
TECHNICAL MANUAL

OPERATOR'S ORGANIZATIONAL,
DIRECT SUPPORT AND GENERAL SUPPORT

MAINTENANCE MANUAL
(INCLUDING REPAIR PARTS
AND SPECIAL TOOLS LIST)

FOR

SIGNATURE ANALYZER TS-3791/U
(HEWLETT-PACKARD MODEL 5004A)

(OPT H10)

(NSN 6625-01-068-8641)

This manual includes copyright material reproduced by permission of the HEWLETT-PACKARD Company.

TECHNICAL MANUAL
NO. 11-6625-2967-14&P



TM 11-6625-2967-14&P

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC 28 January 1980

**OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT AND
GENERAL SUPPORT MAINTENANCE MANUAL
(INCLUDING REPAIR PARTS AND SPECIAL TOOLS LISTS)
FOR**

SIGNATURE ANALYZER TS-3791/U

(HEWLETT-PACKARD MODEL 500XA)

(OPT H10)

(NSN 6625-01-068-8641)

REPORTING OF ERRORS

You can improve this manual by recommending improvements using DA Form 2028-2 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 Forms 2028-2 in the back of your manual, use the standard DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forward to Commander, US Army Communications and Electronics Materiel Readiness Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, NJ 07703.

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

SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed 1704.

This manual is an authentication of the manufacturer's commercial literature which, through usage, has been found to cover the data required to operate and maintain this equipment. Since the manual was not prepared in accordance with military specifications and AR 310-3, the format has not been structured to consider levels of maintenance.

TABLE OF CONTENTS

Section	Title	Page
0	INSTRUCTIONS	0-1
	0-1 Scope	0-1
	0-2 Indexes of Publications	0-1
	0-3 Forms and Records	0-1
	0-4 Reporting Equipment Improvement Recommendations	0-1
	0-5 Administrative Storage	0-1
	0-6 Destruction of Army Electronics Materiel	0-1
I	GENERAL INFORMATION.....	1-1
	1-1 Introduction	1-1
	1-3 Safety Considerations.....	1-1
	1-6 Options (Line Voltages).....	1-1
	1-8 Instruments Covered by Manual	1-1
	1-13 Specifications	1-1
	1-15 Description of 5004A Signature Analyzer.....	1-2
	1-17 Signature Analysis.....	1-2
	1-19 Accessories Supplied.....	1-3
	1-21 Recommended Test Equipment	1-3
II	INSTALLATION.....	2-1
	2-1 Introduction	2-1
	2-3 Initial Inspection	2-1
	2-5 Preparation for Use	2-1
	2-6 Power Requirements.....	2-1
	2-8 Line Voltage Selection	2-1
	2-10 Line Voltage Label	2-1
	2-12 Power Cable.....	2-1
	2-14 Operating Environment	2-2
	2-18 Storage and Shipment	2-3
	2-19 Environment.....	2-3
	2-22 Packaging	2-3
III	OPERATION.....	3-1
	3-1 Introduction	3-1
	3-3 Panel Features.....	3-1
	3-5 Signature Display.....	3-1
	3-8 Hexadecimal Number System Symbols (Digits)	3-1
	3-10 Test Terminal Grabber Connectors	3-1
	3-12 Operator's Maintenance.....	3-5
	3-14 Operator Self-Test of 5004A	3-5
	3-16 Instruments Compatible with 5004A.....	3-7
	3-18 Operating Instructions	3-7
	3-20 Typical Connections of 5004A to Device Under Test	3-8
	3-22 Probe, Pod, and Power Cable Storage.....	3-9
	3-24 Troubleshooting with the 5004A Signature Analyzer	3-9
IV	PERFORMANCE TESTS.....	4-1
	4-1 Introduction	4-1
	4-3 Test Equipment Required	4-1
	4-4 Logic Level Performance Test	4-1
	4-6 Positive Pulse Performance Test.....	4-2
	4-8 Negative Pulse Performance Test	4-3
	4-10 Data Probe Setup Time Performance Test.....	4-3
	4-12 Data Probe Hold Time Performance Test.....	4-5
	4-14 Test Record	4-5

