

**OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT,
AND GENERAL SUPPORT MAINTENANCE MANUAL**

**OSCILLOSCOPE OS-262(P)/U
(NSN 6625-01-007-9416)**

**This copy is a reprint which includes current
pages from Change 1**

DEPARTMENTS OF THE ARMY, THE NAVY, AND THE AIR FORCE

JANUARY 1978

Copyright 1974 by Tektronix Inc., All rights reserved
REPRODUCED BY PERMISSION OF THE COPYRIGHT OWNER, TEKTRONIX INC

TECHNICAL MANUAL
No.11-6625-2736-14
TECINICAL MANUAL
NAVELEX 0967-LP-170-1110
TECHNICL ORDER
TO 33A1-13-499-1

DEPARTMENTS OF THE ARMY, THE NAVY,

AND THE AIR FORCE

WASHINGTON, DC, 4 January 1978

OPERATOR’S, ORGANUATIONAL, DIRECT SUPPORT, AND GENERAL SUPPORT MAINTENANCE MANUAL

**OSCILLOSCOPE OS-262(P)/U
(NSN 662501-007-9416**

REPORTING OF ERRORS

You can improve this manual by recommending improvements using DA Form 2028-2 (Test) located in the back of the manual. Simply tear out the self-addressed form, fill it out as shown on the sample, fold it where shown, and drop it in the mail.

If there are no blank DA Form 20282 (Test) in the back of your manual, use the standard DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forward to the Commander, US Army Electronics Command, A’ITN: DRSELMA-Q, Fort Monmouth, New Jersey 07703.

In either case a reply will be furnished direct to you.

Table of Contents

	Page
SECTION 0 Introduction.....	0-1
Scope	0-1
Indexes Publication	0-1
Farms and Records	0-1
Reporting Equipment Improvement Recommendations (EIR).....	0-1
Administrative Storage	0-1
Destruction of Army Electronics Materiel	0-1

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

SECTION 1

OPERATING INFORMATION

PRELIMINARY OPERATION

AC POWER SOURCES

AC POWER CORD

OPERATING VOLTAGE

OPERATING TEMPERATURE

RACKMOUNTING

PLUG-IN UNITS

PLUG-IN INSTALLATION AND REMOVAL

CONTROLS AND CONNECTORS

FRONT PANEL CONTROLS AND CONNECTORS

REAR PANEL CONTROLS AND CONNECTORS

GENERAL OPERATING INFORMATION

INTENSITY CONTROL

DISPLAY FOCUS

GRATICULE

LIGHT FILTER

BEAMFINDER

READOUT MODES

DISPLAY PHOTOGRAPHY

STORAGE

CARE OF STORAGE SCREEN

VERTICAL MODE

TRIGGER SOURCE

X-Y OPERATION

INTENSITY MODULATION

RASTER DISPLAY

CALIBRATOR

SIGNALS OUT

APPLICATIONS

SECTION 2

SPECIFICATIONS

INTRODUCTION

STANDARD ACCESSORIES

PAGE

1-1

1-1

1-1

1-1

1-3

1-3

1-4

1-4

1-5

1-6

1-8

1-10

1-10

1-10

1-10

1-11

1-11

1-12

1-12

1-13

1-14

1-15

1-16

1-17

1-17

1-18

1-18

1-19

1-20

2-1

2-9

(A)

7623A/R7623A Service

TABLE OF CONTENTS (cont)

