TECHNICAL MANUAL
888-2501-001

DAX-5/DAX-6
AM Transmitter

DAX-5/DAX-6
AM Transmitter

HARRIS

CE 891

T.M. No. 888-2501-001

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Returns And Exchanges

Damaged or undamaged equipment should not 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.

Unpacking

Carefully unpack the equipment and preform a visual inspection to determine that no apparent damage was incurred during shipment. Retain the shipping materials until it has been determined that all received equipment is not damaged. 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.

Technical Assistance

HARRIS Technical and Troubleshooting assistance is available from HARRIS Field Service during normal business hours (8:00 AM - 5:00 PM Central Time). Emergency service is available 24 hours a day. Telephone 217/222-8200 to contact the Field Service Department or address correspondence to Field Service Department, HARRIS Broadcast Communications Division, P.O. Box 4290, Quincy, Illinois 62305-4290, USA. Technical Support by e-mail: *tsupport@harris.com*. The HARRIS factory may also be contacted through a FAX facility (217/221-7096).

Replaceable Parts Service

Replacement parts are available 24 hours a day, seven days a week from the HARRIS Service Parts Department. Telephone 217/222-8200 to contact the service parts department or address correspondence to Service Parts Department, HARRIS CORPORATION, Broadcast Systems Division, P.O. Box 4290, Quincy, Illinois 62305-4290, USA. The HARRIS factory may also be contacted through a FAX facility (217/221-7096).

NOTE:
The # symbol used in the parts list means used with (e.g. #C001 = used with C001).

WARNING: Disconnect primary power prior to servicing.

English	Hereby, *HARRIS Broadcast Communications* declares that this *DAX Radio Transmitter* is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
Finnish	*HARRIS Broadcast Communications* vakuuttaa täten että *DAX Radio Transmitter* tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
Dutch	Hierbij verklaart *HARRIS Broadcast Communications* dat het toestel *DAX Radio Transmitter* in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG
	Bij deze verklaart *HARRIS Broadcast Communications* dat deze *DAX Radio Transmitter* voldoet aan de essentiële eisen en aan de overige relevante bepalingen van Richtlijn 1999/5/EC.
French	Par la présente *HARRIS Broadcast Communications* déclare que l'appareil *DAX Radio Transmitter* est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE
	Par la présente, *HARRIS Broadcast Communications* déclare que ce *DAX Radio Transmitter* est conforme aux exigences essentielles et aux autres dispositions de la directive 1999/5/CE qui lui sont applicables
Swedish	Härmed intygar *HARRIS Broadcast Communications* att denna *DAX Radio Transmitter* står I överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.
Danish	Undertegnede *HARRIS Broadcast Communications* erklærer herved, at følgende udstyr *DAX Radio Transmitter* overholder de væsentlige krav og øvrige relevante krav I direktiv 1999/5/EF
German	Hiermit erklärt *HARRIS Broadcast Communications*, dass sich *dieser/diese/dieses DAX Radio Transmitter* in Übereinstimmung mit den grundlegenden Anforderungen und den anderen relevanten Vorschriften der Richtlinie 1999/5/EG befindet". (BMWi)
	Hiermit erklärt *HARRIS Broadcast Communications* die Übereinstimmung des Gerätes *DAX Radio Transmitter* mit den grundlegenden Anforderungen und den anderen relevanten Festlegungen der Richtlinie 1999/5/EG. (Wien)
Greek	*ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ HARRIS Broadcast Communications ΔΗΛΩΝΕΙ ΟΤΙ DAX Radio Transmitter ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ*
Italian	Con la presente *HARRIS Broadcast Communications* dichiara che questo *DAX Radio Transmitter* è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
Spanish	Por medio de la presente *HARRIS Broadcast Communications* declara que el *DAX Radio Transmitter* cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE
Portuguese	*HARRIS Broadcast Communications* declara que este *DAX Radio Transmitter* está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.

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Declaration of Conformity - R&TTE Directive

Manufacturer:
Harris Broadcast Systems
3200 Wismann Lane
Quincy, Illinois, 62305, USA

European Agent:
Harris Systems Ltd
Eskdale Rd
Winnersh
Wokingham
Berkshire RG41 5TS - UK

Equipment declared compliant by this Declaration:

DAX-5 AM Radio Broadcast Transmitter
DAX-6 AM Radio Broadcast Transmitter

We hereby declare this equipment to be in Conformity to the following Directive:
Directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity.

