

Instructions 2445/2465 RACKMOUNT

INTRODUCTION

DESCRIPTION

The TEKTRONIX 2445 Oscilloscope or the 2465 Oscilloscope can be mounted into a standard 19-inch equipment rack using the 2445/2465 Rack Adapter Kit (Part Number 016-0691-00). Assembling the Rack Adapter Kit and mounting the adapted oscilloscope in accordance with the following instructions allows the instrument to meet the electrical specification as stated in the respective Service Manual and Operators Manual. Changes to the standard instrument's environmental specification are explained in the following paragraphs. Should mounting methods other than those described in these procedures be used, the instrument may not meet the stated environmental characteristics for temperature, vibration, and shock.

Throughout these procedures, the numbered items in parentheses refer to the circled items shown in Figure 8 (exploded view at the rear of these instructions).

ENVIRONMENTAL REQUIREMENTS FOR RACKMOUNTED INSTRUMENTS

With the exception of the following characteristics, the environmental specification listed in the associated Operators and Service Manuals apply to the rack-adapted instrument.

Temperature

Operating

Inside Rack Cabinet -15°C to $+55^{\circ}\text{C}$.

Fan Exhaust

Temperature $\leq +65^{\circ}\text{C}$.

Vibration (operating)

15 minutes along each of three axes at a total displacement of 0.015 inch p-p (2.3 g at 55 Hz), with frequency varied from 10 Hz to 55 Hz in one-minute sweeps. Held 10 minutes at each major resonance or, if none existed, held 10 minutes at 55 Hz (75 minutes total test time).

Shock (operating and nonoperating)

30 g, half-sine, 11-ms duration, three shocks on each face, for a total of 18 shocks.

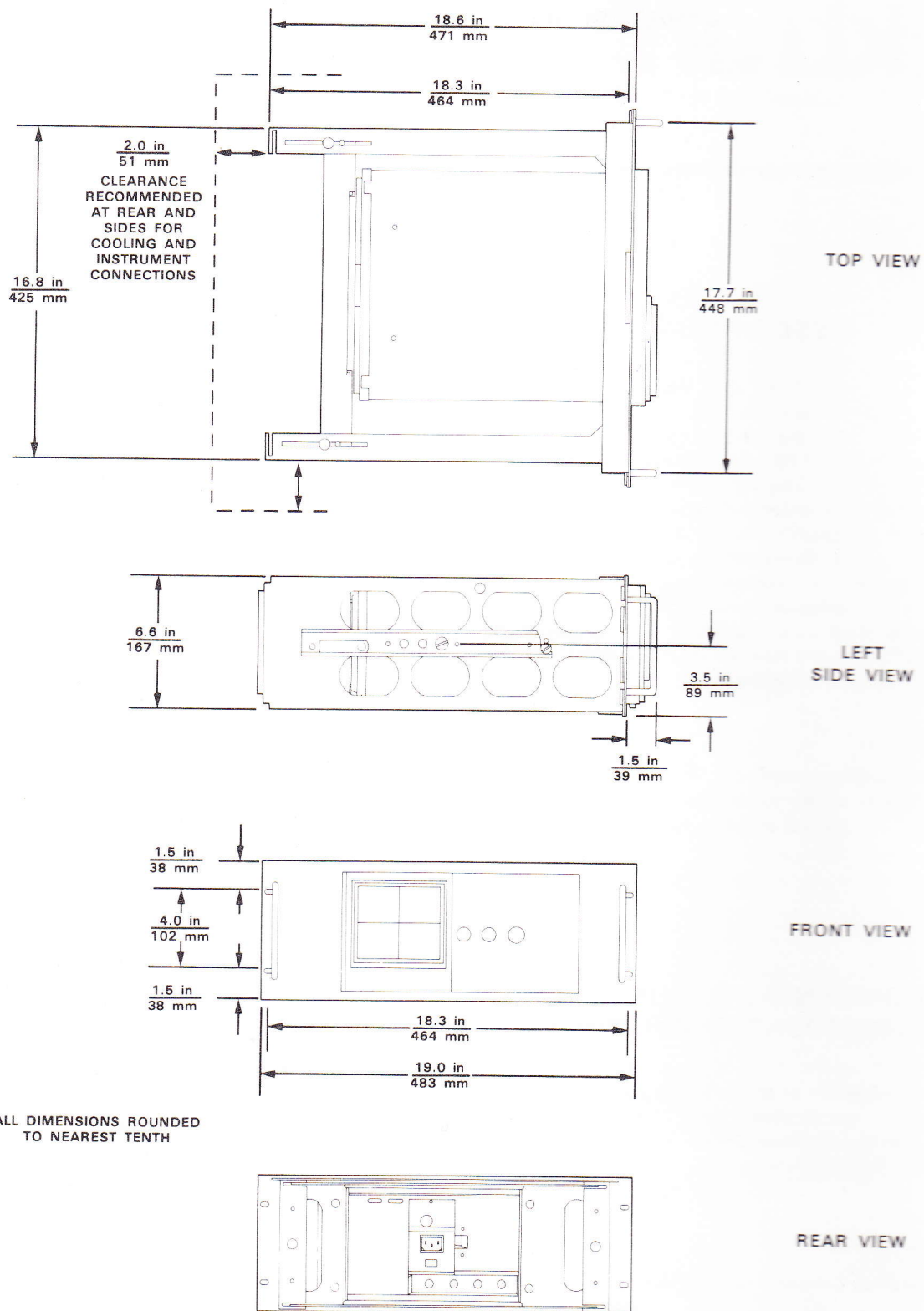
CLEARANCE REQUIREMENTS

The dimensional drawing in Figure 1 illustrates the assembled Rack Adapter and instrument. At least 7 inches (178 mm) of vertical space is required to mount the instrument (with the attached Adapter) into an equipment rack. Minimum width between the left- and right-front rails in the rack must be 17 5/8 inches (448 mm). Total depth of the rack must be at least 20 inches (508 mm). These clearances provide sufficient space for air circulation and accommodation of the power cord and mounting hardware.

TOOLS REQUIRED

The following tools are required to attach the rack-mount adapter and install the rack-adapted instrument into a standard equipment cabinet.

Phillips-head screwdriver
T-15 Torx-head screwdriver
T-20 Torx-head screwdriver
5/16-inch wrench or nut driver
7/16-inch wrench or nut driver
3/32-inch Allen wrench



4366-01

Figure 1. Dimensional drawing of 2445/2465 Rack Adapter.

