

TECHNICAL MANUAL
888-2764-001
Maxiva Series PA Module Test
System

Maxiva Series
PA Module Test System



T.M. No. 888-2764-001

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Rev: A

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Technical Assistance

Technical and troubleshooting assistance for HARRIS Transmission products is available from HARRIS Field Service (factory location: Quincy, Illinois, USA) during normal business hours (8:00 AM - 5:00 PM Central Time). Telephone **+1-217-222-8200** to contact the Field Service Department; FAX **+1-217-221-7086**; or E-mail questions to ***tsupport@harris.com***.

Emergency service is available 24 hours a day, seven days a week, by telephone only.

On-line assistance, including technical manuals, white papers, software downloads, and service bulletins, is available at ***http://support.broadcast.harris.com/eservice_enu***.

Address written correspondence to Field Service Department, HARRIS Broadcast Communications Division, P.O. Box 4290, Quincy, Illinois 62305-4290, USA. For other global service contact information, please visit: ***http://www.broadcast.harris.com/contact***.

NOTE: For all service and parts correspondence, you will need to provide the Sales Order number, as well as the Serial Number for the transmitter or part in question. For future reference, record those numbers here: _____/_____

Please provide these numbers for any written request, or have these numbers ready in the event you choose to call regarding any Service, or Parts requests. For warranty claims it will be required, and for out of warranty products, this will help us to best identify what specific hardware was shipped.

Replaceable Parts Service

Replacement parts are available from HARRIS Service Parts Department from 7:00 AM to 11:00 PM Central Time, seven days a week. Telephone **+1-217-222-8200** or email ***servicepartsreq@harris.com*** to contact the Service Parts Department.

Emergency replacement parts are available by telephone only, 24 hours a day, seven days a week by calling **+1-217-222-8200**.

Unpacking

Carefully unpack the equipment and preform a visual inspection to determine if any apparent damage was incurred during shipment. Retain the shipping materials until it has been verified that all equipment has been received undamaged. Locate and retain all PACKING CHECK LISTS. Use the PACKING CHECK LIST to help locate and identify any components or assemblies which are removed for shipping and must be reinstalled. Also remove any shipping supports, straps, and packing materials prior to initial turn on.

Returns And Exchanges

No equipment can be returned unless written approval and a Return Authorization is received from HARRIS Broadcast Communications Division. Special shipping instructions and coding will be provided to assure proper handling. Complete details regarding circumstances and reasons for return are to be included in the request for return. Custom equipment or special order equipment is not returnable. In those instances where return or exchange of equipment is at the request of the customer, or convenience of the customer, a restocking fee will be charged. All returns will be sent freight prepaid and properly insured by the customer. When communicating with HARRIS Broadcast Communications Division, specify the HARRIS Order Number or Invoice Number.

Manual Revision History

Maxiva Series PA Module Test System

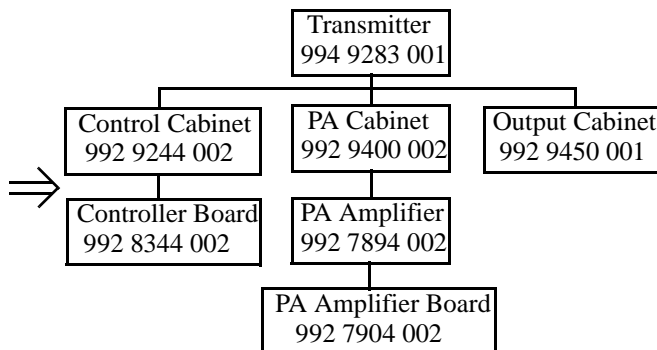
REV.	DATE	ECN	Pages Affected
A	2010 DEC		Creation

Guide to Using Harris Parts List Information

The Harris Replaceable Parts List Index portrays a tree structure with the major items being leftmost in the index. The example below shows the Transmitter as the highest item in the tree structure. If you were to look at the bill of materials table for the Transmitter you would find the Control Cabinet, the PA Cabinet, and the Output Cabinet. In the Replaceable Parts List Index the Control Cabinet, PA Cabinet, and Output Cabinet show up one indentation level below the Transmitter and implies that they are used in the Transmitter. The Controller Board is indented one level below the Control Cabinet so it will show up in the bill of material for the Control Cabinet. The tree structure of this same index is shown to the right of the table and shows indentation level versus tree structure level.

Example of Replaceable Parts List Index and equivalent tree structure:

Replaceable Parts List Index	Part Number	Page
Table 7-1. Transmitter	994 9283 001	7-2
Table 7-2. Control Cabinet	992 9244 002	7-3
Table 7-3. Controller Board	992 8344 002	7-6
Table 7-4. PA Cabinet	992 9400 002	7-7
Table 7-5. PA Amplifier	994 7894 002	7-9
Table 7-6. PA Amplifier Board	992 7904 002	7-10
Table 7-7. Output Cabinet	992 9450 001	7-12




The part number of the item is shown to the right of the description as is the page in the manual where the bill for that part number starts. Inside the actual tables, four main headings are used:

- Table #-#. ITEM NAME - HARRIS PART NUMBER - this line gives the information that corresponds to the
- Replaceable Parts List Index entry;
- HARRIS P/N column gives the ten digit Harris part number (usually in ascending order);
- DESCRIPTION column gives a 25 character or less description of the part number;
- REF. SYMBOLS/EXPLANATIONS column 1) gives the reference designators for the item (i.e., C001, R102, etc.) that corresponds to the number found in the schematics (C001 in a bill of material is equivalent to C1 on the schematic) or 2) gives added information or further explanation (i.e., “Used for 208V operation only,” or “Used for HT 10LS only,” etc.).

NOTE: Inside the individual tables some standard conventions are used:

- A # symbol in front of a component such as #C001 under the REF. SYMBOLS/EXPLANATIONS column means that this item is used on or with C001 and is not the actual part number for C001.
- In the ten digit part numbers, if the last three numbers are 000, the item is a part that Harris has purchased and has not manufactured or modified. If the last three numbers are other than 000, the item is either manufactured by Harris or is purchased from a vendor and modified for use in the Harris product.
- The first three digits of the ten digit part number tell which family the part number belongs to - for example, all electrolytic (can) capacitors will be in the same family (524 xxxx 000). If an electrolytic (can) capacitor is found to have a 9xx xxxx xxx part number (a number outside of the normal family of numbers), it has probably been modified in some manner at the Harris factory and will therefore show up farther down into the individual parts list (because each table is normally sorted in ascending order). Most Harris made or modified assemblies will have 9xx xxxx xxx numbers associated with them.

The term “SEE HIGHER LEVEL BILL” in the description column implies that the reference designated part number will show up in a bill that is higher in the tree structure. This is often the case for components that may be frequency determinant or voltage determinant and are called out in a higher level bill structure that is more customer dependent than the bill at a lower level.


 **WARNING:**
THE CURRENTS AND VOLTAGES IN THIS EQUIPMENT ARE DANGEROUS. PERSONNEL MUST AT ALL TIMES OBSERVE SAFETY WARNINGS, INSTRUCTIONS AND REGULATIONS.

