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# Agilent Technologies E8482A/B Six/Three 1x4 RF Multiplexer Module Service Manual

Agilent Technologies

Manual Part Number: E8482-90010
Printed in Malaysia E0601

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## AGILENT TECHNOLOGIES WARRANTY STATEMENT

**AGILENT PRODUCT:** E8482A/B Six/Three 1x4 RF Multiplexer Module **DURATION OF WARRANTY:** 1 year

1. Agilent Technologies warrants Agilent hardware, accessories and supplies against defects in materials and workmanship for the period specified above. If Agilent receives notice of such defects during the warranty period, Agilent will, at its option, either repair or replace products which prove to be defective. Replacement products may be either new or like-new.

2. Agilent warrants that Agilent software will not fail to execute its programming instructions, for the period specified above, due to defects in material and workmanship when properly installed and used. If Agilent receives notice of such defects during the warranty period, Agilent will replace software media which does not execute its programming instructions due to such defects.

3. Agilent does not warrant that the operation of Agilent products will be interrupted or error free. If Agilent is unable, within a reasonable time, to repair or replace any product to a condition as warranted, customer will be entitled to a refund of the purchase price upon prompt return of the product.

4. Agilent products may contain remanufactured parts equivalent to new in performance or may have been subject to incidental use.

5. The warranty period begins on the date of delivery or on the date of installation if installed by Agilent. If customer schedules or delays Agilent installation more than 30 days after delivery, warranty begins on the 31st day from delivery.

6. Warranty does not apply to defects resulting from (a) improper or inadequate maintenance or calibration, (b) software, interfacing, parts or supplies not supplied by Agilent, (c) unauthorized modification or misuse, (d) operation outside of the published environmental specifications for the product, or (e) improper site preparation or maintenance.

7. TO THE EXTENT ALLOWED BY LOCAL LAW, THE ABOVE WARRANTIES ARE EXCLUSIVE AND NO OTHER WARRANTY OR CONDITION, WHETHER WRITTEN OR ORAL, IS EXPRESSED OR IMPLIED AND AGILENT SPECIFICALLY DISCLAIMS ANY IMPLIED WARRANTY OR CONDITIONS OF MERCHANTABILITY, SATISFACTORY QUALITY, AND FITNESS FOR A PARTICULAR PURPOSE.

8. Agilent will be liable for damage to tangible property per incident up to the greater of $300,000 or the actual amount paid for the product that is the subject of the claim, and for damages for bodily injury or death, to the extent that all such damages are determined by a court of competent jurisdiction to have been directly caused by a defective Agilent product.

9. TO THE EXTENT ALLOWED BY LOCAL LAW, THE REMEDIES IN THIS WARRANTY STATEMENT ARE CUSTOMER'S SOLE AND EXLUSIVE REMEDIES. EXCEPT AS INDICATED ABOVE, IN NO EVENT WILL AGILENT OR ITS SUPPLIERS BE LIABLE FOR LOSS OF DATA OR FOR DIRECT, SPECIAL, INCIDENTAL, CONSEQUENTIAL (INCLUDING LOST PROFIT OR DATA), OR OTHER DAMAGE, WHETHER BASED IN CONTRACT, TORT, OR OTHERWISE.

FOR CONSUMER TRANSACTIONS IN AUSTRALIA AND NEW ZEALAND: THE WARRANTY TERMS CONTAINED IN THIS STATEMENT, EXCEPT TO THE EXTENT LAWFULLY PERMITTED, DO NOT EXCLUDE, RESTRICT OR MODIFY AND ARE IN ADDITION TO THE MANDATORY STATUTORY RIGHTS APPLICABLE TO THE SALE OF THIS PRODUCT TO YOU.

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E8482A/B Six/Three 1x4 RF Multiplexer Module Service Manual
Edition 1
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## Documentation History

All Editions and Updates of this manual and their creation date are listed below. The first Edition 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 or add additional information to the current Edition of the manual. Whenever a new Edition is created, it will contain all of the Update information for the previous Edition. Each new Edition or Update also includes a revised copy of this documentation history page.

Edition 1 . . . . . June, 2001

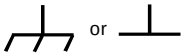
## Safety Symbols



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.



Indicates the field wiring terminal that must be connected to earth ground before operating the equipment — protects against electrical shock in case of fault.



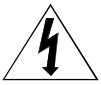
Frame or chassis ground terminal—typically connects to the equipment's metal frame.



Alternating current (AC)



Direct current (DC).



Warning. Risk of electrical shock.

**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.

## 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. Agilent Technologies assumes no liability for the customer's failure to comply with these requirements.

**Ground the equipment:** For Safety Class 1 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 Agilent 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 Agilent for service and repair to ensure that safety features are maintained.

# DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and CEN/CENELEC EN 45014

CE

**Manufacturer's Name:** Agilent Technologies, Incorporated
**Manufacturer's Address:** 815 – 14th St. SW
Loveland, Colorado 80537
USA

**Declares, that the product**

**Product Name:** Six/Three 1x4 RF Multiplexer Module
**Model Number:** E8482A/B
**Product Options:** *This declaration covers all options of the above product(s).*

***Conforms with the following European Directives:***

*The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC (including 93/68/EEC) and carries the CE Marking accordingly.*

**Conforms with the following product standards:**

| **EMC** | **Standard** | **Limit** |
|---|---|---|
| | *IEC 61326-1:1997+A1:1998 / EN 61326-1:1997+A1:1998* | |
| | *CISPR 11:1990 / EN 55011:1991* | *Group 1 Class A* |
| | *IEC 61000-4-2:1995+A1:1998 / EN 61000-4-2:1995* | *4kV CD, 8kV AD* |
| | *IEC 61000-4-3:1995 / EN 61000-4-3:1995* | *3 V/m, 80-1000 MHz* |
| | *IEC 61000-4-4:1995 / EN 61000-4-4:1995* | *0.5kV signal lines, 1kV power lines* |
| | *IEC 61000-4-5:1995 / EN 61000-4-5:1995* | *0.5 kV line-line, 1 kV line-ground* |
| | *IEC 61000-4-6:1996 / EN 61000-4-6:1996* | *3V, 0.15-80 MHz* |
| | *IEC 61000-4-11:1994 / EN 61000-4-11:1994* | *Dips: 30% 10ms; 60% 100ms*<br>*Interrupt > 95%@5000ms* |
| | *Canada: ICES-001:1998*<br>*Australia/New Zealand: AS/NZS 2064.1* | |
| | *The product was tested in a typical configuration with Agilent Technologies test systems.* | |
| **Safety** | *IEC 61010-1:1990+A1:1992+A2:1995 / EN 61010-1:1993+A2:1995*<br>*Canada: CSA C22.2 No. 1010.1:1992*<br>*UL 3111-1: 1994* | |

14 June 2001
Date

**Ray Corson**
Product Regulations Program Manager

For further information, please contact your local Agilent Technologies sales office, agent or distributor.
*Authorized EU-representative: Agilent Technologies Deutschland GmbH, Herrenberger Straβe 130, D 71034 Böblingen, Germany*

## *Notes:*

# Chapter 1
# General Information

## Introduction

This manual contains information required to test, troubleshoot, and repair the Agilent E8482A/B Six/Three 1x4 RF Multiplexer module (see Figure 1-1). For more information on the RF Multiplexer modules operation, see *Agilent E8482A/B Six/Three 1x4 RF Multiplexer Module User's Manual.*

**NOTE** *The E8482B Three 1x4 RF Multiplexer module is identical to the E8482A module with the exception of fewer channels (three 1x4 multiplexers) provided. Unless otherwise stated, this manual applies to both modules.*

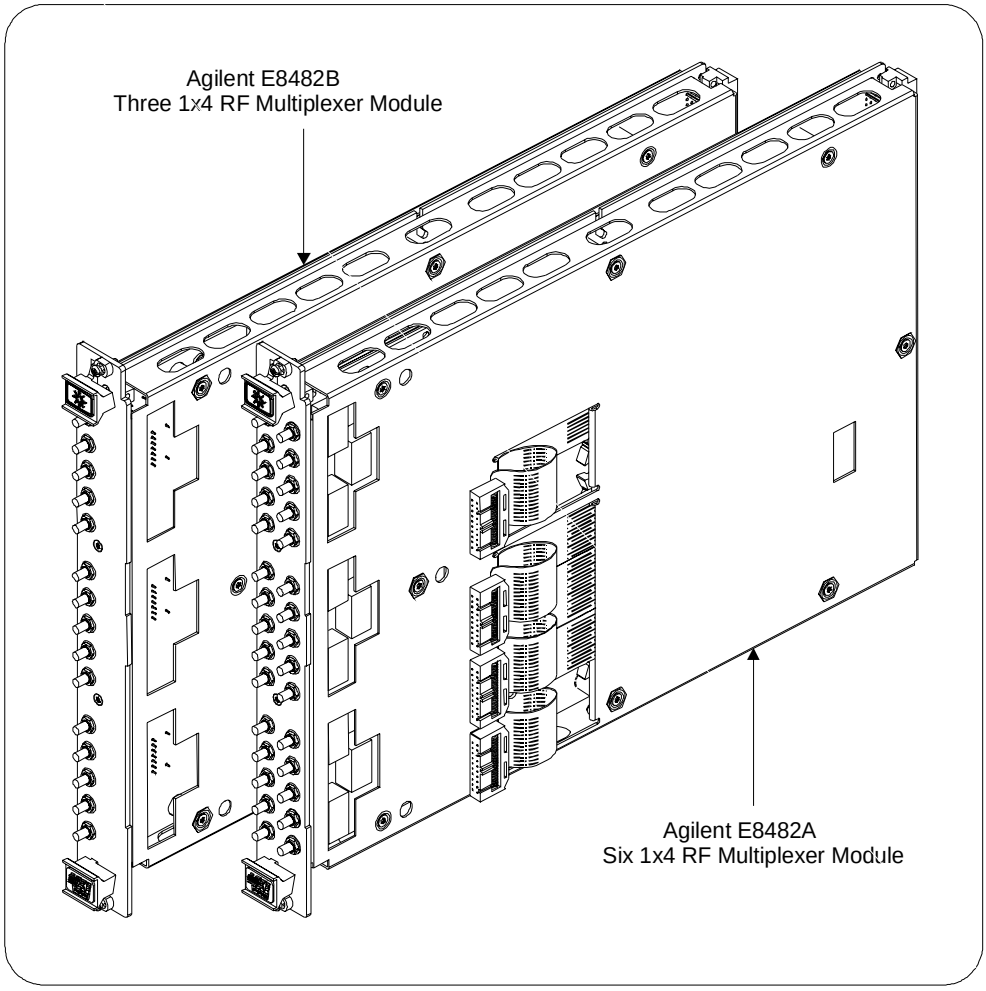



**Figure 1-1. Agilent E8482A/B RF Multiplexer Modules**

# Contacting Agilent Technologies

Any adjustment, maintenance, or repair of this product must be performed by qualified personnel. Contact your customer engineer through your local Agilent Technologies Service Center for repair and service.

- You can go to the main Agilent Customer web site (http://www.agilent.com/find/assist) to find a list of your local Sales and Service Offices.
- The Agilent Calibration and Repair Services web site (http://www.agilent.com/find/repair) describes Agilent calibration and repair services.
- The Agilent Parts web site (http://www.parts.agilent.com/) shows how to order replacement parts from Agilent.

# Safety Considerations

This product is a Safety Class I instrument that is provided with a protective earth terminal when installed in the mainframe. The instrument, mainframe, and all related documentation should be reviewed for familiarization with safety markings and instructions before operation or service.

Refer to the WARNINGS page (page 6) in this manual for a summary of safety information. Safety information for testing and service follows and is also found throughout this manual.

This section contains WARNINGS which must be followed for your protection and CAUTIONS which must be followed to avoid damage to the equipment when performing instrument 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 you are qualified to do so.**

**CHECK MAINFRAME POWER SETTINGS. Before applying power, verify that the mainframe 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 mainframe) 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 mainframe 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 mainframe 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.)**

**WARNING**

**USING AUTOTRANSFORMERS. If the mainframe 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).**

**CAPACITOR VOLTAGES. Capacitors inside the mainframe may remain charged even when the mainframe 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.**

**SHOCK HAZARD. Only service-trained personnel who are aware of the hazards involved should install, remove, or configure the RF Multiplexer module. Before you remove any installed module, disconnect AC power from the mainframe and from other modules that may be connected to the RF multiplexer module.**

**CHANNEL WIRING INSULATION. All channels that have a common connection must be insulated so that the user is protected from electrical shock. This means wiring for all channels must be insulated as though each channel carries the voltage of the highest voltage channel.**

**CAUTION**

**MAXIMUM POWER.** The maximum power that can be applied to any SMB connector of the module is 10 W or 10 VA. The maximum voltage that can be applied to any SMB connector is 30 Vdc or 30 Vac peak. The maximum current that can be applied to any SMB connector is 0.5 Adc.