Directives and Standard(s) used to verify compliance:

EN 301 489-1 V1.4.1 (2002-08)	(EMC) Common Technical requirements
EN 301 489-11 V1.2.1 (2003-05)	(EMC) Specific Conditions for Terrestrial broadcasting transmitters
EN 302 297 **DRAFT versions - Test Plan agreed with Notified Body #0891**	Electromagnetic compatibility and Radio spectrum Matters (ERM); Transmitting equipment for the analogue television broadcasting service; Part 2: Harmonized EN under article 3.2 of the R&TTE Directive
EN 60215 (1989) *+A1:1992; +A2:1994*	Safety requirements for radio transmitting equipment

A Technical Construction File of tests and observations to verify compliance is filed as 2004-02, dated August 27, 2004. The Technical Construction File was prepared by:

Karl Black – Compliance Engineer — Nov. 11, 2004 (Date)

Based on the above tests and inspections, we hereby declare this equipment compliant.

Geoff Mendenhall
V.P. Engineering — 11/11/2004 (Date)

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Manual Revision History

DAX-5/DAX-6 AM Transmitter Technical Manual

REV.	DATE	EC0	Pages Affected
Preliminary	08/15/2002		Created
0	07/25/2003		Review Copy to Service, Engineering, Safety
A	09/08/2003		Rev A Released
B	04/13/04	50147	Updated all pages & parts list
B1	11/19/04		Added CE required material

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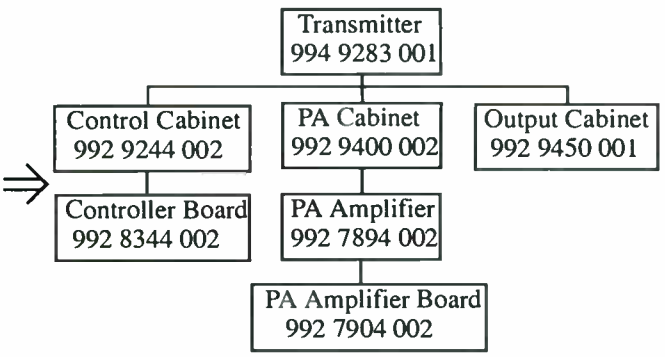
Guide to Using Harris Parts List Information

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.).

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.

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HARRIS Broadcast Systems Division
P.O. Box 4290, QUINCY, IL 62305

PARTS ORDER FORM

HARRIS PHONE: 217-222-8200
HARRIS FAX: 217-221-7096

BILLING INFORMATION

CUSTOMER NAME: _____

ADDRESS: _____

_____

_____

_____

TELEPHONE NUMBER: _____

FAX NUMBER: _____

PREFERRED PAYMENT METHOD: _____

SHIPPING INFORMATION

SHIP TO: _____
(If different from billing information)

ADDRESS: _____

_____

_____

_____

TELEPHONE NUMBER: _____

FAX NUMBER: _____

SHIPPING METHOD PREFERRED: _____

FREQUENCY (If required): _____

EQUIPMENT NAME: _____

EQUIPMENT PART NUMBER: _____

EQUIPMENT SERIAL NUMBER: _____

GUIDE FOR ORDERING PARTS

Please use the following parts order form, filling is as much information as possible. The complete informaiton will allow double checking the part number for correctness or locating a substitude if the part is not available.
The equipment name, part number, and serial number will be found on the metal ID plate on the back of the unit. The serial number MUST be included for any parts ordered under warranty.
Describe the part using the description in the parts list if possible. Include the schematic information, schematic number, or number of next higher assembly. The next higher assembly is usually a 992-xxxx-00x type.

ITEM #	QTY ORD	HARRIS PART NUMBER	DESCRIPTION OF PART (PART'S NAME, DESCRIPTION, SPECIFICATION FROM PARTS LIST IF AVAILABLE)	SCHEMATIC REFERENCE REFERENCE NAME (e.g. C001, R100, etc)	ITEM USED ON (NEXT HIGHER ASSEMBLY IF KNOWN) (e.g. C001 used on 992 8025 001, SCHEMATIC 839 8099 991)	COMMENTS

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.