This manual is intended as a general guide for trained and qualified personnel who are aware of the dangers inherent in handling potentially hazardous electrical/electronic circuits. It is not intended to contain a complete statement of all safety precautions which should be observed by personnel in using this or other electronic equipment.

The installation, operation, maintenance and service of this equipment involves risks both to personnel and equipment, and must be performed only by qualified personnel exercising due care. HARRIS CORPORATION shall not be responsible for injury or damage resulting from improper procedures or from the use of improperly trained or inexperienced personnel performing such tasks. During installation and operation of this equipment, local building codes and fire protection standards must be observed.

The following National Fire Protection Association (NFPA) standards are recommended as reference:

- Automatic Fire Detectors, No. 72E
- Installation, Maintenance, and Use of Portable Fire Extinguishers, No. 10
- Halogenated Fire Extinguishing Agent Systems, No. 12A

 **WARNING:**
ALWAYS DISCONNECT POWER BEFORE OPENING COVERS, DOORS, ENCLOSURES, GATES, PANELS OR SHIELDS. ALWAYS USE GROUNDING STICKS AND SHORT OUT HIGH VOLTAGE POINTS BEFORE SERVICING. NEVER MAKE INTERNAL ADJUSTMENTS, PERFORM MAINTENANCE OR SERVICE WHEN ALONE OR WHEN FATIGUED.

Do not remove, short-circuit or tamper with interlock switches on access covers, doors, enclosures, gates, panels or shields. Keep away from live circuits, know your equipment and don't take chances.

 **WARNING:**
IN CASE OF EMERGENCY ENSURE THAT POWER HAS BEEN DISCONNECTED.

IF OIL FILLED OR ELECTROLYTIC CAPACITORS ARE UTILIZED IN YOUR EQUIPMENT, AND IF A LEAK OR BULGE IS APPARENT ON THE CAPACITOR CASE WHEN THE UNIT IS OPENED FOR SERVICE OR MAINTENANCE, ALLOW THE UNIT TO COOL DOWN BEFORE ATTEMPTING TO REMOVE THE DEFECTIVE CAPACITOR. DO NOT ATTEMPT TO SERVICE A DEFECTIVE CAPACITOR WHILE IT IS HOT DUE TO THE POSSIBILITY OF A CASE RUPTURE AND SUBSEQUENT INJURY.

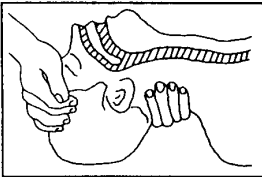
TREATMENT OF ELECTRICAL SHOCK

1. IF VICTIM IS NOT RESPONSIVE FOLLOW THE A-B-CS OF BASIC LIFE SUPPORT.

PLACE VICTIM FLAT ON HIS BACK ON A HARD SURFACE

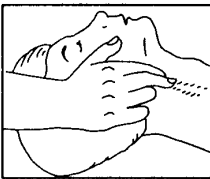
(A) AIRWAY

IF UNCONSCIOUS,
OPEN AIRWAY



LIFT UP NECK
PUSH FOREHEAD BACK
CLEAR OUT MOUTH IF NECESSARY
OBSERVE FOR BREATHING

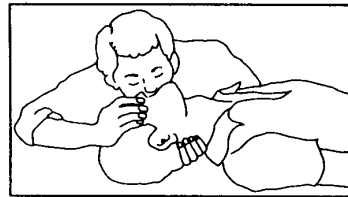
CHECK
CAROTID PULSE



IF PULSE ABSENT,
BEGIN ARTIFICIAL
CIRCULATION

(B) BREATHING

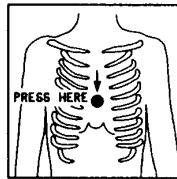
IF NOT BREATHING,
BEGIN ARTIFICIAL BREATHING



TILT HEAD
PINCH NOSTRILS
MAKE AIRTIGHT SEAL
4 QUICK FULL BREATHS
REMEMBER MOUTH TO MOUTH
RESUSCITATION MUST BE
COMMENCED AS SOON AS POSSIBLE

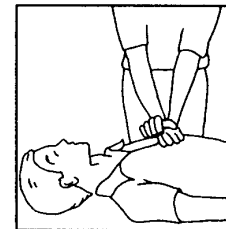
(C) CIRCULATION

DEPRESS STERNUM 1 1/2 TO 2 INCHES



APPROX. RATE
OF COMPRESSIONS { ONE RESCUER
--80 PER MINUTE { 15 COMPRESSIONS
2 QUICK BREATHS

APPROX. RATE
OF COMPRESSIONS { TWO RESCUERS
--60 PER MINUTE { 5 COMPRESSIONS
1 BREATH



NOTE: DO NOT INTERRUPT RHYTHM OF COMPRESSIONS
WHEN SECOND PERSON IS GIVING BREATH

CALL FOR MEDICAL ASSISTANCE AS SOON AS POSSIBLE.

2. IF VICTIM IS RESPONSIVE.

- A. KEEP THEM WARM
- B. KEEP THEM AS QUIET AS POSSIBLE
- C. LOOSEN THEIR CLOTHING
- D. A RECLINING POSITION IS RECOMMENDED

FIRST-AID

Personnel engaged in the installation, operation, maintenance or servicing of this equipment are urged to become familiar with first-aid theory and practices. The following information is not intended to be complete first-aid procedures, it is a brief and is only to be used as a reference. It is the duty of all personnel using the equipment to be prepared to give adequate Emergency First Aid and there by prevent avoidable loss of life.

Treatment of Electrical Burns

1. Extensive burned and broken skin
 - a. Cover area with clean sheet or cloth. (Cleanest available cloth article.)
 - b. Do not break blisters, remove tissue, remove adhered particles of clothing, or apply any salve or ointment.
 - c. Treat victim for shock as required.
 - d. Arrange transportation to a hospital as quickly as possible.
 - e. If arms or legs are affected keep them elevated.

⇒ NOTE:

If medical help will not be available within an hour and the victim is conscious and not vomiting, give him a weak solution of salt and soda: 1 level teaspoonful of salt and 1/2 level teaspoonful of baking soda to each quart of water (neither hot or cold). Allow victim to sip slowly about 4 ounces (a half of glass) over a period of 15 minutes. Discontinue fluid if vomiting occurs. (Do not give alcohol.)

2. Less severe burns - (1st & 2nd degree)
 - a. Apply cool (not ice cold) compresses using the cleanest available cloth article.
 - b. Do not break blisters, remove tissue, remove adhered particles of clothing, or apply salve or ointment.
 - c. Apply clean dry dressing if necessary.
 - d. Treat victim for shock as required.
 - e. Arrange transportation to a hospital as quickly as possible.
 - f. If arms or legs are affected keep them elevated.

