



*Please Check for
CHANGE INFORMATION
at the Rear of this Manual*

620 MONITOR WITH OPTIONS

OPERATOR'S MANUAL


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P.O. Box 500
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NOTE

Refer to the 620 Instruction Manual for information on Installation, Theory of Operation, Maintenance, Calibration, Parts Lists, and Diagrams.

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OPERATORS SAFETY SUMMARY

The general safety information in this part of the summary is for use by both operating and servicing personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear in this summary.

TERMS

IN THIS MANUAL

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

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

AS MARKED ON EQUIPMENT

CAUTION indicates a personal injury hazard not immediately accessible as one reads the marking, or a hazard to property including the equipment itself.

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

SYMBOLS

IN THIS MANUAL



This symbol indicates where applicable cautionary or other information is to be found.

AS MARKED ON EQUIPMENT



DANGER—High voltage.



Protective ground (earth) terminal.



ATTENTION—refer to manual.

POWER SOURCE

This product is intended to operate from a power source that will not apply more than 250 volts rms between the supply conductors or between either supply conductor and ground. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

GROUNDING THE PRODUCT

This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting to the product input or output terminals. A protective ground connection by way of the grounding conductor in the power cord is essential for safe operation.

USE THE PROPER POWER CORD

Use only the power cord and connector specified for your product. Use only a power cord that is in good condition.

Refer cord and connector changes to qualified service personnel.

USE THE PROPER FUSE

To avoid fire hazard, use only the fuse specified in the parts list for your product, and which is identical in type, voltage rating, and current rating.

Refer fuse replacement to qualified service personnel.

DO NOT OPERATE IN EXPLOSIVE ATMOSPHERES

To avoid explosion, do not operate this product in an atmosphere of explosive gases unless it has been specifically certified for such operation.

DO NOT REMOVE COVERS OR PANELS

To avoid personal injury, do not remove the product covers or panels. Do not operate the product without the covers and panels properly installed.

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 nonhazardous 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". Also refer to NFPA 70, National Electrical Code, paragraphs 517-120 through 517-122.

To assure grounding integrity the hospital-grade input plug must be inserted only into a mating hospital-grade receptacle with a grounding contact.

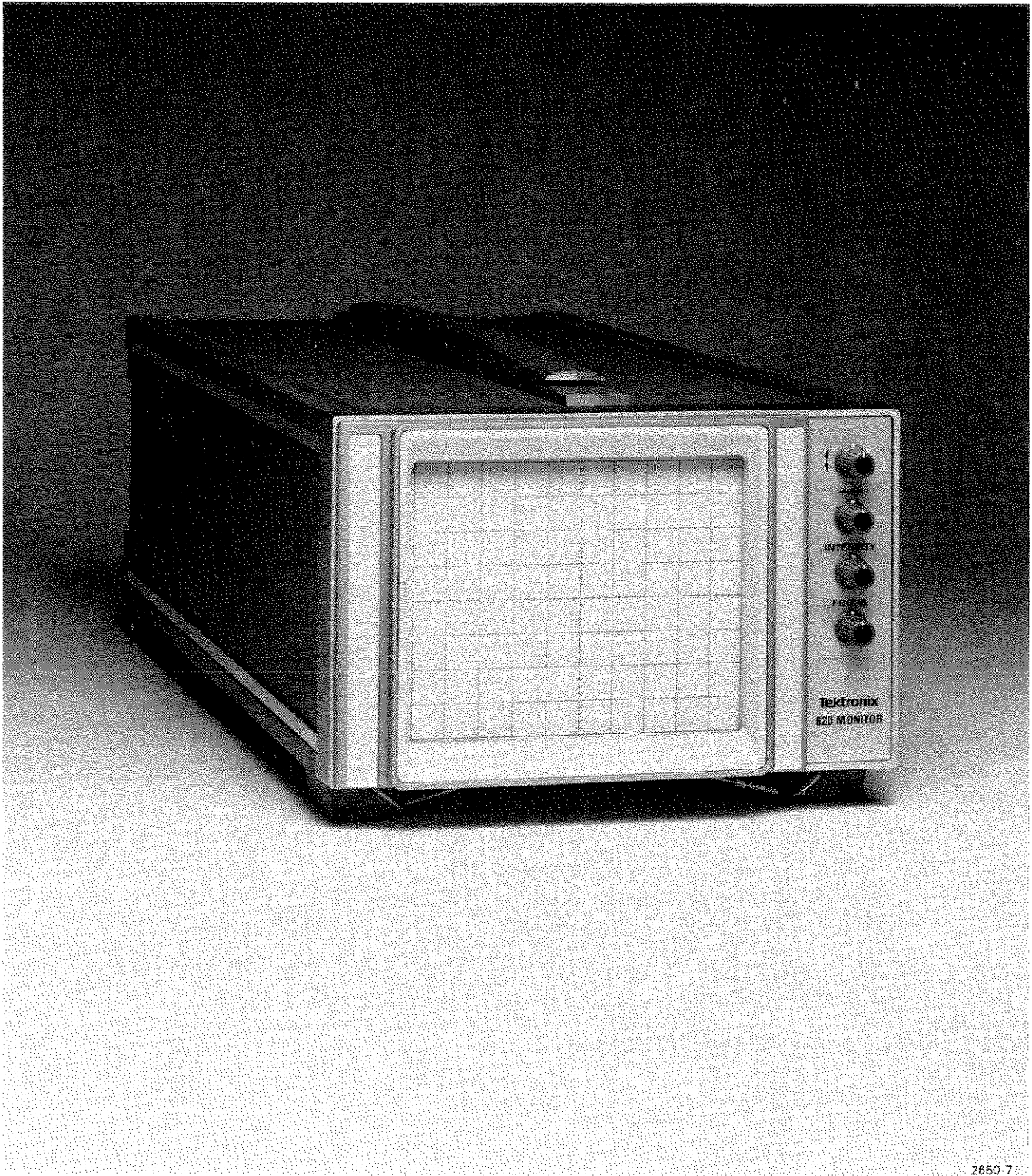
To confirm that the socket-outlet ground is securely grounded, refer to qualified service personnel.