WARNING:
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.

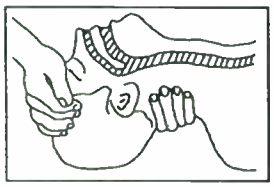
TREATMENT OF ELECTRICAL SHOCK

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

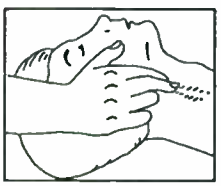
(A) AIRWAY

IF UNCONSCIOUS.
OPEN AIRWAY



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

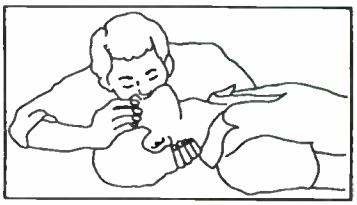
CHECK
CAROTID PULSE



IF PULSE ABSENT.
BEGIN ARTIFICIAL
CIRCULATION

(B) BREATHING

IF NOT BREATHING.
BEGIN ARTIFICIAL BREATHING



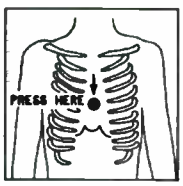
TILT HEAD
PINCH NOSTRILS
MAKE AIRTIGHT SEAL

4 QUICK FULL BREATHS

REMEMBER MOUTH TO MOUTH
RESUSCITATION MUST BE
COMMENCED AS SOON AS POSSIBLE

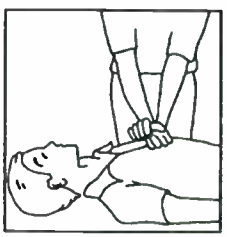
(C) CIRCULATION

DEPRESS STERNUM 1 1/2 TO 2 INCHES



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

APPROX. RATE OF COMPRESSIONS --60 PER MINUTE
- TWO RESCUERS
- 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

WARNING: Disconnect primary power prior to servicing.

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)

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Section 1 Introduction

1

1.1 Purpose of This Manual

This technical manual contains the information pertaining to the DAX-5/DAX-6 Enhanced AM transmitters. The various sections of this technical manual provide the following types of information.

- Section 1, Introduction/Specifications, provides general manual layout, frontispiece, equipment description, block diagram.
- Section 2, Installation/Initial Turn On, provides physical and electrical installation procedures for the transmitter, cooling and RF systems and basic remote control connections.
- Section 3, Operation, provides operation and navigation information for the Graphical User Interface or GUI as well as identification and functions of all external panel controls and indicators.
- Section 4, Overall System Theory provides block diagram and detailed theory of operation.
- Section 5, Maintenance and Alignments, provides preventative and corrective maintenance information and all field alignment procedures.
- Section 6, Diagnostics, provides detailed fault information and diagnostic procedures to the board level.
- Section 7, Parts List, provides a parts list for the overall transmitter as well as individual modules.

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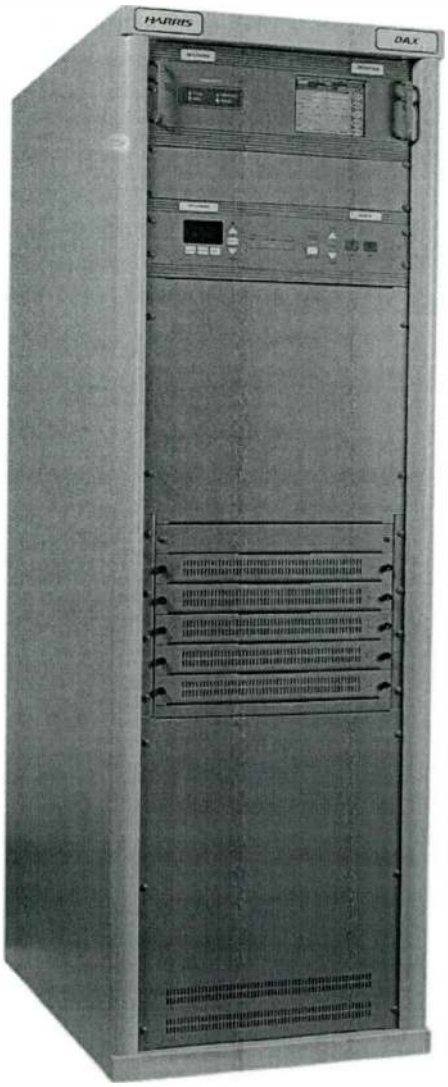

