HP 3245A
Universal Source
Universal Source
HP 3245A

Repair Manual

The information in this manual applies directly to HP 3245A Universal Sources (Standard, Option 001, and Option 002) with serial number prefixes 2831A.

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Notice

Hewlett-Packard to Agilent Technologies Transition

This manual may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard’s former test and measurement, semiconductor products and chemical analysis businesses are now part of Agilent Technologies. To reduce potential confusion, the only change to product numbers and names has been in the company name prefix: where a product name/number was HP XXXX the current name/number is now Agilent XXXX. For example, model number HP8648 is now model number Agilent 8648.

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The sales and service contact information in this manual may be out of date. The latest service and contact information for your location can be found on the Web at:

http://www.agilent.com/find/assist

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(tel) 1 800 452 4844
(fax) 1 800 829 4433

Canada
(tel) +1 877 894 4414
(fax) +1 888 900 8921

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(tel) (305) 269 7500
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(fax) (81) 426 56 7840

New Zealand
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(fax) 64 4 495 8950

Asia Pacific
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(fax) (61 3) 9210 5947
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Declaration of Conformity

According to ISO/IEC Guide 22 and EN 45014

The Hewlett-Packard Company declares that the HP 3245A conforms to the following Product Specifications.

Safety: IEC 1010-1 (1990)
        CSA 234
        UL 1244

EMC: CISPR 11:1990/EN 55011 (1991); Group1 Class A
     IEC 801-2:1991/EN 50082-1 (1992); 4kVCD, 8kVAD
     IEC 801-3:1984/EN 50082-1 (1992); 3 V/m
     IEC 801-4:1988/EN 50082-1 (1992); 1kV

[Signature]

Q.A. Manager
October 1992

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Printing History

The Printing History shown below lists all Editions and Updates of this manual and the printing date(s). The first printing of the manual is Edition 1. The Edition number increments by 1 whenever the manual is revised. Updates, which are issued between Editions, contain replacement pages to correct the current Edition of the manual. Updates are numbered sequentially starting with Update 1. When a new Edition is created, it contains all the Update information for the previous Edition. Each new Edition or Update also includes a revised copy of this printing history page. Many product updates or revisions do not require manual changes and, conversely, manual corrections may be done without accompanying product changes. Therefore, do not expect a one-to-one correspondence between product updates and manual updates.

Edition 1 (Part Number 03245-90015) .............................................. October 1992

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Safety Symbols

⚠ Instruction manual symbol affixed to product. Indicates that the user must refer to the manual for specific Warning or Caution information to avoid personal injury or damage to the product.

Alternating current (AC).

Direct current (DC).

Indicates hazardous voltages.

WARNING

Calls attention to a procedure, practice, or condition that could cause bodily injury or death.

CAUTION

Calls attention to a procedure, practice, or condition that could possibly cause damage to equipment or permanent loss of data.

OR

Frame or chassis ground terminal—typically connects to the equipment's metal frame.

---

WARNINGS

The following general safety precautions must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. Hewlett-Packard Company assumes no liability for the customer’s failure to comply with these requirements.

Ground the equipment: For Safety Class I equipment (equipment having a protective earth terminal), an uninterruptible safety earth ground must be provided from the mains power source to the product input wiring terminals or supplied power cable.

DO NOT operate the product in an explosive atmosphere or in the presence of flammable gases or fumes.

For continued protection against fire, replace the line fuse(s) only with fuse(s) of the same voltage and current rating and type. DO NOT use repaired fuses or short-circuited fuse holders.

Keep away from live circuits: Operating personnel must not remove equipment covers or shields. Procedures involving the removal of covers or shields are for use by service-trained personnel only. Under certain conditions, dangerous voltages may exist even with the equipment switched off. To avoid dangerous electrical shock, DO NOT perform procedures involving cover or shield removal unless you are qualified to do so.

DO NOT operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until safe operation can be verified by service-trained personnel. If necessary, return the product to a Hewlett-Packard Sales and Service Office for service and repair to ensure that safety features are maintained.

DO NOT service or adjust alone: Do not attempt internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

DO NOT substitute parts or modify equipment: Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the product. Return the product to a Hewlett-Packard Sales and Service Office for service and repair to ensure that safety features are maintained.
What's in this Manual

Manual Overview

This manual shows how to service and repair the HP 3245A Universal Source. See the HP 3245A Universal Source Operating and Programming Manual (part number 03245-90003) for additional information on operating and programming the HP 3245A. See the HP 3245A Universal Source Calibration Manual (03245-90013) for Operation Verification and Performance Tests for the HP 3245A. See the HP 3245A Universal Source Component Level Information Packet (CLIP) (03245-90033) for detailed parts lists, component locators, and schematics for the HP 3245A.

