

GENERAL INFORMATION

INTRODUCTION

OPERATORS MANUAL

The Operators Manual is divided into the following three sections:

Section 1—General Information contains instrument description, electrical specifications, environmental characteristics, standard and recommended accessories, installation, and packaging for shipment instructions.

Section 2—Operating Instructions contain information relative to operating and checking the instrument operation.

Section 3—Instrument Options contains a description of available options and gives the location of the incorporated information for those options.

Section 6—Instrument Options contains a description of available options and locations of incorporated information for those options.

Section 7—Replaceable Electrical Parts contains information necessary to order replaceable parts and assemblies related to the electrical functions of the instrument.

Section 8—Diagrams and Circuit Board Illustrations includes detailed circuit schematics, locations of assembled boards within the instrument, voltage and waveform information, circuit board component locators, and locations of adjustments to aid in the performing of the Adjustment and Performance Check portion of the Calibration procedure.

Section 9—Replaceable Mechanical Parts includes information necessary to order replaceable mechanical parts and shows exploded drawings which identify assemblies.

INSTRUCTION MANUAL

The first two sections of the Instruction Manual contain operating instructions which are identical to the first two sections of the Operators Manual.

WARNING

THE REMAINING PORTIONS OF THE INSTRUCTION MANUAL CONTAIN SERVICING INSTRUCTIONS. THESE SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED SERVICE PERSONNEL ONLY. TO AVOID ELECTRIC SHOCK OR OTHER PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT DESCRIBED IN THE OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

Section 3—Theory of Operation contains basic and general circuit analysis that may be useful for servicing or operating the instrument.

Section 4—Maintenance describes routine and corrective maintenance procedures with detailed instructions for replacing assemblies, subassemblies, and individual components.

Section 5—Calibration contains procedures to check the operational performance and electrical characteristics of the instrument. Procedures also include methods for adjustment of the instrument to meet specifications.

INSTALLATION

INITIAL INSPECTION

This instrument was inspected both mechanically and electrically before shipment. It should be free of marks or scratches and should meet or exceed all electrical specifications. To confirm this, inspect the instrument for physical damage incurred in transit and test the electrical performance by following the Operators Checkout Procedure in Section 2, Operating Instructions. Verify Performance Requirements by referring a qualified service person to the servicing sections of the Instruction Manual. If there is damage or deficiency, contact your local Tektronix Field Office or representative.

OPERATING-POWER INFORMATION

This instrument can be operated from either a 115-volt or 230-volt nominal supply source, 48 to 440 hertz. The line fuse remains the same for both 115-volt and 230-volt operation.

CAUTION

To prevent damage to the instrument, always check the LINE VOLTAGE SELECTOR switch located on the rear of the instrument before connecting the instrument to the supply circuit.

WARNING

AC POWER SOURCE AND CONNECTION.
 This instrument operates from a single-phase power source. It has a three-wire power cord and two-pole, three-terminal grounding-type plug. 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, determine that the instrument is adjusted to match the voltage of the power source, and has a suitable two-pole, three-terminal grounding-type plug. Refer any changes to qualified service personnel.

GROUNDING. 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 plug.

The power input plug must only be inserted in 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.

For electric shock protection, the grounding connection must be made before making connection to the instrument's input or output terminals.

TABLE 1-1
Power-Cord Conductor Identification

Conductor	Color	Alternate Color
Ungrounded (Line)	Brown	Black
Grounded (Neutral)	Blue	White
Grounded (Earthing)	Green-Yellow	Green-Yellow

The power-cord plug required depends upon the ac input voltage and the country in which the instrument is to be used. Should you require a power-cord plug other than that supplied with your instrument, refer to the standards listed in Table 1-2.

TABLE 1-2
Power-Cord Plug Configuration

Nominal Line Voltage	Reference Standards
115 V AC	¹ ANSI C73.11
	² NEMA 5-15-P
	³ IEC 83
230 V AC	¹ ANSI C73.20
	² NEMA 6-15-P
	³ IEC 83
	⁴ BS 1363
	⁵ CEE 7, sheets IV, VI, & VII
	⁶ AS C112

¹ANSI—American National Standards Institute

²NEMA—National Electrical Manufacturer's Association

³IEC—International Electrotechnical Commission

⁴BS—British Standards Institution

⁵CEE—International Commission on Rules for the Approval of Electrical Equipment

⁶AS—Standards Association of Australia

OPERATING VOLTAGE

The LINE VOLTAGE SELECTOR switch (located on the rear panel) allows selection of 115-volt or 230-volt nominal line voltage operation. To convert from 115-volt to 230-volt operation, change the power cord and plug to match the power-source receptacle, then use a small screwdriver to move the LINE VOLTAGE SELECTOR switch to the desired range. The line fuse remains the same for both 115-volt and 230-volt operation.