MOUNTING PROCEDURE

NOTE

If your instrument was purchased in the rackmount configuration (Option 1R), the first steps in the following section were already performed at the factory. Proceed to the section titled "Rear-Panel Cabling."

ATTACHING THE ADAPTER

The rackmounting conversion kit contains the necessary hardware and the directions (this Instruction Sheet) for converting a standard instrument into a rackmounted instrument. Installation of additional cabling and hardware required to route the rear-panel BNC connectors to the rack adapter's front panel is explained in the "Rear-Panel Cabling" description.

To convert the standard instrument to the rack-adapted version, perform the following steps.

NOTE

All parts removed from the instrument in this procedure should be kept. Some of them will be needed to perform this rack conversion, and the remainder will be needed if reversion to a standard instrument configuration is desired at a later time.

1. Disconnect the ac-power cord from the power source and detach it from the instrument.
2. Install the protective front cover on the instrument and place it face down on a smooth work surface.
3. Remove the four torx-head screws retaining the instrument's rear feet and two torx-head screws from the center of the rear cover. Note cabinet and rear-cover orientation, then lift the rear cover from the cabinet.
4. Slide the wrap-around cabinet off the instrument, using care not to pull on any internal instrument wiring.
5. Lay the instrument on its top to gain access to the bottom of the front-panel trim ring and remove the protective front cover.

6. Remove the two center flathead screws from the bottom of the front-panel trim ring (do not remove the recessed screw). Place the instrument in a safe place while continuing with the remaining steps.

7. Remove the two torx-head screws and spring washers retaining the cabinet handle and remove the handle. Also remove the three torx-head screws holding the accessory pouch to the cabinet and remove the pouch.

8. On the rack-adapter chassis, loosen (but don't remove) the four torx-head screws (19) with lock washers (20) and the four torx-head screws (17) with nylon washers (18) holding the rear cabinet support (24) in position. Slide the support to the rear of the rack adapter.

9. Place the rear of the rack adapter on a smooth work surface so the chassis is standing face up.

10. Remove the rubber feet from the instrument's rear cover and place the cover on top of the four spacers (25) on the rear cabinet support (24). Orient the rear cover so that the labels are toward the rear of the rack adapter and the holes for the BNC connectors are toward the bottom.

11. Insert the cabinet into the rack adapter through the top or bottom of the adapter chassis so that it mates with the rear panel as noted in step 3 (cabinet seam should be on the bottom and the handle holes nearest the front).

12. Slide the rear cabinet support (24) forward until approximately 1/4 inch of the cabinet protrudes through the rack adapter's front panel (7).

13. Tighten the four screws (19), two on each side, enough to temporarily hold the rear cabinet support (24) in place.

14. Orient the instrument to mate with the cabinet and rear cover as noted in step 3, then slide the instrument into the wrap-around cabinet, using care not to pull on any internal instrument wiring.

NOTE

Before continuing with the next step, ensure that the EMI gasket is in place between the instrument front panel and chassis and is in contact with the cabinet on all sides.

15. Install the four Phillips-head screws (26) with the four flat washers (27) through the rear support bracket (24), spacers (25), and instrument rear cover into the instrument chassis and tighten.

16. Install the two shorter torx-head screws, removed in step 3, into the two center holes of the rear panel and tighten.

17. Loosen the four screws (19) tightened in step 13 and adjust the rear cabinet support (24) until the two holes in the bottom of the instrument trim ring are aligned with the two holes in the angle bracket (9). Maintain this alignment throughout steps 18 and 19.

18. Install two 6-32 x 0.375-inch torx-head screws (1) into the angle bracket (9) and tighten.

19. Tighten the four screws (19) with lock washers (20) and the four screws (17) with nylon washers (18) while maintaining the alignment obtained in step 17.

NOTE

The setscrews are self locking and require some effort to either tighten or loosen.

20. Install two hex-head setscrews (13) into the top of the adapter frame and tighten to hold the front of the instrument firmly in place. Do not overtighten these screws, as they may bend the cabinet.

REAR-PANEL CABLING

The rear-panel connectors are not readily accessible with the rack-adapted instrument mounted in an equipment rack. If it is desired to bring any of the four rear-panel BNC connectors to the front panel of the rack adapter, some additional hardware must be used. Holes in the rack adapter front panel have been provided for mounting any of the desired BNC-to-BNC adapters and interconnecting cables. Part numbers of the required hardware are given below.

Item	Tektronix Part Number
BNC-to-BNC adapter	103-0070-00
30-inch BNC cable	012-0117-00
Adhesive cable clamp	343-0298-00

The adapters and cables are installed as follows.

1. Remove the plastic plug (6) from the desired mounting hole on the rack adapter's front panel and install the BNC-to-BNC adapter (see Figure 2).

2. Install the nylon channel grommet (28) into the appropriate hole in the rear support channel.

3. Connect one end of the cable into its mating connector on the instrument's rear panel. Route the other end through the plastic grommet and connect it to the front-panel adapter. Peel the backing from an adhesive cable clamp and secure the cable to the rack adapter chassis.

4. Peel the backing from the appropriate identity marker (5) and install it above the front-panel connector.

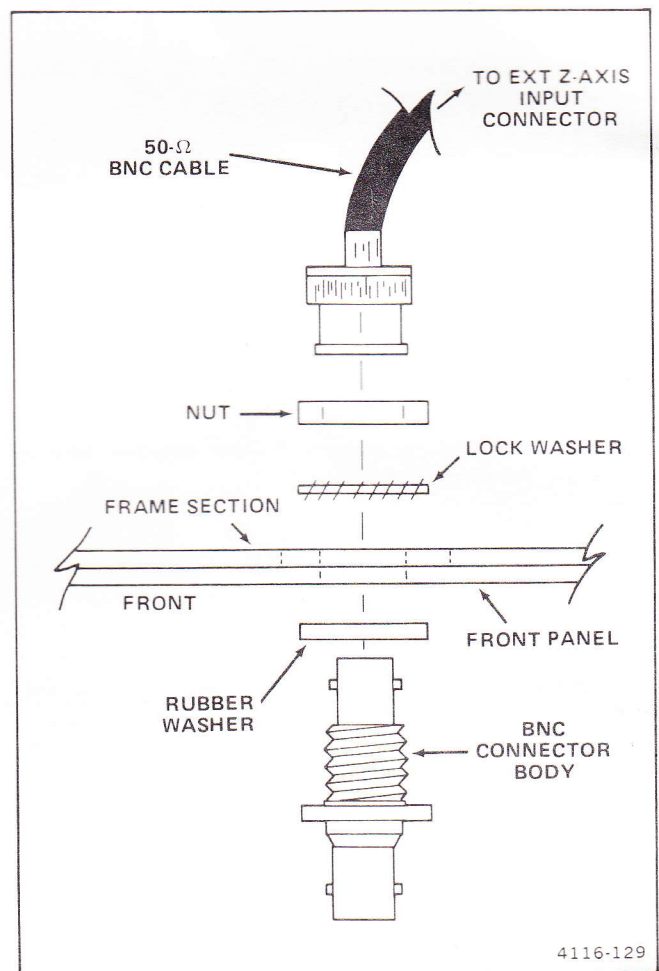


Figure 2. Installing the optional BNC connector(s).