**STATIC ELECTRICITY.** Static electricity is a major cause of component failure. To prevent damage to the electrical components on the RF Multiplexer module, observe anti-static techniques whenever removing a module from the mainframe or whenever working on a module.

# Inspection/Shipping

This section contains initial (incoming) inspection and shipping guidelines for the RF multiplexer modules.

## Initial Inspection

Use the following steps as guidelines to perform initial (incoming) inspection for the E8482A/B RF Multiplexer module.

**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.**

1. Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, contact Agilent Technologies (see page 10).

2. Check the shipping contents and verify they are complete. Normally, the module you ordered (E8482A or E8482B as shown in Figure 1-1) and a User's Manual should be included. If the contents are incomplete or with mechanical damage/defect, contact Agilent Technologies (see page 10).

3. Install the RF multiplexer module in a VXI mainframe. Refer to the *Agilent E8482A/B Six/Three 1x4 RF Multiplexer Module User's Manual* for more information.

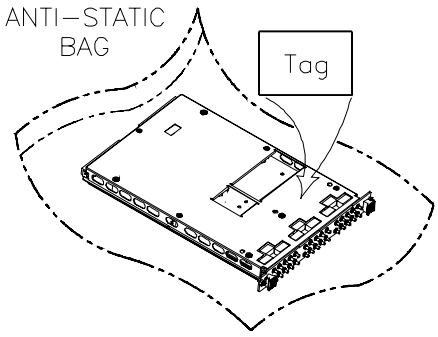
4. Perform the Functional Verification test and the Performance Verification tests (optional). Refer to *Chapter 2* of this manual.

5. If any of the tests do not pass, refer to page 30 in *Chapter 3* of this manual for troubleshooting. If the instrument is to be shipped to Agilent for service or repair, see Figure 1-2 for instructions on repackaging the module for shipment.

6. If all verification tests pass, the module is ready for use.

## Shipping Guidelines

If the instrument is to be shipped to Agilent for service or repair, follow the procedures in Figure 1-2.




**1. Prepare the Module**

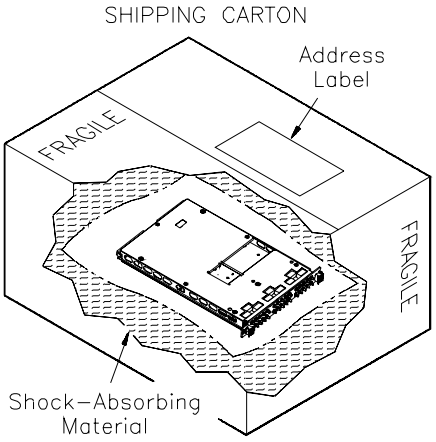
- Remove user wiring from terminal module.
- Attach tag to module/pod that identifies:
  -- Owner
  -- Model Number/Serial Number
  -- Service Required
- Place tagged device in approved anti-static bag.

**2. Package the Module**

- Place packaged module in shipping carton.*
- Place 75 to 100 mm (3 to 4 inches) of shock-absorbing material around the module.
- Seal the shipping carton securely.
- Mark the shipping carton FRAGILE.

**3. Ship the Module to Agilent**

- Place address label on shipping carton.**
- Send carton to Agilent.




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

** See "Contacting Agilent Technologies" on page 10 for the address to which you can return the module.

**Figure 1-2. Packaging/Shipping Guidelines**

# RF Multiplexer Modules Description

The Agilent E8482A/B RF Multiplexer module is a single-slot VXIbus C-Size register-based product which can operate in a C-Size VXIbus mainframe. It is supplied with an E1406A command module driver and a *VXIplug&play* driver. These drivers make the E8482A/B appear as an "instrument" in the slot of a VXIbus mainframe. Each module is assigned an error queue, input and output buffers, and a status register.

**NOTE** *Instruments are based on the logical addresses of the plug-in modules. See Agilent E8482A/B Six/Three 1x4 RF Multiplexer Module User's Manual to set the logical address (factory setting is 120) for the RF multiplexer module to create an instrument.*

## RF Multiplexer Module Block Diagram

As shown in Figure 1-3, the E8482A consists of six banks of channels (banks 0 - 5) to form six 1x4 RF multiplexers, while the E8482B consists of three banks of channels (banks 0 - 2) to form three 1x4 RF multiplexers. The switching sections of each bank are identical.

Each channel in a bank is connected to its COM by closing the appropriate (non-latching) relays. Only one channel in each bank can be connected to its COM at a time. Channels are referred as *n*0 through *n*3 and COM *n*0, where *n* is the bank number (*n = 0-5* for E8482A and *n = 0-2* for E8482B). User inputs/outputs to any module use 50 Ω SMB connectors. At power-off, power-on, or following a reset, the first channel in each bank is connected to its COM. That is, channel *n*0 is connected to the COM *n*0 connector, and all other channels (*n*1 through *n*3) in each bank are open (non-terminated).

In addition, the E8482A/B RF Multiplexer module can control up to two additional expander modules. The expander modules can be either the E1473A 50Ω RF Multiplexer Expander module or the E1475A 75Ω RF Multiplexer Expander module. The Expander modules can be inserted in the C-Size mainframe next to the RF Multiplexer module, or can be located up to eight meters away from the RF multiplexer module using remote expander cables. Locating the expander module close to the external device keeps connecting cable lengths to a minimum, thereby reducing the possibility of crosstalk and insertion loss of high frequency signals. See *Agilent E8482A/B Six/Three 1x4 RF Multiplexer Module User's Manual* for details.

**NOTE** *The Agilent E8482B Three 1x4 RF Multiplexer module is identical in operation to the E8482A Six 1x4 RF Multiplexer module with the exception of fewer switching channels. The E8482B provides a good choice for users requiring fewer RF switching channels.*

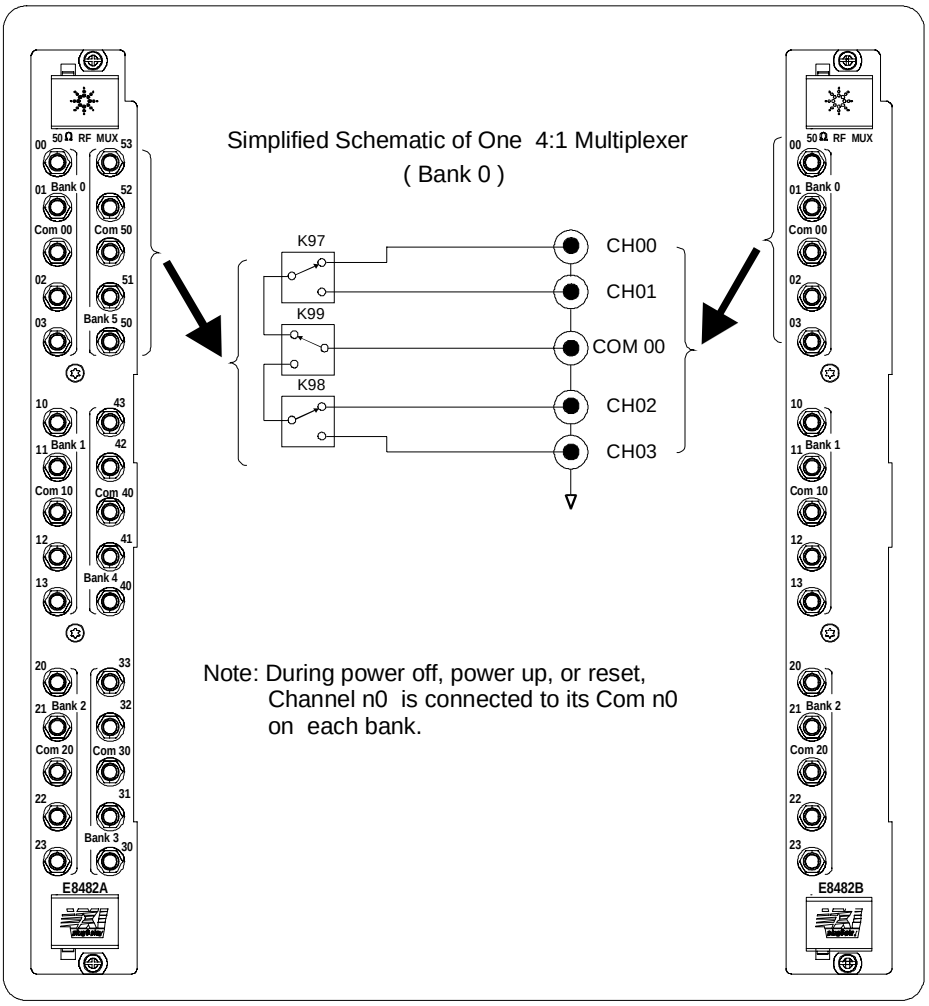



**Figure 1-3. Simplified Schematic of the RF Multiplexers**

## RF Multiplexer Module Specifications

Specifications are listed in Appendix A of this manual. These specifications are the performance standards or limits against which the modules may be tested.

## RF Multiplexer Module Serial Numbers

Devices covered by this manual are identified by Agilent Technologies product number E8482A/B followed with a ten-character serial number (as listed on the title page). Agilent uses a two-part serial number in the form US00000000. The first 2-letter indicates the country in which the product was manufactured (US = United States). The last 8-digit is unique and assigned sequentially for that particular product number. The serial number plate is located on the right-hand shield near the backplane connectors.

## RF Multiplexer Module Options

There are no electrical or mechanical options available for the Agilent E8482A/B RF Multiplexer modules.

# Chapter 2
# Verification Tests

## Introduction

The purpose of the functional verification tests described in this chapter is to provide a relatively fast and easy way to determine that the Agilent E8482A/B Six/Three 1x4 RF Multiplexer module is operational. For more in-depth, higher confidence level test procedures, use the performance verification test in this chapter. The verification tests are:

- Functional Verification Test: Self-Test
- Performance Verification Test: Closed-Channel Resistance Test

## General Test Requirements

Before performing the verification tests, you should check the requirements and assumptions in this section.

### Recommended Test Equipment

Table 2-1 lists the test equipment recommended for testing and servicing the module. Essential requirements for each piece of test equipment are described in the Requirements column.

**Table 2-1. Recommended Test Equipment**

| Instrument | Requirements | Recommended Model | Use [a] |
|---|---|---|---|
| Controller, GPIB | GPIB compatibility as defined by IEEE Standard 488-1987 and the identical ANSI Standard MC1.1: SH1, AH1, T2, TE0, L2, LE0, SR0, RL0, PP0, DC0, DT0, and C1, 2, 3, 4, 5. | IBM Compatible PC with Agilent 82350 GPIB card installed | F, P, T |
| Mainframe | Compatible with the RF Multiplexer module | Agilent E8401A/03A/04A/08A | F, P, T |
| Command Module | Compatible with the RF Multiplexer module | Agilent E1406A | F, P, T |
| Digital Multimeter | 4-wire Ohms | Agilent 3458A or Agilent 34401A | P, T |

a. F = Functional Verification Tests, P = Performance Verification Tests, T = Troubleshooting

**NOTE** *The performance tests, troubleshooting and repair procedures are written for the recommended test equipment. Substituting alternate test equipment may require that some procedures be modified.*

## Test Conditions/ Procedures

You should complete the Performance Verification tests at least once a year. For heavy use or severe operating environments, perform the tests more often.

The verification tests assume that the person performing the tests understands how to operate the mainframe, the RF multiplexer module, and specified test equipment. The test procedures do not specify equipment settings for test equipment, except in general terms. It is assumed that a qualified, service-trained technician will select and connect the cables, adapters, and probes required for the test.

It is assumed that the temperature is no greater than 25°C and the relative humidity is no greater than 40% (within the specifications as shown in *Appendix A)*.

## Performance Test Record

The results of each Performance Verification Test may be recorded in the Performance Test Record (Table 2-3). You can make a copy of this form, if desired.

## Recommended System Configuration

All verification tests in this chapter assume the following:

- An E1406A command module and an E8482A/B RF Multiplexer module are installed in the mainframe.
- The Agilent SICL Library, VISA extensions, and an Agilent 82350 GPIB card had been installed and properly configured in your PC computer.
- The computer is connected to the E1406A command module via GPIB interface. The GPIB select code is 7, the GPIB primary address is 09, and the E8482A/B module is at logical address 120 (secondary address = 120/8 = 15).
- The E8482A/B SCPI driver (Revision A.11.01 or later) had been downloaded into the E1406A command module. For access to the most up to date instrument drivers, go to the web site (http://www.agilent.com/find/inst_drivers).
- DMM is an Agilent 3458A.

**NOTE** *You may need to change the module's address and/or command syntax to perform the tests for your setup. However, substituting alternate configuration may require that some procedures be modified. See Agilent E8482A/B Six/Three 1x4 RF Multiplexer Module User's Manual for more information on address selection, cabling guidelines, and the related SCPI commands.*

# Functional Verification Test

The Functional Verification Test for the E8482A/B RF Multiplexer module consists of sending the self-test command (*TST?) and checking the response. This test can be used at any time to verify that the device is connected properly and is responding to basic commands. However, it does not ensure module's switching operability.