OPERATING TEMPERATURE

The 7104 can be operated where the ambient air temperature is between 0° and +50° C and can be stored in ambient temperatures from -55° to +75° C. After storage at temperatures outside the operating limits, allow the chassis temperature to reach a safe operating limit before applying power.

The 7104 is cooled by air drawn in through holes in the top, side, and bottom panels and blown out through the fan exhaust. To ensure proper cooling of the instrument, maintain the clearance provided by the feet on the bottom and allow at least 2 inches clearance (more if possible) at the top, sides, and rear of the instrument.

OPERATING POSITION

A bail-type stand, mounted on the bottom of the instrument, permits the instrument to be tilted up about 10° for more convenient crt viewing.

PACKAGING FOR SHIPMENT

If this instrument is to be shipped for long distances by commercial transportation, it is recommended that the instrument be packaged in the original manner. The carton and packaging material in which your instrument was shipped should be saved and used for this purpose.

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

If the original packaging is unfit for use or not available, package the instrument as follows:

1. Obtain a corrugated cardboard shipping carton having inside dimensions at least six inches greater than the instrument dimensions; refer to Table 1-3 for carton test strength requirements.
2. Enclose the instrument with polyethylene sheeting or equivalent to protect the finish of the instrument.

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

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.

TABLE 1-3
Shipping Carton Test Strength

Gross Weight (lb)	Carton Test Strength (lb)
0-10	200
10-30	275
30-120	375
120-140	500

SPECIFICATION

The electrical characteristics listed in Table 1-4 apply when the following conditions are met: (1) Calibration of the instrument must have taken place at an ambient temperature between +20° and +30° C, (2) the instrument must be allowed a 20-minute warm-up period, (3) all specifications are valid at an ambient temperature of 0° to +50° C, unless otherwise stated, (4) the instrument must be in an environment that meets the limits described in Table 1-5.

Any applicable conditions not listed above are expressly stated as part of that characteristic. Environmental characteristics are listed in Table 1-5 and Physical characteristics are listed in Table 1-6.

TABLE 1-4
Electrical Characteristics

Characteristic	Performance Requirement
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VERTICAL SYSTEM

Deflection Factor	Compatible with all 7000-series plug-in units.
Difference Between Vertical Compartments	1% or less.
Low-Frequency Linearity	0.1 div or less compression or expansion of a center-screen 2-div display positioned anywhere vertically within the graticule area.
Frequency Response	Varies with plug-in unit selected. See 7104 Oscilloscope Vertical Systems Specification, Table 1-7.
With 7A29 Amplifier Unit	1 GHz at 3 dB down; temperature range from 0° to 35° C.
Step Response	
Risetime (10 to 90%), with 7A29 Amplifier Unit	350 ps or less (calculated from bandwidth).

**TABLE 1-4 (CONT.)
Electrical Characteristics**

Characteristic	Performance Requirement
Isolation Between Vertical Compartments (8 division signal) LEFT, RIGHT, ALT Modes	At least 160:1 from dc to 100 MHz and at least 80:1 from 100 MHz to 1 GHz.
Delay Line	Permits viewing leading edge of triggering signal. <p style="text-align: center;">NOTE</p> <p style="text-align: center;"><i>7B50-series time-base units will not display leading edge of the trigger signal in 7104.</i></p>
Difference in Signal Delay Between Vertical Compartments	50 ps or less.
Vertical Display Modes	Selected by front-panel VERTICAL MODE switch.
LEFT	Left vertical-unit displayed.
ALT	Display chops between left and right vertical units asynchronously to horizontal plug-in unit(s).
ADD	Display is algebraic sum of left and right vertical units.
CHOP	Display chops between Left and Right vertical units asynchronously to horizontal plug-in unit(s).
Repetition Rate	1 MHz within 20%.
RIGHT	Right vertical unit displayed.
"Slaved ALT"	Slaved operation occurs if: (1) VERT MODE switch set to ALT, (2) HORIZ MODE switch set to ALT or CHOP, (3) time-base unit is installed in each horizontal compartment and (4) time-base unit installed in A HORIZ compartment operates in Independent mode. When in slaved operation the display alternates between: (1) trace produced by LEFT VERT unit displayed at sweep rate of B time-base unit and (2) trace produced by RIGHT VERT unit displayed at sweep rate of A time-base unit. <p style="text-align: center;">NOTE</p> <p style="text-align: center;"><i>VERT TRACE SEPARATION (B) control is inoperative in "Slaved ALT" Mode.</i></p>
VERT TRACE SEPARATION (B)	Positions "B" trace at least 4 div above and below "A" trace, when 7104 operates in ALT or CHOP horizontal modes. See note concerning "Slaved ALT" vertical mode.