LIMIT INPUT SIGNAL VOLTAGE

To avoid electric-shock hazard, do not apply input signals of greater than 25 volts (dc + peak ac).

WARNING

This equipment generates, uses, and can radiate radio frequency energy and may cause interference to radio communications if not installed and used in accordance with the instruction manual. It has been tested and found to comply with the limits for Class B computing devices pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when this equipment is operated in a commercial environment. Operation in a residential area is likely to cause interference in which case the users at their own expense must take whatever measures may be required to correct the interference.



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620 FEATURES

The 620 Monitor is a general purpose 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, volume and vibration analysis, auger probes, and biophysical systems. The 620 Monitor may also be used to provide displays of alphanumeric and graphic information from computers and other data transmission systems. (Monitor is shown with Option 23 installed.)

GENERAL INFORMATION

INTRODUCTION

OPERATORS MANUAL

The Operators Manual contains information necessary to effectively operate the 620 Monitor and is divided into three sections: Section 1 provides a basic description of the 620 with instrument accessories and specifications. Section 2 contains operating information for the instrument. Available options for the 620 Monitor are listed in Section 3 of the manual.

WARNING

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

INSTRUCTION MANUAL

The Instruction Manual provides both operating and servicing information for the 620 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. Abbreviations used in the manuals, except those in the parts list and schematic diagrams, comply with the American National Standards Institute Y1.1-1972 publication. The parts lists are computer printouts and use computer-supplied abbreviations. Available options for the 620 Monitor are listed in section 7 of the Instruction Manual.

Vertical and horizontal signals to be displayed on the crt are supplied to the Deflection Amplifiers through the appropriate Y and X 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 rear-panel Z INPUT connector.

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

INSTRUMENT DESCRIPTION

The 620 Monitor is a compact, solid-state instrument providing accurate displays of information from the X, Y, and Z signal inputs.

EXTERIOR CLEANING

Loose dust accumulated on the outside of the instrument can be removed with a soft cloth or small brush. The brush is particularly useful for dislodging dirt on and around the front-panel controls. Dirt which remains can be removed with a soft cloth dampened in a mild detergent and water solution. Abrasive cleaners should not be used.

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, (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.

TABLE 1-1
Electrical Characteristics

Characteristic	Performance Requirement
VERTICAL AND HORIZONTAL AMPLIFIERS	
Deflection Factor	
Vertical	Adjustable from approximately 0.8 V, or less, to at least 1.2 V full scale. (Set at the factory for 1 V, within 2%, for 8 divisions of deflection.)
Horizontal	Adjustable from approximately 0.8 V, or less, to at least 1.2 V full scale. (Set at the factory for 1 V, within 2%, for 8 divisions of deflection.)
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, within 1.0 microsecond from deflection from any on-screen position.
Bandwidth (With 80% Full-Screen Reference Signal)	Dc to at least 2 MHz at -3 dB point.
Rise Time	175 ns or less.
Position Range	Spot may be positioned anywhere on screen with no signal input.
Position Stability	0.1 cm, or less, of drift per hour after 20 minute warm-up. Not more than 0.2 cm drift in 24 hours.
Input Resistance and Capacitance	1 Megohm, within 1%, paralleled by less than 47 pF.
Maximum Nondestructive Input Voltage	+25 V or -25 V (dc plus peak ac).
Crosstalk between X and Y Amplifiers at 1 MHz	0.05 cm, or less, on the undriven channel with the input terminated in less than 50 ohms and the other channel at full-screen deflection.
Linearity	Less than 5% error in any 2-division segment of the display.
Phase Difference DC to 500 kHz	1 degree or less between X and Y amplifiers. X and Y amplifier gain must be set for the same deflection factor (V/div).