Rack conversion of the instrument is now complete. To install the converted instrument into a standard 19-inch rack, use the following procedure.

INSTALLING THE RACK-ADAPTED INSTRUMENT

NOTE

In an environment where the rack-adapted instrument will be subject to severe vibration and shock, the optional rear-support kit (Tektronix Part Number 016-0096-00) must be used.

The slide-out tracks permit the rack-adapted 2445 or 2465 to be extended out of the rack for rear-panel and connector maintenance without removing the instrument from the rack. When the tracks are fully extended, the instrument may be tilted up for easier access to the rear-panel connectors. To operate the oscilloscope in the extended position, be sure the power cord and any inter-connecting cables are long enough for this type of use.

WARNING

During rackmount installation, interchanging the left and right slide-out track assemblies defeats the extension stop (safety latch) feature of the tracks. Equipment could, when extended, come out of the slides and fall from the rack, possibly causing personal injury and equipment damage.

To install the rack-adapted instrument into a standard 19-inch rack using the optional rear-support kit, perform the following.

NOTE

The rack hardware kit contains hardware needed for mounting the instrument in several configurations. All of the hardware in the kit will not be needed.

1. Select the appropriate front-rail mounting holes on the equipment rack cabinet, verifying the 7-inch (178 mm) vertical clearance requirements as shown in Figure 3.

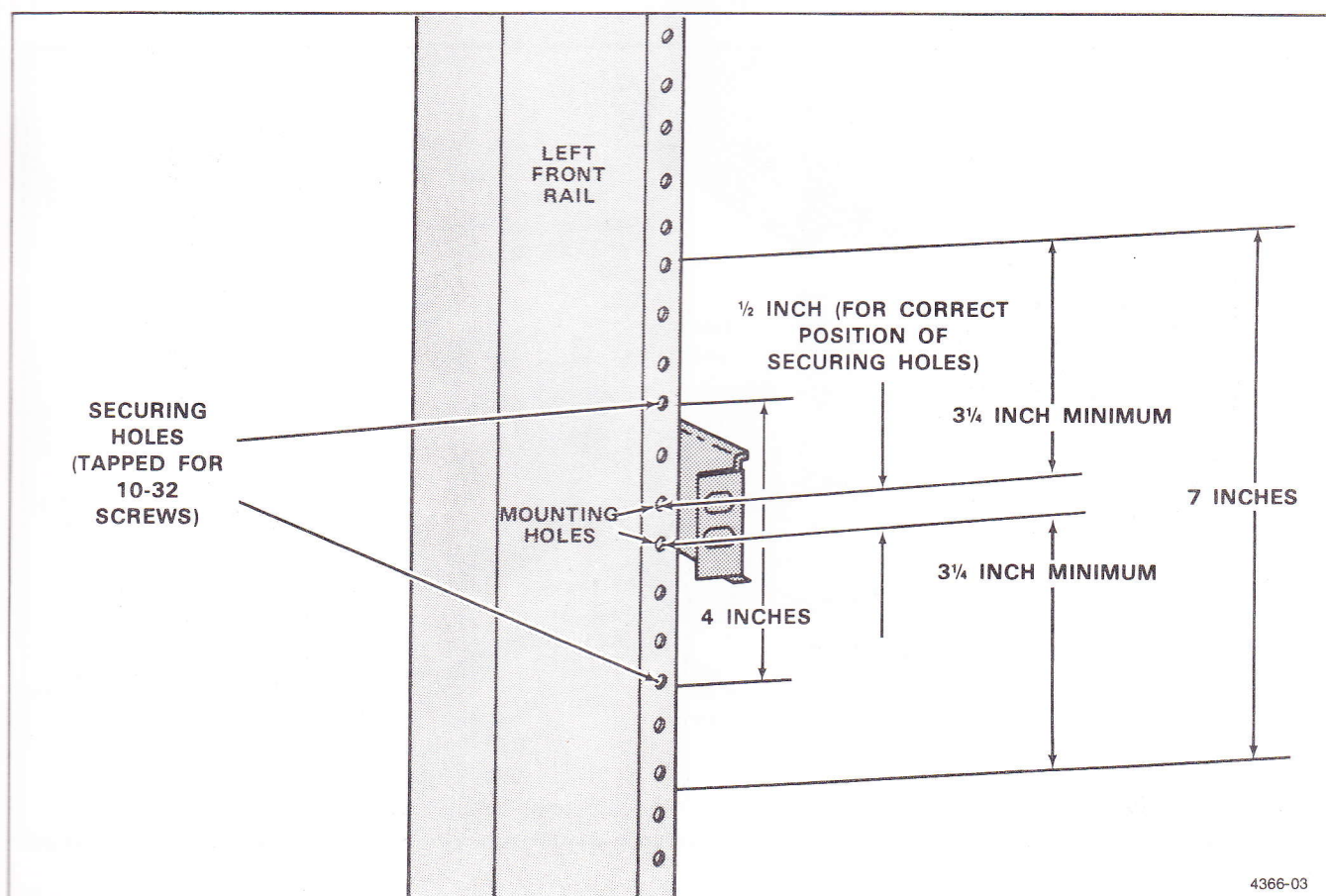


Figure 3. Locating mounting holes for the stationary sections.

2. If the mounting flanges of the stationary section are to be mounted in front of the front rails, attach as shown in Figure 4A. If the mounting flanges are to be mounted behind the front rails, attach them using the bar nuts as shown in Figure 4B.

NOTE

The holes in the spacer block (Figure 5) are not centered. The spacer blocks must be mounted with their narrow edges toward the front of the rack. This allows the instrument to slide fully into the rack.

