MANUAL CHANGE INFORMATION

At Tektronix, we continually strive to keep up with latest electronicdevelopments by adding circuit and component improvements to our instruments as soon as they are developed and tested.

Sometimes, due to printing and shipping requirements, we can't get these changes immediately into printed manuals. Hence, your manual may contain new change information on following pages.

A single change may affect several sections. Since the change information sheets are carried in the manual until all changes are permanently entered, some duplication may occur. If no such change pages appear following this page, your manual is correct as printed.

Tektronix®
COMMITTED TO EXCELLENCE

MANUAL CHANGE INFORMATION

Date: 2-16-83 Change Reference: M50226

Product: 2213, 2215, 2235, 2236 Manual Part No.: See Below

DESCRIPTION

2213 (070-3827-00)—B029390

2215 (070-3826-00)—B031640

2235 (070-4206-00)—B010380

2236 (070-4204-00)—B010550

REPLACEABLE ELECTRICAL PARTS LIST CHANGES

2213, 2215

CHANGE TO:

A10T940	120-1348-01	XFMR,PWR,SDN&SU: HIGH VOLTAGE

2235, 2236

CHANGE TO:

A1T948	120-1348-01	XFMR,PWR,SDN&SU: HIGH VOLTAGE

Tektronix
COMMITTED TO EXCELLENCE

MANUAL CHANGE INFORMATION

Date: 8-22-83 Change Reference: C2/0883

Product: 2235 SERVICE Manual Part No.: 070-4206-00

DESCRIPTION **PG 46**

TEXTCHANGES

(EFFECTIVE ALL SERIAL NUMBERS)

Page 5-5 STEP 4 Adjust Astigmatism (R874).

Change part b. to read as follows:

b. Connect the leveled sine-wave generator output via a 50-R cable and a 50-Ω termination to the CH 1 OR X input connector.

REPLACEABLE ELECTRICAL PARTS LIST CHANGES

(SEE BELOW FOR EFFECTIVE SERIAL NUMBERS)

CHANGE TO:

Al C785	ALL SN's	261-0214-00	CAP,VAR,CER DI: 0.5-3PF,400V	PC9
A1R122	B010450	315-0620-00	RES,FXD,CMPSN: 62 OHM,5%,0.25W	PC16
A1R172	8010450	315-0820-00	RES,FXD,CMPSN: 62 OHM,5%,0.25W	PC16
Al R317	8010450	321-0218-00	RES,FXD,CMPSN: 1.82K OHM,1%,0.125W	PC16
Al R318	8010450	321-0193-00	RES,FXD,CMPSN: 1K OHM,1%,0.125W	PC16
A1R319	B010450	321-0212-00	RES,FXD,CMPSN: 1.58K OHM,1%,0.125W	PC16
Al R322	8010450	321-0238-00	RES,FXD,CMPSN: 2.94K OHM,1%,0.125W	PC16
Al R342	B010450	321-0218-00	RES,FXD,CMPSN: 1.82K OHM,1%,0.125W	PC16
Al R343	B010450	321-0193-00	RES,FXD,CMPSN: 1K OHM,1%,0.125W	PC16
Al R344	B010450	321-0212-00	RES,FXD,CMPSN: 1.58K OHM,1%,0.125W	PC16
Al R347	B010450	321-0238-00	RES,FXD,CMPSN: 2.94K OHM,1%,0.125W	PC16
Al R352	8010450	321-0274-00	RES,FXD,CMPSN: 6.98K OHM,1%,0.125W	PC16
Al R353	8010450	321-0274-00	RES,FXD,CMPSN: 6.98K OHM,1%,0.125W	PC16

ADD:

A1C500	ALL SN's	281-0893-00	CAP,FXD,CER DI: 4.7PF, ±0.5PF,100V	PC11
Al R354	B010450	315-0272-00	RES,FXD,CMPSN: 2.7K OHM,5%,0.25W	PC16
Al R500	ALL SN's	315-0101-00	RES,FXD,CMPSN: 100 OHM,5%,0.25W	PC11
A3R201	ALL SN's	315-0200-00	RES,FXD,CMPSN: 20 OHM,5%,0.25W	PC13
A3R401	ALL SN's	315-0200-00	RES,FXD,CMPSN: 20 OHM,5%,0.25W	PC10