TABLE OF CONTENTS (Continued)

Section	Title	Page
V	ADJUSTMENTS.....	5-1
	5-1 Introduction	5-1
	5-3 Data Probe Threshold Voltage Check and Adjustments	5-1
	5-5 Power Transformer Primary Line Voltage Change Procedure.....	5-1
VI	REPLACEABLE PARTS	6-1
	6-1 Introduction	6-1
	6-4 Ordering Information	6-3
	6-6 HP Part Number Organization	6-3
	6-8 Component Parts and Materials	6-3
	6-11 General Usage Parts.....	6-4
	6-13 Specific Instrument Parts	6-4
	6-15 Mechanical Parts.....	6-4
VII	MANUAL CHANGES	7-1
	7-1. Introduction	7-1
VIII	SERVICE	8-1
	8-1 Introduction	8-1
	8-3 Safety Considerations	8-1
	8-9 Recommended Test Equipment	8-1
	8-11 Logic Symbols.....	8-2
	8-13 Logic Concepts	8-2
	8-15 Negation.....	8-2
	8-17 Logic Implementation and Polarity Indication.....	8-3
	8-26 Other Symbols	8-5
	8-28 Dependency Notation "C" "G" "V" "F".....	8-6
	8-30 Control Blocks.....	8-7
	8-32 Complex Logic Devices	8-8
	8-34 Troubleshooting (Failure Analysis).....	8-9
	8-38 Troubleshooting Flowchart.....	8-9
	8-40 Major Test Point Signatures.....	8-9
	8-42 Troubleshooting Signatures with SELF-TEST and NORMAL/ SERVICE Switches.....	8-9
	8-44 Disassembly and Reassembly Procedures	8-14
	8-46 Data Probe Disassembly and Reassembly.....	8-15
	8-48 Gating Signals Pod Disassembly and Reassembly	8-15
	8-50 Block Diagram Description.....	8-16
	8-54 Clock, Start, and Stop Signal Paths.....	8-16
	8-56 Scan/Test Oscillator (Internal Clock)	8-16
	8-58 Self-Test.....	8-16
	8-60 Display Scan and Comparator Strobe.....	8-18
	8-62 Service (Troubleshooting) Mode.....	8-18
	8-64 Power Supply	8-18
	8-66 Circuit Theory (Principles of Operation).....	8-18
	8-68 Purpose of 5004A	8-18
	8-70 Schematic Diagram.....	8-18
	8-72 Gating Signals Pod	8-18
	8-74 Edge Selection.....	8-18
	8-76 ECL-to-TTL Level Converters	8-19
	8-78 Gate Control.....	8-19
	8-80 State Diagram	8-19
	8-82 Data Signal Flow.....	8-19
	8-86 Pseudo-Random Word Generator (Data Signal Path Continued)	8-20

**Model 5004A
Table of Contents**

TABLE OF CONTENTS

Section	Title	Page
8-88	Display Control (Data Signal Path Continued).....	8-21
8-90	Signature Comparator (UNSTABLE Signature Lamp).....	8-21
8-92	Scan/Test Oscillator.....	8-21
8-94	Display Scan.....	8-21
8-98	NORMAL/SERVICE Test Switch.....	8-21
8-100	Input Signal Timing.....	8-21

APPENDICES

		Page
APPENDIX A	References.....	A-1
APPENDIX B	Components of End Item List	
Section	I. Introduction.....	B-1
	II. Integral Components of End Item.....	B-2
	III. Basic Issue Items.....	B-2
APPENDIX C	Additional Authorization List.....	C-1
APPENDIX D	Maintenance Allocation	
Section	I. Introduction.....	D-1
	II. Maintenance Allocation Chart.....	D-3
	III. Tools and Test Equipment Requirements.....	D-4
APPENDIX E	Manual Backdating Changes.....	E-1