	PAGE
SECTION 3 THEORY OF OPERATION	
LOGIC FUNDAMENTALS	3-2
SYMBOLS	3-2
LOGIC POLARITY	3-5
INPUT/OUTPUT TABLES	3-5
NON DIGITAL DEVICES	3-5
BLOCK DIAGRAM	3-5
THEORY OF OPERATION	3-9
MAIN INTERFACE <1>	3-9
LOGIC CIRCUIT <2>	3-9
Z-AXIS LOGIC	3-9
CLOCK GENERATOR	3-11
VERTICAL CHOPPED BLANKING	3-12
CHOP COUNTER	3-15
VERTICAL MODE CONTROL	3-17
VERTICAL BINARY	3-18
PLUG-IN BINARY	3-20
OUTPUT BUFFERS	3-21
TRIGGER SELECTOR<3>	3-21
TRIGGER MODE AND ADD SIGNALS	3-21
TRIGGER CHANNEL SWITCH	3-23
TRIGGER OUTPUT AMPLIFIER	3-24
VERTICAL SIGNAL BUFFER	3-25
VERTICAL INTERFACE <4>	3-25
VERTICAL CHANNEL SWITCH	3-25
AUXILIARY Y-AXIS INPUT AMPLIFIER	3-26
DELAY-LINE BUFFER	3-26
DELAY LINE	3-27
VERTICAL AMPLIFIER <4>	3-27
CENTERING AND READOUT AMPLIFIER	3-27
INPUT AMPLIFIER	3-28
BEAMFINDER NETWORK	3-28
OUTPUT AMPLIFIER	3-28
HORIZONTAL AMPLIFIER <5>	3-29
HORIZONTAL CHANNEL SWITCH	3-29
RIGHT OUTPUT AMPLIFIER	3-30
LEFT OUTPUT AMPLIFIER	3-30

(A)

TABLE OF CONTENTS (cont)

	PAGE
OUTPUT SIGNALS <6>	3-31
VERT SIG OUT	3-31
+ GATE OUT	3-31
+ SAWTOOTH OUT	3-31
CRT CIRCUIT <7>	3-31
HIGH VOLTAGE REGULATION	3-31
AUTO FOCUS DC RESTORER	3-33
AUTO FOCUS	3-34
CONTROL GRID DC RESTORER	3-34
Z-AXIS AMPLIFIER	3-34
CRT CONTROL CIRCUITS	3-35
LOW-VOLTAGE POWER SUPPLY <8>	3-35
POWER INPUT	3-35
-50-VOLT SUPPLY	3-38
-15-VOLT SUPPLY	3-40
+5-VOLT SUPPLY	3-40
+15-VOLT SUPPLY	3-40
+50-VOLT SUPPLY	3-40
+130-VOLT SUPPLY	3-40
GRATICULE LIGHT SUPPLY	3-41
CALIBRATOR <10>	3-41
READOUT SYSTEM <9>	3-43
INTRODUCTION	3-43
THREE-COMPARTMENT MAINFRAMES	3-43
DISPLAY FORMAT	3-44
DEVELOPING THE DISPLAY	3-44
TIMER	3-51
TIME-SLOT COUNTER	3-53
WORD TRIGGER	3-54
CHANNEL COUNTER	3-54
READOUT CONTROL	3-54
SINGLE-SHOT LOCKOUT	3-55
ENCODING THE DATA	3-56
COLUMN AND ROW DATA SWITCHES	3-59
DISPLAY-SKIP GENERATOR	3-60
COLUMN AND ROW DECODERS	3-60
ZEROS LOGIC AND MEMORY	3-61

(A)

TABLE OF CONTENTS (cont)