TABLE 1-1 (CONT.)
Electrical Characteristics

Characteristic	Performance Requirement
Z-AXIS AMPLIFIER	
Input Voltage	With input Neg/Pos Selecting Straps in "P" position, +1 V applied results in full display intensity with INTENSITY control at about midrange, and -1 V applied results in cutoff with INTENSITY control fully on.
Useful Frequency Range	Dc to at least 5 MHz at -3 dB point.
Rise Time	70 ns or less.
Input Resistance and Capacitance	1 Megohm, within 1%, paralleled by less than 47 pF.
Maximum Nondestructive Input Voltage	+25 V or -25 V (dc plus peak ac) with crt beam positioned off screen.
TTL Input Voltage (Option 25)	
HI	+2.4 V to +5 V dc.
LO	0 V to +0.8 V dc.
Blanking	Input voltage level to produce blanking is selectable by internal modification. Blanking or unblanking can be produced from a HI input.
CATHODE-RAY TUBE DISPLAY	
Screen Area	10 × 12 cm.
Option 1 Graticule	Internal 8 × 10 divisions (1.22 cm/div).
Quality Area	Center 7 × 9 divisions.
Geometry (Within Graticule Area)	Bowing or tilt 0.1 division or less.
Orthogonality (Within Graticule Area)	90° within 1°.
Accelerating Potential	Approximately 12 kV.
Phosphor	P31 standard, P7 with Option 76.
Deflection	Electrostatic.
Brightness	Light output is at least 30 fL. Measured with the screen flooded by a 60 Hz refresh rate raster, 300 horizontal lines.
Spot Size 1	0.038 cm (0.015") or less, at 0.5 microamperes beam current. Measured within quality area with shrinking raster method.
Spot Size 2	0.051 cm (0.020") or less at 25 fL. Measured within the quality area with shrinking raster method.
POWER SOURCE	
LO Line Voltage Range	
Lo (110 V AC)	90 to 110 V ac.
Med (110 V AC)	99 to 121 V ac.
Hi (120 V AC)	108 to 132 V ac.

**TABLE 1-1 (CONT.)
Electrical Characteristics**

Characteristic	Performance Requirement
HI Line Voltage Range	
Lo (220 V AC)	180 to 220 V ac.
Med (220 V AC)	198 to 242 V ac.
Hi (240 V AC)	216 to 250 V ac.
Line Frequency	48 to 440 Hz.
Maximum Power Consumption	26 W, 0.27 A, at 120 V ac, 60 Hz.
Fuse Data	
Lo Line Voltage Range (F42)	0.3 A Slow Blow.
Hi Line Voltage Range (F42)	0.15 A Slow Blow.
Hi Voltage Oscillator (A2F226)	1.5 A Fast Blow.
+15 V DC Unregulated (A2F227)	0.3 A Slow Blow.
DC Supply Fuse (Options 20 and 31 only, A2F225)	1.25 A Slow Blow.
DC Input Power (Options 20 and 31 only)	
DC Input Required	+17.0 to +25.0 V dc, including any ripple excursion.
Maximum Operating Current	1.0 Amperes.
Maximum Allowable Input Ripple	2 V ac, peak-to-peak.

**TABLE 1-2
Environmental Characteristics**

Characteristic	Information
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% relative humidity at 40° C.
Vibration	
Operating and Nonoperating	Standard: Tested to MIL-T-28800B SECT 4.5.5.3.1 Type 2, Class 5, Style E and F. Exception: Tested to 3.8 g's. Rackmount: Installed in a rackmount kit with the instrument complete and operating, vibration frequency swept from 10 to 40 to 10 Hz at 1 minute per sweep. Vibrate 15 minutes in each of the three major axes at 0.25 mm (0.010 inch total displacement). Held 10 minutes at any major resonance, or if none, at 40 Hz. Total time 54 minutes.

**TABLE 1-2 (CONT.)
Environmental Characteristics**

Characteristic	Information
Shock	
Nonoperating	Standard: Tested to MIL-T-28800B SECT 4.5.5.4.1 Type 2, Class 5, Style E and F. Exception: Tested to 60 g's. Rackmount: Not specified when mounted in a rackmount kit.
Transportation	Qualified under National Safe Transit Committee Test Procedure 1A, Category II.

**TABLE 1-3
Physical Characteristics**

Characteristic	Information
Net Weight	
Standard	11 lb 4 oz.
Option 20	9 lb 5 oz.
Overall Dimensions	See Figure 1-1.