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<th>Content</th>
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General Information

Introduction

This service manual contains information required to troubleshoot and repair the HP 3245A Universal Source to the assembly level (e.g. circuit card, module, etc).

See the HP 3245A Calibration Manual for information on performance verification, and the HP 3245A Operating and Programming Manual for additional information on operation.

Figure 1-1 shows a standard single channel HP 3245A Universal Source. Option 001 adds channel B output capability, and Option 002 adds high voltage output capability.

Figure 1-1. HP 3245A Universal Source and Accessories

NOTE

The A1 and A2 assemblies have been changed to accommodate the high voltage option for the HP 3245A Universal Source. Units with serial numbers 2831A01139 and after have REV C A1 and A2 assemblies installed.
Safety Considerations

This product is a Safety Class I instrument that is provided with a protective earth terminal when properly connected to the main power source. Check all related documentation for safety markings and instructions before operation or service.

Refer to the WARNINGS page in this manual for a summary of safety information. Safety information for testing and service follows and is also found throughout this manual.

Warnings

This section contains WARNINGS which must be followed for your protection when performing equipment maintenance or repair.

----------------------------- WARNING -----------------------------

SERVICE-TRAINED PERSONNEL ONLY. The information in this manual is for service-trained personnel who are familiar with electronic circuitry and are aware of the hazards involved. To avoid personal injury or damage to the instrument, do not perform procedures in this manual or do any servicing unless your are qualified to do so.

CHECK POWER SETTINGS. Before applying power, verify that the rear panel line switch setting matches the line voltage and that the correct fuse is installed. An uninterruptible safety earth ground must be provided from the main power source to the supplied power cord set.

GROUNDING REQUIREMENTS. Interruption of the protective (grounding) conductor (inside or outside the instrument) or disconnecting the protective earth terminal will cause a potential shock hazard that could result in personal injury. (Grounding one conductor of a two-conductor outlet is not sufficient protection.)

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

REMOVE POWER IF POSSIBLE. Some procedures in this manual may be performed with power supplied to the instrument while protective covers are removed. Energy available at many points may, if contacted, result in personal injury. (If maintenance can be performed without power applied, the power should be removed.)

USING AUTOTRANSFORMERS. If the instrument is to be energized via an autotransformer (for voltage reduction) make sure the common terminal is connected to neutral (that is, the grounded side of the main's supply).
WARNING

CAPACITOR VOLTAGES. Capacitors inside the instrument may remain charged even when the instrument has been disconnected from its source of supply.

USE PROPER FUSES. For continued protection against fire hazard, replace the line fuses only with fuses of the same current rating and type (such as normal blow, time delay, etc.). Do not use repaired fuses or short-circuited fuseholders.

Cautions

This section contains CAUTIONS which must be followed to avoid damage to the equipment when performing instrument maintenance or repair.

CAUTION

Static electricity is a major cause of component failure. To prevent damage to the electrical components in the instrument, observe anti-static techniques whenever working on the HP 3245A.

Description

The HP 3245A Universal Source generates precise DC voltage and current outputs, and AC waveforms. DC voltage outputs from -10.25 Vdc to +10.25 Vdc with 6 digits of resolution (24 bits) in high resolution mode, or 3.5 digits (12 bits) in low resolution mode, are available. DC current outputs are available from -0.1 A to +0.1 A. AC outputs include sine, square, and arbitrary waveforms up to 1 MHz. Ramp waveforms with variable duty cycles from 5% to 95% are available up to 100 kHz.

Option 001 adds a second channel (B) output, sync out, and trigger I/O capability. Option 002 adds a 10x High Voltage Amplifier to provide 200 V peak-to-peak (AC voltage) and 100 V (DC voltage) output capability.

The HP 3245A also has seven voltage ranges, four current ranges, selectable output impedance, and selectable trigger and timing functions.

See the HP 3245A Operating and Programming Manual for additional information.

Specifications

See Appendix A of the HP 3245A Operating and Programming Manual for specifications.
Environment

The recommended operating environment for the HP 3245A Universal Source is:

<table>
<thead>
<tr>
<th>Environment</th>
<th>Temperature</th>
<th>Humidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating</td>
<td>0°C to +55°C</td>
<td>&lt;95% relative 0°C to +40°C</td>
</tr>
<tr>
<td>Storage and shipment</td>
<td>-40°C to +75°C</td>
<td>&lt;95% relative 0°C to +40°C</td>
</tr>
</tbody>
</table>

Serial Numbers

Instruments covered by this manual are identified by a serial number prefix listed on the title page. Hewlett-Packard uses a two-part serial number in the form XXXXAXYYYY, where XXXX is the serial prefix, A is the country of origin (A = USA), and YYYY is the serial suffix. The serial number prefix identifies a series of identical instruments. The serial number suffix is assigned sequentially to each instrument.