	PAGE
CHARACTER GENERATORS	3-64
DECIMAL POINT LOGIC AND CHARACTER POSITION COUNTER	3-64
FORMAT GENERATOR	3-65
Y-OUTPUT AMPLIFIER	3-67
X-OUTPUT AMPLIFIER	3-67
DISPLAY SEQUENCE	3-67
STORAGE SYSTEM <10>	3-68
LOGIC	3-68
OPERATIONAL AMPLIFIERS	3-73
SECTION 4 MAINTENANCE	
PRELIMINARY INFORMATION	4-1
PANEL REMOVAL	4-1
POWER UNIT REMOVAL	4-2
PREVENTIVE MAINTENANCE	4-3
CLEANING	4-3
LUBRICATION	4-4
VISUAL INSPECTION	4-5
SEMICONDUCTOR CHECKS	4-5
RECALIBRATION	4-5
TROUBLESHOOTING	4-5
TROUBLESHOOTING AIDS	4-5
TROUBLESHOOTING EQUIPMENT	4-8
TROUBLESHOOTING TECHNIQUES	4-8
CORRECTIVE MAINTENANCE	4-13
OBTAINING REPLACEMENT PARTS	4-13
SOLDERING TECHNIQUES	4-13
COMPONENT REPLACEMENT	4-14
SEMICONDUCTOR REPLACEMENT	4-18
CATHODE-RAY TUBE REPLACEMENT	4-20
SWITCH REPLACEMENT	4-21
GRATICULE-BULB REPLACEMENT	4-22
POWER TRANSFORMER REPLACEMENT	4-22
HIGH VOLTAGE COMPARTMENT	4-22
FUSE REPLACEMENT	4-23
RECALIBRATION AFTER REPAIR	4-23
INSTRUMENT REPACKAGING	4-23

(A)

TABLE OF CONTENTS (cont)

		PAGE
SECTION 5	PERFORMANCE CHECK/CALIBRATION	
	PRELIMINARY INFORMATION	5-1
	CALIBRATION INTERVAL	5-1
	TEKTRONIX FIELD SERVICE	5-1
	USING THIS PROCEDURE	5-1
	TEST EQUIPMENT REQUIRED	5-1
	SPECIAL CALIBRATION FIXTURES	5-2
	CALIBRATION EQUIPMENT ALTERNATIVES	5-2
	SIGNAL CONNECTIONS	5-2
	WARM-UP AND TEMPERATURE REQUIREMENTS	5-2
	PART I-PERFORMANCE CHECK	5-4
	INTRODUCTION	5-4
	OUTLINE FOR PART I-PERFORMANCE CHECK	5-4
	PART II-CALIBRATION	5-26
	INTRODUCTION	5-26
	OUTLINE FOR PART II-CALIBRATION	5-26
SECTION 6	OPTIONS	
SECTION 7	ELECTRICAL PARTS LIST	
SECTION 8	DIAGRAMS	
SECTION 9	MECHANICAL PARTS LIST	
CHANGE INFORMATION		

(A)

LIST OF ILLUSTRATIONS

	PAGE
Frontispiece	
Figure 1-1. Location of voltage-selector jumper.	1-2
Figure 1-2. Front panel controls and connectors.	1-5
Figure 1-3. Rear panel controls and connectors.	1-9
Figure 1-4. Definition of measurement lines on the graticule.	1-11
Figure 1-5. Location of Readout Mode switch.	1-13
Figure 1-6. Location of Calibrator jumper on Storage circuit board.	1-20
Figure 3-1. Block diagram 7623A.	3-6
Figure 3-2. Logic circuit block diagram.	3-8
Figure 3-3. Z-Axis logic block diagram.	3-10
Figure 3-4. (A) Clock Generator stage of U55A.(B) Idealized waveforms from Clock Generator stage.	3-11
Figure 3-5. (A) Input and output pins for Vertical Chopped Blanking stage.(B) Idealized waveforms for Vertical Chopped Blanking stage.	3-13
Figure 3-6. (A) Logic diagram for Vertical Chopped Blanking stage.(B) Table of input/output combinations for Vertical Chopped Blanking stage.	3-16
Figure 3-7. Detailed logic diagram of Chop Counter stage.	3-17
Figure 3-8. Idealized input and output waveforms for Chop Counter stage	3-17
Figure 3-9. Logic diagram of Vertical Mode Control and Vertical Mode Buffer Amplifier stages.	3-19
Figure 3-10. Logic diagram of Vertical Binary stage.	3-19
Figure 3-11. Idealized waveforms showing relationship between input and output waveforms for Vertical Binary and Plug-In Binary stages when operating in ALT mode.	3-20
Figure 3-12. Logic diagram of Plug-In Binary and Plug-In Alternate Buffer stage.	3-21
Figure 3-13. Detailed block diagram of Trigger Selector circuit along with simplified diagram of trigger source selection circuitry.	3-22
Figure 3-14. Input levels at pin 4 of U324.	3-23
Figure 3-15. Input/output table for Trigger Channel Switch stage.	3-24
Figure 3-16. Vertical Interface detailed block diagram.	3-25
Figure 3-17. Input/output table for Vertical Channel Switch.	3-26
Figure 3-18. Vertical Amplifier detailed block diagram.	3-27
Figure 3-19. Horizontal Amplifier detailed block diagram.	3-29
Figure 3-20. CRT circuit detailed block diagram.	3-32
Figure 3-21. Low-Voltage Power Supply detailed block diagram.	3-36
Figure 3-22. Schematic illustrating voltage drop between power supply output and load due to resistance of interconnecting wire.	3-39
Figure 3-23. Calibrator detailed block diagram.	3-41
Figure 3-24. Location of readout words on the crt identifying the originating plug-in unit and channel (one complete frame shown).	3-44