CHASSIS PARTS LIST CHANGES

(SEE BELOW FOR EFFECTIVE SERIAL NUMBERS)

ADD:

R909	B010395	315-0390-00	RES,FXD,CMPSN: 39 OHM,5%,0.25W	PC17

DIAGRAM CHANGES

(SEE BELOW FOR EFFECTIVE SERIAL NUMBERS)

DIAGRAM 02 VERTICAL PREAMP AND OUTPUT AMPL

Change R122 (location 3E) and R172 (location 9E) to 62 ohm resistors — 8010450 — PC16

Disconnect pin 1 from ground on S200 (location 6A) and S226 (location 3K). These two pins are then connected together and R201 (20Ω) is added from this connection to ground. — ALL SN's — PC13

DESCRIPTION

DIAGRAM CHANGES (cont)

(SEE BELOW FOR EFFECTIVE SERIAL NUMBERS)

DIAGRAM 3 TRIGGERING

Change R352 (location 2K) and R353 (location 2K) to 6.98K ohm resistors.	8010450	PC16
Change R322 (location 3J) and R347 (location 6J) to 2.94K ohm resistors.	B010450	PC16
Change R319 (location 2H) and R344 (location 5J) to 1.58K ohm resistors.	B010450	PC16
Change R318 (location 1G) and R343 (location 3G) to 1.0K ohm resistors.	B010450	PC16
Change R317 (location 1F) and R342 (location 3F) to 1.82K ohm resistors.	8010450	PC16
Add R354 (2.7K ohm) from the junction of pins 9 and 14 of U350 (location approximately 3K) to -6.6 V_{C1}.	8010450	PC16

DIAGRAM 4 A SWEEP GENERATOR & LOGIC

Disconnect pin 4 from ground on S401B (location 8A) and add R401 (20 ohm) from pin 4 to ground.	ALL SN's	PC10
Add C500 (4.7pF) & R500 (100Ω) to U502 as shown below.	ALL SN's	PC20

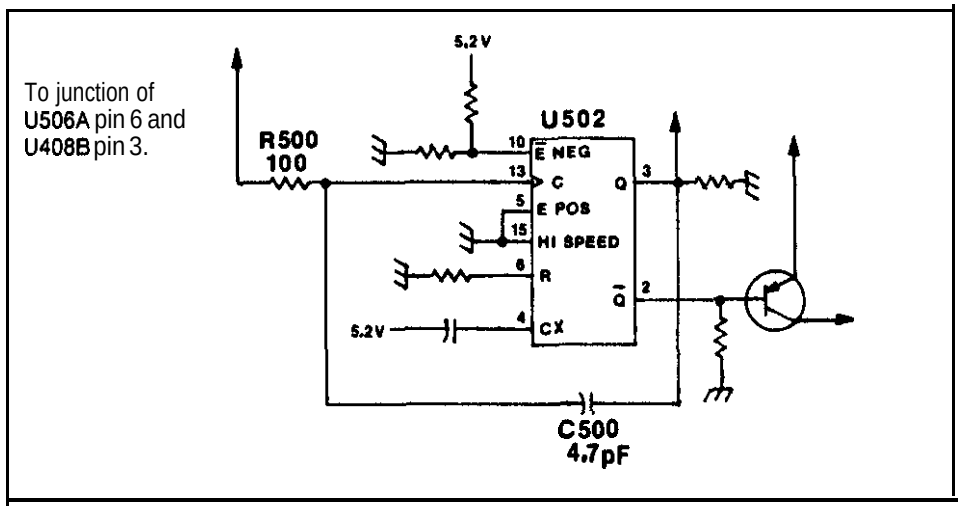
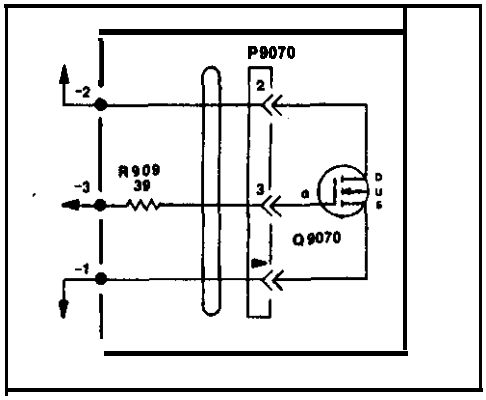