The serial number plate is located on the rear panel. If the serial number prefix of your instrument is greater than the one listed on the title page, a Manual Update (as required) will explain how to adapt this manual to your instrument.

Configurations and Options

The standard HP 3245A is a single channel universal source with channel A output only. This unit can be field upgraded to a two channel source (Option 001) by adding a second Inguard Source PCA for channel B output capability. There is also a High Voltage Option (Option 002) available. However, this option can only be added to instruments with Inguard Source PCA (A1) and Backplane PCA (A2) of Rev C or higher installed.

NOTE

All instruments with serial numbers prior to 2831A01139 have the Inguard Source PCA (A1) and Backplane PCA (A2) revision B assemblies installed. Instruments with serial numbers greater than 2831A01139 have revision C assemblies installed.

The High Voltage Option (Option 002) can only be installed in units with revision C assemblies.

See Chapter 2 - Replaceable Parts for assembly part numbers and locations.
Table 1-1 lists the test equipment recommended for troubleshooting the HP 3245A Universal Source. Essential requirements for each piece of test equipment are described in the Requirements column.

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Requirements</th>
<th>Recommended Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Multimeter</td>
<td>General Purpose</td>
<td>HP 3478A</td>
</tr>
</tbody>
</table>

**Figure 1-2. Initial (Incoming) Inspection Guidelines**

* optional
Inspection/Shipping

Initial Inspection

This section contains initial (incoming) inspection and shipping guidelines for the HP 3245A Universal Source.

Use the steps in Figure 1-2 as guidelines to perform initial inspection for the HP 3245A Universal Source. Installation Instructions are provided in the HP 3245A Operating and Programming Manual. Performance Verification tests (optional) are provided in the HP 3245A Calibration Manual.

WARNING

To avoid possible hazardous electrical shock, do not perform electrical tests if there are signs of shipping damage to the shipping container or to the instrument.

Shipping Guidelines

Follow the steps in Figure 1-3 to return the HP 3245A Universal Source to a Hewlett-Packard Sales and Support Office or Service Center.

1 Prepare the Universal Source
   • Remove user wiring from front panel
   • Attach tag to instrument that identifies
     - Owner
     - Model Number/Serial Number
     - Service Required

2 Package the Universal Source
   • Place packaged instrument in shipping carton*
   • Place 75 to 100 mm (3 to 4 inches) of shock-absorbing material around the instrument.
   • Seal the shipping carton securely.
   • Mark the shipping carton FRAGILE.

3 Ship the Universal Source to Hewlett-Packard
   • Place address label on shipping carton **
   • Send carton to Hewlett-Packard

* We recommend that you use the same shipping materials as those used in factory packaging (available from Hewlett-Packard). For other (commercially-available) shipping materials, use a double-wall carton with minimum 2.4 MPa (350 psi) test.

** A list of Sales and Support Offices can be found at the back of this manual.

Figure 1-3. Packaging/Shipping Guidelines
Replaceable Parts

Introduction

This chapter contains information to order replaceable parts for the HP 3245A Universal Source. Table 2-1 lists the assembly part numbers and quantities for all currently available HP 3245A Universal Source configurations. Table 2-2 lists the assembly, electrical part, and mechanical part numbers for the Universal Source. Table 2-3 shows reference designators for parts in Table 2-2, and Table 2-4 shows the manufacturer code list for these parts.

To order a part listed in Table 2-2, specify the Hewlett-Packard part number and the quantity required. Send the order to your nearest Hewlett-Packard Sales and Support Office. A list of Sales and Support Offices is at the back of this manual.

Table 2-2, HP 3245A Universal Source Replaceable Parts, lists replaceable parts for the Universal Source. See Figure 2-1, Figure 2-2, or Figure 2-3 for locations of selected parts.