3. Attach an angle bracket to each of the rear rails by inserting the mounting bolts through the angle brackets, spacer blocks, stationary sections of the slide-out tracks, and into the rear-support members of the rack cabinet, assembling the parts as shown in Figure 5. The bolts should be fully inserted and lightly seated, but not tightened at this time.

4. Attach the support pins to the angle brackets as shown in Figure 5, temporarily leaving out the spacers between the neoprene support washers and flat washers.

5. Install a support block on each rear corner of the rack-adaptor chassis.

6. If you desire to let the instrument tilt up as shown in Figure 6 (for maintenance purposes), remove the swivel retaining screw from the rear of each chassis rail before performing the next step. Figure 7 illustrates the location of the swivel retaining screw in the chassis rails.

7. Insert the slide-out tracks attached to the rack-adaptor chassis into the stationary tracks mounted in the rack cabinet. Slide the rack-adapted instrument fully into the rack cabinet.

NOTE

Do not install the power cord or front-panel-securing screws until steps 8 through 13 have been performed.

8. With the instrument pushed all the way into the rack, adjust the angle brackets at the rear of the instrument until the neoprene washers on the support pins are firmly seated against the support blocks at the rear of the instrument.

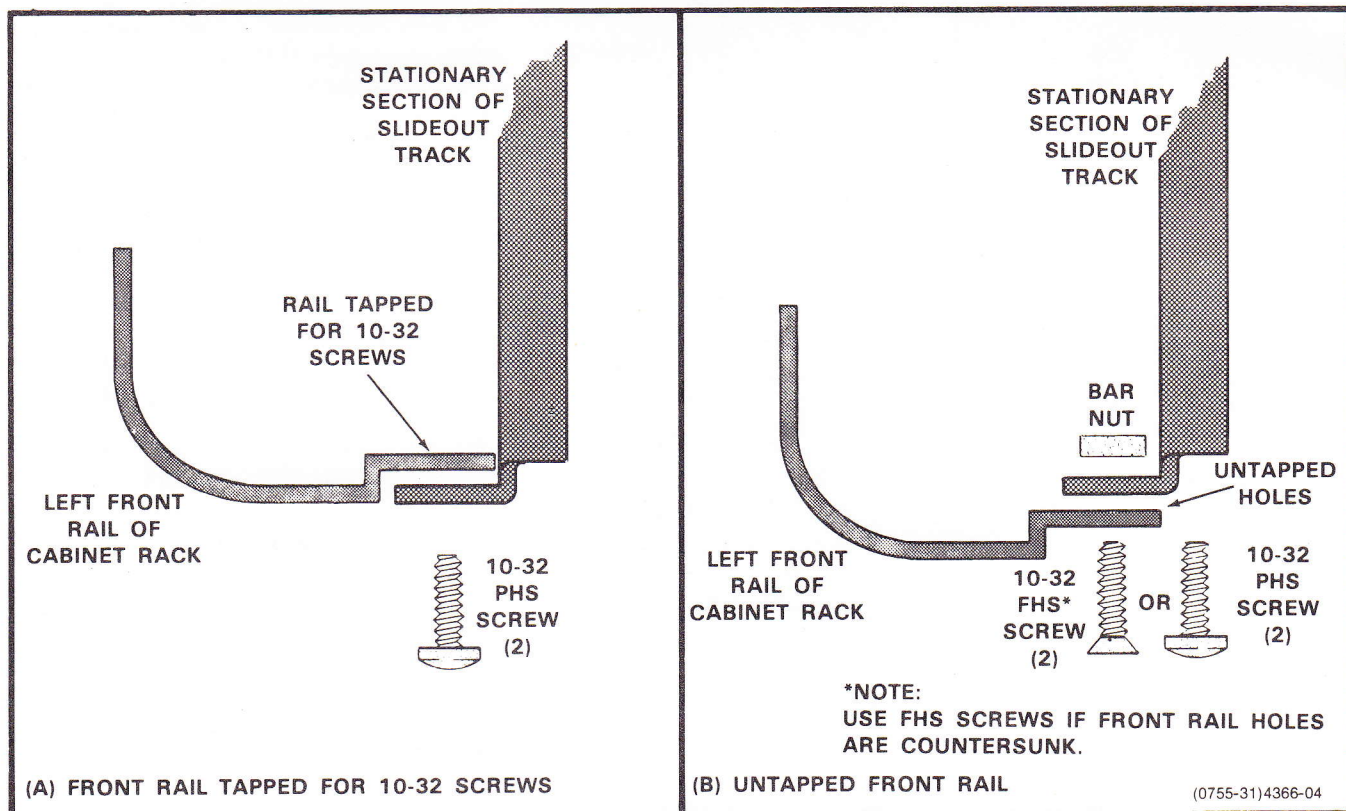


Figure 4. Methods of mounting the stationary sections to the front rails.

9. Tighten the rear mounting bolts; then pull the instrument partially out of the rack.

10. Remove the neoprene washers, install spacers on the support pins, and reinstall the neoprene washers.

11. Position the instrument so the pivot screws are approximately even with the front rails.

12. Loosen the mounting screws at the front of both stationary track sections (the two screws attached to each front rail of the cabinet) and allow the tracks to seek their normal positions.

13. Retighten the screws and push the instrument all the way into the rack. If the tracks do not slide smoothly, recheck track alignment as set in steps 8 through 13.

14. Attach the power cord and any other cabling to the rear of the instrument.

15. With the instrument pushed all the way into the rack cabinet, install and tighten the mounting screws at the four corners of the rack adapter's front panel.