DIAGRAM 7 POWER SUPPLY, Z-AXIS AND CRT

Add R909 (39 ohm) at location 8H as shown below.	6010395	PC17



Tektronix®
COMMITTED TO EXCELLENCE

MANUAL CHANGE INFORMATION

Date: 12-15-83 Change Reference: C3/1283

Product: 2235 SERVICE Manual Part No.: 070-4206-00

DESCRIPTION PG 46

TEXT CHANGES

THIS IS A PAGE PULL AND REPLACEMENT PACKAGE.

1. Remove the designated pages from your manual and insert the attached pages.
2. Keep this cover sheet in the Change Information Section at the back of your manual for permanent record.

REMOVE THE FOLLOWING PAGES AND REPLACE THEM WITH THE ATTACHED PAGES:

Pages iii and iv, 1-1 and 1-2, 1-9 and 1-10.

Tektronix®

COMMITTED TO EXCELLENCE

WARNING

THE" FOLLOWING SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO. REFER TO OPERATORS SAFETY SUMMARY AND SERVICE SAFETY SUMMARY PRIOR TO PERFORMING ANY SERVICE.

Tektronix
National Marketing Center
for Product Order Information, call
1-800-426-2200 ext 41
In Oregon call collect (503)627-9000 ext 41
Tektronix National Marketing Center
P.O. Box 500 D/S Y6-088, Beaverton, OR 87077

PLEASE CHECK FOR CHANGE INFORMATION AT THE REAR OF THIS MANUAL.

2235

OSCILLOSCOPE

SERVICE

INSTRUCTION MANUAL

Tektronix, Inc.
P.O. Box 500
Beaverton, Oregon 97077

Serial Number _____

070-4206-00
Product Group 46

First Printing DEC 1962
Revised DEC 1963

INSTRUMENT SERIAL NUMBERS

Each instrument has a serial number on a panel insert, tag, or stamped on the chassis. The first number or letter designates the country of manufacture. The last five digits of the serial number are assigned sequentially and are unique to each instrument. Those manufactured in the United States have six unique digits. The country of manufacture is identified as follows:

6000000	Tektronix, Inc., Beaverton, Oregon, USA
100000	Tektronix Guernsey, Ltd., Channel Islands
200000	Tektronix United Kingdom. Ltd., London
300000	Sony/Tektronix, Japan
700000	Tektronix Holland, NV, Heerenveen, The Netherlands

LIST OF ILLUSTRATIONS

LIST OF TABLES

OPERATORS SAFETY SUMMARY

The general safety information in this part of the summary is for both operating and servicing personnel. Specific warnings and cautions will be found throughout the manual where they apply and do 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.

Terms as Marked on Equipment

CAUTION indicates a personal injury hazard not immediately accessible as one reads the markings, 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. For maximum input voltage see Table l-l.

Symbols as Marked on Equipment

DANGER – High voltage.

Protective ground (earth) terminal.

A

ATTENTION – Refer to manual.

Power Source

This product is intended to operate from a power source that does 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 receptable 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.

Danger Arising From Loss of Ground

Upon loss of the protective-ground connection, all accessible conductive parts (including knobs and controls that may appear to be insulating) can render an electric shock.

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.

For detailed information on power cords and connectors see Figure 2-l.

Use the Proper Fuse

To avoid fire hazard, use only a fuse of the correct type. voltage rating and current rating as specified in the parts list for your product.

Do Not Operate in Explosive Atmospheres

To avoid explosion, do not operate this product in an explosive atmosphere 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.