STANDARD ACCESSORIES

1 ea	Operators Manual
1 ea	Instruction Manual
1 ea	External Lined Graticule (8 × 10 division)

For more detailed information, refer to the tabbed Accessories page at the rear of the 620 Instruction Manual.

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 reuse the package in which your 620 Monitor was shipped to you. If the original packaging is unfit for use or is not available, repack the instrument as follows:

1. Obtain a corrugated cardboard carton 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.

5. Mark the address of the Tektronix Service Center and your return address on the carton in one or more prominent locations.

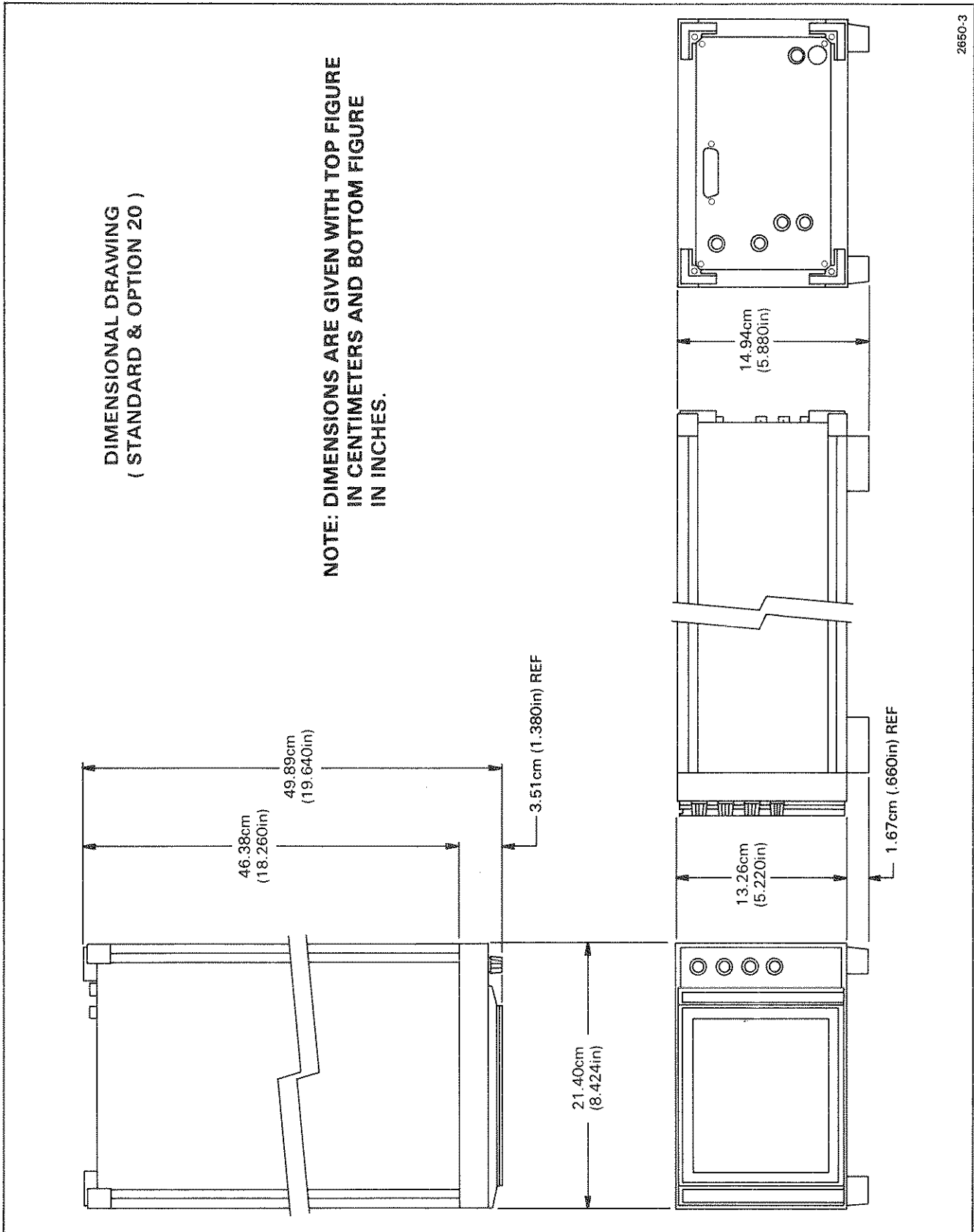


Figure 1-1. 620 Dimensional drawing.

OPERATING INSTRUCTIONS

AMBIENT TEMPERATURE CONSIDERATIONS

This instrument can be operated where the ambient air temperature is between 0° and +50° C, and can be stored in ambient temperatures between -40° and +70° C. After being stored in temperatures beyond the 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 620 is mounted in a rack with other equipment, do not allow the temperature surrounding the Monitor to exceed +50° C. Additional clearance or forced ventilation methods (fan) may be necessary to maintain ambient temperatures below +50° C. The reliability and performance of the 620 will be affected if the ventilation holes in the protective panels are obstructed or if the 620 is operated at an ambient temperature higher than +50° C. Other environments and mounting configurations may require additional cooling measures.

