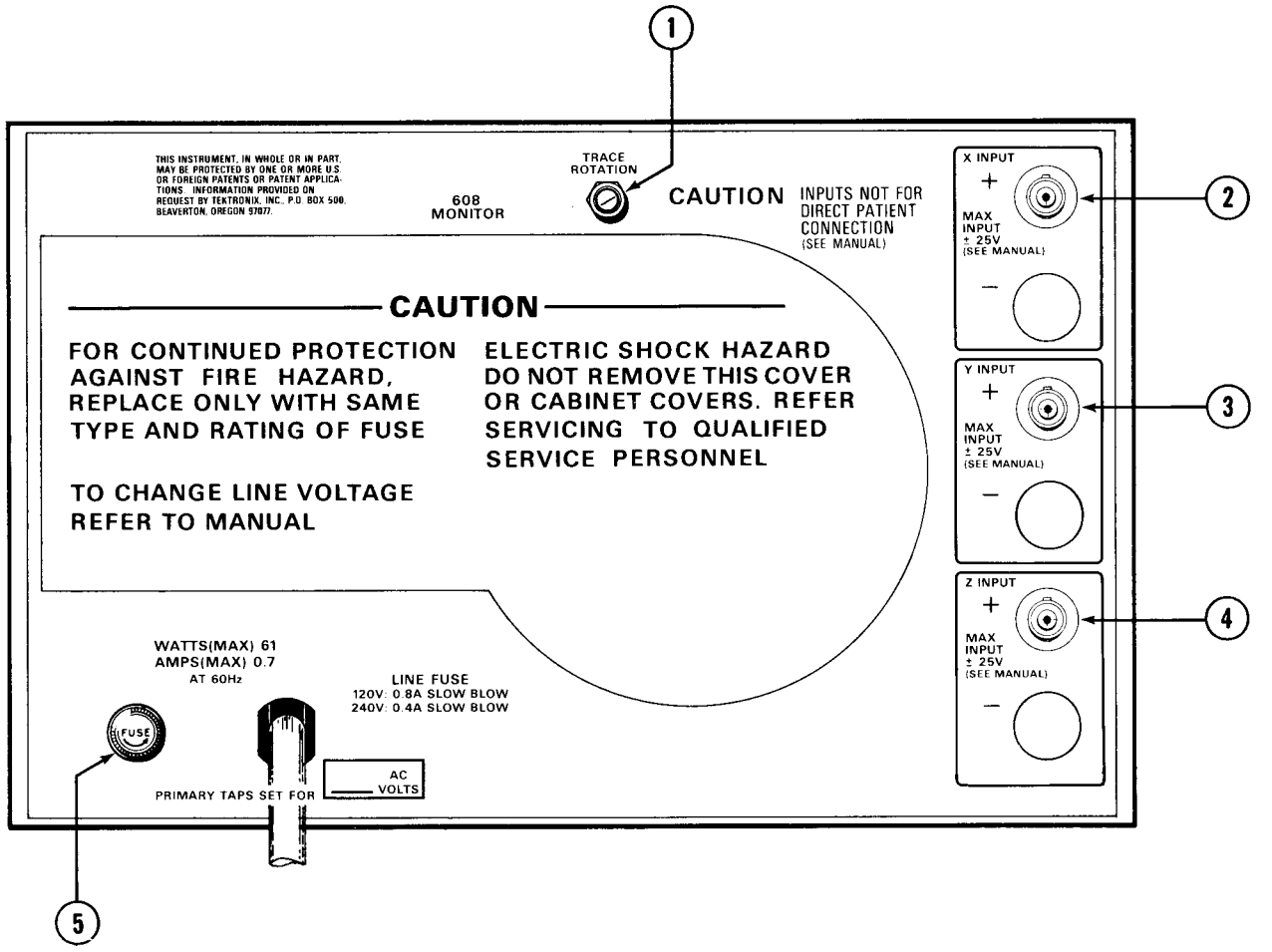
Figure 2-1. Front-panel controls and indicators.



(1) **TRACE ROTATION**—Adjustment to align the trace with the horizontal axis.

(2) **+X INPUT**—BNC input connector to allow application of input signals. A positive signal applied deflects beam to the right; a negative signal deflects beam to the left.