Table 2-1. HP 3245A Configurations/Options

<table>
<thead>
<tr>
<th>HP 3245A Option</th>
<th>Reference Designator and Part Number (prior to serial number 2831A01139)</th>
<th>Reference Designator and Part Number (serial number 2831A01140 to 2831A01562)</th>
<th>Reference Designator and Part Number (serial number 2831A01563 and later)</th>
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<tr>
<td></td>
<td>A5 03245-66505</td>
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<td>A7 03458-66507</td>
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<tr>
<td>Option 002</td>
<td>N/A</td>
<td>A1 03245-66511 REV C [1 ea]</td>
<td>A1 03245-66517 [1 ea]</td>
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<tr>
<td></td>
<td></td>
<td>A2 03245-66502 REV C [1 ea]</td>
<td>A2 03245-66516 [1 ea]</td>
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<td>A3 03245-66503</td>
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<td>A7 03458-66507</td>
<td>A7 03458-66507 [1 ea]</td>
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Table 2-2. HP 3245A Universal Source Replaceable Parts

<table>
<thead>
<tr>
<th>Reference Designator</th>
<th>HP Part Number</th>
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<th>Part Description</th>
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<td>03245-66511</td>
<td>1</td>
<td>INGUARD SOURCE PCA (STD AND OPTION 001)</td>
<td>28480</td>
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<td>A1</td>
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<td>A2</td>
<td>03245-66502</td>
<td>1</td>
<td>BACKPLANE PCA (STD AND OPTION 001)</td>
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<td>03245-66503</td>
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<td>03245-66505</td>
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<td>OUTGUARD LOGIC PRINTED CIRCUIT ASSEMBLY</td>
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Table 2-2. HP 3245A Universal Source Replaceable Parts
## Table 2-2. HP 3245A Universal Source Replaceable Parts

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<th>Qty</th>
<th>Part Description</th>
<th>Mfr. Code</th>
<th>Mfr. Part Number</th>
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<td>JUMPER-REMOVABLE FOR .025 IN SQ PINS</td>
<td>18873</td>
<td>65474-004</td>
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### Table 2-3. HP 3245A Universal Source Reference Designators

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<td>A.................................. assembly</td>
<td>JM.................................. jumper</td>
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<tr>
<td>PCA................................ printed circuit assembly</td>
<td>K.................................. relay</td>
</tr>
<tr>
<td>B.................................. fan</td>
<td>KYC................................ mechanical part</td>
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<tr>
<td>BRK................................ bracket</td>
<td>MP.................................. panel</td>
</tr>
<tr>
<td>CS.................................. case</td>
<td>PNL.................................. screw</td>
</tr>
<tr>
<td>CVR................................ cover</td>
<td>SCW.................................. shield</td>
</tr>
<tr>
<td>F.................................. fuse</td>
<td>SHD.................................. shield</td>
</tr>
<tr>
<td>FC.................................. fuse cap</td>
<td>T.................................. transformer</td>
</tr>
<tr>
<td>FRM................................ frame</td>
<td>W.................................. cable assembly</td>
</tr>
<tr>
<td>J.................................. electrical connector (jack)</td>
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### Table 2-4. HP 3245A Universal Source Code List of Manufacturers

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<th>Mfr. Code</th>
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<td>00779</td>
<td>AMP INC</td>
<td>HARRISBURG PA US</td>
<td>17111</td>
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<tr>
<td>09216</td>
<td>PHOENIX TRANSFORMER CO</td>
<td>PHOENIX AZ US</td>
<td>85040</td>
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<tr>
<td>09915</td>
<td>RICHD PLASTIC CO</td>
<td>CHICAGO IL US</td>
<td>60646</td>
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<td>12014</td>
<td>CHICAGO RIVET &amp; MACHINE CO</td>
<td>NAPERVILLE IL US</td>
<td>60540</td>
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<tr>
<td>16428</td>
<td>COOPER INDUSTRIES INC</td>
<td>HOUSTON TX US</td>
<td>77210</td>
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<td>18873</td>
<td>DUPONT E I DE NEMOURS &amp; CO</td>
<td>WILMINGTON DE US</td>
<td>19601</td>
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<tr>
<td>24931</td>
<td>SPECIALTY CONNECTOR CO</td>
<td>FRANKLIN IN US</td>
<td>46131</td>
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<td>27264</td>
<td>MOLEX INC</td>
<td>LISLE IL US</td>
<td>60532</td>
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<td>28480</td>
<td>HEWLETT-PACKARD COMPANY - CORP</td>
<td>PALO ALTO CA US</td>
<td>94304</td>
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<td>30817</td>
<td>INSTRUMENT SPECIALTIES CO INC</td>
<td>DEL WATER GP PA US</td>
<td>07424</td>
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<td>46384</td>
<td>PENN ENGINEERING &amp; MFG CORP</td>
<td>DOYLESTOWN PA US</td>
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<td>54294</td>
<td>SHALLCROSS INC</td>
<td>NORTHBROOK IL US</td>
<td>60062</td>
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<td>57771</td>
<td>STIMPSON EDWIN B CO INC</td>
<td>BROOKLYN NY US</td>
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<td>59790</td>
<td>THOMAS &amp; BETTS CORP</td>
<td>RARITAN NJ US</td>
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<td>71707</td>
<td>COTO WABASH</td>
<td>PROVIDENCE RI US</td>
<td>02907</td>
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<td>71983</td>
<td>DOW CHEMICAL CO</td>
<td>MIDLAND MI US</td>
<td>48674</td>
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<td>73734</td>
<td>FEDERAL SCREW PRODUCTS CO</td>
<td>CHICAGO IL US</td>
<td>60618</td>
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<td>74970</td>
<td>EF JOHNSON CO</td>
<td>WASECA MN US</td>
<td>56093</td>
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<td>75915</td>
<td>LITTELFUSE INC</td>
<td>DES PLAINES IL US</td>
<td>60016</td>
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<td>76381</td>
<td>3M CO</td>
<td>ST PAUL MN US</td>
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<td>ILLINOIS TOOL WORKS INC SHAKEPROOF</td>
<td>ELGIN IL US</td>
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<td>79983</td>
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<td>MT KISCO NY US</td>
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<td>80509</td>
<td>AVERY LABEL CO</td>
<td>MONROVIA CA US</td>
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<td>86928</td>
<td>SEASTROM MFG CO</td>
<td>GLENDALE CA US</td>
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<td>90201</td>
<td>EMHART CORP</td>
<td>FARMINGTON CT US</td>
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**NOTE**