CONTROLS AND CONNECTORS

Controls and connectors necessary for operation of the 620 Monitor are located on the front and rear panels of the instrument. To make full use of the capabilities of the 620, 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 Figures 2-2 and 2-3.

DETAILED OPERATING INFORMATION

SIGNAL CONNECTORS

The bnc connectors on the rear panel of the standard 620 Monitor are provided for application of input signals to the vertical (Y) and horizontal (X) Deflection Amplifiers for display on the crt, and to the Z-Axis Amplifier to control the display intensity. An additional bnc connector is provided on 620 Option 25 Monitors to allow application of TTL-compatible input voltages to blank the display.

The 620 Option 10 Monitor also provides a 25-pin Alternate Input connector on the rear panel for direct connections to the Deflection and Z-Axis Amplifiers from a remote location. See Alternate Input Connector (Option 10) for additional details.

INPUT ATTENUATION AND IMPEDANCE

The input circuits of all amplifiers in the standard 620 Monitor present a high impedance to the applied signal. However, the Deflection and Z-Axis Amplifiers can be modified to provide a range of input attenuation and impedance. The desired input attenuation should be set by qualified service personnel only.

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.

The best transient response from the 620 Monitor is achieved when the input signal amplitude to the X and Y INPUT is no greater than that sufficient to provide full-screen deflection.

WARNING

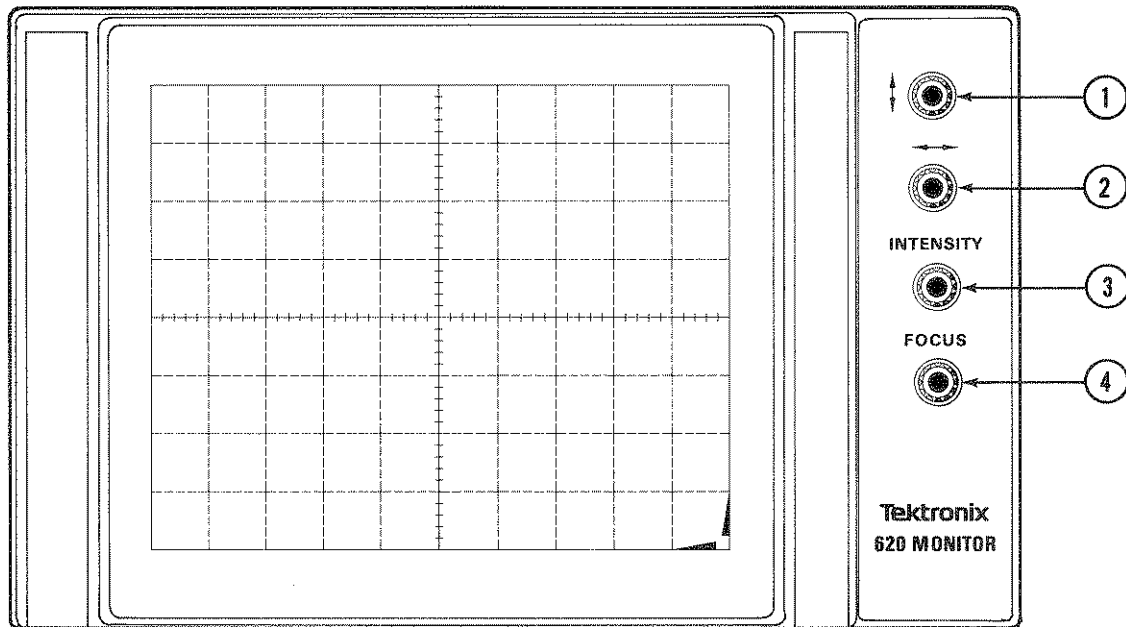
To avoid electric shock hazard, do not apply input signals of more than 25 volts (dc plus peak ac).