## Test Procedure

1. Verify the RF multiplexer module is properly installed in the mainframe and the mainframe has passed its power-on sequence test.
2. Verify that the computer is properly connected to the mainframe via GPIB interface.
3. Send the *TST? command to the RF multiplexer module (GPIB primary address is 09 and secondary address is 120/8 = 15) from *Agilent VISA Assistant* application program.
4. A "+0" returned means no self-test failure, while any non-zero error code returned indicates a self-test failure. See Table 2-2 below for the description of self-test error codes.

**NOTE** *Test failures can be caused by improper cabling,improper selection of the interface select code, primary, and/or secondary address setting. Verify proper connection and address selection before troubleshooting. As required, see Agilent E8482A/B Six/Three 1x4 RF Multiplexer Module User's Manual for more information on module installation, address selection, and the related SCPI commands.*

## Corrective Action

An non-zero error code is returned when the module self-test fails. The meaning of each code is given in Table 2-2. If a self-test failure occurs, recycle power and repeat the self-test procedure as shown above. If the problem reoccurs, the module requires to be repaired. Contact Agilent Technologies for repair and service (see page 10).

**Table 2-2. Self-test Error Codes**

| Error [a] | Description (probable Causes) |
|---|---|
| +0 | Self-test passes. |
| +ss01 | Firmware error. |
| +ss02 | Bus error (problem communicating with the module). |
| +ss03 | Incorrect ID information in ID register. |
| +ss05 | Card data register incorrect (hardware and firmware with different values). |
| +ss10 | Interrupt expected but not received. |
| +ss11 | Card busy time incorrect. |

a. ss = card number (with leading zero deleted, the typical is 1)

# Performance Test: Closed-Channel Resistance Test

The most likely specification to change with time is the relay contact resistance. Therefore, the performance verification test in this section is to test the closed-channel resistance for each channel of the E8482A/B RF multiplexer module. It is suitable for identifying a damaged relay.

In general, a new relay should have a contact resistance of 1 Ω or less. Relays with contact resistance in excess of 2 Ω should be replaced. Performance of a relay will deteriorate with use.

**NOTE** *In the following procedures, card number ss **is with t**he typical value of 1. All commands sending to the RF multiplexer module (GPIB primary address is 09 and secondary address is 120/8 = 15) are from the VISA Assistant Application Program.*

**NOTE** *Only one channel in each bank is connected to its COM at a time. At power-off, power-on, or following a reset, the first channel in each bank (n0, where bank number n = 0-5 for E8482A and n = 0-2 for E8482B) is connected to its COM n0.*

## Test Procedure

1. Verify that the E8482A/B module is properly installed in the mainframe and the mainframe has passed its power-on sequence test.

2. Verify that the computer is properly connected to the mainframe via GPIB interface.

3. Measure closed-channel resistance for channel 00 (in Bank 0)

   -- Connect the DMM (Agilent 3458A) between the center conductor of the COM 00 connector and the center conductor of the channel 00 connector (see Figure 2-1). Refer to Figure 1-3 for the channel connector locations on the module's front panel.
   -- Power on the DMM (Agilent 3458A), and set the DMM to 4-wire Ohms, autorange.
   -- Send CLOS (@*ss00*) to the RF multiplexer module to close channel 00.
   -- Observe the DMM display and record the reading in Table 2-3.

**NOTE** *As required, see the Agilent 3458A Multimeter Operating, Programming, and Configuration Manual for more configuration information.*

4. Repeat step 3 for channels 01, 02 and 03 (in Bank 0) with the following changes:

   -- Move the DMM LO line to the center conductor of the channel under test.
   -- Use CLOS (@*sscc*), where *ss* = card number and *cc* = channel number under test (01-03 for Bank 0).

5. Repeat Steps 3 & 4 for channels in Banks 1, 2, 3, 4, and 5 (Banks 1 and 2 for E8482B) with the following changes:

   -- Move the DMM HI line to the COM connector of the Bank under test and the DMM LO line to the channel under test within the tested bank.
   -- Use CLOS (@*sscc*), where *ss* = card number and *cc* = channel number (10-13 for Bank 1, 20-23 for Bank 2, 30-33 for Bank 3, 40-43 for Bank 4 and 50-53 for Bank 5).

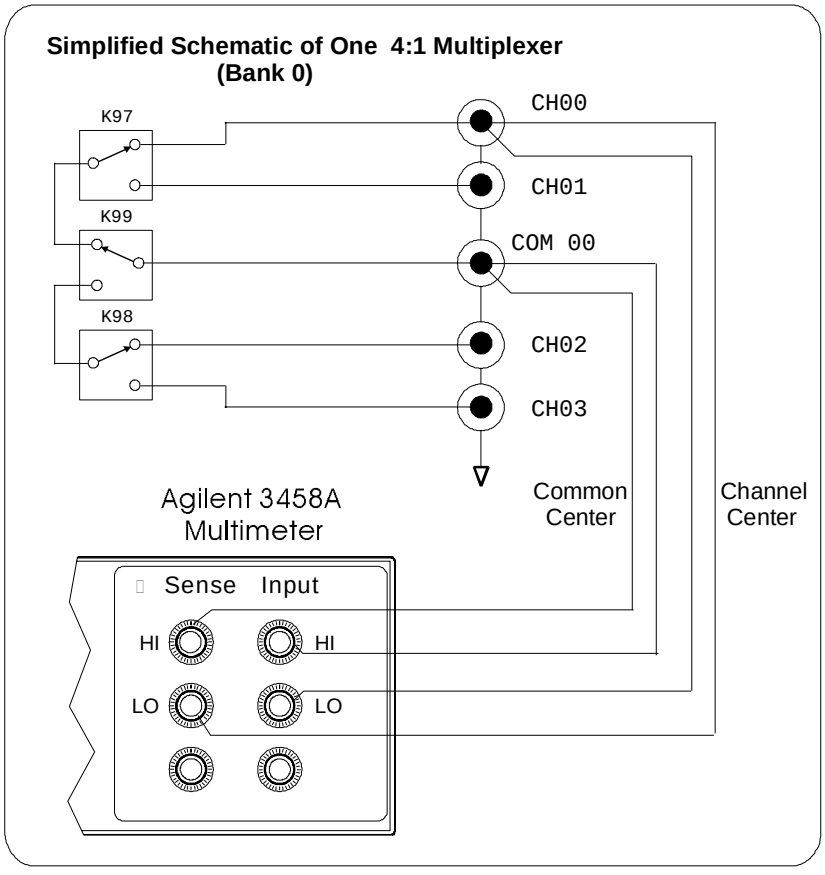



**Figure 2-1. Closed-Channel Resistance Test Connections**

## Corrective Action

As shown in *Appendix A*, the initial closed-channel resistance for any relay contact of the E8482A/B RF multiplexer module should be less than 1 Ω. However, the electromechanical relays are subject to normal wear-out (see *Appendix B*). As the relay begins to wear out, its contact resistance increases. When any channel's resistance is greater than 2 Ω (or not suit for your application), the relays in the corresponding channel should be replaced.

According to the repair strategy for the E8482A/B module (see page 27), you may need to replace entire printed circuit assembly (PCA) board when any relay on the board is out of the specification limit. However, the sensitivity of the application should be weighed against the cost of replacing the entire PCA board (P/N E8482-60001) with some useful life remaining.

**WARNING** **Any maintenance and repair of the module must be performed by qualified personnel. Contact Agilent Technologies (see page 10) for repair and service.**

# Performance Test Record

Table 2-3 is a form you can copy and use to record performance verification test results for the RF Multiplexer modules. Information concerning test limits, measurement uncertainty, and test accuracy ratio (TAR) is provided below.

**NOTE** *The accuracy, measurement uncertainty, and TAR values shown in Table 2-3 are valid ONLY for the specific test conditions, test equipment, and assumption described. If you use test equipment and/or change the test conditions, you will need to compute the specific values for your test setup.*

## Test Limits

Test limits are defined for closed-channel resistance test using the specifications in Appendix A of this manual. The closed-channel resistance test specifications are single-sided (i.e., there is an upper limit but no lower limit). In the Performance Test Record, the Minimum column is blank.

## Measurement Uncertainty

For the performance verification tests in this manual, the measurement uncertainties are based on 90-day accuracy specifications for the Agilent 3458A Digital Multimeter. The calculations are shown below.

### Closed-Channel Resistance Test

Conditions:

- 4-wire ohms function, 10 Ω range
- 90-day specifications
- Worst-case reading = 2.0 Ω

M.U. = 15 *ppm of Reading* + 5 *ppm of Range*

= $(15 \times 10^{-6} * 2.0) + (5 \times 10^{-6} * 10)$ Ω

= $8.0 \times 10^{-5}$ Ω

## Test Accuracy Ratio (TAR)

Test Accuracy Ratios are not defined for single-sided measurements, so all closed-channel resistance measurements have 'NA' (Not Applicable) in the TAR column.

**Table 2-3. Performance Test Record (Page 1 of 2)**

| **Model** _____ **Report Number** _____ **Date** _____ |
|---|

**General Information**

| ***Test Facility*** | |
|---|---|
| Name _____ | Phone _____ |
| Address _____ | Fax _____ |
| City, State, ZIP _____ | e-Mail _____ |
| Customer _____ | Tested by _____ |
| ***Notes*** | |
| _____ | |
| _____ | |
| _____ | |
| _____ | |
| _____ | |
| _____ | |
| _____ | |

**Test Equipment Used**

| ***Description*** | ***Model No.*** | ***Trace No.*** | ***Cal Due Date*** |
|---|---|---|---|
| 1. _____ | _____ | _____ | _____ |
| 2. _____ | _____ | _____ | _____ |
| 3. _____ | _____ | _____ | _____ |
| 4. _____ | _____ | _____ | _____ |
| 5. _____ | _____ | _____ | _____ |
| 6. _____ | _____ | _____ | _____ |

**Table 2-3. Performance Test Record (Page 2 of 2)**

**Model** _____ **Report Number** _____ **Date** _____

| Test No/Description [a] | Minimum Value [b] | Measured Value | Maximum Value | Measurement Uncertainty | Test Accuracy Ratio (TAR) |
|---|---|---|---|---|---|
| ***Closed-Channel Resistance Test (****Values in Ohms****)*** | | | | | |
| Channel 00 | | _____ | 2.0 | 8.0E-5 | NA |
| Channel 01 | | _____ | 2.0 | 8.0E-5 | NA |
| Channel 02 | | _____ | 2.0 | 8.0E-5 | NA |
| Channel 03 | | _____ | 2.0 | 8.0E-5 | NA |
| Channel 10 | | _____ | 2.0 | 8.0E-5 | NA |
| Channel 11 | | _____ | 2.0 | 8.0E-5 | NA |
| Channel 12 | | _____ | 2.0 | 8.0E-5 | NA |
| Channel 13 | | _____ | 2.0 | 8.0E-5 | NA |
| Channel 20 | | _____ | 2.0 | 8.0E-5 | NA |
| Channel 21 | | _____ | 2.0 | 8.0E-5 | NA |
| Channel 22 | | _____ | 2.0 | 8.0E-5 | NA |
| Channel 23 | | _____ | 2.0 | 8.0E-5 | NA |
| Channel 30 | | _____ | 2.0 | 8.0E-5 | NA |
| Channel 31 | | _____ | 2.0 | 8.0E-5 | NA |
| Channel 32 | | _____ | 2.0 | 8.0E-5 | NA |
| Channel 33 | | _____ | 2.0 | 8.0E-5 | NA |
| Channel 40 | | _____ | 2.0 | 8.0E-5 | NA |
| Channel 41 | | _____ | 2.0 | 8.0E-5 | NA |
| Channel 42 | | _____ | 2.0 | 8.0E-5 | NA |
| Channel 43 | | _____ | 2.0 | 8.0E-5 | NA |
| Channel 50 | | _____ | 2.0 | 8.0E-5 | NA |
| Channel 51 | | _____ | 2.0 | 8.0E-5 | NA |
| Channel 52 | | _____ | 2.0 | 8.0E-5 | NA |
| Channel 53 | | _____ | 2.0 | 8.0E-5 | NA |

a. Channels 30 through 53 are not available for E8482B module.
b. Single-sided specification - Minimum Value does not apply.

## *Notes:*

# Chapter 3
# Service

## Introduction

This chapter contains service information for the Agilent E8482A/B RF Multiplexer modules, including repair strategy, ordering replaceable parts, repair/maintenance guidelines, as well as troubleshooting techniques.

**WARNING** **Do not perform any of the service procedures shown unless you are a qualified, service-trained technician, and have read the "Safety Considerations" in Chapter 1.**

**NOTE** *The performance tests, troubleshooting and repair procedures are written for the recommended test equipment as shown in Table 2-1 on page 17 of this manual. Substituting alternate test equipment may require that some procedures be modified.*

## Repair Strategy

Agilent recommends replacement of the entire printed circuit assembly (PCA) board for the E8482A/B RF Multiplexer modules when any of the relay on the board fails or the end of relay life approaches. However, the sensitivity of the application should be weighed against the cost of replacing the entire circuit board with some useful life remaining. Table 3-1 shows the ordering information for the user-replaceable assemblies. See Figure 3-1 for the simplified diagrams of the replaceable PCA boards. For more repair information, contact Agilent Technologies (see page 10).