SPECIFICATION

INTRODUCTION

The TEKTRONIX 2235 oscilloscope is a rugged, lightweight, dual-channel, 100-MHz instrument that features a bright, sharply defined trace on an 80- by 100-mm cathode ray tube (crt). Its vertical system provides Calibrated deflection factors from 2 mV per division to 5 V per division. Trigger circuits enable stable triggering over the full bandwidth of the vertical system. The horizontal system provides calibrated sweep speeds from 0.5 s per division to 50 ns per division along with delayed-sweep features for accurate relative-time measurements. A X10 magnifier extends the maximum sweep speed to 5 ns per division.

ACCESSORIES

The instrument is shipped with the following standard accessories:

1 Operators Manual	2 Probe packages
	1 Power Cord

For part numbers and information about instrument accessories, refer to the tabbed "Accessories" part of the Replaceable Mechanical Parts section in the back of this manual.

The service manual and all other optional accessories are orderable from Tektronix, Inc. A local Tektronix Field Office, representative, or the Tektronix product catalog can provide ordering and product information.

PERFORMANCE CONDITIONS

The following electrical characteristics (Table I-l) are valid for the 2235 when it has been adjusted at an ambient temperature between +20°C and +30°C, has had a warm-up period of at least 20 minutes, and is operating at an ambient temperature between 0°C and +50°C (unless otherwise noted).

Items listed in the "Performance Requirements" column are verifiable qualitative or quantitative limits, while items listed in the "Supplemental Information" column are either explanatory notes, 'calibration setup descriptions, performance characteristics for which no absolute limits are specified, or characteristics that are impractical to check.

Environmental characteristics are given in Table I-2. The 2235 meets the requirements of MIL-T-28800C, paragraphs 4.5.5.1.3. 4.5.5.1.4, and 4.5.5.1.2.2 for Type III, Class 5 equipment, except where otherwise noted.

Physical characteristics of the instrument are listed in Table I-3.

Table 1-1
Electrical Characteristics

Charecterirtics	Performance Requirements	Supplemental Information
VERTICAL DEFLECTION SYSTEM		
Deflection Factor Range	2 mV per division to 5 V per division in a 1-2-5 sequence	5 mV per division to 5 V per division gain is adjusted with VOLTS/DIV switch set to 10 mV per division. 2 mV per division gain is adjusted with VOLTS/DIV switch set to 2 mV per division
Accuracy +15°C to +35°C	±2%.	
0°C to +50°C	±3%.[a]	
Range of VOLTS/DIV Variable Control	Continuously variable between settings. Increases deflection factor by at least 2.5 to 1.	
Step Response Rise Time 0°C to +35°C 5 mV per Division to 5 V per Division	3.5 ns or less.8	Rise time is calculated from the formula: $\frac{0.35}{\text{Bandwidth (-3 dB)}}$
2 mV per Division	3.9 ns or less.0	
+35°C to +50°C 5 mV per Division to 5 V per Division	3.9 ns or less.[a]	
2 mV per Division	4.4 ns or less.[a]	
Aberrations Positive-Going Step 2 mV per Division to 0.5 V per Division	+4%, −4%, 4% p-p.	Measured with 5-division reference signal, centered vertically, from a 50 Ω source driving a 50 Ω coaxial cable terminated in 50 Ω at the input connector with the VOLTS/DIV Variable control in the CAL detent.
1 V per Division to 5 V per Division	+12%, −12%, 12% p-p.[a]	
Bandwidth (-3 dB) 0°C to +35°C 5 mV per Division to 5 V per Division	Dc to at least 100 MHz.	Measured with a vertically centered S-division reference signal from a 50 Ω source driving a 50 Ω coaxial cable that is terminated in 50 Ω, both at the input connector and at the probe input. with the VOLTS/DIV Variable control in the CAL detent.
2 mV per Division	Dc to at least 90 MHz.	
+35°C to +50°C 5 mV per Division to 5 V per Division.	Dc to at least 90 MHz.[a]	
2 mV per Division	Dc to at least 80 MHz.[a]	
AC Coupled Lower Limit	10 Hz or less at -3 dB.[a]	

[a] Performance Requirement not checked in Service Manual.