(3) **+Y INPUT**—BNC input connector. A positive signal applied deflects beam up; a negative signal deflects beam down.

(4) **+Z INPUT**—BNC input connector. A positive signal applied provides a linear function to increase crt brightness; a negative signal decreases crt brightness.

(5) **LINE FUSE**—120 V: 0.8 A SLOW; 220 V: 0.4 A SLOW. (Line fuse is internal for Option 6 instruments.)*

* **Refer qualified service personnel to the servicing information sections of the 608 Instruction Manual for further information.**

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Figure 2-2. Rear-panel controls and connectors.

FUNCTIONAL CHECK

The following procedure is provided to aid in obtaining a display on the 608 Monitor and may be used as a check of basic instrument operation. The procedure may be used for incoming inspection to verify proper operation, and may also be used by the operator for instrument familiarization. Only instrument functions, and not measurement quantities or specifications, are checked in these procedures. Therefore, a minimum amount of test equipment is required. If performing the Functional Check procedure reveals improper performance or instrument malfunction, first check the operation of associated equipment; then refer to qualified service personnel for repair or adjustment of the instrument.

NOTE

Functional Check Procedures for the available options are located in the Instrument Options section of this manual.

TEST EQUIPMENT REQUIRED

The following test equipment was used as a basis to write the Functional Check procedure. Other test equipment, which meets these requirements, may be substituted. When other equipment is substituted, the control settings or set up may need to be altered.

1. Power Module

   Description: Tektronix TM 500-series power module with one or more plug-in compartments.

   Type Used: TEKTRONIX TM 501 (used with the FG 503 Function Generator).

2. Function Generator

   Description: Frequency range, one hertz to 50 kilohertz; output amplitude, one volt peak-to-peak into 50 ohms, waveform output, sine wave.

   Type Used: TEKTRONIX FG 503 (used with TM 501 Power Module).

3. Cables (2 Required)

   Description: Length, 42 inches (1 required), 18 inches (1 required); connectors, BNC.

   Type Used: Type RG-58/U, 50-ohm coaxial, Tektronix Part 012-0057-01 (42 inch), Tektronix Part 012-0076-00 (18 inch).

4. T Connector

   Description: Connectors, BNC-to-BNC.

   Type Used: BNC-to-BNC T connector, Tektronix Part 103-0030-00.

5. 50-Ohm Termination

   Description: Impedance, 50 ohm; connectors, BNC.

   Type Used: Tektronix Part 011-0049-01.

PRELIMINARY SET UP

1. Install the function generator in the power module and turn on the power module.

2. Connect the 608 power cord to a suitable power source.

NOTE

Check the line voltage information recorded on the rear panel. If the source voltage is not within this range, refer qualified service personnel to the servicing information sections of the 608 Instruction Manual.

3. Open the access door on the front panel and set the controls as follows:

   Vertical and Horizontal Position ..... Midrange

   INTENSITY ..... Fully counterclockwise

   FOCUS ..... Midrange

   ON/OFF ..... ON (pushbutton in)

4. Allow at least one minute for the instrument to warm up.

DISPLAY FUNCTIONS

1. Perform the Preliminary Set Up procedure.

2. Notice that a spot will appear on the crt, increasing in brightness as you slowly turn the INTENSITY control clockwise.

CAUTION

A high intensity level combined with a stationary spot will damage the crt phosphor. Therefore, set the INTENSITY control to the minimum necessary for good visibility.

3. Adjust the FOCUS and ASTIG controls for a sharp, well-defined display.

4. Turn the Vertical and Horizontal Position controls and notice that the spot position can be controlled by both controls.

@

5. Set the function generator for a 1-volt (peak-to-peak), 50-kilohertz sine-wave output.

6. Connect the function generator output to the rear-panel +X INPUT connector via the 50-ohm termination and 42-inch cable.

7. Center the display with the Horizontal Position control, and position the trace on the center horizontal graticule line.

8. Check that the rear-panel TRACE ROTATION control will align the trace with the center horizontal graticule line.

DEFLECTION AND Z-AXIS FUNCTIONS

1. Perform the Preliminary Set Up procedure.

2. Set the function generator for a 2-volt (peak-to-peak), 50-kilohertz sine-wave output.

3. Connect the function generator output to the rear-panel +X INPUT connector via the 50-ohm termination and 42-inch cable.