With no signals applied to the Z INPUT, 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

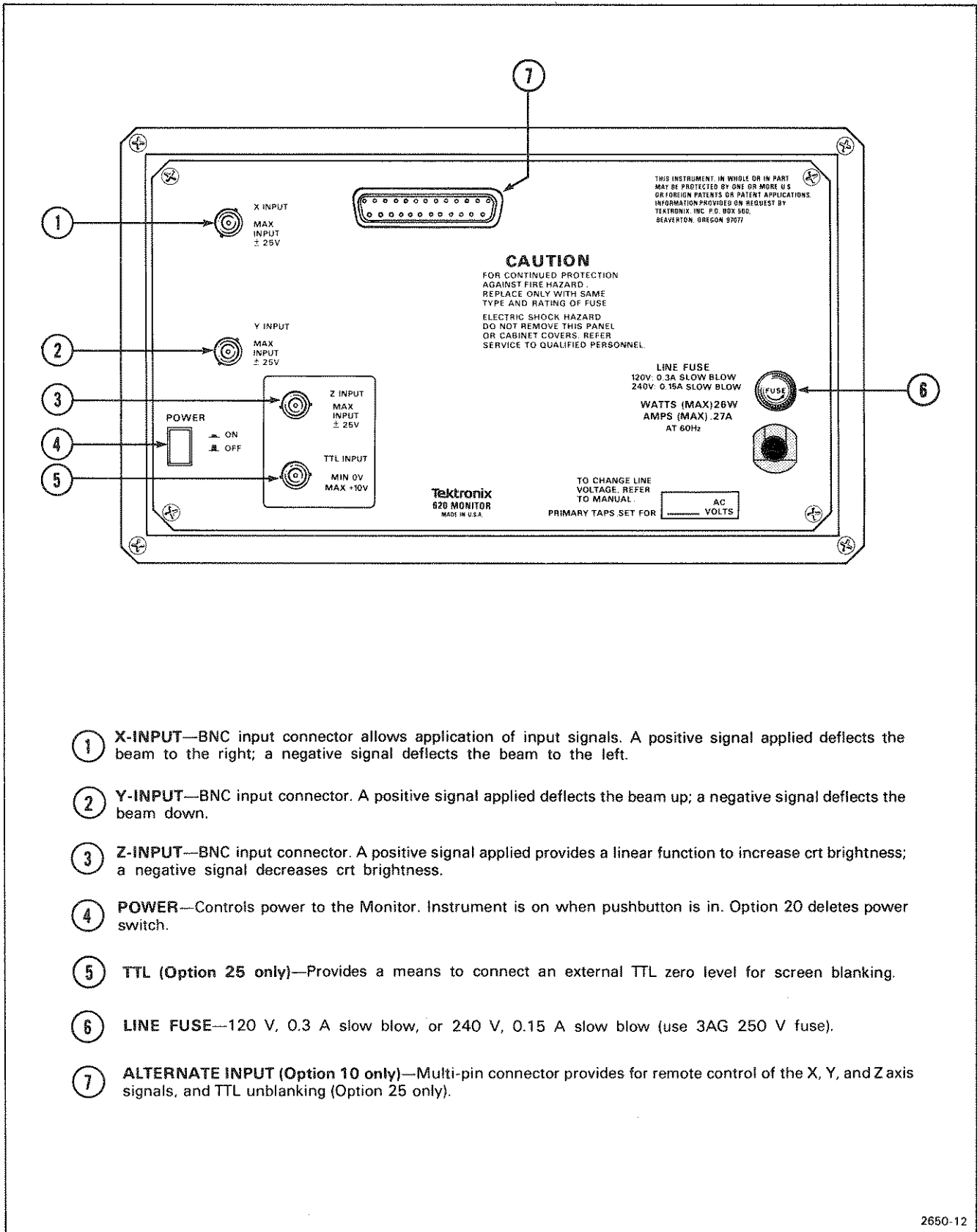
Exercise care in establishing the correct display intensity; a high-amplitude Z-Axis input signal, combined with an excessively high setting of the INTENSITY control, may damage the crt phosphor.

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.



- ① Vertical (↑↓) Position—Position the crt beam in the Y axis.
- ② Horizontal (↔) Position—Position the crt beam in the X axis.
- ③ INTENSITY—Controls brightness of the crt display and is the affect control for the Z-Axis Input.
- ④ FOCUS—Provides adjustment to obtain a well-defined display.