(A)

LIST OF ILLUSTRATIONS (Cont.)

	PAGE
Figure 3-25. Character Selection Matrix for 7623A Readout System.	3-46
Figure 3-26. Typical readout display where only channel 2 of the Right Vertical and Horizontal units is displayed.	3-47
Figure 3-27. Detailed block diagram of the Readout System.	3-48
Figure 3-28. Output waveforms of Timer stage.	3-50
Figure 3-29. Detail of output at pins 12, 13, 14, and 16 of U2126.	3-51
Figure 3-30. Timer stage operation when Display-Skip condition occurs.	3-52
Figure 3-31. Time relationship of the time-slot (TS) pulses produced by U2159.	3-53
Figure 3-32. Typical encoding scheme for voltage-sensing amplifier plug-in unit. Coding shown for deflection factor of 100 microvolts.	3-57
Figure 3-33. Idealized current waveforms of: (A) Row analog data, (B) Column analog data.	3-58
Figure 3-34. Block representation of memory sequence in U2232.	3-61
Figure 3-35. Typical output waveforms for Zeros Logic and Memory stage operation (at pin 7 of U2232).	3-62
Figure 3-36. Readout word relating 10 possible character locations to the decimal point instructions that can be encoded, and the resultant crt display.	3-65
Figure 3-37. Flow chart for character generation by the Readout System.	3-66
Figure 3-38. Storage circuit simplified block diagram.	3-68
Figure 3-39. Time relationship of Storage logic pulses.	3-69
Figure 3-40. BISTABLE mode Storage waveforms.	3-70
Figure 3-41. VAR PERSIST mode Storage waveforms.	3-71
Figure 3-42. FAST BISTABLE mode Storage waveforms.	3-72
Figure 3-43. FAST VAR PERSIST mode Storage waveforms.	3-74
Figure 4-1. Power Unit removal.	4-2
Figure 4-2. Location of circuit boards in the 7623A.	4-6
Figure 4-3. Location of circuit boards in the R7623A.	4-7
Figure 4-4. Circuit isolation troubleshooting chart.	4-10
Figure 4-5. Location of screws holding Low Voltage sub-chassis.	4-17
Figure 4-6. Location of screws holding Signals Out rear panel.	4-18
Figure 5-1. Typical crt display when checking X-Y phase shift.	5-15
Figure 5-2. Location of Calibrator AC/DC jumper.	5-17
Figure 5-3. Location of High-Voltage Test Point.	5-30
Figure 5-4. Location of adjustments in High-Voltage cover.	5-32
Figure 5-5. Typical crt display when checking X-Y phase shift.	5-43
Figure 5-6. Location of Calibrator AC/DC jumper.	5-46

(A)

LIST OF ILLUSTRATIONS

Section 8 figures are located near their associated diagrams on the foldout pages.