Figure 1-1
DAX 5 Transmitter

1.2 Features/Benefits

Performance

- Exceptional redundancy based on the same rugged and conservatively-rated RF modules used in Harris' highly successful Destiny 3DX transmitters
- On-air serviceability with modular architecture and "hot-swappable" RF modules

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- Broadband design from the frequency synthesizer through the output filter, with frequency dependant components used only in the output network.
- Enhanced audio performance — even at low-power PSSA power levels
- Loud-yet clean! With peak modulation to +145%
- Linear high voltage power supply for simplicity and easy maintenance
- Quiet DC-controlled cooling
- Designed as a digital transmitter from the start, simply add a Harris DEXSTAR IBOC exciter for a seamless IBOC transition

Intelligent User Interface

- Extensive diagnostics and lower-stage metering
- Easy to control and monitor with software-driven LCD display that provides parameter metering, status, fault log retention, and set-up/configuration menu
- Extensive parallel user interface for remote metering, control and status
- Serial port for control, diagnostics, and configuration
- Integrated remote-able switching from IBOC to analog-only mode, with status indication
- Five user preset power levels

Protection

- Designed to keep you on the air with comprehensive fault monitoring and recovery including power limit protection for low-power antenna systems, and transient protection on AC input, antenna output, and remote inputs and outputs
- Foldback protection from high VSWR keeps transmitter operating at reduced power

CE Compliance

Upon installion of the provided EMI Immunity Kit, the DAX transmitter will comply with the RFI immunity test level condition of 10 VRMS as defined in EN 301 489-1[1] for CE certification.

NOTE:
The EMI Immunity Kit can also be used for non-CE installations requiring improved shielding for high RF environments.

1.3 General Description

The DAX-5/DAX-6 is a state of the art solid state medium wave transmitter with a rated output power of 5/6kW combining improved digital amplitude modulation technology with APDM (Advanced PDM). The Direct Digital Drive (3D) system supplies the RF amplifier with TTL level signals eliminating the need for a high-level drive chain, splitters, cables and tuned circuits.