As shown in Figure 3-3, the E8482A RF Multiplexer module contains three PCA boards (A1, A2, and A3). The E8482B module contains two PCA boards (A1 and A2) as shown in Figure 3-4. Both the E8482A and the E8482B have one relay driver PCA (A1, P/N E8482-60002) where the VXI interface, relay decoders and relay drivers are located. The relay assembly PCA (A2/A3, P/N E8482-60001) where the multiplexer relays, tree relays, and their associated RF connectors are located provides three banks of channels. Therefore, the E8482A RF Multiplexer (six banks of channels) has two relay assembly PCAs, while the E8482B module (three banks of channels) has one relay assembly PCA only.

**NOTE** *As required, see Appendix C of this manual for the detailed schematics and component locator diagrams of the Agilent E8482A/B Six/Three 1x4 RF Multiplexer module.*

# Replaceable Parts

The replaceable parts for the Agilent E8482A/B modules are the PCA boards (see Figure 3-1). To order a replaceable PCA board, specify the Agilent part number listed in Table 3-1 and the quantity required. Send your order to Agilent Technologies. See "Contact Agilent Technologies" in *Chapter 1* for details.

**Table 3-1. E8482A/B RF Multiplexer Module Replaceable PCAs**

| Reference Designator | Part Number | Quantity | Description |
|---|---|---|---|
| A1 | E8482-60002 | 1 | Relay Driver PCA |
| A2 - A3 | E8482-60001 | 2 [a] | Relay Assembly PCA |

a. The E8482B RF Multiplexer module contains one Relay Assembly PCA.

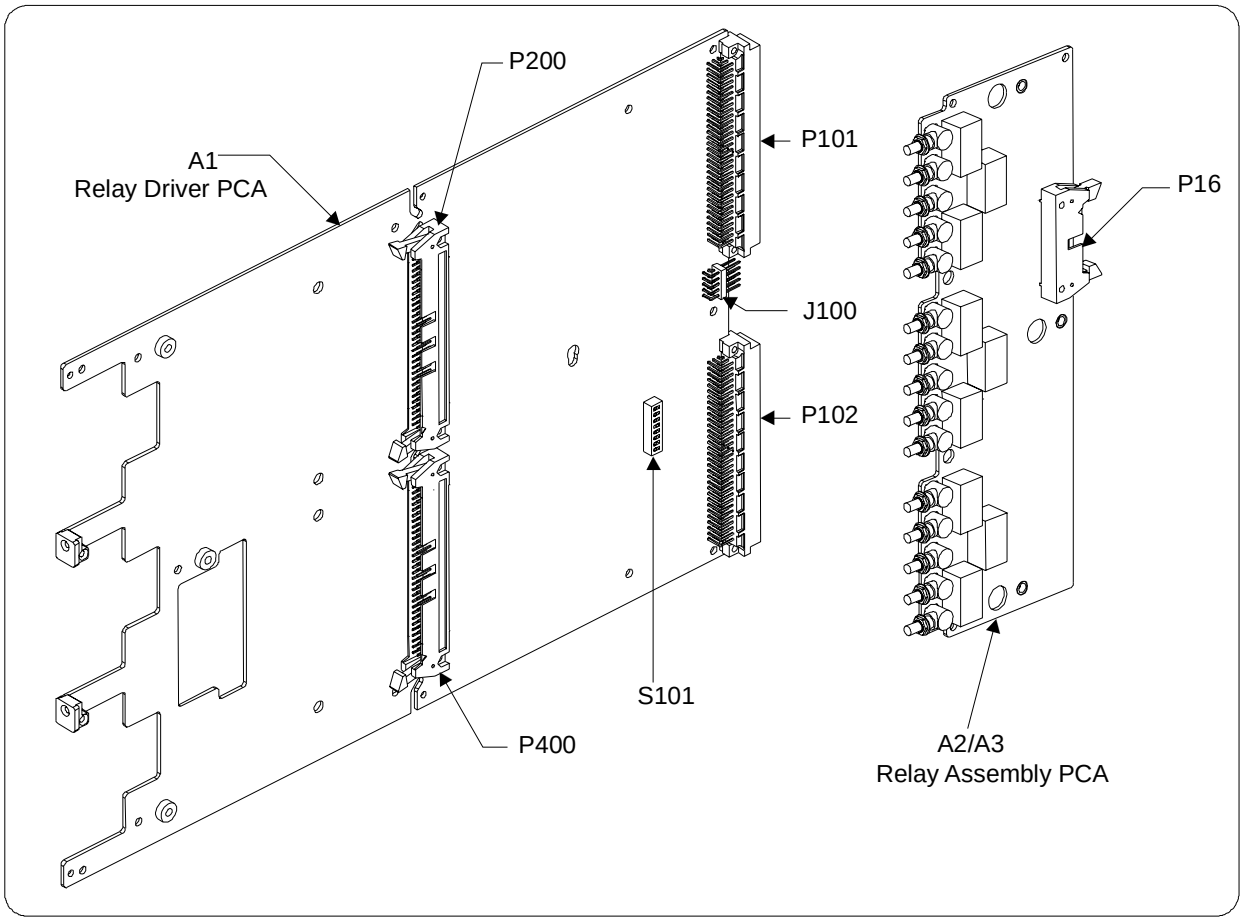



**Figure 3-1. Printed Circuit Assemblies of the E8482A/B**

# Repair/Maintenance Guidelines

This section provides guidelines for repairing and maintaining the Agilent E8482A/B RF Multiplexer modules, including:

- ESD precautions
- Cleaning Requirements

## ESD Precautions

Electrostatic discharge (ESD) may damage static-sensitive devices in the RF multiplexer modules. This damage can range from slight parameter degradation to catastrophic failure. When handling multiplexer assemblies, follow these guidelines to avoid damaging components:

- Always use a static-free work station with a pad of conductive rubber or similar material when handling electronic components.
- After you remove an assembly from the module, place the assembly on a conductive surface to guard against ESD damage. Do not stack assemblies.

## Cleaning Requirements

Preventive maintenance for the Agilent E8482A/B RF multiplexer module consists of periodically cleaning the module to remove dust and debris that will build up over time. The cleaning interval is dependent on the environment conditions and application. For best results, you should clean the module once a year or more often if the module is used in extremely dusty or very humid area. The front panel and the top/bottom cover can be cleaned with a dry cloth or one slightly dampened with water.

**WARNING** **To prevent electrical shock, disconnect any AC power from the mainframe and from other modules that may be connected to the RF multiplexer module before cleaning.**

# Troubleshooting

To troubleshoot an Agilent E8482A/B RF Multiplexer module problem, you should first identify the problem, and then isolate the cause to a user-replaceable assembly.

**NOTE** *Test failures can be caused by improper cabling,improper selection of the interface select code, primary, and/or secondary address setting. Verify proper connection and address selection before troubleshooting. As required, see the Agilent E8482A/B Six/Three 1x4 RF Multiplexer Module User's Manual for information on address selection and cabling guidelines.*

## Identifying the Problem

Table 3-2 lists some common problems, along with symptoms and possible solutions.

**NOTE** *If the problem can not be identified or traced to a user-replaceable assembly with the following procedures, contact Agilent Technologies for repair and service (see page 10).*

**Table 3-2. Agilent E8482A/B Common Problems**

| Problem Type | Symptom | Recommended Actions [a] |
|---|---|---|
| Self-test Errors | Non-zero error code in response to the *TST? command. | See page 19 in *Chapter 2*. |
| Operator Errors | Non-zero error code in response to the SYST:ERR? command. | See *Appendix C - Error Messages* in *the Agilent E8482A/B Six/Three 1x4 RF Multiplexer User's Manual* for module errors and causes. |
| Catastrophic Failures | Not responding to commands. | See "Testing the Assembly" later in this chapter. |
| Performance Out of Specification | Failing Closed-channel Resistance Test | See page 22 in *Chapter 2*. |

a. Verify proper connections and correct logical address setting before troubleshooting.

## Testing the Assembly

You can use the tests and checks in Table 3-3 to identify the problem on the user-replaceable assembly. See Figure 3-1 for the locations of the checked components on the E8482A/B PCAs. The typical checks for the RF multiplexer modules include:

- Checking for heat damage
- Checking logical address switch setting
- Checking E1472A mode switch setting
- Checking connectors contacts

**Table 3-3. Agilent E8482A/B Tests/Checks**

| Test/Check | Reference Designator | Check: |
|---|---|---|
| Heat Damage | N.A. | Discolored PC boards<br>Damaged insulation<br>Evidence of arcing |
| Logical Address Switch | S101 | Logical address setting |
| E1472A Mode Switch | J100 | Mode Switch setting |
| Connectors | J100, P101, P102, P200, P400 (on A1)<br><br>P16 (on A2/A3) | Bent or damaged connectors |

**NOTE** *See the Agilent E8482A/B Six/Three 1x4 RF Multiplexer Module User's Manual for more information on the Logical Address Switch (S101) and the E1472A Mode Switch (J100) settings. If there are no apparent problems following the typical checks, run the Performance Verification Test in Chapter 2 of this manual to see if the module is defective.*

### Checking for Heat Damage

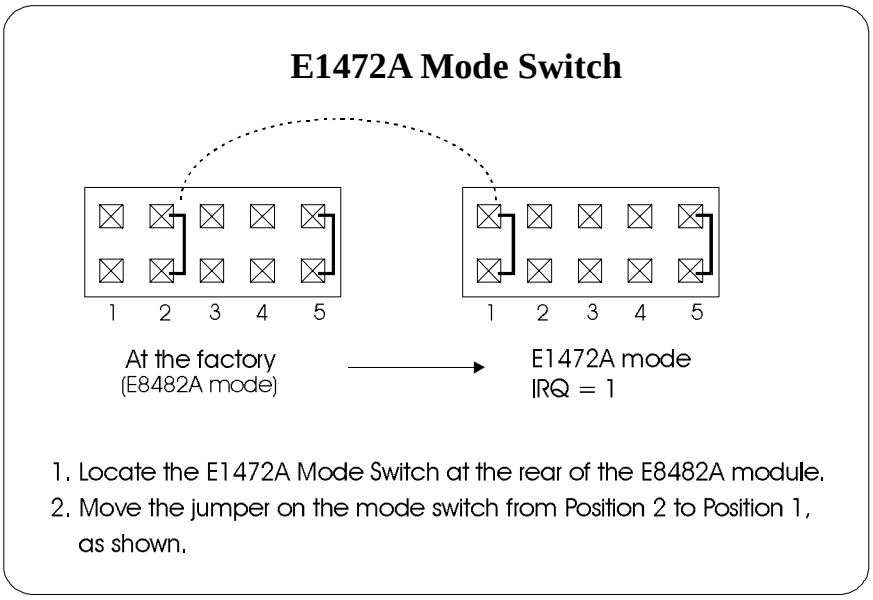
Inspect the assembly for signs of abnormal internally generated heat such as discolored printed circuit boards or components, damaged insulation, or evidence of arcing. If there is damage, do not operate the module until you have corrected the problem.

### Checking Logical Address Switch

Verify that the logical address switch (S101) is set correctly (factory set at 120). See *Agilent E8482A/B Six/Three 1x4 RF Multiplexer Module User's Manual* for information on address setting.

## Checking E1472A Mode Switch

Verify that the E1472A Mode Switch (J100) is set correctly (see Figure 3-2). For more details, see *Agilent E8482A/B Six/Three 1x4 RF Multiplexer Module User's Manual*.




| Position Numbers (1=Jumper; 0=No Jumper; - =Unused) 1 2 3 4 5 | Jumper Configuration |
|---|---|
| 0 - 0 0 1 | E8482A mode (factory default) |
| 1 - 0 0 0 | E1472A mode, IRQ = X |
| 1 - 0 0 1 | E1472A mode, IRQ = 1 |
| 1 - 0 1 0 | E1472A mode, IRQ = 2 |
| 1 - 0 1 1 | E1472A mode, IRQ = 3 |
| 1 - 1 0 0 | E1472A mode, IRQ = 4 |
| 1 - 1 0 1 | E1472A mode, IRQ = 5 |
| 1 - 1 1 0 | E1472A mode, IRQ = 6 |
| 1 - 1 1 1 | E1472A mode, IRQ = 7 |

NOTES:

a. Position 1 is used for setting E1472A/E8482A mode.
1= E1472A mode; 0 = E8482A mode.
b. Position 2 is not used.
c. Postions 3 - 5 are used for setting Interrupt Priority Level when in E1472A mode and are not used in E8482A mode.