Part numbers and reference designators without option designation are used on all configurations.
Figure 2-1 through 2-3 shows locations of selected assemblies, electrical parts, and mechanical parts for the HP 3245A Universal Source.

Figure 2-1. Universal Source Parts, Front/Rear View
Figure 2-2. Universal Source Parts, Top View
Introduction

This chapter contains service information for the HP 3245A Universal Source. Also included are troubleshooting, repair, and maintenance guidelines.

WARNING

Do not perform any of the service procedures shown unless you are a qualified, service-trained technician and have read the WARNINGS and CAUTIONS in Chapter 1.

Equipment Required

Equipment required for universal source troubleshooting and repair is listed in Table 1-1, Recommended Test Equipment. Any equipment that satisfies the requirements given in the table may be substituted.

Service Aids

See Chapter 2 - Replaceable Parts for descriptions and locations of the HP 3245A Universal Source parts. Service notes, manual updates, and service literature for the instrument may be available through Hewlett-Packard. For information, contact your nearest Hewlett-Packard Sales and Service Office.

Troubleshooting Techniques

To troubleshoot an HP 3245A Universal Source problem you must first identify the problem and then isolate the cause of the problem to a replaceable assembly/part. See Chapter 2 - Replaceable Parts for descriptions and locations of HP 3245A Universal Source replaceable parts.

NOTE

If the problem cannot be isolated to a user-replaceable part shown in Table 2-1 and/or Table 2-2 we suggest you return the HP 3245A Universal Source to Hewlett-Packard for repair. See Chapter 2 - Replaceable Parts for procedures to return the HP 3245A Universal Source to Hewlett-Packard.
Identifying the Problem

Table 3-1 lists a variety of problems that can occur in the HP 3245A Universal Source, along with symptoms and recommended troubleshooting procedures. If any of these failure modes match your instrument's problem type, turn to that portion in this chapter and follow the diagnostic steps provided. If the problem cannot be identified using these steps, perform "General Troubleshooting" using the fault location diagram in Figure 3-1.

<table>
<thead>
<tr>
<th>Problem Type</th>
<th>Symptom</th>
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| Turn-on failures   | Inoperative with blank display  
                        | Inoperative with unintelligible message in the display  
                        | Operative with an ERRORS message in the display         |
| Self-test failures | ERRORS generated with the execution of FTET                          |
| Performance failures | Instrument that wakes up and passes self-test but fails to  
                        | meet performance specifications.                       |
| Miscellaneous failures | HP-IB problems  
                        | Fan inoperative                                        |

Making Visual Checks

Visual checks for the HP 3245A Universal Source include the following. See Table 3-2 for typical symptoms/actions.