REFERENCE:

ILLINOIS HEART ASSOCIATION
AMERICAN RED CROSS STANDARD FIRST AID AND PERSONAL SAFETY
MANUAL (SECOND EDITION)

Glossary:

ASI - Asynchronous serial interface

BPF- Band pass filter. May also be called a mask filter, or critical mask filter.

CAN - Controller Area Network (*CAN* or *CAN-bus*) is a vehicle bus standard designed to allow micro controllers and devices to communicate with each other

DAC - digital analog converter

FPGA - Field programmable gate array

GUI - graphical user interface

Hot-pluggable - device can be removed while transmitter is operating.

HTML - HyperText Markup Language

LCD - Liquid crystal display

LPF - Low pass filter. Typically located at the transmitter output port. Used to attenuate out of band emissions.

LPU - Low power unit. Contains modulator and amplifier sections.

MCM - Master control module (card in TCU)

PA - Power amplifier

PAB - Power amplifier block

PCM - Processor control module (card in TCU)

PS - Power supply

RF - Radio frequency

RS-485 -TIA/EIA standard for serial multipoint communications lines

RTACTM - Real time adaptive correction

SFN - Single frequency network

SMA - SMA connector consists of a 0.250x36 thread. The male is equipped with a.312 inch (7.925mm) hex nut

UDC - Up-down converter

UPS - Uninterruptable power supply

VGA - Video graphics array

WEB - A system of Internet servers that support HTML formatted documents.

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Section 1

Introduction

1

1.1 Purpose of This Manual

This technical manual contains the information pertaining to the Maxiva PA module test set. The various sections of this technical manual provide the following types of information.

- Section 1: Introduction, identifies the product components and gives block diagrams.
- Section 2: Installation, details the procedures to receive, install and set up the test system.
- Section 3: Operation, describes operation of the test system.
- Section 4: Theory of Operation, is included to help service personnel to understand the inner workings of the system.
- Section 5: Maintenance, lists and explains adjustments and component replacements that could be required to maintain PA modules. Principle reference is the Maxiva ULX technical manual.
- Section 6: Troubleshooting, is included as a servicing aid to be used along with the Maxiva ULX manual by qualified service personnel to identify and correct an equipment malfunction.
- Section 7: Parts List, a listing of the test system components that may be replaced in the field.

1.2 Features / Benefits

The Maxiva PA module test system is not included with the Maxiva transmitter. It is available for purchase as an option. The Harris PA Module Test system offers the following features and benefits:

- The test system can be used to test either digital or analog modules.
- System includes test bench, cooling system, control box, test load and output coupler.
- The handheld PA diagnostic unit and connecting cables are also available as options.

1.3 General Description

The Maxiva PA module test system allows extensive testing of PA modules that are removed from a Maxiva transmitter. This section includes detailed descriptions of the test set and a simplified block diagram. PA module test systems contain the following components:

- Test Bench
- Control Box
- Interconnecting Cables and AC/Control Test Interface
- 2500 W air cooled test load
- Cooling System
- PA Module Fixture

The replacement parts list for the PA module test system can be found in Section 7. The part numbers associated with the handheld PA diagnostics unit are:

- Unit, PA Diagnostics 971-00040-080
- PA Diagnostics Unit Cable 256-0346-000
- Cable Assy, USB-A/B, 1.5M 256-0166-015
- Doc Pkg, 988-2765-001 (includes technical manual 888-2765-001)
- Kit, PA Diagnostics Unit, Interconnect 50C Cable, USB-A/B Cable and Documentation 971-0040-081.

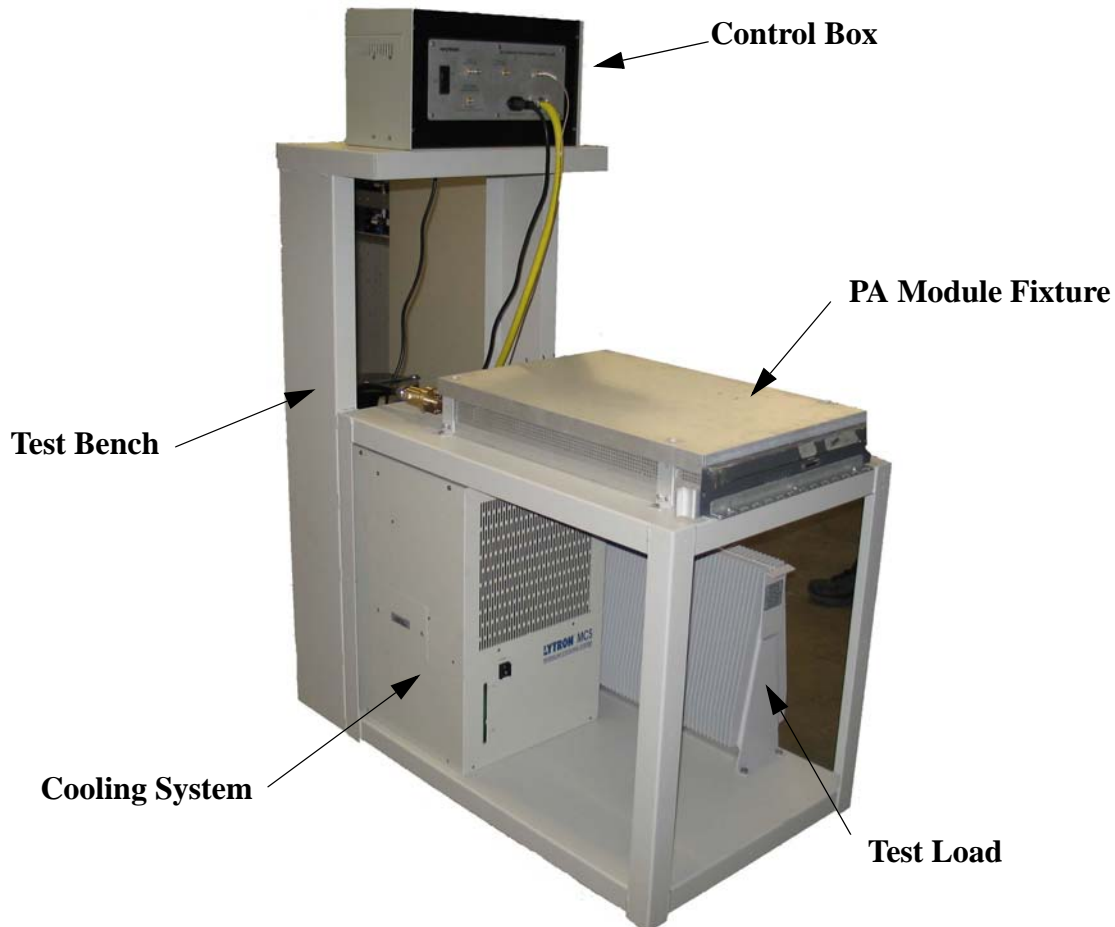


Figure 1-1 PA Module Test System

1.4 Operating voltages:

The control box requires one single phase, 230 VAC, 47-63 Hz, connection (see Figure 1-2). The supply wire is included with the test system but a suitable AC connector must be provided by the customer. This single phase input is used to provide input power for the cooling system. The test set contains a 25 amp internal circuit breaker switch for this input. The circuit breaker switch is on the front of the control box.