**Figure 3-2. E1472A Mode Switch Settings**

## Checking Connectors

Check all connectors (J100, P101, P102, P200 and P400) on the Relay Driver PCA board (A1) for bent pins or damaged contacts. If any of them is damaged, you may have to replace the PCA (P/N E8482-60002).

Check the connector (P16) on the Relay Assembly PCA board (A2 or A3) for bent pins or damaged contacts. You may have to replace the PCA (P/N E8482-60001) for the damaged connector.

**WARNING** **Any maintenance and repair of the module must be performed by qualified personnel. Contact Agilent Technologies (see page 10) for repair and service as required.**

## E8482A Module Disassembly

Use the following procedures to disassemble the Agilent E8482A Six 1x4 RF Multiplexer module (see Figure 3-3).

**NOTE** *To avoid damage to the screw head slots, use a T8 Torx driver to remove the front panel handles and a T10 Torx driver to remove the top/bottom covers and the A2/A3 PCAs.*

1. To remove the top/bottom covers:

   -- Remove all 30 nuts and washers from the RF connectors as shown.
   -- Remove the eight T10 Torx screws from the top cover as shown.
   -- Lift the top cover off the module. The cover may be a tight fit around the RF connectors.
   -- Turn the assembly over and lift off the bottom cover. The cover may be a tight fit around the RF connectors.

2. To remove the A2 and A3 assemblies:

   -- Remove the 3-to-1 cable from the A1, A2 and A3 assemblies as shown.
   -- Remove the three T10 Torx screws from the relay assembly PCA (A2) as shown.
   -- Lift the top relay assembly PCA (A2) out.
   -- Lift the shield board (between A2 and A3) out as shown.
   -- Lift the bottom relay assembly PCA (A3) out.

3. To remove the front panel and front panel handles:

   -- Remove the two T8 Torx screws from the handles as shown.
   -- Remove the two T8 Torx screw holding the front panel to the A1 PCA as shown.
   -- Lift the front panel off the A1 PCA.

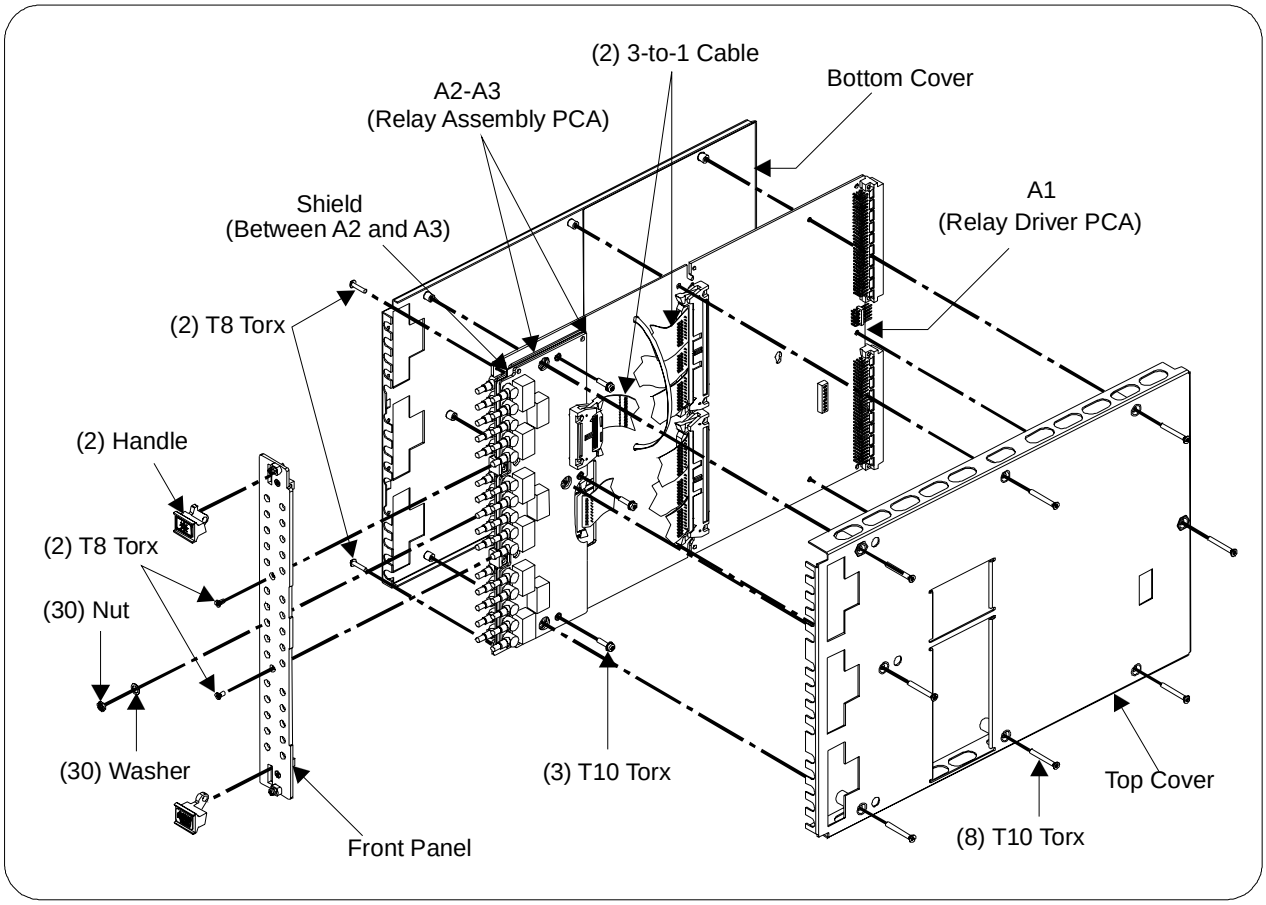



**Figure 3-3. Agilent E8482A Disassembly**

## E8482B Module Disassembly

Use the following procedures to disassemble the Agilent E8482B Three 1x4 RF Multiplexer module (see Figure 3-4).

**NOTE** *To avoid damage to the screw head slots, use a T8 Torx driver to remove the front panel handles and a T10 Torx driver to remove the top/bottom covers and A2 PCA.*

1. To remove the top/bottom covers:

   -- Remove all 15 nuts and washers from the RF connectors as shown.
   -- Remove the eight T10 Torx screws from the top cover as shown.
   -- Lift the top cover off the module. The cover may be a tight fit around the RF connectors.
   -- Turn the assembly over and lift off the bottom cover. The cover may be a tight fit around the RF connectors.

2. To remove the A2 assembly:

   -- Remove the 3-to-1 cable from the A1and A2 assemblies as shown.
   -- Remove the three T10 Torx screws from the relay assembly PCA (A2) as shown.
   -- Lift the relay assembly PCA (A2) out.

3. To remove the front panel and front panel handles:

   -- Remove the two T8 Torx screws from the handles as shown.
   -- Remove the two T8 Torx screw holding the front panel to the A1 PCA as shown.
   -- Lift the front panel off the A1 PCA.

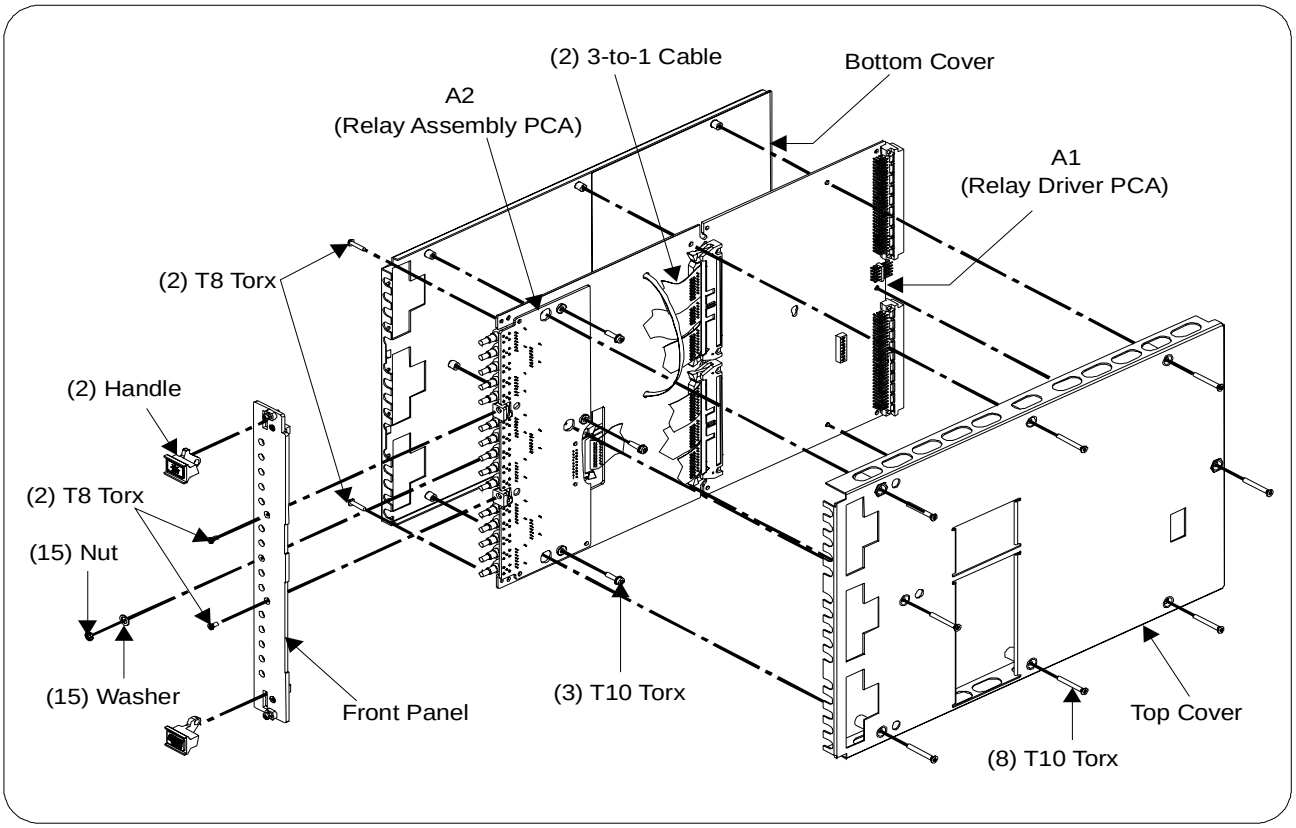



**Figure 3-4. Agilent E8482B Module Disassembly**

## *Notes:*

# Appendix A
# E8482A/B Specifications

**Table 3-4. E8482A/B Specifications**

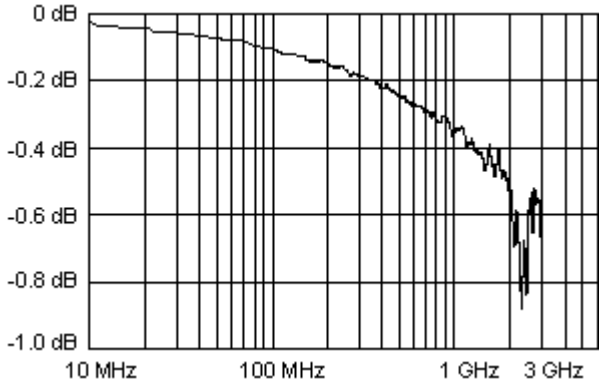
| ITEMS | | SPECIFICATIONS |
|---|---|---|
| ***GENERAL CHARACTERISTICS*** | | |
| **Module Size/Device Type:** | | C-Size 1-Slot, Register based, A16, slave only, P1 and P2 Connectors |
| **Total Channels:** | | Six 1x4 Multiplexers (E8482A);<br>Three 1x4 Multiplexers (E8482B) |
| **Relays Type:** | | Non-latching armature |
| **Typical Relay Life:** | At rated load:<br>(10 mA, 24 V, 2.5GHz, 50 impedance) | $10^5$ |
| **Power Requirements:** | Peak module current:<br>Dynamic module current: | 0.1 A @ +5 V; 0.21 A @ +12 V<br>0.1 A @ +5 V; 0.1 A @ +12 V |
| **Watts/slot:** | | 6 W |
| **Cooling/slot:** | | 0.1 mm $H_2O$ @ 0.5 Liter/sec for $10^oC$ rise |
| **Operating Temperature:** | | 0 - $55^oC$ |
| **Operating Humidity:** | | 65% RH, 0 - $40^oC$ |
| ***INPUT CHARACTERISTICS*** | | |
| **Maximum Voltage:** | Any two terminals: | 30 V dc, 30 V ac peak |
| **Maximum Current:** | Per channel or common: | 0.5 A dc |
| **Maximum Power:** | Per channel or common: | 10 Wdc, 10 VA ac |
| **Characteristic Impedance:** | | 50 |
| ***DC ISOLATION*** | | |
| **Initial Closed Channel Resistance:** | | < 1 |
| **Isolation resistance:**<br>**(between any two terminals)** | < ($40^oC$, 65% RH): | > $10^6$ |
| **Thermal Offset:** | Per channel: | < 10 V |