**TABLE 1-4 (CONT.)
Electrical Characteristics**

Characteristic	Performance Requirement
TRIGGERING	
A and B TRIGGER SOURCE	Selected by front-panel switches. Lights behind pushbuttons are illuminated to indicate trigger source.
VERT MODE	The trigger source is controlled by vertical display mode selection. Source (sources) is (are) shown by the illumination of the LEFT and RIGHT trigger source buttons. Source follows (is same as) the vertical display with the following two exceptions:
VERT MODE	Trigger Source
CHOP	LEFT
"Slaved ALT"	RIGHT for A TRIGGER LEFT for B TRIGGER
	See Vertical Display Modes for slaved operation.
LEFT	Trigger source: LEFT vertical unit. LEFT trigger source button illuminated.
RIGHT	Trigger source: RIGHT vertical unit. RIGHT trigger source button illuminated.

HORIZONTAL SYSTEM

Deflection Factor	Compatible with all 7000-series plug-in units.
Gain Difference Between Horizontal Compartments	1% or less.
DC Linearity	0.05 division or less error at each graticule line after adjusting for no error at second and tenth graticule lines.
Fastest Calibrated Sweep Rate	200 ps/div.
Horizontal Display Modes	Selected by front-panel HORIZONTAL MODE switch.
A	A horizontal unit displayed.
ALT	Display alternates between A and B horizontal units.
CHOP	Display chops between A and B horizontal units.
B	B horizontal unit displayed.
Chopped Mode Repetition Rate	200 kHz within 20%.
Phase Shift Between Vertical and Horizontal Deflection Systems	2° or less from dc to at least 50 kHz.
Option 2 (B HORIZ compartment only) with 7A19s or 7A29s, at least one of which has the variable delay option	2° or less from dc to 50 MHz after adjusting variable delay for balance at 25 MHz. Phase balance can be obtained at any frequency up to 250 MHz.
Bandwidth	350 MHz

**TABLE 1-4 (CONT.)
Electrical Characteristics**

Characteristic	Performance Requirement
X-Y Displays	X-Y displays can only be obtained in conjunction with a time-base unit. With an amplifier unit installed in the A(B) horizontal compartment the Z-axis can only be controlled by the time-base unit in the B(A) horizontal compartment. This is independent of the horizontal mode switch selection.

CALIBRATOR

Waveshape	Square wave.
Polarity	Positive going, with baseline near 0 volt.
Output Resistance	450 Ω .
Output Voltage	(Selected by front-panel CALIBRATOR switch.)
Into 100 k Ω or greater	40 mV, 0.4 V, 4 V.
Into 50 Ω	4 mV, 40 mV, 0.4 V.
Output Current	40 mA available through CALIBRATOR output with optional bnc-to-Current Loop adapter. CALIBRATOR must be set to 4 V for calibrated output.
Amplitude Accuracy (P-P Voltage)	Within 1%.
Repetition Rate	1 kHz within 0.25%.
Duty Factor	49.8% to 50.2%.
Rise Time and Fall Time	500 ns or less into 100 pF or less.

SIGNAL OUTPUTS

+SAWTOOTH OUT	
Source	Selected by front-panel switch. A: A HORIZ time-base unit. B: B HORIZ time-base unit.
Polarity	Positive-going with baseline at 0 V within 1 V into 1 M Ω .
Output Voltage	
Rate of Rise	
Into 50 Ω	50 mV/unit of time selected by time-base unit time/div switch, within 15%, 100 ns/div maximum sweep rate.
Into 1 M Ω	1 V/unit of time selected by the time-base unit time/div switch, within 10%; 1 μ s/div maximum sweep rate.
Output Resistance	Approximately 950 Ω .
+GATE	
Source	Selected by front-panel switch. A: A Gate, derived from A HORIZ time-base unit main gate. B: B Gate, derived from B HORIZ time-base unit main gate.