The control box also requires a three phase 230 VAC, 47-63Hz, connection (see Figure 1-2) The AC supply wire is included with the system but a suitable AC connector must be provided by the customer. This three phase input provides input power for the PA module. The test system does not contain a circuit breaker for the 3 phase AC input. The 40 amp circuit breaker must be provided by the customer.

NOTE:

The PA module test system requires three phase power with a neutral connection. There must be 115 VAC between any three phase leg and neutral.

The single phase input is required to activate a contactor inside the control box which allows the three phase voltage to go to the PA module.

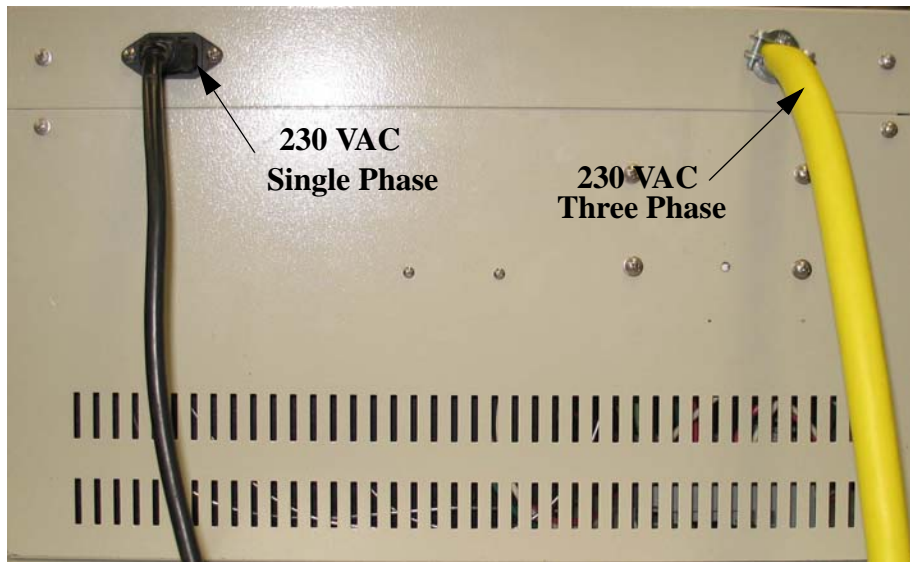


Figure 1-2 AC Inputs on Rear of Control Box

1.5 Block Diagram

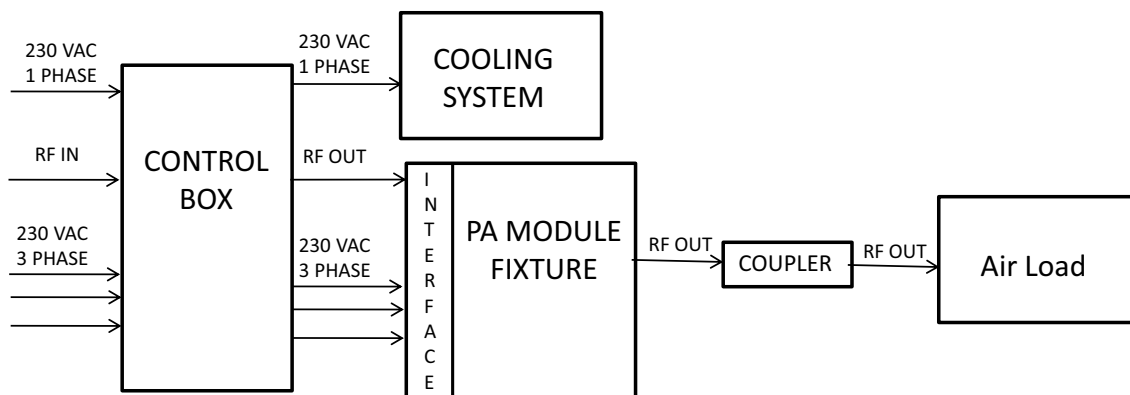


Figure 1-3 Block Diagram PA Module Test System

Section 2

Installation /

Initial Turn-On

2

2.1 Introduction

This section includes the information necessary for installation and initial turn on of a Maxiva PA module test system.

2.2 Returns and Exchanges

Damaged or undamaged equipment should not be returned unless written approval and a Return Authorization is received from HARRIS CORPORATION, Broadcast Division. Special shipping instructions and coding will be provided to assure proper handling. Complete details regarding circumstances and reasons for return are to be included in the request for return. Custom equipment or special order equipment is not returnable. In those instances where return or exchange of equipment is at the request of the customer, or convenience of the customer, a restocking fee will be charged. All returns will be sent freight prepaid and properly insured by the customer. When communicating with Harris Corporation, Broadcast Division, specify the Harris Order Number or Invoice Number.

2.3 Documentation

The following is a list of documentation that ships with the test system. Find and save all documentation. The top level Document Package numbers for each transmitter model are shown below:

- Documentation package, Harris part number **988-2764-001**

A document package includes:

1. This technical manual: **888-2764-001**

2. Drawing Package with a set of schematics for the test system.
3. Application notes (if required).

2.3.1 Installation Drawings

It is recommended that you look through the drawing package to familiarize yourself with the information available. Most installation and planning information is given in the following drawings (see Table 2-1 below for specific drawing numbers):

- a. **AC Mains Plug** - Shows details for the AC/Control test interface to the PA module. This does not refer to the AC mains input connections on the control unit.
- b. **AC Distribution** - Shows connections for AC and DC lines inside the control box and in between system component parts.
- c. **RF Power Budget** - Shows RF flow and typical RF levels within the system.

Table 2-1 Maxiva PA Module Test System Drawings

Drawings	Part No.
Documentation Package	988-2764-001
SCH, AC Mains Plug (for interface box)	801-0222-151
AC Distribution, Test Fixture ULX	843-5602-148
Schematic, RF Power Budget	843-5601-611



NOTE:

Thoroughly review all documentation prior to installation.

2.4 Unpacking

Upon receipt of the PA module test system, carefully unpack the components and perform a visual inspection to ensure that no apparent damage was incurred during shipment. Retain the shipping materials until it has been determined that the unit is not damaged. The contents of the shipment should be as indicated on the packing list. If the contents are incomplete or if the unit is damaged electrically or mechanically, notify the carrier and Harris Corporation, Broadcast Division.

Remove the bolts or straps holding the test system to the pallet and carefully slide the test system off the pallet.

2.5 Installation Steps

Steps in the installation section are numbered in each section. As each step is completed, the step number can be circled to indicate completion. This provides a quick confidence check at the end of the procedure that no steps were skipped.

⇒ NOTE:

In case of discrepancy between the connections listed in schematics versus information given in this installation section, the wiring information in the schematics should be considered the most accurate. *All connections listed in this section should be verified with the schematics before initial turn on.*

2.5.1 PA Module Test System Placement

The PA module test system is designed for indoor use only. It should be located in a position that is free from exposure to condensation, dust and dirt. The PA module test system includes a cart to which major components are attached. The test system should be placed on a level surface that allows ready access to all sides. The front of the test system should have a clearance of at least 1.5 meters to allow access for removal and installation of the PA modules.