Table I-3
Physical Characteristics

Characteristics	Description
Weight With Power Cord	
With Cover, Probes, and Pouch	6.2 kg (13.7 lb).
Without Cover, Probes, and Pouch	5.2 kg (11.5 lb).
Domestic Shipping Weight	7.3 kg (16.0 lb).
Height	
With Feet and Handles	137 mm (5.4 in).
Width	
With Handle	360 mm (14.2 in).
Without Handle	327 mm (12.9 in)
Depth	
With Front Cover	445 mm (17.5 in).
Without Front Cover	440 mm (17.3 in).
With Handle Extended	511 mm (20.1 in).

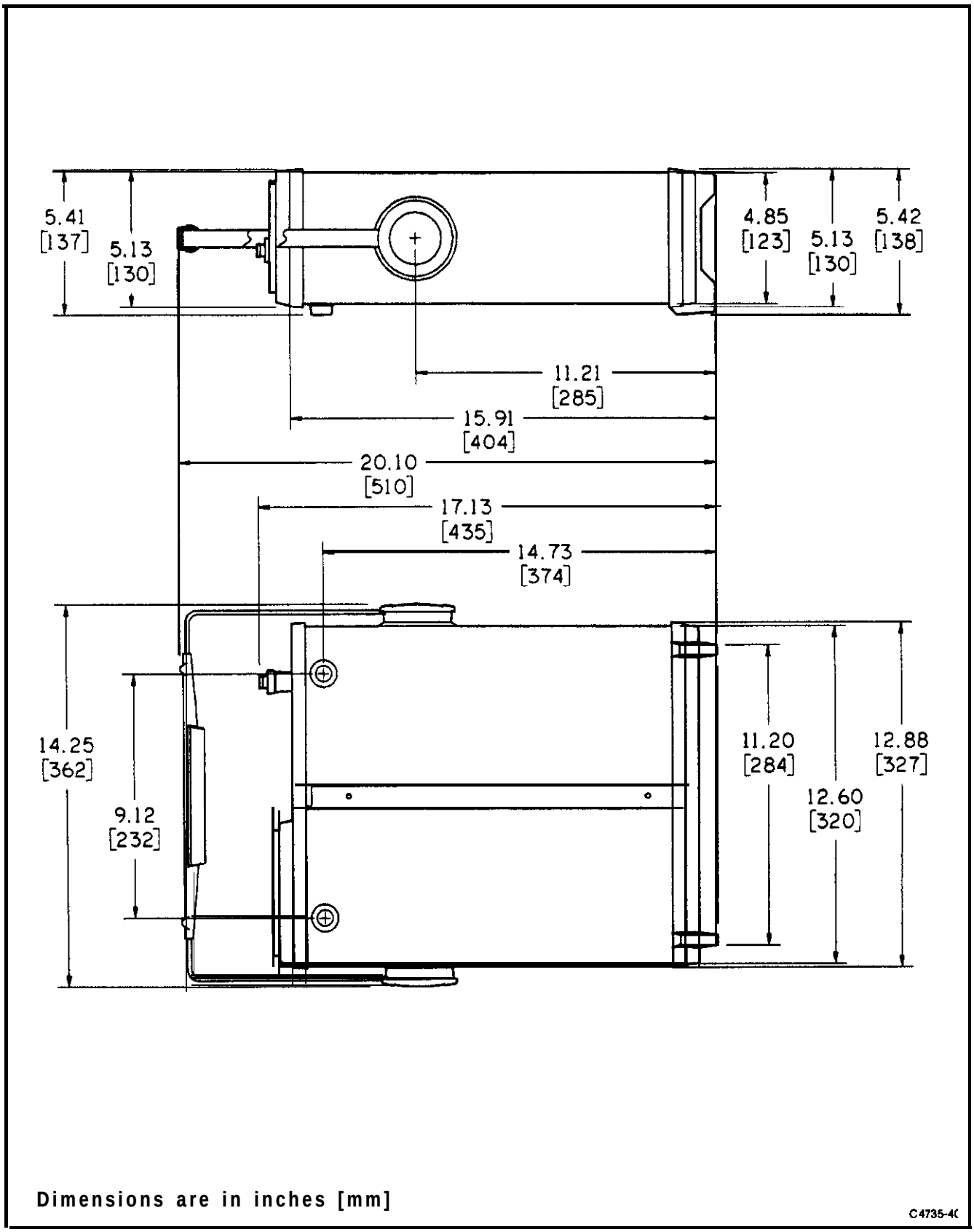


Figure 1-2. Physical dimensions of the 2235 Oscilloscope.