- Figure 8-1. Semiconductor lead configurations.
- Figure 8-2. A1-Main Interface Board.
- Figure 8-3. A2-Logic Board.
- Figure 8-4. A3-Trigger Selector Board.
- Figure 8-5. A4-Vertical Interface Board.
- Figure 8-6. A5-Vertical Amplifier Board (front).
- Figure 8-7. A5-Vertical Amplifier Board (rear).
- Figure 8-8. A6-Horizontal Amplifier Board.
- Figure 8-9. A7-Output Signals Board.
- Figure 8-10. A8-Z-Axis Board.
- Figure 8-11. A9-Anode Board.
- Figure 8-12. A10-High-Voltage Board.
- Figure 8-13. A11-Low-Voltage Rectifier Board.
- Figure 8-14. A12-Low-Voltage Regulator Board.
- Figure 8-15. A13-Readout Board.
- Figure 8-16. A14-Storage Board.
- Figure 8-17. Adjustment locations-Low-Voltage Regulator board.
- Figure 8-18. Adjustment locations-Z-Axis board.
- Figure 8-19. Adjustment locations-High-Voltage board.
- Figure 8-20. Adjustment locations-Vertical Amplifier board.
- Figure 8-21. Adjustment locations-Horizontal Amplifier board.
- Figure 8-22. Adjustment locations-Signals Out board.
- Figure 8-23. Adjustment locations-Readout board.
- Figure 8-24. Adjustment locations-Storage board.

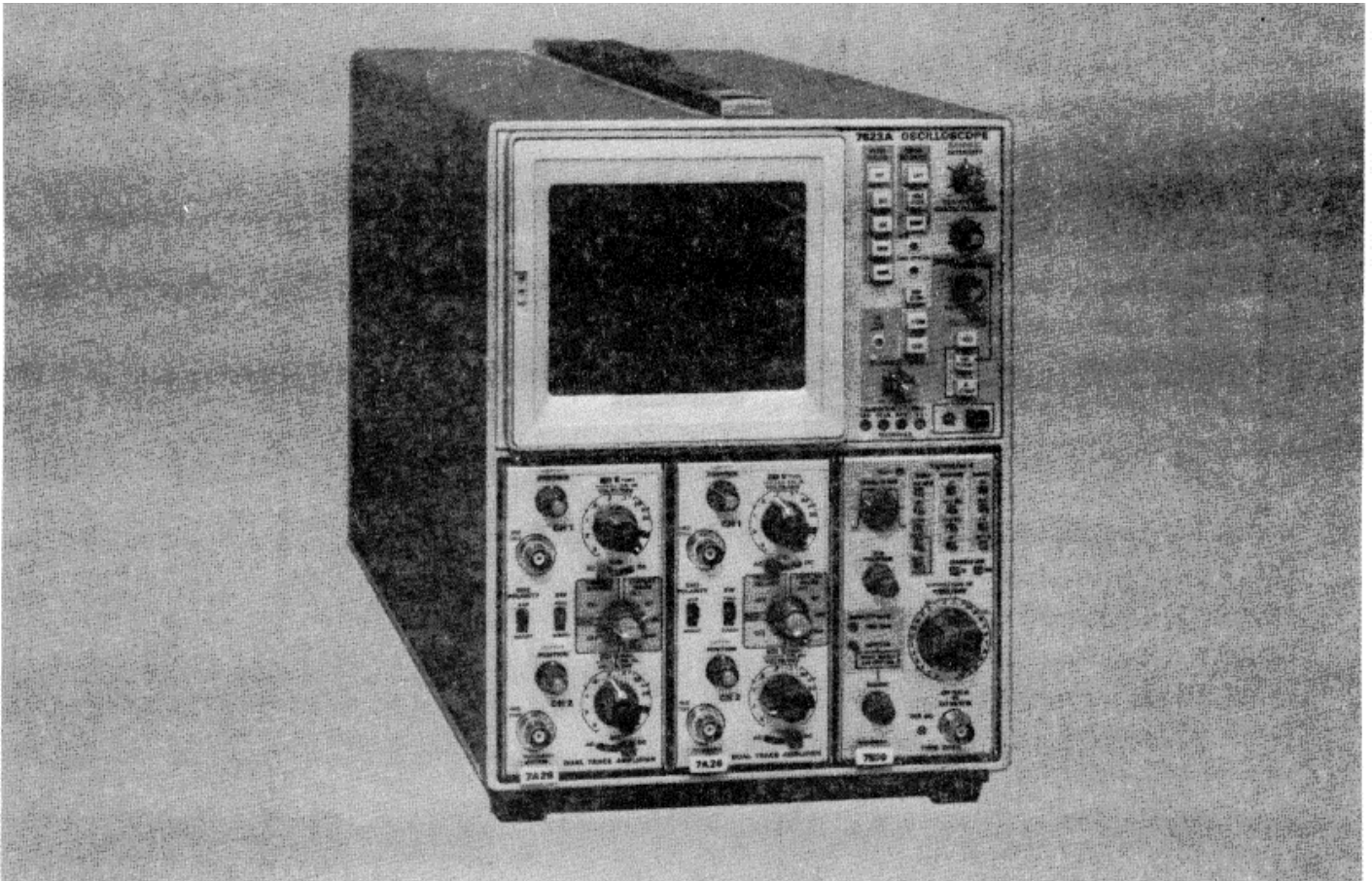
(A)