- STEP 1** Place the test set in position on a solid flat surface and use small wedged blocks against the wheels to hold it in a stable position while working with the equipment.
- STEP 2** Refer to drawing 843-5601-612. Connect the black AC input cable (see Figure 1-2 on page 1-4) to a single phase, 230 VAC, 25 amp, source. The mains connection should include a an emergency disconnect (supplied by the customer) to allow the mains voltage to be removed from the test system when required for maintenance or troubleshooting. The control box for the test system includes a breaker/switch for the single phase AC input.
- STEP 3** Refer to drawing 843-5601-612. Connect the yellow AC input cable (see Figure 1-2 on page 1-4) to a three phase, 230 VAC, 45 amp, source. The mains connection should include (supplied by the customer) 45 amp circuit breakers or fuses and an emergency disconnect to allow the mains voltage to be removed from the test system when required for maintenance or troubleshooting. The control box for the test system includes a breaker/switch for the single phase AC input.



NOTE:

The three phase AC must measure 115 VAC from L1, L2, or L3 to the ground or neutral connection

2.6 Test System AC Connection

Refer to the AC Distribution Test Fixture ULX drawing 843-5601-612. The drawing shows the required single phase 230VAC and the three phase AC 230VAC connections (see the wiring in Figure 1-2 on page 1-4) and also shows the current draw for each AC input. The single phase input supplies power to the modular cooling system. Loss of the single phase AC input will disable the three phase AC supplying the module.

The single phase input has a built in 20 A switch/breaker built into the front of the control box. The three phase input does not have a circuit breaker. The customer must supply suitable three phase 230 VAC circuit breakers or fuses as well as a safety disconnect. A safety disconnect for the single phase input must also be provided by the customer for use in case of emergencies or to allow safe servicing of the test system with no AC applied. The safety disconnects should be located within view and near the test system so they are easily accessible.

**WARNING:**

DISABLE AND LOCK OUT STATION PRIMARY POWER BEFORE PRIMARY POWER CABLES ARE CONNECTED TO THE EQUIPMENT.

**CAUTION:**

IF VOLTAGE VARIATIONS IN EXCESS OF $\pm 10\%$ ARE ANTICIPATED, THE TEST SET POWER INPUT MUST BE EQUIPPED WITH AUTOMATIC VOLTAGE REGULATORS (OPTIONAL EQUIPMENT) CAPABLE OF CORRECTING THE MAINS VOLTAGE.

**WARNING:**

AN EXTERNAL CIRCUIT PROTECTION DEVICE (BREAKER OR FUSE) IS REQUIRED FOR EACH LPU AND POWER AMPLIFIER BLOCK INPUT. THIS IS PROVIDED BY THE CUSTOMER IN ACCORDANCE WITH THE AC INTERCONNECT DRAWING OR BY HARRIS IF AN IN-RACK AC DISTRIBUTION CHASSIS IS PURCHASED (OPTIONAL). IN THE LATTER CASE, AN EXTERNAL CIRCUIT PROTECTION DEVICE TO COVER THE ENTIRE TRANSMITTER LOAD AT THE MAIN AC DISTRIBUTION POINT IS STILL REQUIRED, IN ACCORDANCE WITH PREVAILING LOCAL SAFETY NORMS

2.6.1 Safety Ground

A safety ground wire is required for each AC mains input and they should be connected to the station ground system. The safety ground wire is green and is included in both the single and three phase wiring harness Refer to the AC Distribution Test Fixture 843-5601-612 for connector wiring instructions that are suitable for the on site AC mains supply. The AC connectors used to connect to the AC mains must be provided by the customer.

2.6.2 AC Connections Procedure

**NOTE:**

It is important that the correct voltage, frequency and connection type be verified prior to installation.

STEP 1 Turn off all test set breakers and switches. Turn off AC mains at mains panel.

STEP 2 Attach the single and three phase harnesses (provided with test system) to suitable AC plugs (provided by customer). The ground connection is required on each AC input. Suitable disconnect panels are required (provided by customer). For additional information refer to 2.6 on page 2-5.

**NOTE:**

Test systems ship without AC mains connectors. Suitable connectors must be supplied by the customer. The AC wiring harnesses ship with the test system and must be connected to the customer supplied connectors which should then be then attached to customer supplied fuses or circuit breaker panels equipped with emergency disconnects.

**CAUTION:**

BE CERTAIN THAT THE INSULATION ON EACH AC SUPPLY CABLE HAS BEEN SUFFICIENTLY CUT BACK TO ALLOW FULL CONTACT BETWEEN THE CONNECTOR AND THE COPPER CABLE. FAILURE TO REMOVE THE INSULATION MAY RESULT IN HEATING AND FAILURE OF THE CONNECTION.

- STEP 3** Connect the green wire in each harness to ground. Verify that the Primary AC line voltage is correct. Measure the primary 230 VAC line voltage from phase to neutral (ground) and phase to phase and record for future reference.
- STEP 4** There must be less than a 10% imbalance between any one phase and the average of all three phases to allow the test system to operate, however the phase imbalance and frequency variation must be 5% or less to meet transmitter specifications.

2.6.3 Surge Suppression Devices

Harris strongly recommends the use of surge protection devices on the incoming AC mains lines. These devices protect against damages due to transients arising from both natural and man-made sources. (e.g. lightning and inductive load switching). Clear preference is to be given to “series” type surge protection devices -- featuring protection by both a series inductance / shunt capacitor filter and shunt threshold device -- over simple shunt-only clamping devices. The surge protector must be sized to handle the full amperage of the load it is protecting (plus a nominal safety margin) and be connected to the building ground system by short, direct connections. In the case where the shunt protection elements are protected by a fuse, it is necessary to periodically check the integrity of the fuse to ensure continued transient protection.

2.7 Signal Connections

⇒ NOTE:

Control and signal wires should never be run in the same conduit with any AC wiring. A separate conduit should be used for control/signal cables.

- STEP 1** Connect the RF input signal from an exciter or signal generator to the RF input connector (BNC) on the test system control box. The RF input level must be less than 10 dBm to prevent damage to internal components. RF input at an 8 dBm (6.3 mW) level is optimal.