Tektronix®
COMMITTED TO EXCELLENCE

MANUAL CHANGE INFORMATION

Date: 1 l-28-64 **ChangeReference:** M53367

Product: 2235 SERVICE **Manual Part No.:** 070-4206-00

DESCRIPTION **PG 46**

EFFECTIVE SERIAL NUMBER: 8014080

REPLACEABLE ELECTRICAL PARTS LIST CHANGES

CHANGE TO:

A l	670-7614-04	CKT BOARD ASSY: MAIN
A3	670-761 l-04	CKT BOARD ASSY: FRONT PANEL
A1R758	321-0336-00	RES,FXD,CMPSN: 30.9K OHM,5%,0.125W

ADD:

A1C199	281-0862-00	CAP,FXD,CER DI: 0.001UF,+80-20%,100V

DIAGRAM CHANGES

DIAGRAM 02 VERTICAL PREAMP & OUTPUT AMPL

Add C199 (0.001μF) from the Anode of VR200 to ground.
VR200 is located in grid 5G.

DIAGRAM 06 PROBE ADJ, XY AMPL & HORIZONTAL OUTPUT

Change R756 (location 4C) to a 30.9K Ω resistor.

TEXTCHANGES

Page 5-20-S-21 Step 2.

Replace 2. Adjust Trigger Sensitivity with the following procedure.

2. Adjust Trigger Sensitivity (R479) and (R627–SN: B012945 and above)

a. set:

VERTICAL MODE	CH 1
CH 1 VOLTS/DIV	0.1 v
AC-GND-DC (both)	AC
A SEC/DIV	10 μs

b. Connect the leveled sine-wave generator output via a 50-Ω cable and a 50-R termination to the CH 1 OR X input connector.

c. Set the generator to produce a 50-kHz, 2.2-division display.

d. Set the CH 1 VOLTS/DIV switch to 1 V.

e. ADJUST-A Trigger Sensitivity (R479) while rotating the A TRIGGER LEVEL control slowly so that the A Trigger is just able to be maintained.

f. Adjust the A TRIGGER LEVEL control for a stable display.

NOTE

For instrument serial numbers below 8012945, skip to step 3.

g. Set the HORIZONTAL MODE switch to B.

h. ADJUST-B Trigger Sensitivity (R627) while rotating the B TRIGGER LEVEL contol slowly so that the B Trigger is just able to be maintained.

i. Return the HORIZONTAL MODE switch to A.

REPLACEABLE ELECTRICAL PARTS LIST CHANGES

(SEE BELOW FOR EFFECTIVE SERIAL NUMBERS)

CHANGE TO:

A1	670-7614-02	B011700	CKT BOARD ASSY: MAIN	M51265
A2	670-7561-01	B011700	CKT BOARD ASSY: ATTENUATOR	M51265
A3	670-761 l-02	8011700	CKT BOARD ASSY: FRONT PANEL	M51265
A1Q756	151-0432-00	B011700	TRANSISTOR: NPN,SI	M51265
A1R144	315-0471-00	8012945	RES,FXD,CMPSN: 470 OHM,5%,0.25W	M50324
A1R194	315-0471-00	8012945	RES,FXD,CMPSN: 470 OHM,5%,0.25W	M50324
A1 R233	321-0066-00	8012945	RES,FXD,FILM: 76.6 OHM,1%,0.125W	M50324
A1 R236	315-0821-00	8012945	RES,FXD,CMPSN: 620 OHM,5%,0.25W	M50324
A1R945	301-0202-00	8011700	RES,FXD,CMPSN: 2K OHM,5%,0.5W	M51265
A2R6	317-0105-00	8011700	RES,FXD,CMPSN: 1M OHM,5%,0.125W	M51265
A2R56	317-0105-00	8011700	RES,FXD,CMPSN: 1M OHM,5%,0.125W	M51265
A3R983	315-0201-00	8011700	RES,FXD,CMPSN: 200 OHM,5%,0.25W	M51265