(*continued on the next page*)

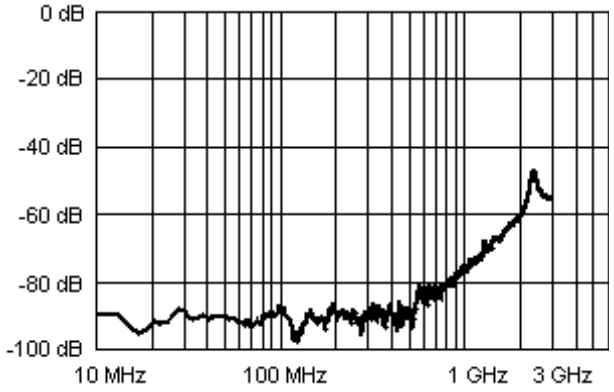
**Table 3-4. E8482A/B Specifications**

| ITEMS | | SPECIFICATIONS |
|---|---|---|
| ***AC ISOLATION / PERFORMANCE ($Z_I = Z_S = 50$ < (40°C, 95% RH):)*** | | |
| **Bandwidth (-1.5 dB):** | | 2.5 GHz |
| **Insertion Loss:** | < 500 MHz:<br>< 1 GHz:<br>< 2 GHz:<br>< 2.5 GHz:<br>< 3 GHz: | < -0.5 dB<br>< -0.6 dB<br>< -1.0 dB<br>< -1.5 dB<br>< -2.0 dB (typical) |
| **Crosstalk:**<br>(Closed channel to Closed Channel,<br>with 50 termination) | < 500 MHz:<br>< 1 GHz:<br>< 2 GHz:<br>< 2.5 GHz:<br>< 3 GHz: | < -60 dB<br>< -57 dB<br>< -55 dB<br>< -40 dB<br>< -39 dB (typical) |
| **VSWR** (with 50 termination) | < 500 MHz:<br>< 1 GHz:<br>< 2 GHz:<br>< 2.5 GHz:<br>< 3 GHz: | < 1.15<br>< 1.25<br>< 1.35<br>< 1.45<br>< 1.50 (typical) |

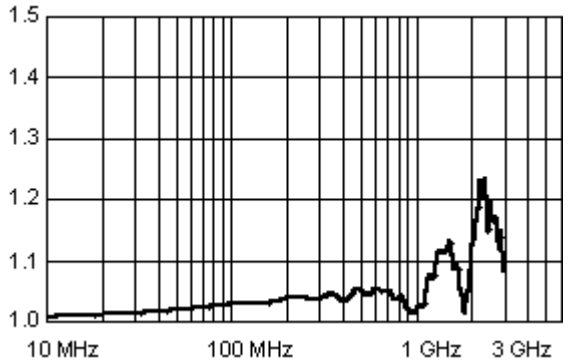
**Typical Insertion Loss**




**Typical Crosstalk (Channel-to-channel)**




**Typical VSWR**



# Appendix B
# Relay Life

## Replacement Strategy

Electromechanical relays are subject to normal wear-out. Relay life depends on several factors as shown below. The recommended repair strategy for the E8482A/B RF Multiplexer modules is PCA-level replacement. User repairs to the E8482A/B RF Multiplexer modules are limited to replacement of the entire circuit board (P/N E8482-60001) when any of the relay fails or the end of relay life approaches. The sensitivity of the application should be weighed against the cost of replacing the entire circuit board with some useful life remaining. For more information, contact Agilent Technologies (see page 10).

**NOTE** *Relays that wear out normally or fail due to misuse should not be considered defective and are not covered by the product's warranty.*

## Relay Life Factors

Some effects of loading and switching frequency on relay life follow.

- **Relay Load.** In general, higher power switching reduces relay life. In addition, capacitive/inductive loads and high inrush currents (for example, turning on a lamp or starting a motor) reduces relay life. *Exceeding specified maximum inputs can cause catastrophic failure.*

- **Switching Frequency.** Relay contacts heat up when switched. As the switching frequency increases, the contacts have less time to dissipate heat. The resulting increase in contact temperature also reduces relay life.

## End-of-Life Determination

A preventive maintenance routine can prevent problems caused by unexpected relay failure. The end of the life of the relay can be determined by using one or more of the three methods described below. The best method (or combination of methods), as well as the failure criteria, depends on the application in which the relay is used.

- **Contact Resistance Maximum Value.** As the relay begins to wear out, its contact resistance increases. When the resistance exceeds a predetermined value, the relay should be replaced.

- **Contact Resistance Variance.** The stability of the contact resistance decreases with age. Using this method, the contact resistance is measured several (5-10) times, and the variance of the measurements is determined. An increase in the variance indicates deteriorating performance.

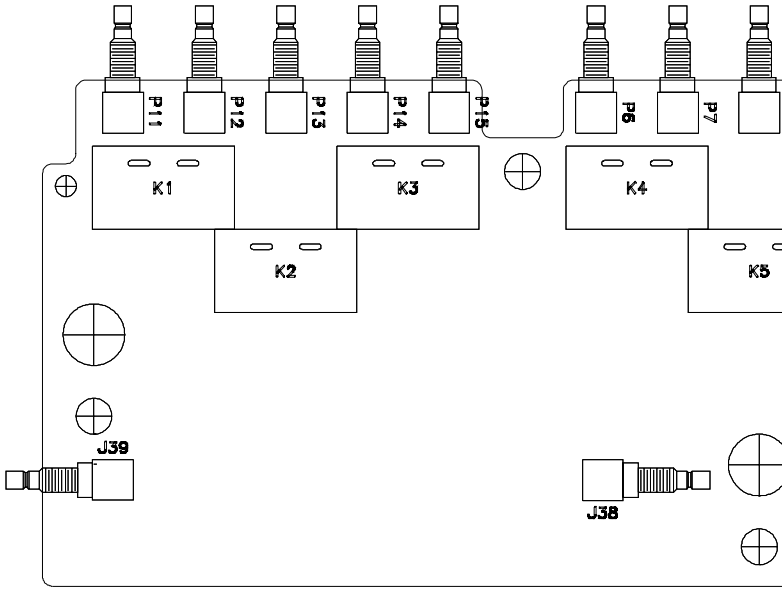
- **Number of Relay Operations.** Relays can be replaced after a predetermined number of contact closures. However, this method requires knowledge of the applied load and life specifications for the applied load.

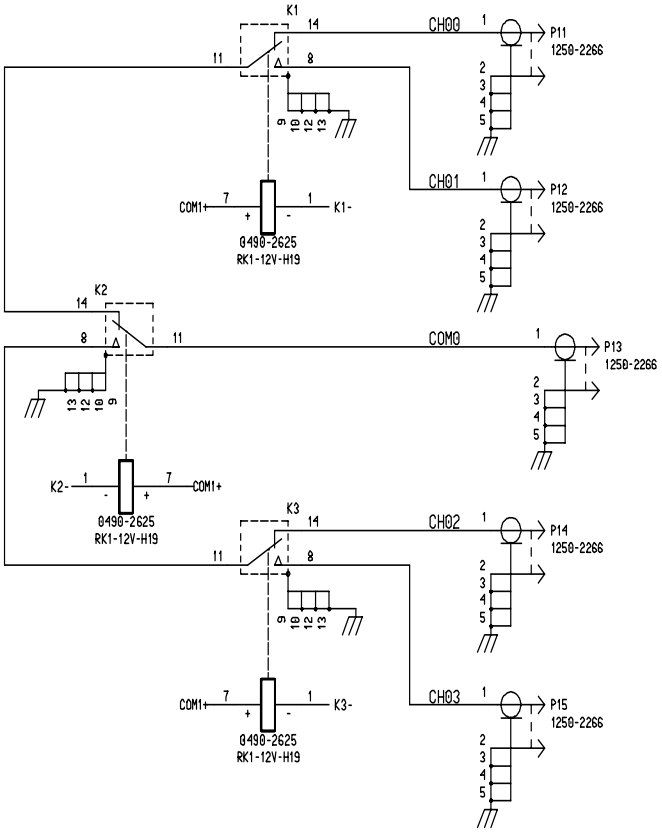
# Appendix C
# Schematics

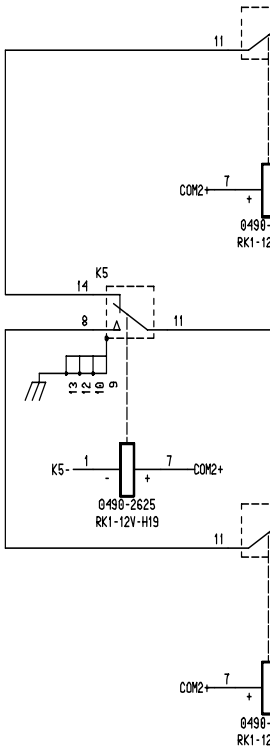
This appendix contains the schematics and component locator drawings for the Agilent E8482A/B Six/Three 1x4 RF Multiplexer Modules.


- E8482-60001 Component Locator . . . . . 43
- E8482-60001 Schematic Sheet 1 of 1 . . . . . 44
- E8482-60002 Component Locator . . . . . 45
- E8482-60002 Schematic Sheet 1 of 5 . . . . . 46
- E8482-60002 Schematic Sheet 2 of 5 . . . . . 47
- E8482-60002 Schematic Sheet 3 of 5 . . . . . 48
- E8482-60002 Schematic Sheet 4 of 5 . . . . . 49
- E8482-60002 Schematic Sheet 5 of 5 . . . . . 50