LIST OF TABLES

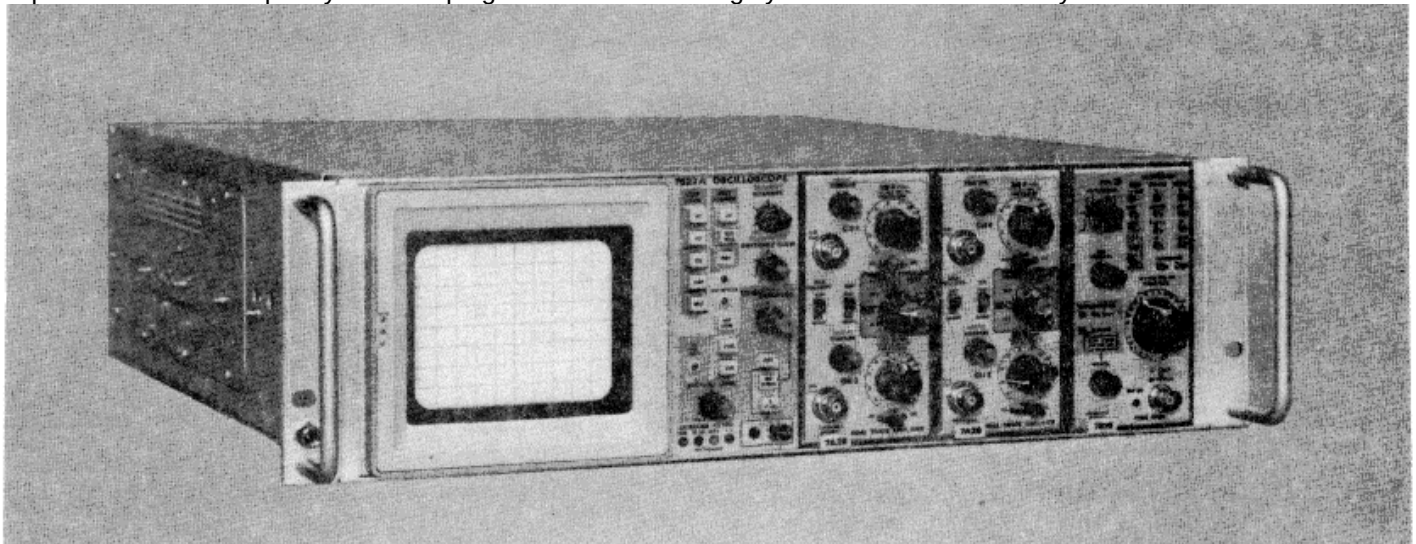
	PAGE
TABLE 1-1. Power Cord Color-Coding	1-1
TABLE 1-2. Regulating Range and Fuse Data	1-3
TABLE 2-1. ELECTRICAL	2-1
TABLE 2-2. ENVIRONMENTAL	2-8
TABLE 2-3. PHYSICAL	2-8
TABLE 2-4. 7623A SYSTEM SPECIFICATIONS	2-10
TABLE 3-1. Basic Logic Reference	3-2
TABLE 3-2. Standard Readout Format	3-45
TABLE 3-3. Channel Address Code	3-55
TABLE 4-1. Power Supply Tolerances	4-9
TABLE 4-2. Fuse Rating	4-23
TABLE 5-1. Test Equipment	5-3
TABLE 5-2. Power Supply Tolerances	5-30
TABLE 5-3. High-Frequency Compensation Adjustments	5-38