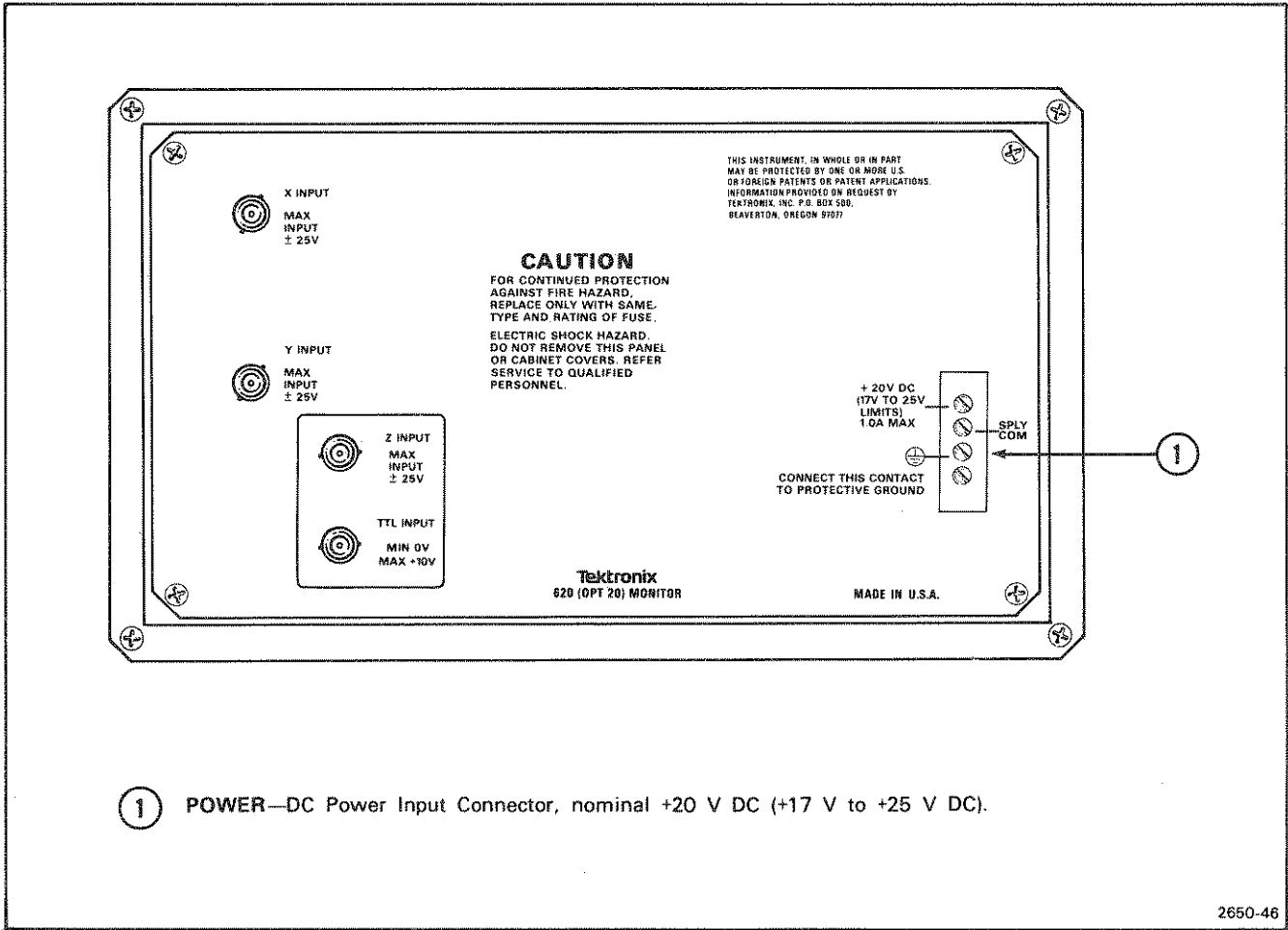
Figure 2-1. 620 Monitor front panel controls.



- ① **X-INPUT**—BNC input connector allows application of input signals. A positive signal applied deflects the beam to the right; a negative signal deflects the beam to the left.
- ② **Y-INPUT**—BNC input connector. A positive signal applied deflects the beam up; a negative signal deflects the beam down.
- ③ **Z-INPUT**—BNC input connector. A positive signal applied provides a linear function to increase crt brightness; a negative signal decreases crt brightness.
- ④ **POWER**—Controls power to the Monitor. Instrument is on when pushbutton is in. Option 20 deletes power switch.
- ⑤ **TTL (Option 25 only)**—Provides a means to connect an external TTL zero level for screen blanking.
- ⑥ **LINE FUSE**—120 V, 0.3 A slow blow, or 240 V, 0.15 A slow blow (use 3AG 250 V fuse).
- ⑦ **ALTERNATE INPUT (Option 10 only)**—Multi-pin connector provides for remote control of the X, Y, and Z axis signals, and TTL unblanking (Option 25 only).

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Figure 2-2. 620 Monitor rear panel controls and connectors. (See Fig. 2-3 for Option 20 rear panel.)



1 POWER—DC Power Input Connector, nominal +20 V DC (+17 V to +25 V DC).

Figure 2-3. 620 Monitor Option 20 rear-panel connectors.

An additional bnc connector is provided on the rear panel of the 620 Option 25 Monitor for applications of TTL-compatible input voltages to blank the crt display. The input voltage level necessary to produce blanking is internally selectable, and should be set by qualified service personnel only.

With the internal Option 25 selectors in the HI = Blank position, a TTL HI level (+2.4 to +5 V dc) applied to the TTL INPUT connector will blank the display, and a TTL LO level (0 to +0.8 V dc) will unblank the display and allow

the INTENSITY control and Z INPUT to control the display brightness. With the selectors in the HI = Unblank position, a HI level applied will unblank the display.