## *Notes:*

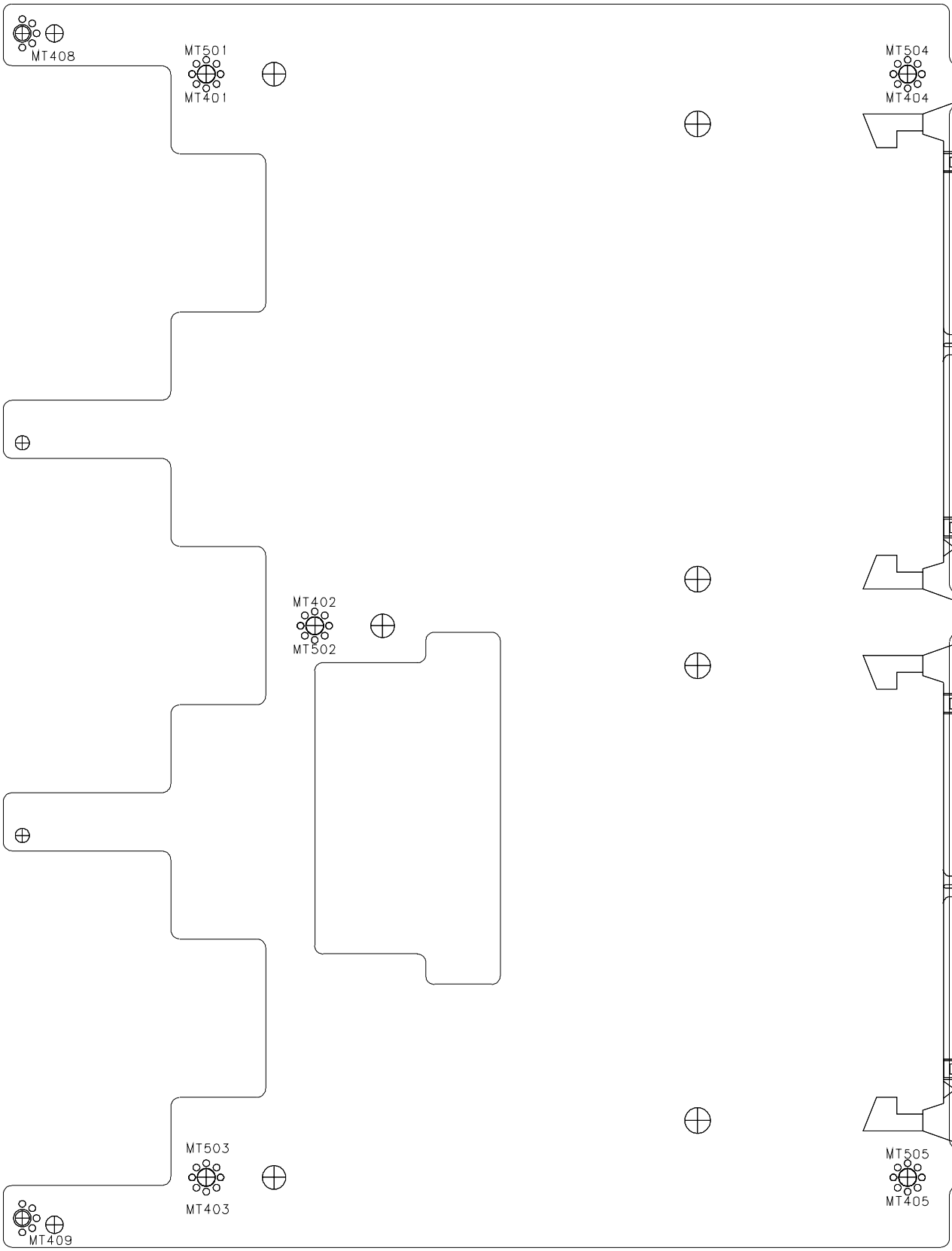

P11
P12
P13
P14
P15
P6
P7
K1
K2
K3
K4
K5
J39
J38

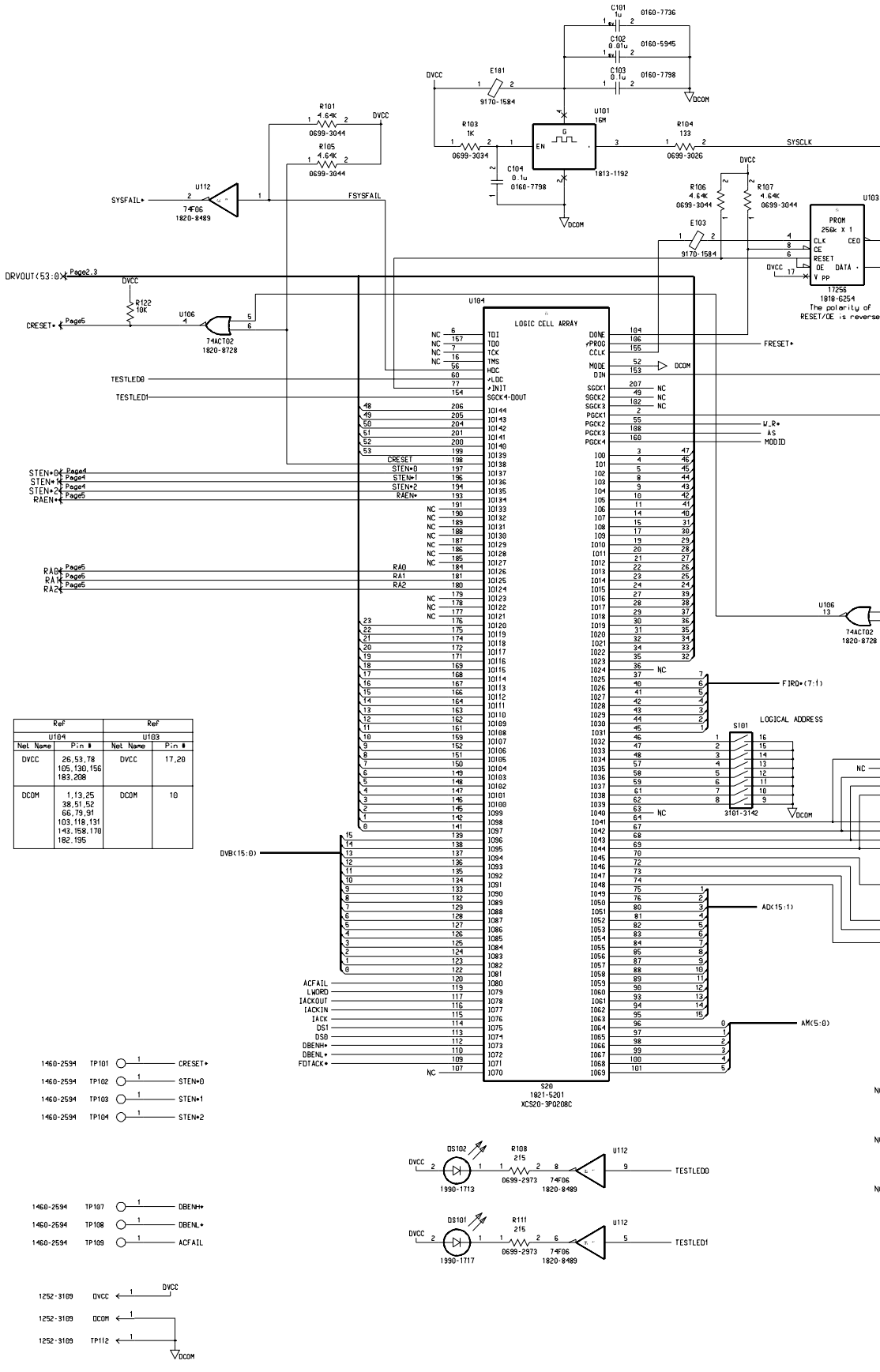


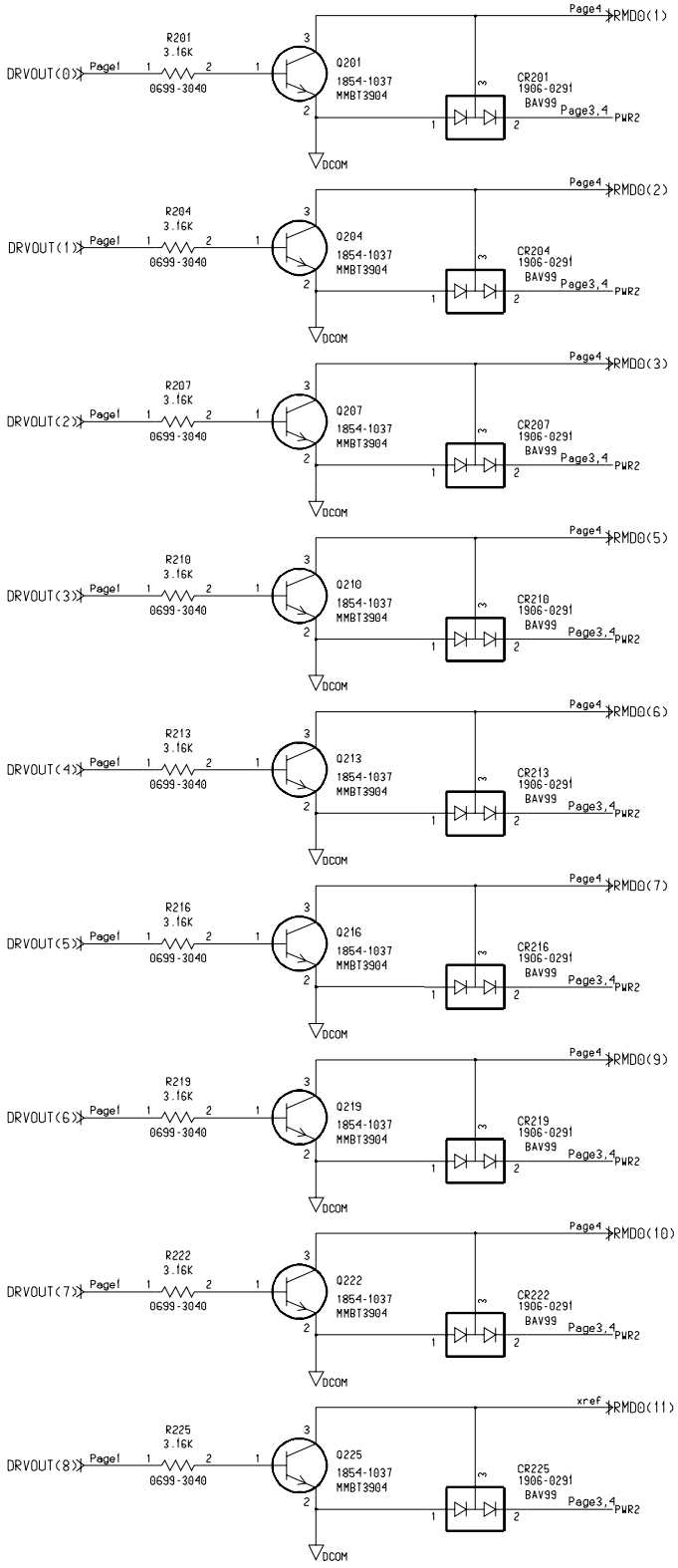

1252-3548

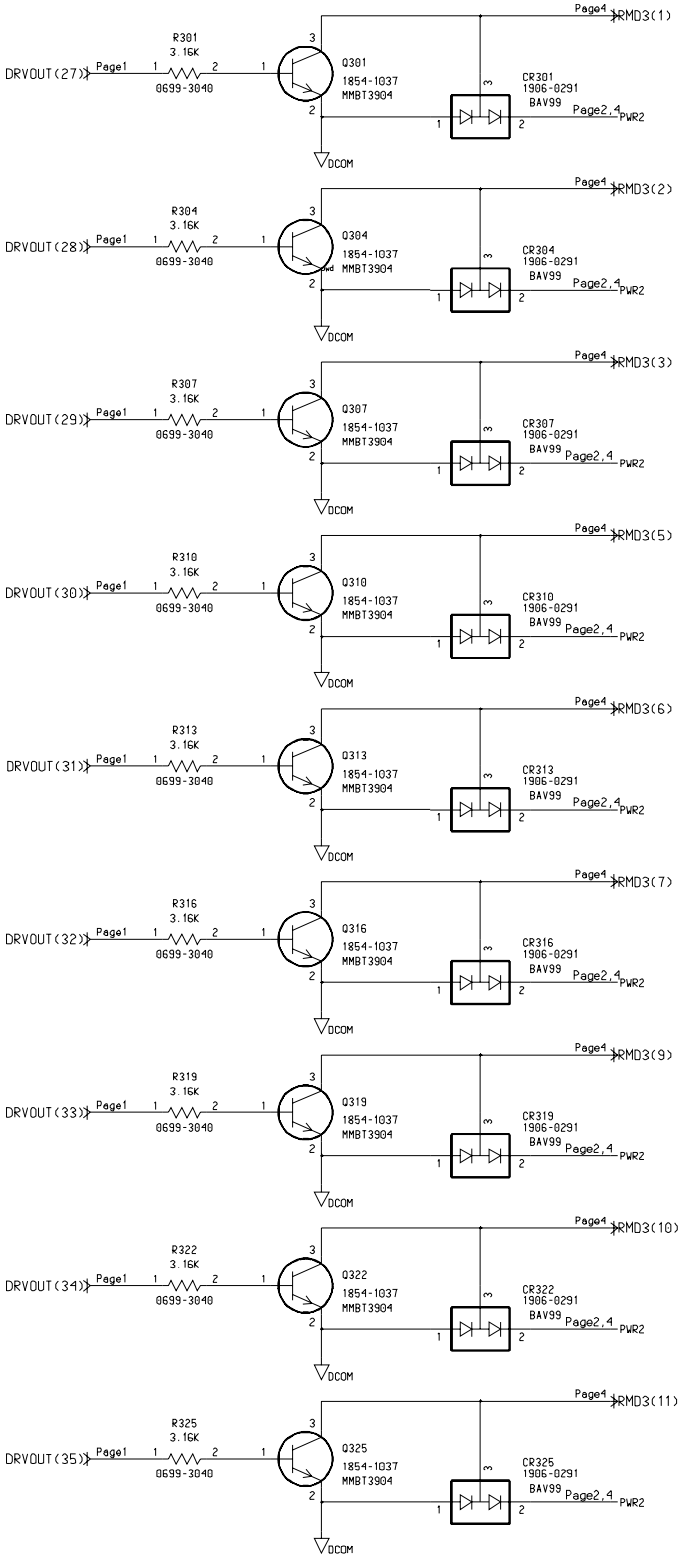
| | | |
|---|---|---|
| P16 | 1 | |
| P16 | 2 | |
| P16 | 3 | NC |
| P16 | 4 | |
| P16 | 5 | |
| P16 | 6 | COM3+ |
| P16 | 7 | K9- |
| P16 | 8 | K8- |
| P16 | 9 | K7- |
| P16 | 10 | NC |
| P16 | 11 | COM2+ |
| P16 | 12 | K6- |
| P16 | 13 | K5- |
| P16 | 14 | K4- |
| P16 | 15 | NC |
| P16 | 16 | COM1+ |
| P16 | 17 | K3- |
| P16 | 18 | K2- |
| P16 | 19 | K1- |
| P16 | 20 | NC |

