

# PART I

# OPERATORS INFORMATION

Section 1—604A

## GENERAL INFORMATION

### PRODUCT DESCRIPTION

The TEKTRONIX 604A Display Monitor is a low-cost, compact, general-purpose instrument, providing accurate displays of information from the X (horizontal), Y (vertical), and Z(intensity) signal inputs.

The display unit provides a bright presentation of analog data in a large screen area (6-1/2 inches diagonal). Resolution is adequate for most monitor uses, including alphanumeric applications. A large variety of factory-installed options are available to tailor the instrument to a particular application area.

In medical diagnostic ultrasound applications, the 604A displays an A-scan waveform that shows the depth of tissue density changes. The screen is calibrated, so that the waveform on the TEKTRONIX 604A can be matched to the scan to determine the precise distances and movements of the organs.

The 604A is well suited for many applications in ultrasonic detection systems, electron microscope systems, radiation and thermal scanning systems, speech therapy, mechanical pressure, volume, shock and vibration analysis, and medical, dental, and biophysical systems. Options are also available to adapt the 604A to present vector displays of color television signals in NTSC, PAL, and SECAM systems.

The compact size of the 604A Display Monitor permits mounting two instruments side-by-side in a standard 19-inch instrument rack, requiring only 5-1/4 inches of vertical rack space. The instrument can be operated from either a 120-volt or a 220-volt (nominal) line-voltage source.

### 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 instrument to operate at an ambient temperature substantially higher than that specified may result in poor reliability as well as inaccurate performance.

When the 604A 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 this upper limit. Reliability and performance of the 604A will be affected if the ventilation holes in the protective panels (if used) are obstructed, or if the instrument is operated at an ambient temperature that is higher than specified. Other environments and mounting configurations may require additional cooling measures.

### Damage Inspection

When unpacking the instrument, carefully remove it from the shipping carton and inspect for any possible damage incurred during shipment. Report any damage or shortage to the carrier as soon as possible.

Save the shipping carton and packing in case it is needed to repackage the instrument for subsequent shipment.

## General Information—604A

### Standard Accessories

Standard accessories supplied with this instrument can be found listed on the last page of the Replaceable Mechanical Parts list illustrations in the rear of this manual.

### Optional Accessories

A variety of optional accessories and peripheral equipment is available to extend the usefulness of your monitor, such as trace-recording cameras, special rackmounting hardware, light filters and graticules, etc. See your current Tektronix catalog for a complete listing, or contact your local Tektronix Field Engineer for technical assistance.

### Repackaging For Shipment

If this instrument is to be shipped to a Tektronix Service Center for service or repair, attach a tag showing: owner (with address) and the name of an individual at your firm

that can be contacted; complete instrument serial number; and a description of the service required.

If the instrument is to be shipped long distances by commercial transportation, repackage it in the original manner for maximum protection. Save and re-use the carton and packing in which your instrument was shipped. If the original packaging is unfit for use or not available, repackage the instrument as follows:

Surround the instrument with polyethylene sheeting to protect the finish of the instrument. Obtain a carton of corrugated cardboard of the correct carton strength and having inside dimensions of no less than six inches more than the instrument dimensions. Cushion the instrument by tightly packing three inches of dunnage or urethane foam between carton and instrument, on all sides. Seal the carton with shipping tape or an industrial stapler.

The carton test strength for your instrument is 275 pounds.

# SPECIFICATION

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

Items listed in the Performance Requirements column of the Electrical Characteristics are verified by completing the Performance Check in Section 4 of this manual. Items listed in the Supplemental Information column are not verified in the Performance Check; they are either explanatory notes, performance characteristics for which no limits are specified, or characteristics that are impractical to check during routine maintenance.

**Table 3-1**  
**ELECTRICAL CHARACTERISTICS**

Characteristic	Performance Requirements	Supplemental Information	Perf. Ch. Step No.
<b>VERTICAL AND HORIZONTAL AMPLIFIERS</b>			
Deflection Factor			
Vertical (Y)	Adjustable from 0.5 V, or less, to at least 2.5 V full scale.	Nominally set for 1 V full scale.	C1
Horizontal (X)	Adjustable from 0.5 V, or less, to at least 2.5 V full scale.		C5
Attenuators (Option 22)	Internal 1X—5X step attenuator extends deflection factor range to at least 12.5 V full scale.		C2, C6
Polarity			
+Y INPUT	Positive signal applied deflects beam up; negative signal deflects beam down.	Substantiated by other checks.	
-Y INPUT (Option 21)	Positive signal applied deflects beam down; negative signal deflects beam up.		
+X INPUT	Positive signal applied deflects beam to the right; negative signal deflects beam to the left.		
-X INPUT (Option 21)	Positive signal applied deflects beam to the left; negative signal deflects beam to the right.		
Settling Time	Spot must reach new writing position within 1 $\mu$ s from any onscreen position.		C4, C8

Table 3-1 (cont)

Characteristic	Performance Requirements	Supplemental Information	Perf. Ch. Step No.
Bandwidth, (80% Full-Screen Reference Signal)	Dc to at least 2 MHz at -3 dB point.		C9
Risetime		0.18 $\mu$ s or less (10-90%).	
Phase Difference (Dc to 500 kHz)	1° or less between X and Y amplifiers. X and Y amplifier gain (V/div) must be set for the same deflection factor.		C10
Common-Mode Rejection (Option 21)			
Attenuator at 1X	At least 100:1 cmr ratio to 100 kHz with input signals of $\pm 3$ V or less.		C3, C7
Attenuator at 5X (Option 22)	At least 50:1 cmr ratio to 100 kHz with input signals of $\pm 15$ V or less.		C3, C7
Position Stability		0.1 division or less (0.050" or less) per hour after 20-minute warmup.	
Position Range	Front-panel controls allow spot to be set anywhere within the viewing area.	Approximately $\pm 12$ divisions from screen center.	
Input R and C (Both Inputs)		1 M $\Omega$ , within 1%, paralleled by 47 pF or less.	
Maximum Nondes-structive Input Voltage (Fault Condition Only)		+100 V or -100 V (dc plus peak ac).	