4. Center the display with the Horizontal Position control and check that the X GAIN control will adjust for 8 divisions of horizontal deflection.

5. Disconnect the signal from the +X INPUT connector and apply it to the +Y INPUT connector.

6. Center the display with the Vertical Position control and check that the Y GAIN control will adjust for 8 divisions of vertical deflection.

7. Adjust the INTENSITY control for a barely-visible display.

8. Disconnect the signal from the +Y INPUT connector and apply it to the +X INPUT and +Z INPUT connectors via the 50-ohm termination, 42-inch cable, BNC T connector, and the 18-inch cable.

9. Notice that the right end of the crt display becomes bright, and that the left end disappears.

10. Disconnect the function generator.

This completes the Functional Check procedure for the 608 Monitor.

INSTRUMENT OPTIONS

Your instrument may be equipped with one or more instrument options. A brief description of each available option is given in the following discussion. Refer to Table 3-1 for location of option information. For further information on instrument options, see your Tektronix Catalog or contact your Tektronix Field Office.

OPTION 1

An internal, unlighted graticule of 8 X 10 divisions is included on the crt faceplate.

OPTION 21

Includes differential INPUT connectors on the rear panel for the Horizontal (X), Vertical (Y), and Z-Axis Amplifiers.

OPTION 22

Includes internal 1:1 or 5:1 switchable input attenuators in the Horizontal (X), and Vertical (Y) Amplifiers.

OPTION 23

Includes a carrying handle, protective cabinet panels, and feet. (Cannot be ordered with Option 28.)

OPTION 24

Modifies the Z-Axis Amplifier for gamma correction.

OPTION 25

Modifies the Z-Axis Amplifier and the rear panel to include a TTL unblanking input.

OPTION 26

Modifies the input impedance of the Horizontal (X), Vertical (Y) and Z-Axis Amplifiers to 50 ohms.

OPTION 27

Removes the X GAIN and Y GAIN controls from the front panel and provides them as internal adjustments.

OPTION 28

Includes protective cabinet panels. (Cannot be ordered with Option 23.)

OPTION 30

Includes a full crt magnetic shield.

OPTION 74

Uses P4 phosphor in the crt.

OPTION 76

Uses P7 phosphor in the crt.

OPTION 78

Uses P11 phosphor in the crt.

TABLE 3-1
Option Information Locator

Instrument Option	Manual Section	Location of Information
Option 21 (Differential Inputs)	3 Instrument Options	All operating information is contained in this section.
Option 22 (Switchable Input Attenuators)	3 Instrument Options	All operating information is contained in this section.
Option 23 (Includes Panels, Feet, and Handle)	3 Instrument Options	All operating information is contained in this section.
Option 25 (Includes TTL Blanking Input)	3 Instrument Options	All operating information is contained in this section.
Option 30 (Includes Full Crt Shield)	3 Instrument Options	All operating information is contained in this section.

OPTION 21

GENERAL INFORMATION

SPECIFICATION

Option 21 provides differential INPUT connectors on the rear-panel of the Monitor for the Horizontal (X), Vertical (Y), and Z-Axis Amplifiers. The following electrical specifications, in addition to those given in Section 1, General Information, apply to the Option 21 instrument when the following conditions are met: (1) The instrument must have been adjusted at an ambient temperature between +15° and +25° C, (2) the instrument must be operating in an ambient temperature between 0° and +50° C, and (3) the instrument must have been operating for at least 20 minutes.

OPTION 21—TABLE 1
Option 21 Electrical Specifications

Characteristic	Performance Requirement
VERTICAL AND HORIZONTAL AMPLIFIERS	
Polarity	
-Y INPUT	Positive signal applied deflects beam down; negative signal deflects beam up.
-X INPUT	Positive signal applied deflects beam to the left; negative signal deflects beam to the right.
Common-Mode Rejection	
DC to 100 kHz	At least 100:1 cmr ratio for signals of ±5 V or less (1X attenuation.)
100 kHz to 1 MHz	At least 50:1 cmr ratio for signals of ±5 V or less. (1X attenuation.)
Z-AXIS AMPLIFIER	
Useful Input Voltage Range (-Z INPUT)	Adjustable from -1 V, or less, to at least -5 V for full intensity when INTENSITY control is set to midrange.
Common-Mode Rejection	
DC to 100 kHz	At least 100:1 cmr ratio with input signals of ±5 V or less, at any setting of Z-Axis Gain.
100 kHz to 1 MHz	At least 50:1 cmr ratio with input signals of ±5 V or less, at any setting of Z-Axis Gain.