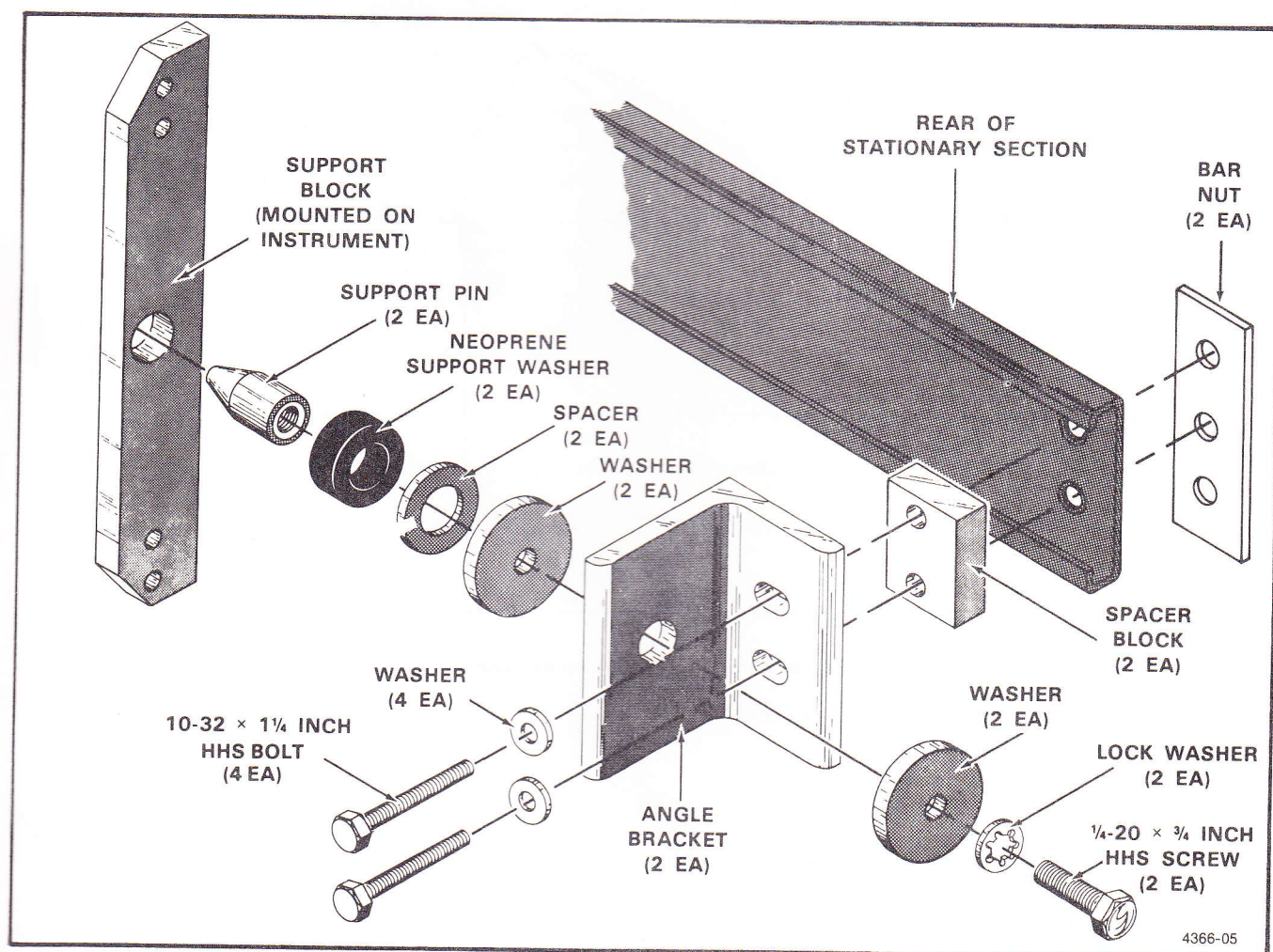


Figure 5. Rear support kit.

ALTERNATE MOUNTING METHOD

CAUTION

Although the following method provides satisfactory mounting under normal conditions, it does not provide solid support at the rear of the instrument. Should the instrument be subjected to severe shock or vibration when mounted in the following manner, it may be damaged.

The rear-support extension brackets supplied with the rack-adapter chassis tracks (30) allow the rack-adapted instrument to be mounted in equipment cabinets having front-to-rear rail spacings between 14 inches and 26 inches. Depending on how the rear-support brackets are attached to the cabinet's rear rail, mounting points for the rear of the stationary track (30) can be provided either in front of or behind the rear cabinet rail. The rear-support kit cannot be properly used with this type of installation.