TABLE 1-4 (CONT.)
Electrical Characteristics

Characteristic	Performance Requirement
+GATE (continued)	
Polarity	Positive-going with baseline at 0 V within 1.0 V into 1 M Ω .
Output Voltage	
Into 50 Ω	0.5 V within 10%.
Into 1 M Ω	10 V within 10% (up to 1 μ s/div sweep rate).
Rise Time Into 50 Ω	5 ns or less.
Fall Time Into 50 Ω	15 ns or less.
Output Resistance	Approximately 950 Ω .
SIG OUT	
Source	Selected by B TRIGGER SOURCE switch.
Output Voltage	Same as B TRIGGER SOURCE.
Into 50 Ω	25 mV/div of vertical deflection within 25%.
Into 1 M Ω	For a maximum output of ± 2 V: 0.5 V/div of vertical deflection within 25%.
Bandwidth Into 50 Ω	Varies with vertical plug-in selected; see 7104-series Oscilloscope Systems Specification.
DC Centering	0 V within 1 V into 1 M Ω .
Aberrations	15% or less p-p within 50 ns of step.
Output Resistance	Approximately 950 Ω .

READOUT DISPLAY

Readout Modes	
Free-Run (Not Labeled)	Continuously displayed.
PULSED	
Pulse Source	Single-shot operation.
	Selected by front-panel switches.
	+GATE: Triggered by the trailing edge of the +GATE selected by the front-panel switch.
	EXT: Controlled through rear-panel remote control connector.
	MAN: Manual trigger, independent of other pulse sources.

**TABLE 1-4 (CONT.)
Electrical Characteristics**

Characteristic	Performance Requirement
DISPLAY	
Graticule	
Type	Internal, illuminated with variable edge lighting.
Lighting	
Normal	Continuously lighted.
PULSED	Single-shot operation. Lights are pulsed on for approximately 0.5 seconds.
Pulse Source	Selected by front-panel switches. +GATE: Triggered by trailing edge of +GATE selected by front-panel switch. EXT: Controlled through rear-panel remote control connector. MAN: Manual trigger, independent of other pulse sources.
Area	8 × 10 div 0.85 cm/div.
Phosphor	P31.
Vertical and Horizontal Resolution	17 lines/div.
High Voltage	
Screen Voltage	Approximately 12.5 kV.
Limited Viewing Time Indicator	
Steady Yellow	Crt display time is limited to 20 minutes or less.
Flashing Yellow	Crt display time is limited to 2 minutes or less and intensity is being limited.
Geometry	Within 0.1 div of vertical and horizontal graticule lines.
BEAMFINDER	When actuated, limits display to within graticule area and defocuses display.
Photographic Writing Speed	20 cm/nsec (without blue filter). Phosphor: Standard P31. Camera: TEKTRONIX C53; f/1.9 1:0.85 lens. Film: Polaroid Type 107; 3000 ASA.

REMOTE CONNECTORS AND SWITCHES

Control Illumination	HIGH, MEDIUM and OFF. Three position switch located on rear panel of power supply.
Camera Power	Three-contact connector compatible with TEKTRONIX C-50 Series Cameras.
Bottom Pin	Ground
Center Pin	Single sweep reset.
Top Pin	+15 V.