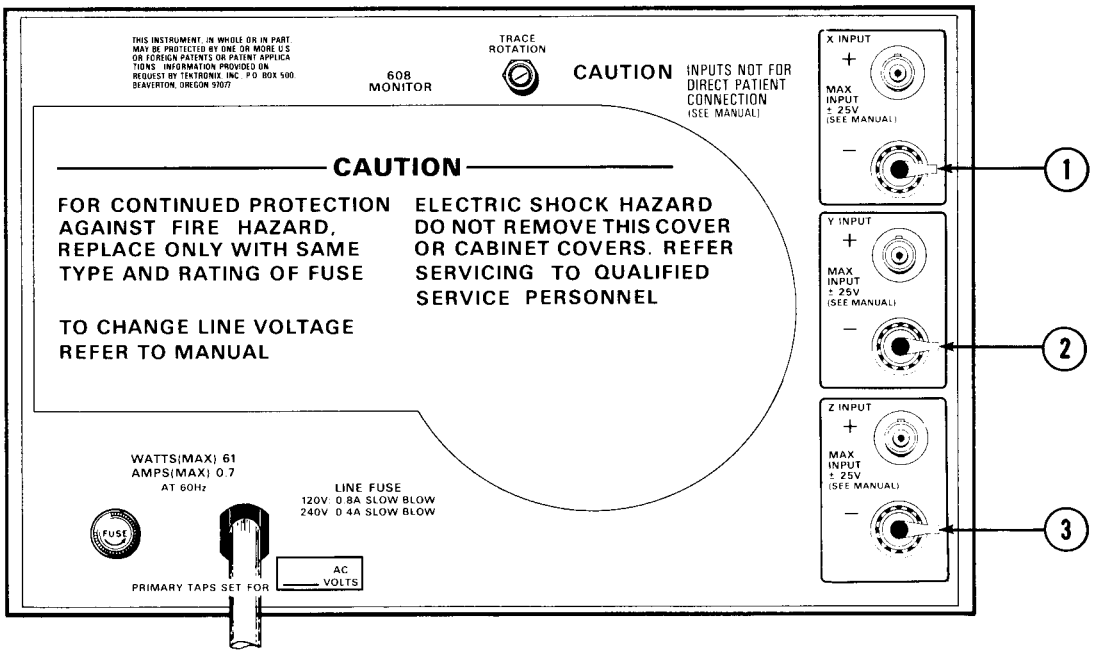
OPERATING INSTRUCTIONS

OPTION 21 CONNECTORS

Brief descriptions of the Option 21 rear-panel connectors are given in Option 21—Figure 1. (No controls have been added to the 608 front panel for this option.)

DETAILED OPERATING INFORMATION

BNC connectors are provided at the rear of the instrument for application of input signals to the Horizontal (X) and Vertical (Y) Amplifiers for display on the crt, and to the Z-Axis Amplifier to control display intensity. Each amplifier in the Option 21 instrument is designed for either single-ended or differential operation. The instrument is shipped from the factory prepared for single-ended operation with a grounding cap connected to the -INPUT of each axis. For differential operation, remove the grounding cap and apply the input signals to the BNC connectors of the appropriate axis. For additional information, see Detailed Operating Information in Section 2, Operating Instructions.



(1) **-X INPUT**—BNC input connector to allow application of input signals. A positive signal applied deflects beam to the left; a negative signal deflects beam to the right.

(2) **-Y INPUT**—BNC input connector. A positive signal applied deflects beam down; a negative signal deflects beam up.

(3) **-Z INPUT**—BNC input connector. A positive signal applied provides a linear function to decrease crt brightness; a negative signal increases crt brightness.

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Option 21—Figure 1. Option 21 rear-panel connectors.