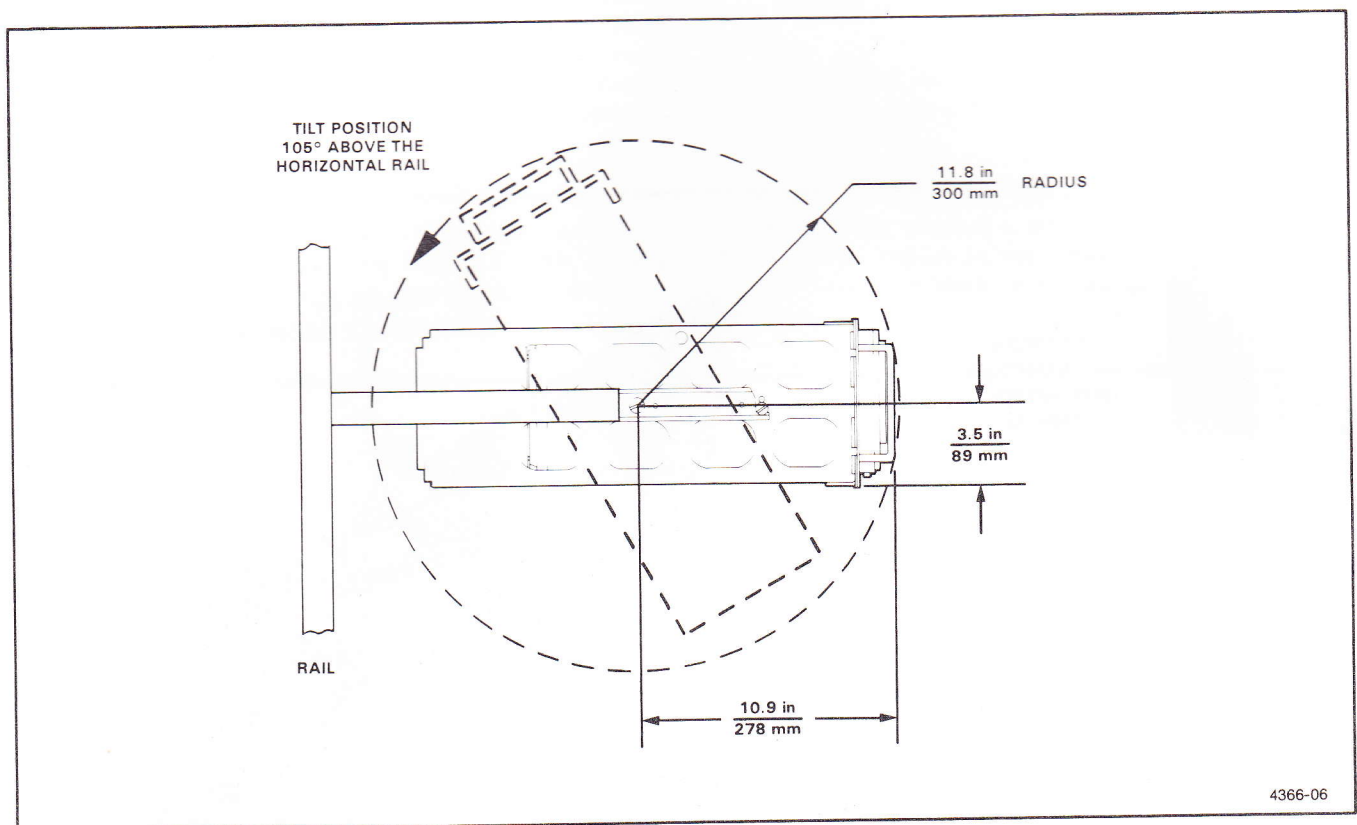


Figure 6. Tilting the rack-adapted instrument.

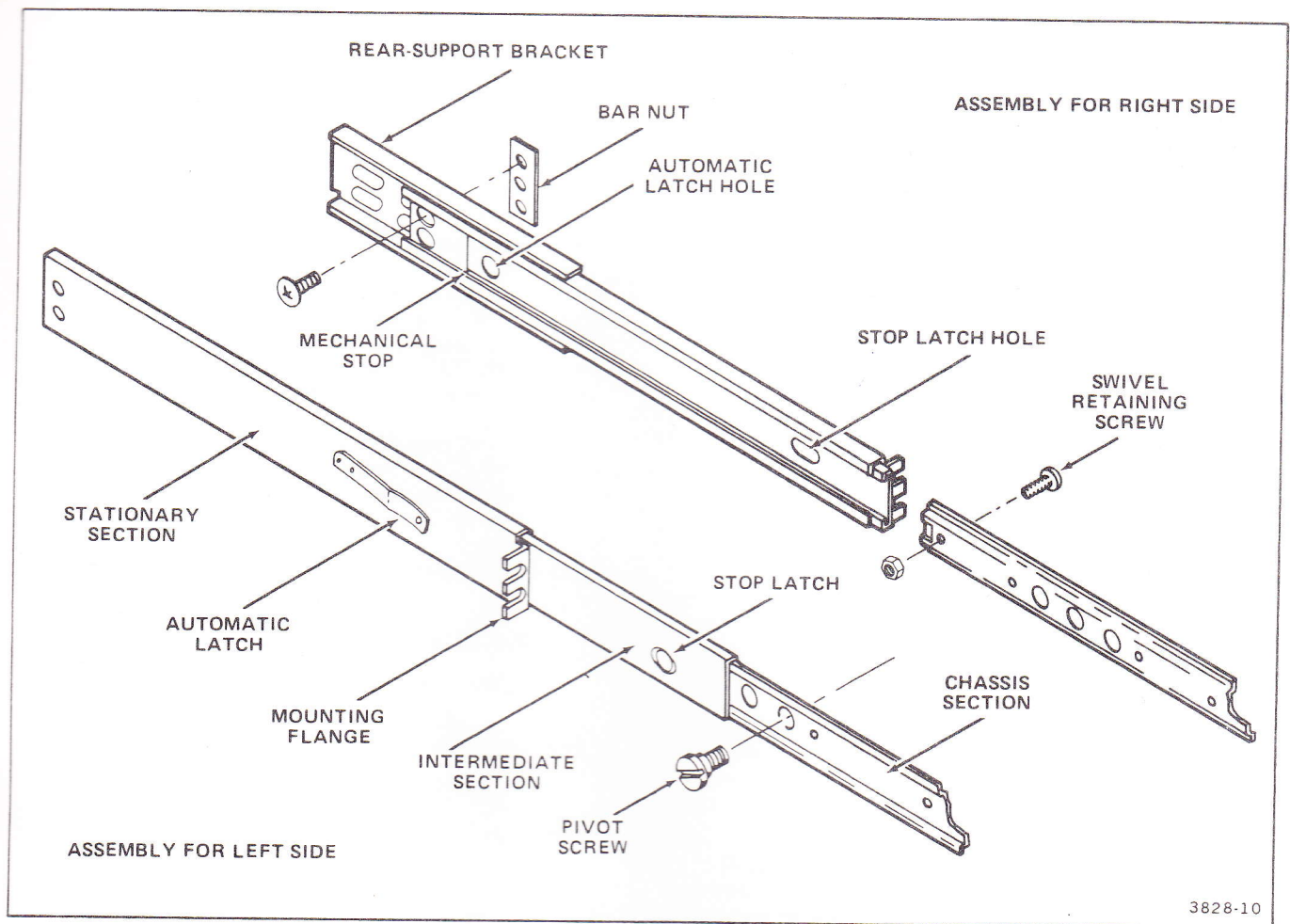


Figure 7. Slide-out track assembly.

REPLACEABLE MECHANICAL PARTS

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

SPECIAL NOTES AND SYMBOLS

X000 Part first added at this serial number

00X Part removed after this serial number

FIGURE AND INDEX NUMBERS

Items in this section are referenced by figure and index numbers to the illustrations.

INDENTATION SYSTEM

This mechanical parts list is indented to indicate item relationships. Following is an example of the indentation system used in the description column.

```

1 2 3 4 5
Name & Description
Assembly and/or Component
Attaching parts for Assembly and/or Component
    ---*---
Detail Part of Assembly and/or Component
Attaching parts for Detail Part
    ---*---
Parts of Detail Part
Attaching parts for Parts of Detail Part
    ---*---
  
```

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation. The separation symbol ---*--- indicates the end of attaching parts.

Attaching parts must be purchased separately, unless otherwise specified.

ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

ABBREVIATIONS

#	INCH	ELECTRN	ELECTRON	IN	INCH	SE	SINGLE END
ACTR	NUMBER SIZE	ELEC	ELECTRICAL	INCAND	INCANDESCENT	SECT	SECTION
ADPTR	ACTUATOR	ELECTLT	ELECTROLYTIC	INSUL	INSULATOR	SEMICON	SEMICONDUCTOR
ALIGN	ADAPTER	ELEM	ELEMENT	INTL	INTERNAL	SHLD	SHIELD
AL	ALIGNMENT	EPL	ELECTRICAL PARTS LIST	LPHLDR	LAMPHOLDER	SHLDR	SHOULDERED
ASSEM	ALUMINUM	EOPT	EQUIPMENT	MACH	MACHINE	SKT	SOCKET
ASSY	ASSEMBLED	EXT	EXTERNAL	MECH	MECHANICAL	SL	SLIDE
ATTEN	ASSEMBLY	FIL	FILLISTER HEAD	MTG	MOUNTING	SLFLKG	SELF-LOCKING
AWG	ATTENUATOR	FLEX	FLEXIBLE	NIP	NIPPLE	SLVG	SLEEVEING
BD	AMERICAN WIRE GAGE	FLH	FLAT HEAD	NON WIRE	NOT WIRE WOUND	SPR	SPRING
BRKT	BOARD	FLTR	FILTER	OBD	ORDER BY DESCRIPTION	SQ	SQUARE
BRS	BRACKET	FR	FRAME or FRONT	OD	OUTSIDE DIAMETER	SST	STAINLESS STEEL
BRZ	BRASS	FSTNR	FASTENER	OVH	OVAL HEAD	STL	STEEL
BSHG	BRONZE	FT	FOOT	PH BRZ	PHOSPHOR BRONZE	SW	SWITCH
CAB	BUSHING	FXD	FIXED	PL	PLAIN or PLATE	T	TUBE
CAP	CABINET	GSKT	GASKET	PLSTC	PLASTIC	TERM	TERMINAL
CER	CAPACITOR	HDL	HANDLE	PN	PART NUMBER	THD	THREAD
CHAS	CERAMIC	HEX	HEXAGON	PNH	PAN HEAD	THK	THICK
CKT	CHASSIS	HEX HD	HEXAGON HEAD	PWR	POWER	TNSN	TENSION
COMP	CIRCUIT	HEX SOC	HEXAGONAL SOCKET	RCPT	RECEPTACLE	TPG	TAPPING
CONN	COMPOSITION	HLCPS	HELICAL COMPRESSION	RES	RESISTOR	TRH	TRUSS HEAD
COV	CONNECTOR	HLEXT	HELICAL EXTENSION	RGD	RIGID	V	VOLTAGE
CPLG	COVER	HV	HIGH VOLTAGE	RLF	RELIEF	VAR	VARIABLE
DEG	COUPLING	IC	INTEGRATED CIRCUIT	RTNR	RETAINER	W	WITH
DWR	CATHODE RAY TUBE	ID	INSIDE DIAMETER	SCH	SOCKET HEAD	WSHR	WASHER
	DEGREE	IDNT	IDENTIFICATION	SCOPE	OSCILLOSCOPE	XFMR	TRANSFORMER
	DRAWER	IMPLR	IMPELLER	SCR	SCREW	XSTR	TRANSISTOR