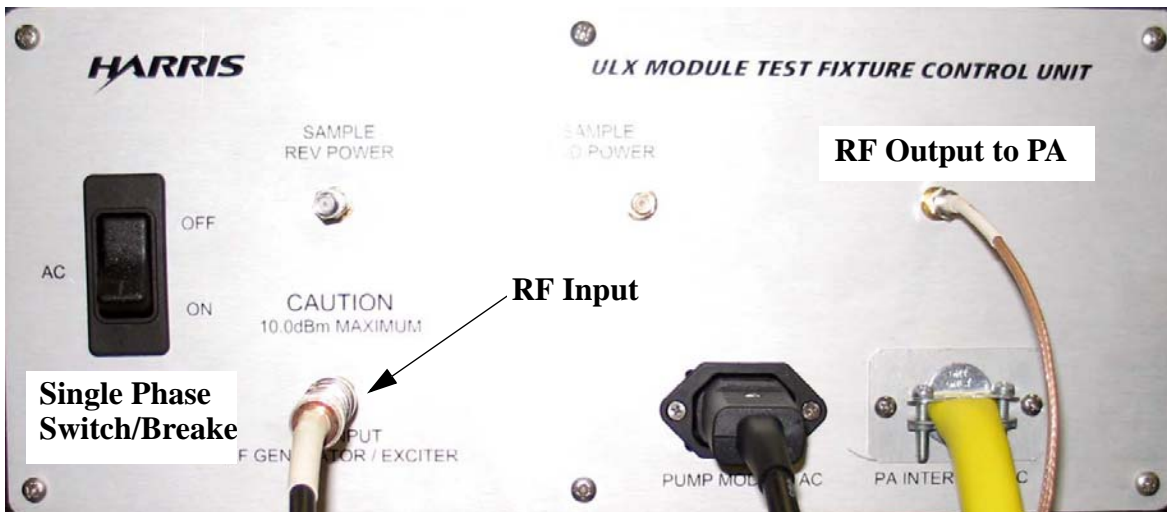


Figure 2-1 Control Box Front Panel

- STEP 2** Connect the RF output (SMA) on the front of the control box to the PA module input cable. Connect the module input cable to the SMA connector on the side of the AC/Control interface box (see Figure 2-2 on page 2-9). The AC/Control interface box connects to the rear connector of the PA module under test.

⚠ WARNING:

NEVER INSTALL OR REMOVE A PA MODULE WITHOUT FIRST TURNING OFF THE 3 PHASE DISCONNECT PANEL SUPPLYING THE TEST SYSTEM. AN INTERNAL SHORT IN THE PA MODULE COULD CAUSE COMPONENTS TO EXPLODE WHEN 3 PHASE AC IS APPLIED. NEVER APPLY AC POWER TO A PA MODULE UNLESS THE MODULE COVER IS IN PLACE.



Figure 2-2 Rear Connections on Module Test Fixture

- STEP 3** Attach the 7/8 to DIN adapter to one end of the semiflex coaxial line. Connect the other end of the semiflex coax line to the test load.
- STEP 4** Insert the PA module to be tested into the test fixture. The module should be pushed all the way to the rear of the fixture.
- STEP 5** Install the AC/Control interface box on the rear connector of the PA module under test
- STEP 6** Connect the 7/8 to DIN adapter to the rear output connector of the PA module under test. Be sure the 7/8" od outer conductor is fully seated inside the output connector on the rear of the PA module under test.

CAUTION:
THE 7/8" OUTER CONDUCTOR ON THE ADAPTER MUST BE FULLY SEATED INTO THE PA MODULE OUTPUT CONNECTOR. FAILURE TO FULLY SEAT THIS OUTER CONDUCTOR MAY RESULT IN DAMAGE TO THE ADAPTER OR TO THE OUTPUT CONNECTOR ON THE PA MODULE.

- STEP 7** With the PA module fully inserted into the test fixture rotate the hinged retainer upward and into the front of the PA module and firmly press it into place. The hinged retainer prevents the module from sliding forward during normal operation.

2.8 Cooling System

The MCS 50 is a water/glycol-to-air type liquid cooling system designed for use with laboratory equipment. The MCS 50 pumps ambient temperature water from the reservoir tank to the heat source being cooled, through a radiator where it is cooled, and then the fluid returns to the tank. The external plumbing and the heat source are provided by the end user.

For detailed information regarding the modular cooling system refer to the Lytron technical manual number 820-0146 for model MCS50. The manual can be found on the CD that ships with the cooling unit or online at <http://www.lytron.com/cooling-systems/service/manuals.aspx>.

2.8.1 Safety Instructions for Cooling System

- STEP 1** Do not operate the unit without fluid in the reservoir.
- STEP 2** Never place the unit in a location where excessive heat, moisture, or corrosive materials are present.
- STEP 3** The unit must be plugged into a properly grounded power source.
- STEP 4** Do not connect the SUPPLY or RETURN fitting to your building water supply or any pressurized source.
- STEP 5** Do not use or maintain the unit outdoors. These units were not designed to withstand outdoor weather conditions.
- STEP 6** Performance of installation, operation or maintenance procedures other than those described in the manual may result in a hazardous situation and may void the warranty.
- STEP 7** Transport the unit with care. Sudden jolts or drops can damage the unit.
- STEP 8** Observe all warning labels. Never remove warning labels.
- STEP 9** Do not operate damaged or leaking equipment.
- STEP 10** Always turn the unit "OFF" and disconnect the power cord from the power source before performing any service, maintenance procedures or before moving the unit.
- STEP 11** Do not operate equipment with damaged power cords.
- STEP 12** A qualified technician should perform service and repairs.
- STEP 13** For additional information consult the Lytron manual noted above.

2.8.2 Location of Cooling System

Locate the cooling system in an area with 18" minimum clearance in the rear of the unit for air circulation and ventilation. The cooling system should be located as close as possible to the heat load to minimize pressure drop due to excessive line length. Cooling lines are best run at or near the same level as the cooling system, until reaching the equipment being cooled.

2.8.3 Quick Reference Start-Up Procedure

- STEP 1** Locate the unit as close to the heat load as possible leaving at least 18" around the case for air circulation and ventilation.
- STEP 2** Remove plastic caps covering fluid ports.
- STEP 3** Attach process fluid lines to the inlet and outlet ports on the rear panel.
- STEP 4** Install the 5 micron cooling fluid filter by unscrewing the filter housing, inserting the filter and hand tightening the filter housing on the filter unit.
- STEP 5** Remove reservoir cover and fill tank with clean water. Continue to add water until the system is filled and the reservoir remains at a constant level.

⇒ NOTE:

For Systems with Centrifugal pump the pump must be primed prior to starting.

- STEP 6** Connect IEC 320 Type Power Cord to power entry module, and to standard power source.
- STEP 7** Turn on the system using the ON/OFF toggle switch located on the front panel.
- STEP 8** Check all external fittings and hoses for fluid leaks. If a leak exists, turn cooling system off and take necessary action to repair the leak.

⇒ NOTE:

Do not operate cooling system until leak has been repaired

- STEP 9** Drain the system and replace the water with a 50/50 mixture of glycol and distilled water.

Section 3

Operation

3

3.1 Introduction

This section gives detailed operational information for the Maxiva UAX Series Solid-State UHF TV transmitter. Information pertains to the operation and navigation of the front panel controls, the web interface and in transmitters with dual LPU's the TCU (transmitter control unit) touchscreen display.

3.2 Handheld PA Diagnostics Unit

The handheld PA diagnostics unit is designed to connect to the 50 pin connector on the front of the PA module under test with a test cable. The test set contains a 4-line LCD text screen.