FUNCTIONAL CHECK

The Functional Check procedure in Section 2, Operating Instructions, can be altered to check all functions of the Option 21 instrument by replacing the Deflection and Z-Axis Functions with the following:

1. Perform the Preliminary Set Up procedure.

2. Set the function generator for a 2-volt (peak-to-peak), 50-kilohertz sine-wave output.

3. Connect the function generator output to the rear-panel +X INPUT connector via the 50-ohm termination and 42-inch cable.

4. Center the display with the Horizontal Position control and check that the X GAIN control will adjust for 8 divisions of horizontal deflection.

5. Remove the grounding cap from the -X INPUT connector. Disconnect the signal from the +X INPUT and apply to the -X INPUT. Place the grounding cap on the +X INPUT.

6. Center the display with the Horizontal Position control and check that the X GAIN will adjust for 8 divisions of horizontal deflection.

7. Disconnect the signal from the -X INPUT and apply to the +Y INPUT.

8. Center the display with the Vertical Position control and check that the Y GAIN control will adjust for 8 divisions of vertical deflection.

9. Remove the grounding cap from the -Y INPUT connector. Disconnect the signal from the +Y INPUT and apply to the -Y INPUT. Place the grounding cap on the +Y INPUT.

10. Center the display with the Vertical Position control and check that the Y GAIN control will adjust for 8 divisions of vertical deflection.

11. Adjust the INTENSITY control for a barely-visible display.

12. Move the grounding cap from the +X INPUT to the -X INPUT. Disconnect the signal from the -Y INPUT and apply it to the +X and +Z INPUTs via the 50-ohm termination, 42-inch cable, BNC T connector, and the 18-inch cable.

13. Notice that the right end of the crt display becomes bright, and that the left end disappears.

14. Remove the grounding cap from the -Z INPUT. Disconnect the signal from the +Z INPUT and apply to the -Z INPUT. Place the grounding cap on the +Z INPUT.

15. Notice that the left end of the crt display becomes bright, and that the right end disappears.

16. Disconnect the function generator.

This completes the Functional Check procedure for the Option 21 instrument.

OPTION 22

GENERAL INFORMATION

SPECIFICATION

Option 22 provides internal switchable 1:1 or 5:1 input attenuators for the Horizontal (X) and Vertical (Y) Amplifiers. The following electrical specifications, in addition to those given in Section 1, General Information, apply to the Option 22 instrument when the following conditions are met: (1) The instrument must have been adjusted at an ambient temperature between +15° and +25° C, (2) the instrument must be operating in an ambient temperature between 0° and +50° C, and (3) the instrument must have been operating for at least 20 minutes.

OPTION 22—TABLE 1
Option 22 Electrical Specifications

Characteristic	Performance Requirement
VERTICAL AND HORIZONTAL AMPLIFIERS	
Deflection Factor	
Vertical (Y)	Internal 5:1 attenuator extends the deflection factor range to at least 12.5 V full scale.
Horizontal (X)	Internal 5:1 attenuator extends the deflection factor range to at least 12.5 V full scale.
Attenuators	Deflection factor reduced five times, within 3%.
Common-Mode Rejection (With Option 21 Only)	
DC to 100 kHz	At least 50:1 cmr ratio for signals of ±25 V or less. (5X attenuation.)
100 kHz to 1 MHz	At least 20:1 cmr ratio for signals or ±25 V or less. (5X attenuation.)

OPERATING INSTRUCTIONS

FUNCTIONAL CHECK

The Functional Check procedure in Section 2, Operating Instructions, can be altered to check the functions of the Option 22 instrument as follows:

1. Have a qualified service person determine which input attenuators are set in the 5X position.

2. When applying a signal to any INPUT with the attenuator set at 5X, always set the function generator for a 10-volt (peak-to-peak), 50-kilohertz sine-wave output.

3. Perform the indicated check.

OPTION 23

Instrument includes a carrying handle, protective cabinet panels, and feet. This option cannot be ordered with Option 28.

OPTION 25

GENERAL INFORMATION

SPECIFICATION

Option 25 provides a TTL input connector on the rear panel for application of signals to unblank the crt. The following electrical specifications for the Z-Axis Amplifier, in addition to those given in Section 1, General Information, apply to the Option 25 instrument when the following conditions are met: (1) The instrument must have been adjusted at an ambient temperature between +15° and +25° C, (2) the instrument must be operating in an ambient temperature between 0° and +50° C, and (3) the instrument must have been operating for at least 20 minutes.