- Check switches/jumpers
- Check for heat damage
- Checking cable connections

Table 3-2. HP 3245A Universal Source Visual Test/Checks

<table>
<thead>
<tr>
<th>Test/Check</th>
<th>Reference Designator</th>
<th>Check</th>
<th>Action/Notes</th>
</tr>
</thead>
</table>
| Heat Damage         | NA                   | Discolored PC boards  
                        | Damaged insulation  
                        | Evidence of arcing                                  | If there is damage, do not operate the universal source until you have corrected the problem. |
| Jumper Settings     | A5JM132 and A5JM600  | A5JM132 no jumper installed  
                        | A5JM600 jumper                                          | Install/remove jumpers as required.              |
| Component Assembly  | Main Fuse (F1M)  
                        | Fuses A1F1-3  
                        | Fuses A3F101, A3F201-A3F204  
                        | (option 002)  
                        | W1-W4 Cable Assemblies                             | Check fuses with ohmmeter                        |
                        |                      | Fuse continuity  
                        | Fuse continuity  
                        | Fuse continuity  
                        | Disconnected, dirty, or bent pins                  | Straighten/clean pins                             |
Figure 3-1. General Troubleshooting Diagram

**Turn-on Failures**

A turn-on self-test is automatically executed upon instrument power up. This test is controlled by firmware residing in ROM on the A5 Outguard Logic PCA. Typical turn-on errors include: inoperative instrument with a blank display, inoperative instrument with unintelligible messages on the display, and operative unit with an error string in the display.

Turn the Universal Source power switch to on and verify that it beeps once, displays "TESTING ROM", displays "TESTING RAM", then relays switch and the display shows "0.000000E + 0DCV".

- If this sequence executes as described, proceed with "Self-test Failures" to continue troubleshooting.
- If this sequence is incorrect, follow the turn-on failure diagnostics tree in Figure 3-2 to isolate these errors to the assembly level.
Figure 3-2. Turn-on Failure Troubleshooting Diagram (1 of 2)
Figure 3-2. Turn-on Failure Troubleshooting Diagram (2 of 2)
Self-test Failures

Two individual self-tests can be executed if the Universal Source performs a successful turn-on: TEST and FTEST.

TEST

TEST is used to provide a basic confidence check of the Universal Source, and does not change the instrument's current state or set-up. Executing TEST from the front panel checks the display panel, then each source module register that can be addressed without affecting the module's I/O state. During the display panel test, all of the normally used display elements are lit (except the shift annunciator). During the source module portion, if any register fails to respond the test fails. The source module busy times are checked and compared to an internal table of limit values, and the contents of the ID registers of the source modules that are stored in the CPU memory at power-on are read and compared. If there are any changes in these read values, the test will fail.

NOTES

TEST performs only a minimum set of routines. If instrument problems are suspected, FTEST should be performed to verify source module functionality. If TEST or FTEST is executed without designating a channel number (using HP-IB only), the first test will be the display panel test. The display panel test is not executed if channel numbers are included with the TEST command. Refer to Chapters 6 and 8 in the HP 3245A Universal Source Operating and Programming Guide for more information on TEST.

TEST is executed (from the front panel) by pressing the shift (blue key), then the TEST key on the front panel. PASS or FAIL is returned to the front panel display at the completion of the tests.

- If PASS is displayed, and there is still uncertainty about instrument functionality, FTEST should be performed.
- If FAIL is displayed, verify that Cable Assembly W2 is not the problem.
- If cable W2 is OK, replace the A5 Outguard Logic PCA (A5).
- If that fails to correct the malfunction, replace the Inguard Source PCA (A1).
- If that fails to correct the malfunction, replace the Backplane PCA (A2).
FTEST ( fixtured test) is used to perform a full pass/fail functional test on the
Inguard Source PCA specified.

NOTE

FTEST can be performed over the HP-IB interface or the Front Panel. Refer to
Chapter 9 in the HP 3245A Universal Source Operating and Programming Guide
for more information on the FTEST command.

Connect a BNC cable from the channel under test to the trigger I/O port of the
same channel. Execute the FTEST ch command, where ch is the channel under
test (where 0 = front panel A; 1 = rear panel A; 100 = front panel B;
101 = rear panel B). PASS or FAIL is returned to the front panel display at the
completion of the test. If fail is returned, the ERR$ is viewed by pressing the
error key (I key) on the front panel.

Example: To test rear panel channel A connect channel A (rear) to the channel
A trigger I/O on the front panel (as shown) and execute FTEST 1.

![Front and back view of the instrument]

NOTE

Only the first four error messages are returned to the error buffer. Always
troubleshoot the errors in the order given, as usually the first problem repaired will
eliminate the rest.

- If PASS is displayed, repeat test for all channels.
- If FAIL is displayed after running FTEST 1 or FTEST 101, verify that
  relay A2K1 is not the problem. If the relay checks good, replace the
  Inguard Source PCA (A1) under test. If that fails to correct the
  malfunction,replace the Backplane PCA (A2).*
- If FAIL is displayed after running FTEST 0 or FTEST 100, replace the
  Inguard Source PCA (A1) under test.
Performance Failures

Performance test failures are problems that may not be detected during the turn-on and self-test procedures, but are detected during the performance tests. Refer to Chapters 2 and 3 in the HP 3245A Calibration Manual for Operation verification and performance tests.