(A)

(A)



The Tektronix 7623A/R7623A Storage Oscilloscope is a solid-state instrument designed for fast writing rate storage applications. The 7623A operates in three display modes-NON STORE, STORE, and SAVE, and has four storage modes- BISTABLE, VAR PERSIST, FAST BISTABLE, and FAST VAR PERSIST. This instrument has three plug-in compartments that accept any 7-series plug-in units to form a highly flexible measurement system.



(A)

SECTION 0 INTRODUCTION

0-1. Scope

This manual contains instructions for the operation and organizational, direct support, and general support maintenance of Oscilloscope OS-262(P)/U. Throughout this manual Oscilloscope OS-262(P)/U is referred to as 7623A/R7623A Storage Oscilloscope.

0-2. Indexes of Publications

a. DA Pam 310-4. Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

b DA Pam 310-7. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment.

0-3. Forms and Records

a. Reports of Maintenance and Unsatisfactory equipment. Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by TM 38-750 (Army). Air Force personnel will use AFM 66-1 for maintenance reporting and TO-00-35D54 for unsatisfactory equipment reporting. Navy personnel will report maintenance performed utilizing the Maintenance Data Collection Subsystem (MDCS) IAW OP- NAVINST 4790.2, Vol 3 and unsatisfactory material/ conditions (UR submission) IAW OPNAVINST 4790.2, Vol 2, chapter 17.

b. Report of Packaging and Handling Deficiencies Fill out and forward DD Form 6 (Packaging Improvement Report) as prescribed in AR 700-58/NAVSUPINST

4030.29/AFR 71-13/MCO P4030.29A, and DSAR 4145.8.

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33A/AFR 75-18/MCO P4610.19B and DSAR 4500.15.

0-4. Reporting Equipment Improvement Recommendations (EIR)

a. Army. EIR's will be prepared using DA Form 2407, Maintenance Request. Instructions for preparing EIR's are provided in TM 38-750, The Army Maintenance Management System EIR's should be mailed direct to Commander, US Army Electronics Command, ATTN: DRSELMA-Q, Fort Monmouth, New Jersey 07703 A reply will be furnished direct to you.

b. Navy. Navy personnel are encouraged to submit EIR's through their local Beneficial Suggestion Program.

c. Air Force. Air Force personnel are encouraged to submit EIR's in accordance with AFM 900-4.

0-5. Administrative Storage

Administrative storage of equipment issued to and used by Army activities shall be in accordance with TM 740-90-1.

0-6. Destruction of Army Electronics Materiel

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244 2.