Refer to the PA Diagnostics Unit technical manual 888-2765-001 which is included in document package 988-2765-001 for installation instructions and operational information for the handheld PA diagnostics unit.

3.3 PA Module Test System Operation

Once the test system has been installed as outlined in Section 2 a PA module can be installed and locked in place.

⚠ WARNING:
NEVER INSTALL OR REMOVE A PA MODULE WITHOUT FIRST TURNING OFF THE 3 PHASE DISCONNECT PANEL SUPPLYING THE TEST SYSTEM. AN INTERNAL SHORT IN THE PA MODULE COULD CAUSE COMPONENTS TO EXPLODE WHEN 3 PHASE AC IS APPLIED. NEVER APPLY AC POWER TO A PA MODULE UNLESS THE MODULE COVER IS IN PLACE.

Prior to activation of the test system a known good test load must be attached to the output port of the PA module under test. In order to produce RF the amplifier must have an RF input (8 dBm optimal, 10 dBm maximum) from a signal generator or exciter. The AC/Control Test Interface must be also be connected to the connector on the back of the module under test.

3.3.1 AC/Control Test Interface

The AC/Control test interface connector (shown in Figure 3-1 on page 3-2) contains four toggle switches that must be properly set for PA module testing. The first two switches (SW1 and SW2) need to be set depending on PA module frequency and modulation type. The front panel control switch must be ON to enable PA module RF output and activation of the PA module front connector. The mute switch should be in the OFF position to allow RF output and it is also used to accept changes of SW1 and SW2 to new voltage settings. Changes to SW1 and SW2 are only activated after the mute switch is toggled ON then OFF.



Figure 3-1 AC/Control Test Interface Connector Switches

Table 3-1 SW1 and SW2 Settings

Modulation	SW1	SW2	Voltage
Digital	ON	ON	50V
Digital	OFF	ON	46.1V
Digital	ON	OFF	48V
Analog	OFF	OFF	44.1V

Sync must be present in analog mode in order to light the input power LED on the front of the PA module. Sync is not required in digital modes.

Section 4

Theory of

Operation

4

4.1 Introduction

Consult the Maxiva ULX technical manuals for detailed theory of operation for PA modules. Section 4.3 in the ULX manual contains detailed information about the IPA and PA modules. Table 4-16 in the ULX manual contains detailed information about the LED's on the front of the modules.

Section 5

Maintenance and Alignments

5

5.1 Introduction

This section contains the maintenance and alignment procedures for the Maxiva PA module test system.

PA module testing and repair should only be attempted by qualified, trained personnel. Hazardous voltages and RF radiation hazards exist.

 **CAUTION:**

TOXIC BERYLLIUM

SOME COMPONENTS IN THE MODULE CONTAIN TOXIC BERYLLIUM. THIS LIMITS MODULE REPAIR TO A MODULAR LEVEL CONSISTING OF PALLETS, FET ASSEMBLY AND PC BOARDS ONLY.

HOT SURFACE

MAXIVA PA MODULES ARE DESIGNED TO HANDLE VERY HIGH TEMPERATURES AND MAY BE EXTREMELY HOT, UP TO 90° F (32° C) ABOVE ROOM TEMPERATURE. DO NOT TOUCH THE MODULES WITH BARE HANDS AFTER THE TRANSMITTER HAS BEEN RUNNING, ESPECIALLY IN HIGH AMBIENT TEMPERATURE ENVIRONMENTS. PROTECTIVE GLOVES CAN BE OBTAINED FROM HARRIS, PART #0990006483 OR GRAINGER ITEM #4JF36.

WEIGHT

THE PA MODULE WEIGHS APPROXIMATELY 22KG AND CAN BE AWKWARD TO HANDLE. USE CAUTION WHEN REMOVING, HANDLING AND REPLACING PA MODULES.

 **CAUTION:**
RADIO FREQUENCY HAZARD. UNQUALIFIED PERSONNEL SHOULD NOT ATTEMPT TO OPERATE THE PA MODULE WITH THE COVER REMOVED.

5.2 PA Module Maintenance and Repair

For additional information about PA module maintenance and repair consult Section 5 in the Maxiva ULX technical manual. The manual ships with each transmitter and is also available on line at the Harris service web portal at

http://support.broadcast.harris.com/eservice_enu/start.swe

Consult Section 5 in the Maxiva ULX manual prior to attempting PA module repairs.

Detailed information about PA module repair can be found in the Maxiva ULX manual section 5. Section 5.5 contains location and identification of PA & IPA pallet replacement. Section 5.6 contains information about module PS replacement.

Troubleshoot the PA problem using the handheld PA diagnostic unit with the PA module operating in the transmitter or in the PA module test system. Review the currents and voltages present on the various module components (see available readings listed in the PA diagnostics unit technical manual 888-2765-001).

5.2.1 Verification of Failed FET

Each PA module contains four PA pallet boards. Each pallet contains two FETs. In order to identify or confirm a failed FET use the following procedure:

- STEP 1** Turn off module via the GUI screen and then turn off the module circuit breaker. Allow the module to cool in the rack for 30 seconds prior to removal from rack.
- STEP 2** There should be no power applied to the module. Place module on table or bench.
- STEP 3** Remove the PA module cover.
- STEP 4** Confirm the bad FET by using a voltmeter (Fluke 87 for example) to measure the resistance between the FET gates and ground.

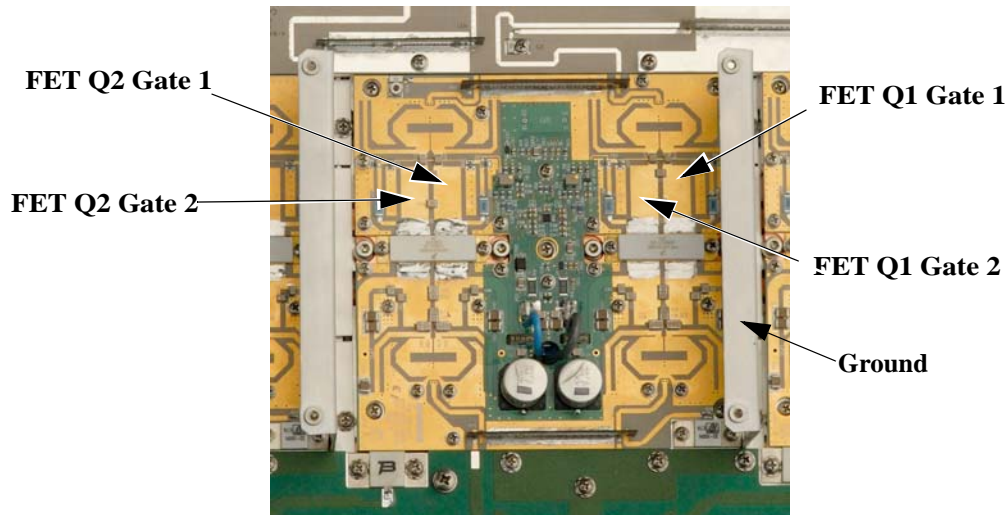


Figure 5-1 FET Gate ID

A measured resistance between 13 and 15 Kohms indicates FET is OK. If significantly lower than 13 Kohms (say 10 Kohms or less) the FET has probably failed. In this case a pallet or FET change is indicated. See Section 5.5 in the ULX TM for details on pallet removal and replacement.