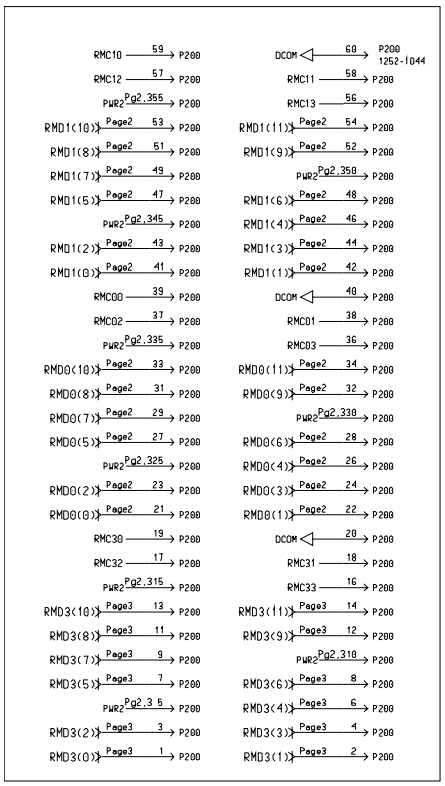

MT408
MT501
MT401
MT504
MT404
MT402
MT502
MT503
MT403
MT505
MT405
MT409

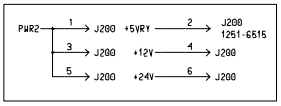


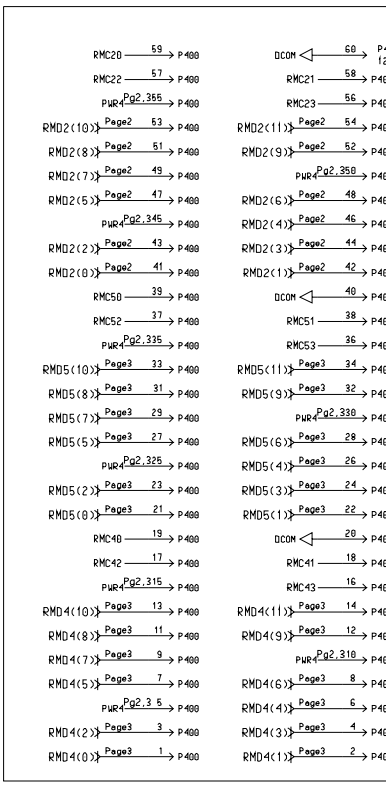

| Ref | | Ref | |
|---|---|---|---|
| U104 | | U103 | |
| Net Name | Pin # | Net Name | Pin # |
| DVCC | 26,53,78 105,130,156 183,208 | DVCC | 17,20 |
| DCOM | 1,13,25 38,51,52 66,79,91 103,118,131 143,158,170 182,195 | DCOM | 10 |

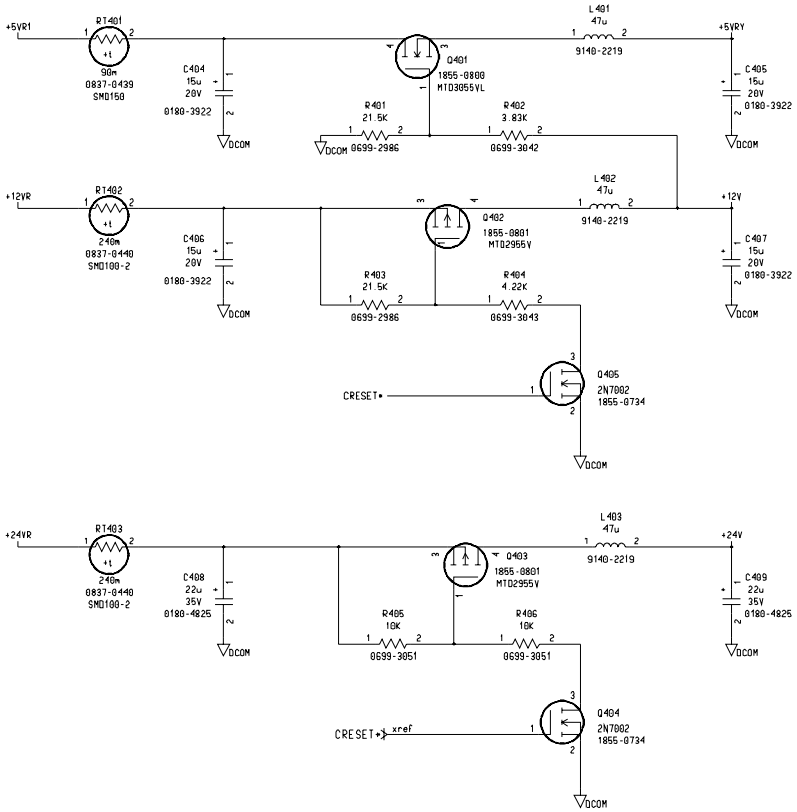

DRVOUT(0)
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3.16K
0699-3040
Q201
1854-1037
MMBT3904
CR201
1906-0291
BAV99
Page3,4
PWR2
DCOM
Page4
RMD0(1)
DRVOUT(1)
R204
Q204
CR204
RMD0(2)
DRVOUT(2)
R207
Q207
CR207
RMD0(3)
DRVOUT(3)
R210
Q210
CR210
RMD0(5)
DRVOUT(4)
R213
Q213
CR213
RMD0(6)
DRVOUT(5)
R216
Q216
CR216
RMD0(7)
DRVOUT(6)
R219
Q219
CR219
RMD0(9)
DRVOUT(7)
R222
Q222
CR222
RMD0(10)
DRVOUT(8)
R225
Q225
CR225
xref
RMD0(11)
DRVOUT(9)
R202
DRVOUT(10)
R205
DRVOUT(11)
R208
DRVOUT(12)
R211
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R214
DRVOUT(14)
R217
DRVOUT(15)
R220
DRVOUT(16)
R223
DRVOUT(17)
R226

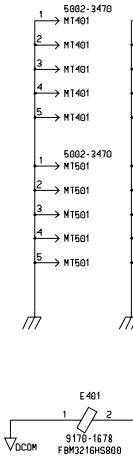

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Q304
1854-1037
MMBT3904
CR304
1906-0291
BAV99
DRVOUT(28)
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Page4
Page2,4
PWR2
DCOM
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Q307
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CR307
1906-0291
BAV99
DRVOUT(29)
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Page4
Page2,4
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3.16K
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Q310
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CR310
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Page1
RMD3(5)
Page4
Page2,4
PWR2
DCOM
R313
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0699-3040
Q313
1854-1037
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CR312
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RMD3(6)
Page4
Page2,4
PWR2
DCOM
R316
3.16K
0699-3040
Q316
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DRVOUT(32)
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RMD3(7)
Page4
Page2,4
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DCOM
R319
3.16K
0699-3040
Q319
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MMBT3904
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1906-0291
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DRVOUT(33)
Page1
RMD3(9)
Page4
Page2,4
PWR2
DCOM
R322
3.16K
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DRVOUT(34)
Page1
RMD3(10)
Page4
Page2,4
PWR2
DCOM
R325
3.16K
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DRVOUT(35)
Page1
RMD3(11)
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PWR2
DCOM
R302
3.16K
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DRVOUT(36)
Page1
R305
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0699-3040
DRVOUT(37)
Page1
R308
3.16K
0699-3040
DRVOUT(38)
Page1
R311
3.16K
0699-3040
DRVOUT(39)
Page1
R314
3.16K
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DRVOUT(40)
Page1
R317
3.16K
0699-3040
DRVOUT(41)
Page1
R320
3.16K
0699-3040
DRVOUT(42)
Page1
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0699-3040
DRVOUT(43)
Page1
R326
3.16K
0699-3040
DRVOUT(44)
Page1

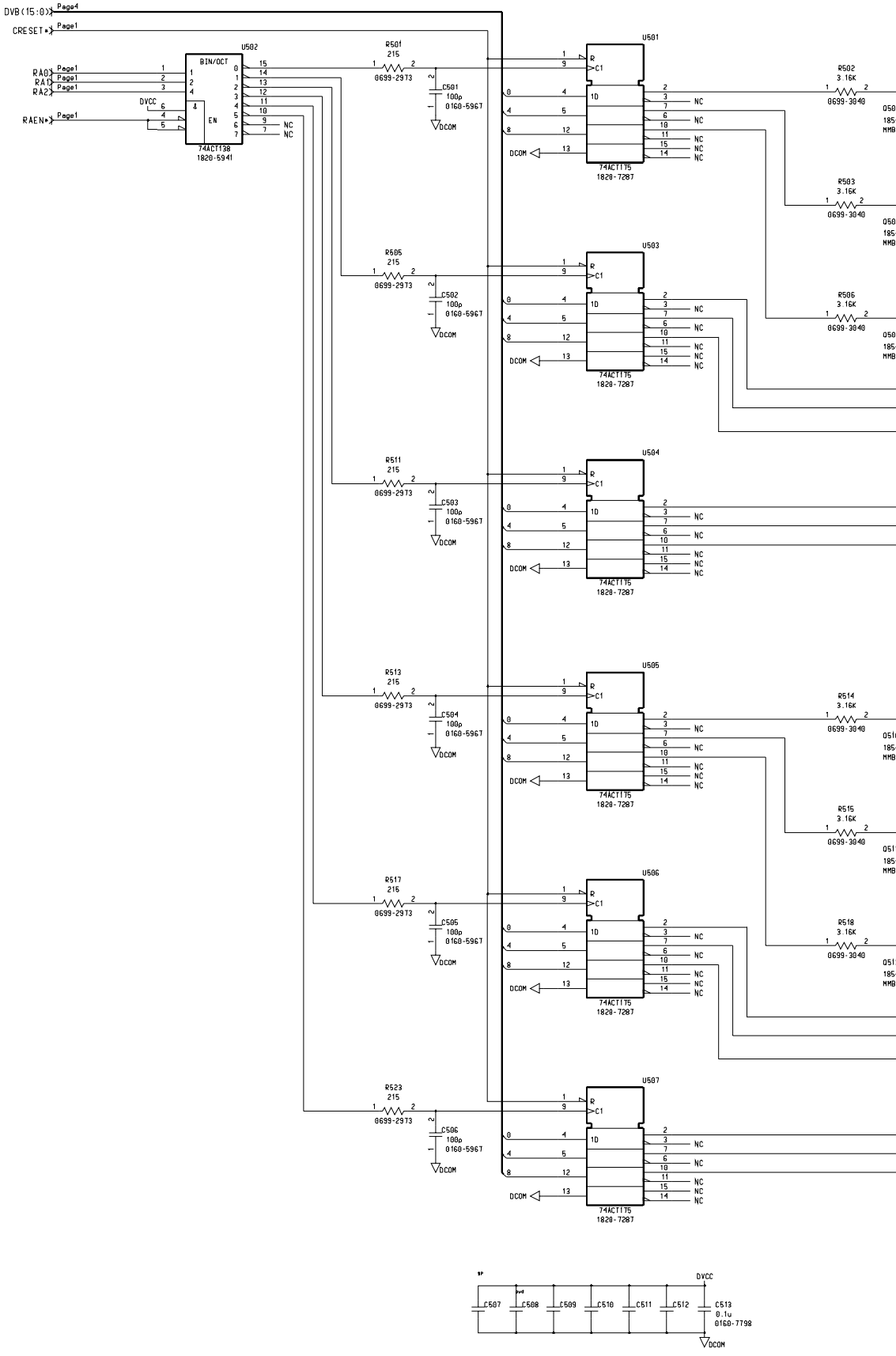

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RMD1(5) Page2 47 P200
PWR2 Pg2,345 P200
RMD1(2) Page2 43 P200
RMD1(0) Page2 41 P200
RMC00 39 P200
RMC02 37 P200
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RMD0(10) Page2 33 P200
RMD0(8) Page2 31 P200
RMD0(7) Page2 29 P200
RMD0(5) Page2 27 P200
PWR2 Pg2,326 P200
RMD0(2) Page2 23 P200
RMD0(0) Page2 21 P200
RMC30 19 P200
RMC32 17 P200
PWR2 Pg2,315 P200
RMD3(10) Page3 13 P200
RMD3(8) Page3 11 P200
RMD3(7) Page3 9 P200
RMD3(5) Page3 7 P200
PWR2 Pg2,3 6 P200
RMD3(2) Page3 3 P200
RMD3(0) Page3 1 P200
DCOM 60 P200 1252-1044
RMC11 58 P200
RMC13 56 P200
RMD1(11) Page2 54 P200
RMD1(9) Page2 52 P200
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RMD1(6) Page2 48 P200
RMD1(4) Page2 46 P200
RMD1(3) Page2 44 P200
RMD1(1) Page2 42 P200
DCOM 40 P200
RMC01 38 P200
RMC03 36 P200
RMD0(11) Page2 34 P200
RMD0(9) Page2 32 P200
PWR2 Pg2,330 P200
RMD0(6) Page2 28 P200
RMD0(4) Page2 26 P200
RMD0(3) Page2 24 P200
RMD0(1) Page2 22 P200
DCOM 20 P200
RMC31 18 P200
RMC33 16 P200
RMD3(11) Page3 14 P200
RMD3(9) Page3 12 P200
PWR2 Pg2,310 P200
RMD3(6) Page3 8 P200
RMD3(4) Page3 6 P200
RMD3(3) Page3 4 P200
RMD3(1) Page3 2 P200


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1 J200 +5VR1 2 J200 1251-6515
3 J200 +12V 4 J200
5 J200 +24V 6 J200


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RMC22 57 P400
PWR4 Pg2,355 P400
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RMD2(8) Page2 51 P400
RMD2(7) Page2 49 P400
RMD2(5) Page2 47 P400
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RMD2(0) Page2 41 P400
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PWR4 Pg2,335 P400
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RMD5(8) Page3 31 P400
RMD5(7) Page3 29 P400
RMD5(5) Page3 27 P400
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RMD4(4) Page3 6 P4
RMD4(3) Page3 4 P4
RMD4(1) Page3 2 P4


+5VR1
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15u
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47u
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RA2
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0160-7798
DVCC
DCOM



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