ALTERNATE INPUT CONNECTOR (OPTION 10)

The Alternate Input connector, located on the rear panel of 620 Option 10 Monitor, provides direct connections to the inputs of the Deflection and Z-Axis Amplifiers from a remote location. Signal requirements are the same as for the bnc inputs. See Figure 2-4 for additional details.

OPERATORS CHECKOUT PROCEDURE

The Operators Checkout Procedures are located in the servicing information sections of the 620 Instruction Manual for use by qualified service personnel only. These procedures have not been made available to the operator because of internal controls and selectors which affect the functions of certain operating controls.

WARNING

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

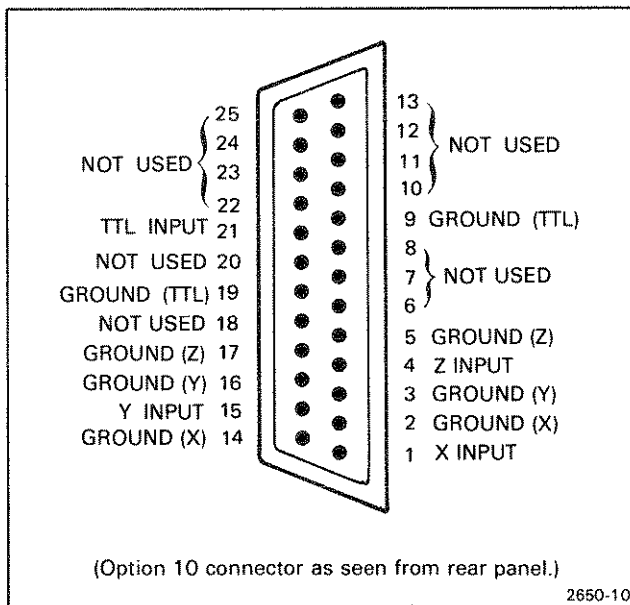


Figure 2-4. Alternate input connector data for Option 10.

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. Detailed information unique to each option is provided in appropriate locations within this manual. For further information on 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 6

Listed as Professional Medical Equipment by Underwriters Laboratories, Inc. Modifications include warnings required for medical equipment, a hospital grade cord and plug cap, an internal line fuse, a carrying handle, protective panels, and feet (cannot be ordered with Option 20, Option 23, or Option 28).

OPTION 9

Certified as a recognized component, Professional Medical Equipment, by Underwriters Laboratories, Inc.

OPTION 10

Alternate input connector (25-pin) added to the rear panel for X, Y, and Z-Axis inputs (cannot be ordered with Option 31).

OPTION 20

The ac power supply, line fuse, and power cord are removed from the rear panel of the instrument. The monitor requires nominal +20 V dc (+17 V to +25 V dc unregulated) to operate. (Cannot be ordered with Option 31.)

OPTION 23

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

OPTION 25

Modifies the Z-Axis Amplifier and rear panel to include an external TTL blanking input. (When Option 25 is ordered with Option 31 there will be no rear-panel connector; however, the Z-Axis Amplifier will be modified.)

OPTION 28

Includes protective cabinet panels and rear feet. (Cannot be ordered with Option 23 or rackmount and special cabinet kits.)

OPTION 31

The ac power supply, line fuse, power cord, and the X, Y and Z-Axis input connectors are removed from the instrument. The monitor requires nominal 20 V dc (+17 V to +25 V dc unregulated) connected to interconnect pins inside the instrument for proper operation.

OPTION 76

Provides a crt with P7 phosphor (external graticule or Option 1 available).

TABLE 3-1
Option Information Locator

Instrument Option	Location		Information
	Manual Section	Heading	
Option 1 (Internal CRT Graticule)	1 General Information	Specification	Table 1-1 contains a partial description.
Option 6 (Meets UL 544 requirements)	3 Instrument Options	Option 6	A description of the Option 6 instrument is given.
Option 9 (UL recognized component)	3 Instrument Options	Option 9	A description of the Option 9 instrument is given.
Option 10 (Alternate Input Connector, 25 pin)	2 Operating Instructions	Controls and Connectors	Figure 2-2 depicts and describes the connector.
		Signal Connectors	Purpose of the connector.
		Alternate Input Connector (Option 10)	Location and function of the connector (reference to Figure 2-4).
Option 20 (Requires 20 V DC supply to operate)	1 General Information	Specification	Weight of the Option 20 instrument.
		2 Operating Instructions	Controls and Connectors
	Detailed Operating Information		Description and function information.
Option 25 (TTL blanking)	2 Operating Instructions	Controls and connectors	Figure 2-2 depicts and describes the connector.
		Signal Connectors	Signal requirement and purpose.
		Input Signal Requirements	Input versatility.
Option 28 (Panels and feet)	3 Instrument Options	Option 28	Provides a description.