DESCRIPTION

REPLACEABLE ELECTRICAL PARTS LIST CHANGES (cont)

CHANGE TO (cont):

A5R623	315-0620-W	8012945	RES,FXD,CMPSN: 62 OHM,5%,0.25W	M50324
A5R627	311-1921-W	6012945	RES,VAR,NONWIR: 250 OHM,10%,0.5W	M50324
A5U625	156-0205-03	B012945	MICROCKT,DGTL: QUAD 2-INPUT NOR GATE	M50324

REMOVE:

A1CR945	152-0141-02	B011700	SEMICOND DEVICE: SILICON,30V,150MA	M51265

ADD:

A2R12	315-0360-00	8011700	RES,FXD,CMPSN: 36 OHM,5%,0.25W	M51265
A2R62	315-0360-00	8011700	RES,FXD,CMPSN: 36 OHM,5%,0.25W	M51265

DIAGRAM CHANGES

(SEE BELOW FOR EFFECTIVE SERIAL NUMBERS)

DIAGRAM 1 CH 1 & CH 2 ATTENUATORS & LOGIC SWITCH

Change R6 (location 2G) and R56 (location 6G) to 1 MΩ resistors.	B011700	M51265
Add R12 & R62 (36Ω) to the CH 1 & CH 2 10X attenuators as shown here.	B011700	M51265

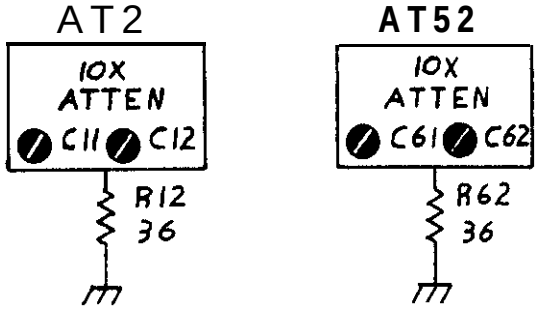


DIAGRAM 2 VERTICAL PREAMP & OUTPUT AMPL

Change R144 (location 2H) and R194 (location 8H) to 470Ω resistors.	B012945	M50324
Change R233 (location 5N) to a 76.8Ω resistor.	B012945	M50324
Change R236 (location 5N) to an 820Ω resistor.	6012945	M50324

DIAGRAM 5 B TIMING & ALTERNATE B SWEEP

Change R623 (locaton 8J) to an 82Ω resistor.	8012945	M50324
Change R627 (location 6J) to a 250Ω variable resistor.	6012945	M50324

DIAGRAM 7 POWER SUPPLY, Z-AXIS & CRT

Change R912 (location 9C) to a 475R resistor.	B011700	M51265
Change R945 (location 9F) to a 2KΩ resistor.	B011700	M51265
Change R983 (location 3S) to a 200Ω resistor.	B011700	M51265
Remove CR945 (location 9F) from the circuit.	8011700	M51265

Tektronix®
COMMITTED TO EXCELLENCE

MANUAL CHANGE INFORMATION

Date: 12-I 3-64 **Change Reference:** M53742

Product: 2235 SERVICE **Manual Part** No.: 070-4206-00

DESCRIPTION PG 46

EFFECTIVE SERIAL NUMBER: 8014706

REPLACEABLE ELECTRICAL PARTS LIST CHANGES

CHANGE TO:

A2	670-7561-02	CKT BOARD ASSY: ATTENUATOR
A2R41	321-0151-00	RES,FXD,CMPSN: 365 OHM,1%,0.125W
A2R91	321-0151-00	RES,FXD,CMPSN: 365 OHM,1%,0.125W

DIAGRAM CHANGES

DIAGRAM 0 1 CH 1 & CH 2 ATTENUATORS

Change R41 (location 4P) to a 365 Ω resistor.
Change R91 (location 9M) to a 365 Ω resistor.