NOTE

Before assuming that a performance test has failed, verify that the test equipment and performance test methods have sufficient accuracy to check the instrument. The Universal Source is very accurate and needs appropriately accurate standards to verify specifications. Be sure to check the accuracy requirements before troubleshooting performance test failures.

If a performance test has failed:

- Attempt a recalibration to correct the failed performance specification.
- If recalibration does not correct the problem, replace the Inguard Source PCA (A1) under test.
- Perform the turn-on, self-test, and failed performance test to verify that the performance problem has been corrected.

Miscellaneous Failures

If problems cannot be categorized as Turn-on, Self-test, or Performance Failures, use the following information to troubleshoot the malfunction:

HP-IB PROBLEMS

For HP-IB failures, check/clean all connector and interconnecting cable contacts. If malfunction remains, replace the A5 Outguard Logic PCA (A5).

FAN PROBLEMS

If the fan is not running, check the voltage at A6P3 for +15 Vdc. If +15V is present, replace the Fan (B1), otherwise, replace the Outguard Power Supply PCA (A6).

DISPLAY PROBLEMS

For front panel display problems (e.g., lights, etc.) replace the Display Logic PCA (A7).
Assembly/Disassembly Procedures

Procedures are provided for disassembly and reassembly of the following items:

- Covers
- A1/A11 Inguard Source Printed Circuit Assembly
- A2 Backplane Printed Circuit Assembly
- A3 High Voltage Amplifier Printed Circuit Assembly (Option 002 only)
- A5 Outguard Logic Printed Circuit Assembly
- A6 Outguard Power Supply Printed Circuit Assembly
- A7 Display Logic Printed Circuit Assembly

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<th>Applies to Option 002</th>
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</tr>
<tr>
<td>A7</td>
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</tr>
<tr>
<td>A11</td>
<td>NO</td>
<td>YES</td>
<td>NO</td>
</tr>
</tbody>
</table>

WARNING

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

Tools Required

- #2 Pozi Drive
- #T-8 Torx driver
- #T-10 Torx driver
- #T-15 Torx driver
- 3/8 inch spin-tite
- 1/2 inch spin-tite
- 9/16 inch spin-tite
- 7 mm spin-tite
- 5/8 inch open-end wrench

Service 3-9
Covers

1. Set power to OFF, and remove the power cable.

2. Remove both screws, then the front cap, rear cap, and strap handle from both sides of the cover (see Figure 3-3).

3. Remove four Torx T15 screws from the rear of the instrument, then remove the rear bezel (screws will remain in bezel).

4. Remove two Torx T10 screws from the side of the instrument.

5. Remove the top and bottom covers.

6. Reverse order to reinstall the cover.

---

NOTE

When reinstalling the cover, verify the RFI shield fingers are in place and not damaged. These fingers cause the cover to fit snugly, with positive electrical contact. DO NOT FORCE the cover into place.

---

Figure 3-3. Remove and Replace Covers
A1/A11 Inguard Source PCA

1. Remove covers (refer to Figure 3-3).

NOTE

There may be 1 (STD) or 2 (Option 001) Inguard Source PCA’s installed in the Universal Source. The procedure for each is the same, however, the illustration only shows one installed.

2. Locate the three screws on the side of the instrument that retain the metal deck in place. Remove the outer two screws and loosen the center screw (see Figure 3-4).

3. Slide the metal deck/Inguard Source PCA(s)/optional A3 High Voltage Amplifier PCA (if installed) combination toward the front of the instrument to disengage the PCA(s) from the A2 Backplane PCA connectors.

NOTE

The connectors may require some force to disengage. Do not pry on the connectors or the Backplane PCA. If necessary, pry in one of the cutouts between the right side frame and the sheet metal deck.

4. Remove the BNC connectors from the front panel.

5. Remove the seven T10 screws and the A1 Inguard Source PCA(s).

6. Reverse order to reinstall the A1 Inguard Source PCA(s).
A2 Backplane PCA

1. Remove covers (refer to Figure 3-3).

2. Disengage the connectors on the A1 Inguard Source PCA, and if installed the optional A3 High Voltage Amplifier PCA (refer to Figure 3-4 steps 2 and 3).