TABLE 1-4 (CONT)
Electrical Characteristics

Characteristic	Performance Requirement
REMOTE RESET INPUT	Input to reset single-sweep function of time-base units installed in A and B HORIZ compartments.
Signal Required	Closure to ground or switching from the high level (+50 to +10 V; sink less than 40 μ A) to low level (+0.5 V to -5 V; sink less than 12 mA) in less than 1 msec, resets the sweep. Compatible to 15 V open collector TTL source.
Minimum Pulse Width	10 μ s at 50% amplitude points.
Maximum Safe Input Voltage	+50 V to -5 V (dc + peak ac).
A SINGLE SWEEP READY	Connector (bnc) on rear panel. Remote ready indicator for A HORIZ time-base unit.
Output Signal	Open when not ready. +5 V at 47 Ω source impedance when ready. Output will light a No. 49 bulb.
B SINGLE SWEEP READY	Connector (bnc) on rear panel. Remote ready indicator for B HORIZ time-base unit.
Output Signal	Open when not ready. +5 V at 47 Ω source impedance when ready. Output will light a No. 49 bulb.
GRATICULE/READOUT SINGLE SHOT	Connector (bnc) on rear panel. Switching to the low level (+1 V to -5 V; sink less than 2 mA) from the high level (+10 V to +15 V; sink less than 0.3 mA), in less than 1 μ sec, triggers the readout to display one complete readout frame and the GRAT ILLUM to be illuminated for approximately 0.5 sec. Compatible to 15 V open collector TTL source.
Maximum Open Circuit Voltage	+15 V.
Maximum Safe Input Voltage	+15 V to -5 V (dc plus peak ac).
Probe Power	Two probe power connectors on rear panel.
Pin 1	+5 V.
Pin 2	Chassis ground.
Pin 3	-15 V.
Pin 4	+15 V.
Z-AXIS INPUT (External)	Connector (bnc) on rear panel.
Polarity and Sensitivity	Positive 2 V provides complete blanking from maximum intensity condition. Negative 2 V provides complete unblanking from minimum intensity condition.
Low Frequency Limit	Dc.
Input Resistance	Approximately 500 Ω .
Input Capacitance	Less than 50 pF.
Open Circuit Voltage	0 V.
Maximum Safe Input Voltage	15 V, dc plus peak ac.
Maximum Repetition Rate	1 MHz.

**TABLE 1-4 (CONT.)
Electrical Characteristics**

Characteristic	Performance Requirement
POWER SOURCE	
Voltage Range (AC, RMS)	Selected by rear-panel LINE VOLTAGE SELECTOR switch.
115 V Rated	From 90 V to 132 V.
230 V Rated	From 180 V to 250 V.
Line Frequency	From 48 Hz to 440 Hz.
Maximum Power Consumption	215 W.
Maximum Current	3.3 A at 60 Hz, 90 V Line. 1.7 A at 60 Hz, 180 V Line.
Fuse Data Line (P1200)	4 A fast blow. (For both LINE VOLTAGE SELECTOR ranges.)

**TABLE 1-5
Environmental Characteristics**

Characteristic	Information
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NOTE

This instrument will meet the electrical characteristics given in the Performance Requirement column of Table 1-4 over the following environmental limits.

Temperature	
Operating	0° to +50° C.
Storage	-55° to +75° C.
Altitude	
Operating	5 km (15,000 feet).
Storage	15 km (50,000 feet).
EMC (Electromagnetic Compatibility Option 3 Only)	<p style="text-align: center;">NOTE</p> <p><i>Any unused plug-in compartments must be covered with a blank plug-in panel (EMI shielded) in order to meet EMC specifications. See Instrument Options section for additional information.</i></p> <p>Meets requirements of MIL-STD-461 A, when tested in accordance with the following test methods of MIL-STD-462: CE-01, CE-03, CS-01, CS-02, CS-06, RE-02, (Limited to 1 GHz), (T) RE-04, RS-01, and RS-03 (Limited to 1 GHz).</p>

TABLE 1-6
Physical Characteristics

Characteristic	Information
Ventilation	Safe operating temperature maintained by dc fan. Automatic resetting thermal cutout protects instrument from overheating.
Finish	Anodized front- and rear-panel with blue-vinyl painted aluminum cabinet.
Overall Dimensions (measured at maximum points)	See Figure 1-1.
Height	13.6 inches. 34.5 cm.
Width	12.0 inches. 30.5 cm.
Length	23.5 inches. 59.2 cm.
Net Weight (Instrument without Plug-Ins)	43.6 lb. 19.8 kg.

SYSTEM ELECTRICAL SPECIFICATION

Your TEKTRONIX 7104 Oscilloscope system provides exceptional flexibility in operation with a wide choice of general- and special-purpose plug-in units. The type number of a particular plug-in unit identifies its usage as follows:

The first digit (7) denotes the oscilloscope system for which the plug-in is designed (7000-series).

The second letter describes the purpose of the plug-in unit:

- A—Amplifier unit
- B—"Real time" time-base unit
- C—Curve tracer
- D—Digital unit
- L—Spectrum analyzer
- M—Miscellaneous
- S—Sampling unit
- T—Sampling time-base unit

The third and fourth digits of the plug-in type number do not carry any special connotation.