Z-AXIS AMPLIFIER

Bandwidth	Dc to at least 5 MHz (at -3 dB).		D2
Risetime		70 ns or less (10%-90%).	
Common-Mode Rejection (Option 21)	At least 100:1 cmr ratio to 100 kHz with input signals of $\pm 5$ V or less.		D3
Input R and C		1 M $\Omega$ , within 1%, paralleled by 47 pF or less.	
Maximum Nondes-structive Input Voltage (Fault Condition Only)		+100 V or -100 V (dc plus peak ac) when INTENSITY control is fully counter-clockwise. See Caution in Operating Instructions.	

Table 3-1 (cont)

Characteristic	Performance Requirements	Supplemental Information	Perf. Ch. Step No.
Polarity			
+ Z INPUT	Positive signal applied brightens spot; negative signal dims spot.	Substantiated by other checks.	
Z INPUT (Option 21)	Positive signal applied dims spot; negative signal brightens spot.		
Useful Input Voltage			
+ Z INPUT	Adjustable. With Z Gain at maximum, no more than +1 V will provide full intensity.	INTENSITY control range is 1 V.	D1
	With Z Gain at minimum, at least +5 V is required to produce full intensity.	INTENSITY control range is 5 V.	
- Z INPUT (Option 21)	Adjustable. With Z Gain at maximum, no more than -1 V will provide full intensity.	INTENSITY control range is 1 V.	
	With Z Gain at minimum, at least -5 V is required to produce full intensity.	INTENSITY control range is 5 V.	

## CATHODE-RAY TUBE DISPLAY

Crt Screen Size		6 1/2 inches (diagonal).	
Display Quality Area		8 x 10 divisions (4 x 5").	
Geometry (Within Graticule Area)	Bowing or tilt is 0.1 division (0.050" or less).		B4
Display Linearity (Vertical and Horizontal)		No more than 5% difference between any 2 divisions.	
Accelerating Potential	3.5 kV.		A3
Phosphor Standard		P31.	
Deflection		Electrostatic.	
Maximum Spot Size		25 mils. (0.025").	
Resolution		128 line pairs vertically, 160 line pairs horizontally.	

Table 3-1 (cont)

Characteristic	Information
Graticule	
Standard	Blank faceplate.
Option 1	Internal. Lined in 8 x 10 divisions. Non-illuminated.
Option 5	Internal. Ruled for vector displays of R-Y and B-Y information in NTSC color television systems. Non-illuminated.
Option 8	External. Ruled for vector display in SECAM and PAL color television systems. Non-illuminated.

POWER SOURCE

Line Voltage (ac, rms)	120 Vac nominal
Low (100 Vac)	90 to 110 Vac.
Medium (110 Vac)	99 to 121 Vac.
High (120 Vac)	108 to 132 Vac.
	220 Vac nominal
Low (200 Vac)	180 to 220 Vac.
Medium (220 Vac)	198 to 242 Vac.
High (240 Vac)	216 to 264 Vac.
Line Fuse Data	
120 Vac Nominal	1.25 A Slow-blow.
220 Vac Nominal	0.6 A Slow-blow.
Line Frequency	48 to 440 Hz.

Power Supplies	Tolerance	Perf. Ch. Step No.
-30 V dc	Adjustable to -30 V dc.	A1, A2
+15 V dc	+14.7 V to +15.3 V.	A1
+215 V dc	+208.5 V to +221.5 V.	A1
-3450 V dc	±170 V.	A3

Table 3-1 (cont)

Characteristic	Performance Requirements	Supplemental Information	Perf. Ch. Step No.
<b>OPTION 4 SWEEP SYSTEM</b>			
Sweep Range	100 ms/div to 1 $\mu$ s/div.	Decade steps.	E3
Sweep Accuracy Over Center 8 Divisions	Within 3%.	VARIABLE fully clockwise.	E3
Linearity of Any 2 Division Portion Within Center 8 Divisions		Within 2%, except for first 5% of total sweep length.	
VARIABLE (Uncalibrated)	Provides continuously variable sweep rates between calibrated settings.	Decreases each sweep rate setting by at least 10:1. Extends slowest rate to at least 1 s/div.	E4
Triggering Sensitivity (Repetitive Signals)	Requires at least 0.5 division vertical deflection from dc to 2 MHz.		E2

Table 3-2

**ENVIRONMENTAL CHARACTERISTICS**

Characteristic	Information
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*NOTE*

*This instrument will meet the electrical characteristics given in the Performance Requirements column of Table 3-1 over the following environmental limits.*

Temperature	
Operating	0 to +50°C (+32 to +122°F).
Non-operating	-40 to +70°C (-40 to +158°F).
Altitude	
Operating	To 4.6 km (15,000 ft.).
Non-operating	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.