3. Disconnect W2, W3, and 24-pin cable assembly from the A2 Backplane PCA (refer to Figure 3-5).

4. Remove one Torx T10 screw, the two standoffs, and the A2 Backplane PCA.

5. Remove A2 Backplane PCA (standard) or A2 Backplane PCA/A3 High Voltage Amplifier PCA combination (Option 002).

6. Reverse order to reinstall the A2 Backplane PCA.

Figure 3-5. Remove and Replace A2 Backplane PCA
1. Remove covers (refer to Figure 3-3).

2. Disengage the connectors on the A1 Inguard Source PCA/A3 High Voltage Amplifier PCA (refer to Figure 3-4 steps 2 and 3).

3. Disconnect coax cable assembly from A3 (refer to Figure 3-6).

4. Remove five Torx T10 screws and A3 High Voltage Amplifier PCA.

5. Reverse order to reinstall the A3 High Voltage Amplifier PCA.

---

**Figure 3-6. Remove and Replace A3 High Voltage Amp PCA**
A5 Outguard Logic PCA

1. Remove covers (refer to Figure 3-3).

2. Disconnect W1, W2, and 24-pin cable assembly from A5 Outguard Logic PCA (refer to Figure 3-7).

3. Remove three Torx T10 screws and two rear panel connector standoffs.

4. Slide A5 Outguard Logic PCA forward and lift out.

5. Reverse order to reinstall the A5 Outguard Logic PCA. If installing a new PCA, verify that jumper is not installed at A5JM132, and that jumper is installed at A5JM600 pins 1 - 2.

Figure 3-7. Remove and Replace A5 Outguard Logic PCA
A6 Outguard Power Supply PCA

1. Remove covers (refer to Figure 3-3).

2. Remove the power switch actuator (refer to Figure 3-8).

3. Disconnect W1, 26-pin cable assembly, 8-pin cable assembly, 2-pin cable assembly, blue wire, and line filter wires (W3 and W4) from A6 Outguard Power Supply PCA.

4. Cut cable ties next to heatsink.

5. Remove two screws holding heatsink to side panel, and two Torx T15 screws retaining the A6 Outguard Power Supply PCA.


7. Reverse order to reinstall the A6 Outguard Power Supply PCA.

Figure 3-8. Remove and Replace A6 Outguard Power Supply PCA
A7 Display Logic PCA

1. Remove covers (refer to Figure 3-3).

2. Remove A1/A11 Ingward Source PCA(s) (refer to Figure 3-4).

3. Remove the screw (located behind the front panel BLUE key) that holds the front panel to the center frame (refer to Figure 3-9).

4. Remove the power switch actuator.

5. Push the side frame in toward the center of the instrument until frame disengages from the front panel.

6. The center frame has a small metal tab that holds the front panel to the center frame. Lift the front panel away from the center frame small metal tab and move the front panel away from the center frame.

7. Remove the front panel from the other side frame.

8. Remove one screw and slide the A7 Display Logic PCA out of the retaining tabs.

9. Reverse order to reinstall the A7 Display Logic PCA. When reinstalling, verify that rubber switch pad is in place prior to replacing the PCA.

Figure 3-9. Remove and Replace A7 Display Logic PCA
This section provides guidelines for repairing and maintaining the HP 3245A Universal Source including:

- ESD precautions
- Soldering printed circuit boards
- Post-repair safety checks

**ESD Precautions**
Electrostatic discharge (ESD) may damage static sensitive devices in the Universal Source. This damage can range from slight parameter degradation to catastrophic failure. When handling Universal Source assemblies, observe the following guidelines to avoid damaging the assemblies:

- Always use a static-free work station with a pad of conductive rubber or similar material when handling assemblies.

- If a device requires soldering, be sure the assembly is placed on a pad of conductive material. Also, be sure that you, the pad, and the soldering iron tip are grounded to the assembly.

**Soldering Printed Circuit Boards**
The etched circuit boards of the Universal Source assemblies have plated-through holes that provide a solder path to both sides of the insulating material. Soldering can be done from either side of the board with equally good results. When soldering to any circuit board:

- Avoid unnecessary component unsoldering and soldering. Excessive replacement can result in damage to the circuit board, adjacent components, or both.

- Do not use a high-power soldering iron on etched circuit boards, as excessive heat may lift a conductor or damage the board.

- Use a suction device or wooden toothpick to remove solder from component mounting holes. When using a suction device, be sure that the equipment is properly grounded.

**Post-Repair Safety Checks**
After making repairs to the Universal Source, inspect the instrument for any signs of abnormal internally generated heat, such as discolored printed circuit boards or components, damaged insulation, or evidence of arcing. Determine and correct the cause of the condition. Then perform the functional tests as described in Chapter 2 and 3 of the Calibration Manual to verify that the instrument is functional.
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