LIST OF TABLES

Table	Title	Page
1-1	Specifications.....	1-2
1-2	Recommended Test Equipment.....	1-3
4-1	Test Equipment Required.....	4-1
4-2	Performance Test Record.....	4-5a
6-1	Replaceable Parts.....	6-5
6-2	Manufacturers Code List.....	6-9
8-1	Troubleshooting Signatures Major Test Points.....	8-11
8-2	SELF-TEST and NORMAL/SERVICE Signatures.....	8-13

LIST OF FIGURES

Figure	Title	Page
1-1	Model 5004A Signature Analyzer.....	1-0
2-1	Power Cable HP Part Numbers Versus Mains Plugs Available.....	2-2
3-1	Front Panel, Probe, and Pod Features.....	3-2
3-2	Operator Self-Test.....	3-4
3-3	Operating Instructions.....	3-6
3-4	Typical Connections of 5004A to Device Under Test.....	3-8
3-5	Probe, Pod, and Power Cable Storage.....	3-9

**Model 5004A
Table of Contents**

LIST OF FIGURES

Figure	Title	Page
4-1	Logic Level Performance Test Setup	4-2
4-2	Positive Pulse Performance Test Setup	4-2
4-3	Negative Pulse Performance Test Setup	4-3
5-1	Data Probe V_{CC} -- V_{ref} Graph	5-2
5-2	Fuse and Line Voltage Selection	5-3
6-1	Mechanical Parts.....	6-10
8-1	Troubleshooting Flowchart.....	8-11
8-2	Heat Sink Screws Locations	8-14
8-3	5004A Circuit Block Diagram	8-17
8-4	Gate Control State Diagram.....	8-20
8-5	Input Signals Timing.....	8-21
8-6	Schematic Diagram Notes	8-22
8-7	Probe and Pod (A3 and A4) Component Locations.....	8-24
8-8	Display Board and Main Board (A1) Component Location	8-25
8-9	Schematic Diagram.....	8-27

SAFETY CONSIDERATIONS

GENERAL

This is a Safety Class I instrument. This instrument has been designed and tested according to IEC Publication 348, "Safety Requirements for Electronic Measuring Apparatus."

OPERATION

BEFORE APPLYING POWER verify that the power transformer primary is matched to the available line voltage and the correct fuse is installed (see Section II). Make sure that only fuses with the required rated current and of the specified type (normal blow, time delay, etc.) are used for replacement. The use of repaired fuses and the short-circuiting of fuseholders must be avoided.

SERVICE

Although this instrument has been designed in accordance with international safety standards, this manual contains information, cautions, and warnings which must be followed to ensure safe operation and to retain the instrument in safe condition. Service and adjustments should be performed only by qualified service personnel. Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible and, when inevitable, should be carried out only by a skilled person who is aware of the hazard involved.

Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply.

Whenever it is likely that the protection has been impaired, the instrument must be made inoperative and be secured against any unintended operation.

SECTION 0 INTRODUCTION

0-1. SCOPE

a. This manual describes Signature Analyzer TS-3791/U (fig. 1-1) and provides maintenance instructions. Throughout this manual, TS-3791/U is referred to as the Hewlett Packard (HP) Model 5004A Signature Analyzer.

0-2. INDEXES OF PUBLICATIONS.

a. *DA Pam 3104.* 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.

b. *Report of Packaging and Handling Deficiencies.* Fill out and forward DD Form 6 (Packaging Improvement Report) as prescribed in AR 70058/NAVSUPINST 4030.29/AFR 71-13/MCO P4030.29A and DLAR 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 4610.33B/AFR 7518/MCO P4610.19C and DLAR 4500.15.

0-4. REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR).

EIR's will be prepared using SF 368 (Quality Deficiency Report). 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 Communication and Electronics Materiel Readiness Command, ATTN: DRSEL-ME-MQ, Fort Monmouth, NJ 07703. A reply will be furnished direct to you.

0-5. ADMINISTRATIVE STORAGE.

Administrative storage of equipment issued to and used by Army activities shall be in accordance with TM 740-90-1 and paragraph 2-8.

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.