A "N" suffix letter added to the normal four-digit type number identifies a unit not equipped with the circuitry necessary to encode data for the 7000-series readout system.

Table 1-7 lists the vertical specifications which are system dependent. For more complete specifications on plug-in units for the 7000-series oscilloscope system, refer to the Tektronix Products catalog.

Table 1-8 lists the horizontal specifications which are system dependent. For more complete specifications on plug-in units for the 7000-series oscilloscope system, refer to the Tektronix Products catalog.

Table 1-9 lists some special purpose plug-in units available for use with the 7104 Oscilloscope.

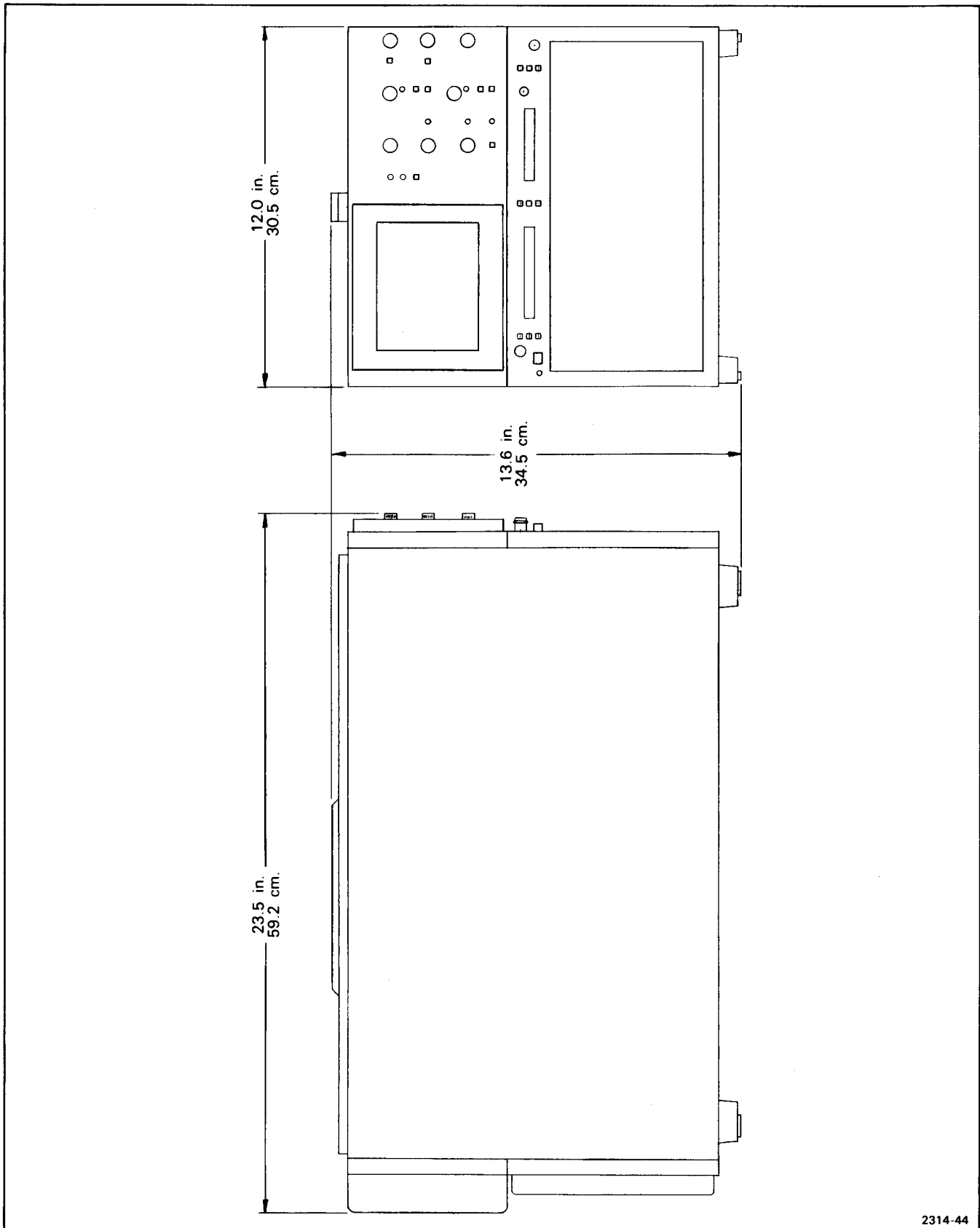


Figure 1-1. 7104 dimensional drawing.