5.2.2 Replacing FET Assembly 943-5601-041

Each FET ships from the factory pre-mounted to a copper spreader plate as shown in Figure 5-1.

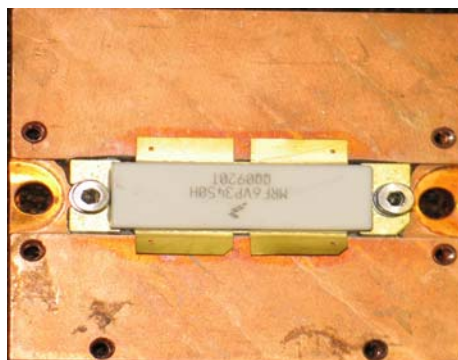


Figure 5-2 FET Assembly

STEP 1 Remove the module cover.

- STEP 2** Remove the pallet containing the failed FET from the module. Follow the pallet removal and reinstallation instructions provided in the ULX technical manual Section 5.5.
- STEP 3** Remove the FET mounting hardware (size M2, qty 6, pt no. 302-0803-001).

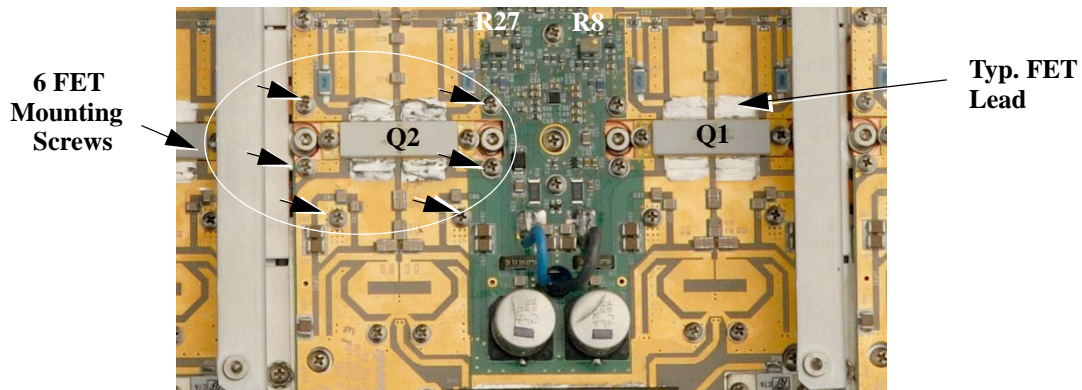


Figure 5-3 FET Mounting Screws

- STEP 4** Unsolder FET leads from the board (qty 4) and bend leads upward to clear the board.
- STEP 5** Slide the bad FET assembly 943-5601-041 out of the PWB.
- STEP 6** Slide a new FET assembly 943-5601-041 back in.
- STEP 7** Secure the mounting hardware (qty 6). These must be torqued to 7 in. lbs.
- STEP 8** Gently bend the FET leads onto the board, and solder them.

⇒ NOTE:
IMPORTANT: Turn the associated bias potentiometer all the way down, or counterclockwise. If replacing Q1 FET assembly the potentiometer R8 needs to be turned down. If replacing Q2 FET assembly the potentiometer R27 needs to be turned down.

⇒ NOTE:
 After FET assembly is replaced, it is necessary to re-bias the new FET

- STEP 9** Place the pallet back in the PA module assembly. Follow all instructions in the ULX technical manual Section 5.5 for pallet installation.

STEP 10 Install the module into the PA module test system and energize the system but do not apply RF drive. This will supply 50V to the pallet

STEP 11 Use the handheld PA diagnostics unit to monitor the FET current for the replaced FET then turn the associated bias potentiometer (R8 for Q1, R27 for Q2) clockwise until the current reported by the onboard current sensor equals 1.0 Amp. Check the FET currents in the other pallets to be sure they are close to 1 Amp.

STEP 12 Remove power from the PA module and replace the module cover.

STEP 13 Put the PA module back into service by following the PA module replacement instructions given in the ULX manual section 5.2.3.

5.3 Modular Cooling System Maintenance and Service

Refer to the Lytron manual for recommended maintenance, service guidelines and replacement parts.

5.4 Technical Assistance

Refer to the page *iii* at the front of the manual for further information regarding technical assistance.

Section 6

Diagnostics

6

6.1 Introduction

This section contains diagnostic and troubleshooting information for the Maxiva PA module test system. Refer to the Maxiva ULX technical manual for detailed information on PA module faults.

Section 7 Spare Parts List

7

7.1 PA Module Test System Parts List

Table 7-1 PA Module Test System Parts List

Harris PN	Description	Qty UM	Ref. Des.
2500506000	Cable, 4C 12 AWG Type SO	20 ft	
2500684020	Cable, 7-16M to 7-16M , 2 meter	1	
4320573000	Cooling System, Lytron MCS	1	
5441768000	Res, 2.5 kW Load Digital, 8892D-300	1	
6090031000	AC Inlet, 15 amp Male IEC-C14	1	
6101296000	Plug, IEC C14 for 14AWG I	1	
6202604000	Adaptor, 7/8 FL to 7/8 UNFL	1	
6202605000	Conn, Anchor Insulator 7/8	1	
6203254000	Dir Coupler, 1-5/8" UHF	1	
620342900	Reducer, 1-5/8 to 7/16 Jack	1	
628001700	Adapter, 7/8 to 7-16	1	
9435601600	Chassis, Module Test Fixture	1	
9435601602	Cover, Module Test Fixture	1	
9435601603	Cover, MTG Test Fixture	1	
9435601604	Hinge, Stop, Test Fixture	1	
9435601605	Angle, Stop, Module Test Fixture	1	
9435601606	Guide, Module Test Fixture	1	(slides)

Table 7-1 PA Module Test System Parts List

Harris PN	Description	Qty UM	Ref. Des.
9435601608	AC Panel Interface, Module Test Fixture	1	
9810223001	Control Unit, Maxiva PA Module Test Fixture	1	
9810223002	PA Module Interface Unit, Maxiva PA Module Test Fixture		
9810223002	Assy, PA Module Fixture, Maxiva ULX		

7.2 Modular Cooling System Replacement Parts

Table 7-2 Modular Cooling System

Item	Description	Lytron Part No.
1	Filter, Air	330-0021
2	Filter, Water 5 Micron	330-0022
4	Fan, 230VAC MCS40/50	101116-02
5	Pump, Brass 2.3 gpm	410-0112
5	Pump, Stainless Steel gpm	410-135
6	Motor, 1/4 HP 208/230VAC	230-214

**NOTE:**

Item and part numbers are from Lytron modular cooling system MCS 40/50 technical manual.