OPTION 25—TABLE 1
Option 25 Electrical Specifications

Characteristic	Performance Requirement
Z-AXIS AMPLIFIER	
TTL Input Voltage	
HI	+2.4 V to +5 V.
LO	0 V to +0.8 V.
Unblanking	Input voltage level to produce unblanking is internally selectable by switch S550. With S550 in minus (-) position, a LO input produces unblanking. With S550 in positive (+) position, a HI input produces unblanking.

OPERATING INSTRUCTIONS

OPTION 25 CONNECTOR

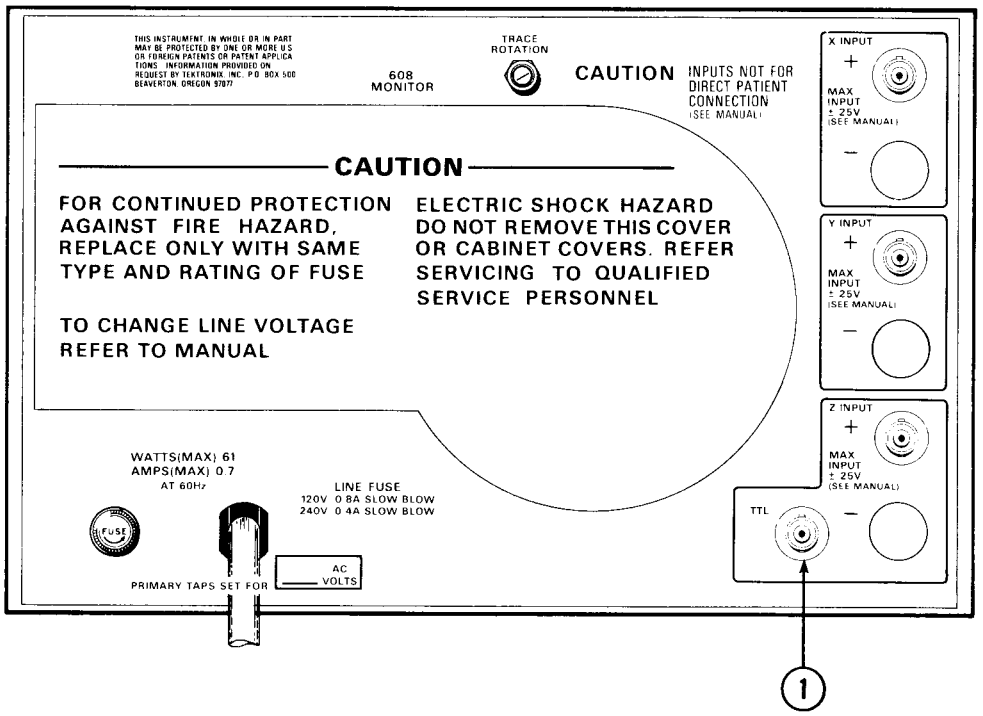
A brief description of the Option 25 rear-panel connector is given in Option 25—Figure 1. (No controls have been added to the 608 front panel for this option.)

DETAILED OPERATING INFORMATION

A BNC connector is provided at the rear of the instrument for application of TTL-compatible input voltages to either blank or unblank the crt display. (Crt unblanking = visual display.) With the internal Blanking Level Selector in the positive (+) position, a LO input voltage applied to the TTL Z INPUT connector will blank the display. A HI input voltage, or no applied voltage, will return control of the display intensity to the front-panel INTENSITY control and the +Z INPUT (and -Z INPUT with Option 21) connector(s). With the Blanking Level Selector in the minus (-) position, a HI input voltage, or no applied voltage, will blank the display.

FUNCTIONAL CHECK

The Functional Check procedure in Section 2, Operating Instructions should be used to check all instrument functions, except the functions of the TTL Z INPUT connector. Refer qualified service personnel to the servicing information for Option 25 in the 608 Instruction Manual for the procedure to check the TTL Z INPUT functions.



(1) **TTL**—BNC input connector to allow application of TTL-compatible voltages to unblank the crt display.

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Option 25—Figure 1. Option 25 rear-panel connector.

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OPTION 30

Instrument includes a full crt magnetic shield.