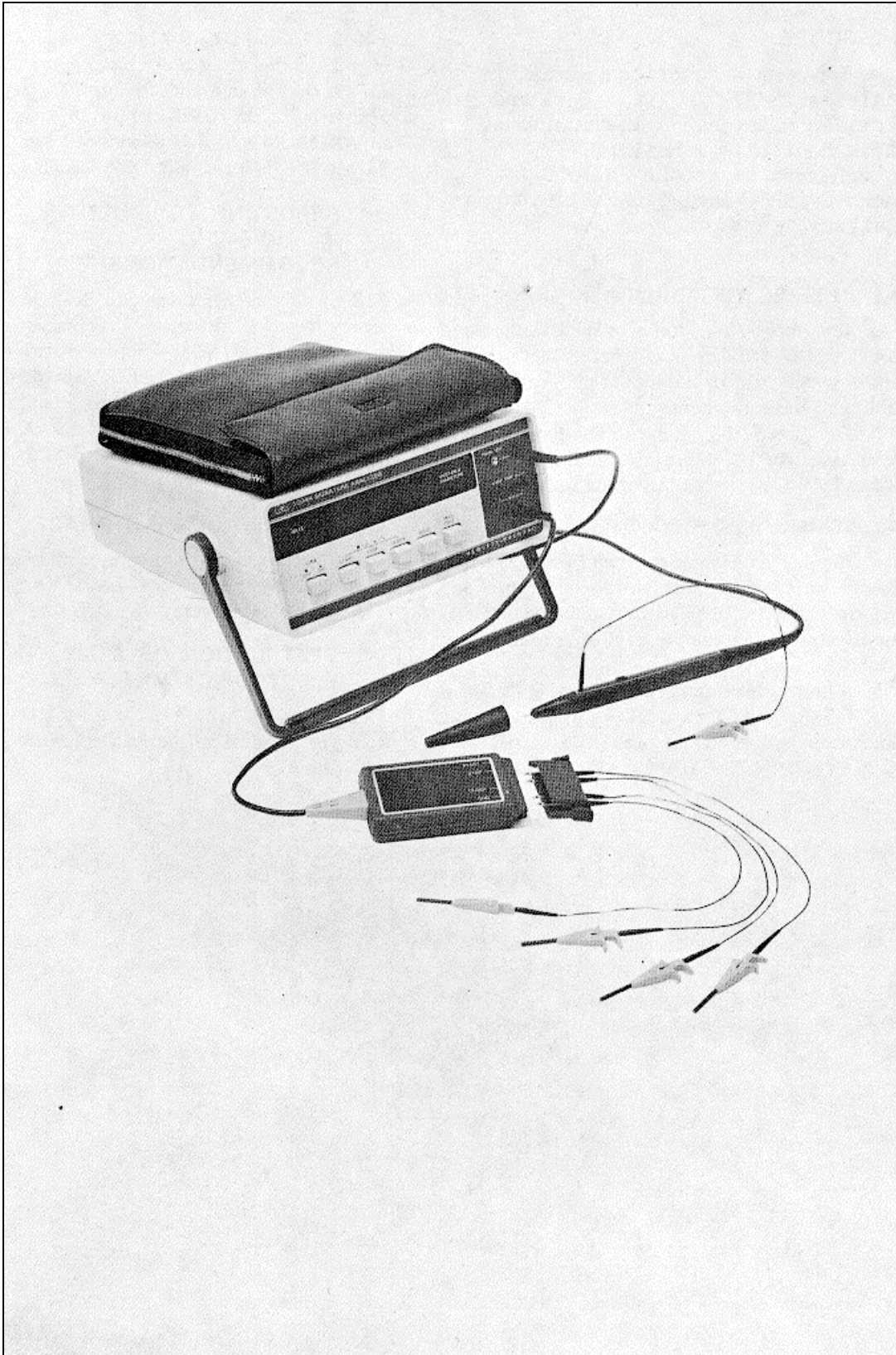


Figure 1-1. Model 5004A Signature Analyzer