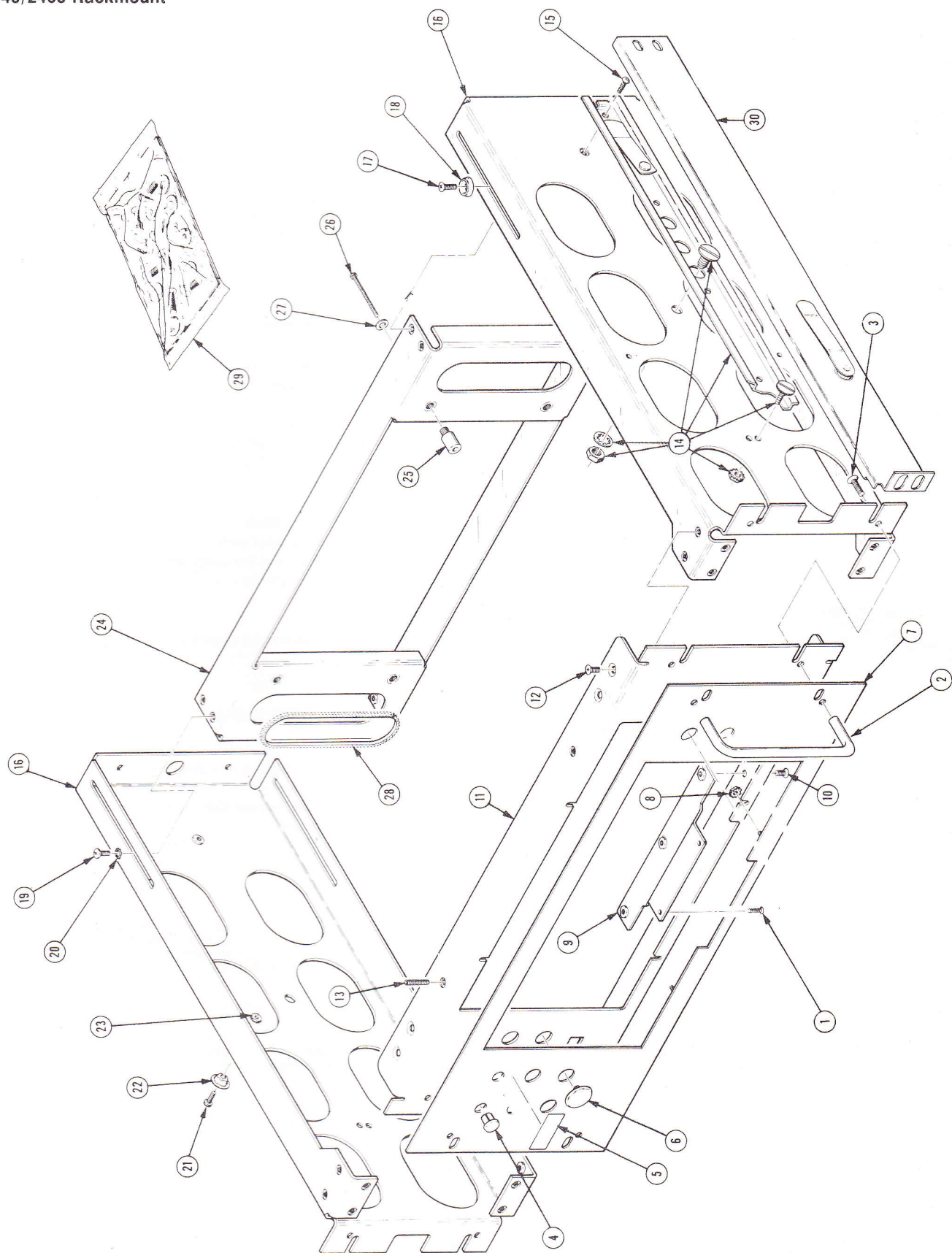


Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-	016-0691-00		1		RACK MOUNT KIT:2445/2465 ***** (ATTACHING PARTS) *****	80009	016-0691-00
-1	211-0721-00 -----		2		SCREW,MACHINE:6-32 X 0.375,PNH,TORX (ATTACHES RM KIT TO EXISTING RACK) ***** (END ATTACHING PARTS) *****	93907	OBD
-2	367-0022-00		2		HANDLE,BOW:1.5 X 4.5 INCH ***** (ATTACHING PARTS) *****	06540	10353-B-1032-25A
-3	212-0671-00		4		SCREW,MACHINE:10-32 X 0.625 ,FLH,100 DEG ***** (END ATTACHING PARTS) *****	93907	OBD
-4	214-3405-01		2		PLUG,HOLE:0.47 DIS,ACETAL		
-5	334-4866-00		1		MKR SET,IDENT:2465 OPT 1R	80009	334-4866-00
-6	134-0144-01		6		BUTTON,PLUG:0.875 OD X 0.08,SMOKE TAN	80009	134-0144-01
-7	333-2934-00		1		PANEL,FRONT: ***** (ATTACHING PARTS) *****	80009	333-2934-00
-8	210-0586-00		4		NUT,PLASSEM WA:4.40 X 0.25,STL ***** (END ATTACHING PARTS) *****	83385	OBD
-9	407-2887-00		1		BRKT,DBL ANGLE:UPPER & LOWER,FRAME PANEL ***** (ATTACHING PARTS) *****	80009	407-2887-00
-10	212-0159-00		3		SCREW,MACHINE:8-32 X 0.375,FLH,100 DEG ***** (END ATTACHING PARTS) *****	93907	OBD
-11	426-1893-00		1		FRAME PANEL,CAB:FRONT ***** (ATTACHING PARTS) *****	80009	426-1893-00
-12	212-0159-00		8		SCREW,MACHINE:8-32 X 0.375,FLH,100 DEG ***** (END ATTACHING PARTS) *****	93907	OBD
-13	213-0921-00		2		SCREW,MACHINE:10-32 X 0.625,HEX SCH,NYLON	000KH	213-0921-00
-14	351-0104-00		PR		SLIDE SECT,DWR:12.625 X 2.25 ***** (ATTACHING PARTS) *****	06666	C-1353
-15	212-0158-00		6		SCREW,MACHINE:8-32 X 0.375,PNH,TORX ***** (END ATTACHING PARTS) *****	93907	OBD
-16	426-1900-00		2		FRAME SECT,CAB.:RIGHT & LEFT ***** (ATTACHING PARTS) *****	80009	426-1900-00
-17	212-0157-00		4		SCREW,MACHINE:8-32 X 0.5,FLH,100 DEG,TORX	93907	OBD
-18	210-1143-00		4		WASHER,FNSH:FOR #8 FH SCREW,NYLON	0000Q	198-NN-0205
-19	212-0004-00		2		SCREW,MACHINE:8-32 X 0.312 INCH,PNH STL	83385	OBD
-20	210-0007-00		4		WASHER,LOCK:#8 EXT,0.02 THK,STL CD PL ***** (END ATTACHING PARTS) *****	78189	1108-00-00-0541C
-21	211-0721-00		2		SCREW,MACHINE:6-32 X 0.375,PNH,TORX	93907	OBD
-22	210-0808-00		2		EYELET,METALLIC:CENTERING	63743	25151.13-3
-23	210-0457-00		2		NUT,PLASSEM WA:6-32 X 0.312,STL CD PL	83385	OBD
-24	386-4821-00		1		SUPPORT,CABINET:REAR	80009	386-4821-00
-25	361-1177-00		4		SPACER,SLEEVE:0.46 L X 0.188 ID,AL ***** (ATTACHING PARTS) *****	80009	361-1177-00
-26	212-0037-00		4		SCREW,MACHINE:8-32 X 1.75 INCH,FILH,STL	83385	OBD
-27	210-0804-00		4		WASHER,FLAT:0.17 ID X 0.375 INCH OD,STL ***** (END ATTACHING PARTS) *****	12327	OBD
-28	255-0334-00		2		PLASTIC CHANNEL:12.75 X 0.175 X 0.155,NYL	11897	122-37-2500
-29	016-0099-00		1		HDW KIT,ELEK EQ:RACKMOUNT HDW	80009	016-0099-00
STANDARD ACCESSORIES							
-30	351-0241-00		PR		SLIDE,DWR,EXT:PAIR	80009	351-0241-00
	070-4366-00		1		SHEET,TECHNICAL:INSTR,016-0691-00 RACK	80009	070-4366-00
	016-0521-00		1		POUCH,ACCESSORY:	05006	OBD
OPTIONAL ACCESSORIES							
	016-0096-00		-		HDW KIT,ELEK EQ:RACKMOUNTING	80009	016-0096-00
	020-0104-00		-		ACCESSORY KIT:1R PROBE POWER	80009	020-0104-00
	-----		-		(2465 ONLY)		

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
0000Q	PLASLIGLIDE MANUFACTURING	2701 W EL SEGUNDO	HAWTHORNE, CA 90250
000KH	LEXINGTON CO.	PO BOX 66T	EDEN, NY 14057
05006	TWENTIETH CENTURY PLASTICS, INC.	415 E WASHINGTON BLVD.	LOS ANGELES, CA 90015
06540	AMATOM ELECTRONIC HARDWARE, DIV. OF MITE CORP.	446 BLAKE ST.	NEW HAVEN, CT 06515
06666	GENERAL DEVICES CO., INC.	525 S. WEBSTER AVE.	INDIANAPOLIS, IN 46219
11897	PLASTIGLIDE MFG. CORPORATION	P O BOX 867, 1757 STANFORD ST.	SANTA MONICA, CA 90406
12327	FREEWAY CORPORATION	9301 ALLEN DRIVE	CLEVELAND, OH 44125
63743	WARD LEONARD ELECTRIC CO., INC.	31 SOUTH ST.	MOUNT VERNON, NY 10550
78189	ILLINOIS TOOL WORKS, INC. SHAKEPROOF DIVISION	ST. CHARLES ROAD	ELGIN, IL 60120
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153
93907	TEXTRON INC. CAMCAR DIV	600 18TH AVE	ROCKFORD, IL 61101