TABLE 1-7
7104 Oscilloscope Vertical System Specification

Amplifier Plug-In Unit	Probe	Bandwidth (MHz)	Rise Time (ns)	Accuracy (%) ¹		VERT SIG OUT	
				0° to +50° C EXT CAL	0° to +50° C INT CAL	BW (MHz)	Tr (ns)
7A11	Integral	250	1.4	2	3	150 MHz	2.4 ns
7A12	None	105	3.4	2	3	110 MHz	3.2 ns
	P6053B			3	4		
7A13	None	100	3.5	1.5	2.5	100 MHz	3.5 ns
	P6053B					100 MHz	3.5 ns
	P6055	65	5.4			65 MHz	5.4 ns
7A14	P6021	55	6.4	2	3	50 MHz	7.0 ns
	P6022	110	3.2			100 MHz	3.5 ns
7A15A/N	None	80	4.4	2	3	70 MHz	5.0 ns
	P6053A			3	4		
7A16A	None	225	1.6	2	3	150 MHz	2.4 ns
	P6053B			3	4		
7A17	None	150	2.4			15 MHz	24 ns
7A18	None	75	4.7	2	3	70 MHz	5.0 ns
	P6053B			3	4		
7A19	None	600	0.6	3	4	600 MHz	0.6 ns
	P6056			4	5		
	P6057						
	P6201			500	0.7		
7A22	None or Any	1 MHz (within 10%)	350 (within 9%)	2	3	1.0 MHz ±10%	350 ns ±9%
7A24	None	400	0.9	3	4	200 MHz	1.75 ns
	P6056, P6057	400	0.9	4	5		
	P6201	350	1.0	4	5		
7A26	None	200 ²	1.75 ²	2	3	150 MHz	2.4 ns
	P6053B			3	4		
7A29	None	1000 ³	0.35 ³	3	4	750 MHz	0.47 ns
	P6056	1000 ³	0.35 ³	4	5	700 MHz	0.50 ns
	P6057	800	0.45			600 MHz	0.60 ns
	P6201	600	0.60	4	5	500 MHz	0.70 ns

¹ Deflection Factor accuracy is checked as follows:

EXT CAL 0° to +50° C: Plug-in gain set at a temperature within 10° C of operating temperature, using an external calibrator with accuracy within 0.25%.

INT CAL 0° to +50° C: Plug-in gain set using the oscilloscope calibrator (within 10° C of the operating temperature) in a temperature range between 0° and +50° C.

² System temperature range from 0° to +35° C; derate 10% from +35° to +50° C.

³ System temperature range from 0° to +35° C.

TABLE 1-8
7104 Oscilloscope System Horizontal Specification

Time-Base Unit	Performance Feature	Maximum Calibrated Sweep Rate	Triggering Frequency Range
7B10	Delayed Sweep	200 psec/div	Dc to 1000 MHz
7B15	Delaying Sweep	200 psec/div	Dc to 1000 MHz
7B92A	Display Switching	500 psec/div	Dc to 500 MHz
7B80	Delayed Sweep	1 ns/div	Dc to 400 MHz
7B85	Delaying Sweep	1 ns/div	Dc to 400 MHz

TABLE 1-9
Special Purpose Plug-In Units

Plug-In	Performance Feature
7CT1N	Low-Power Semiconductor Curve Tracer
7D10	Digital Events Delay
7D11	Digital Delay
7D12	A/D Converter; plug-in modules provide flexible measurement capability
7D13	Measures Temperature, Voltage, Current and Resistance
7D14	Directly Gated Counter to 525 MHz
7K11	CATV Preamplifier
7L12	100 kHz to 1.8 GHz Spectrum Analyzer
7L13	1 kHz to 1.8 GHz Spectrum Analyzer
7M11	Dual Delay Line
7M13	Readout Access Unit
7S11	Accepts Plug-In Sampling Heads
7S12	Time Domain Reflectometer and Sampling Applications
7S14	Dual Trace Delayed Sweep Sampler
7T11	Random or Sequential; equivalent or Real-Time Sampling

STANDARD ACCESSORIES

- 1 ea Operators Manual
- 1 ea Instruction Manual
- 1 ea Gray Faceplate Filter (installed)
- 1 ea Power Cord