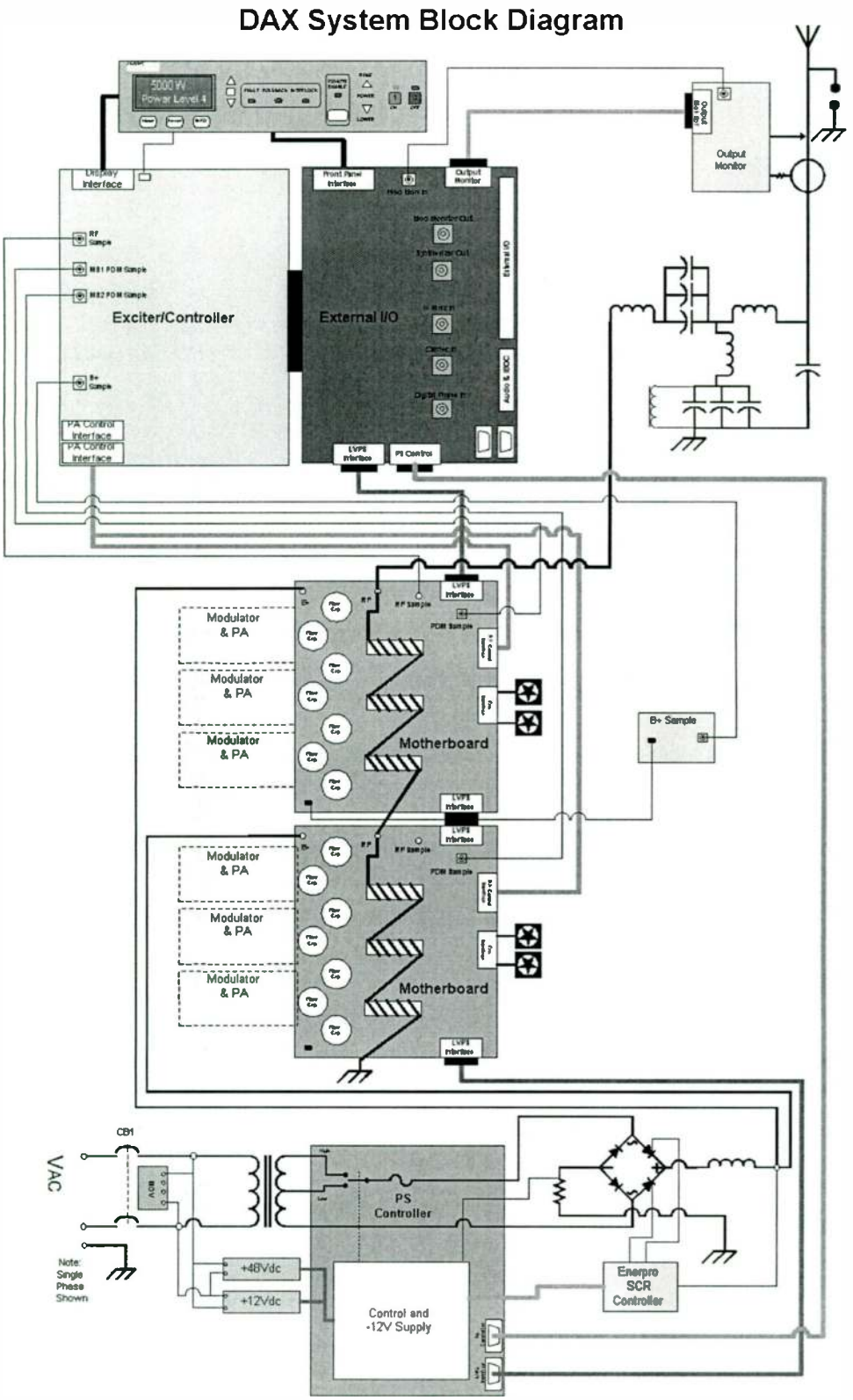

Figure 1-2
DAX Simplified Block Diagram

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Section 2 Installation

2

2.1 Introduction

This section details the procedures to receive, install, and prepare the transmitter for use, as well as initial turn-on steps.

2.2 Unpacking & Returns and Exchanges

Refer to the second page of this manual for instructions on unpacking, inspecting, and procedures in the event of any damages from shipment or omissions.

2.2.1 Inspection

Prior to performing the installation of the DAX transmitter, it should be thoroughly inspected for any connections which may have loosened during shipment. Also check that all ribbon cables are properly locked into their respective printed circuit board connectors, and that the PA modules are securely inserted. Check for debris or loose hardware, especially around the high current power supply connections.

2.2.2 Weight and Dimensions

Along with the shipping skid underneath, the DAX weighs approximately 644 pounds (292 kg).

The DAX Transmitter has been designed for rapid installation. In addition to the 23.1 inch width by 34 inch depth of the equipment, a minimum of 24 inches should be allowed for maintenance access from both the front and rear of the cabinet.

2.2.3 Factory Test Data

Locate and retain the FACTORY TEST DATA. During installation and initial turn on procedures, reference will be made to FACTORY TEST DATA. This data is normally packed in an envelope and may be inserted in the technical manual, or may be packed

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with the Transmitter. This data includes meter readings, measured performance data, information and data measured with external equipment, frequency determined parts and adjustments specifically for your Transmitter's operating frequency.

2.3 Installation

CAUTION:
ALL CONNECTIONS REFERRED TO IN THIS INSTALLATION PROCEDURE SHOULD BE VERIFIED USING THE SCHEMATICS SUPPLIED WITH THE TRANSMITTER. THE SCHEMATICS SHOULD BE CONSIDERED THE MOST ACCURATE IN CASE OF A DISCREPANCY.

The installation section contains the information related to cabinet placement, inter-cabinet wiring, static checks, application of low-voltage and initial turn-on and initial adjustments of the system.

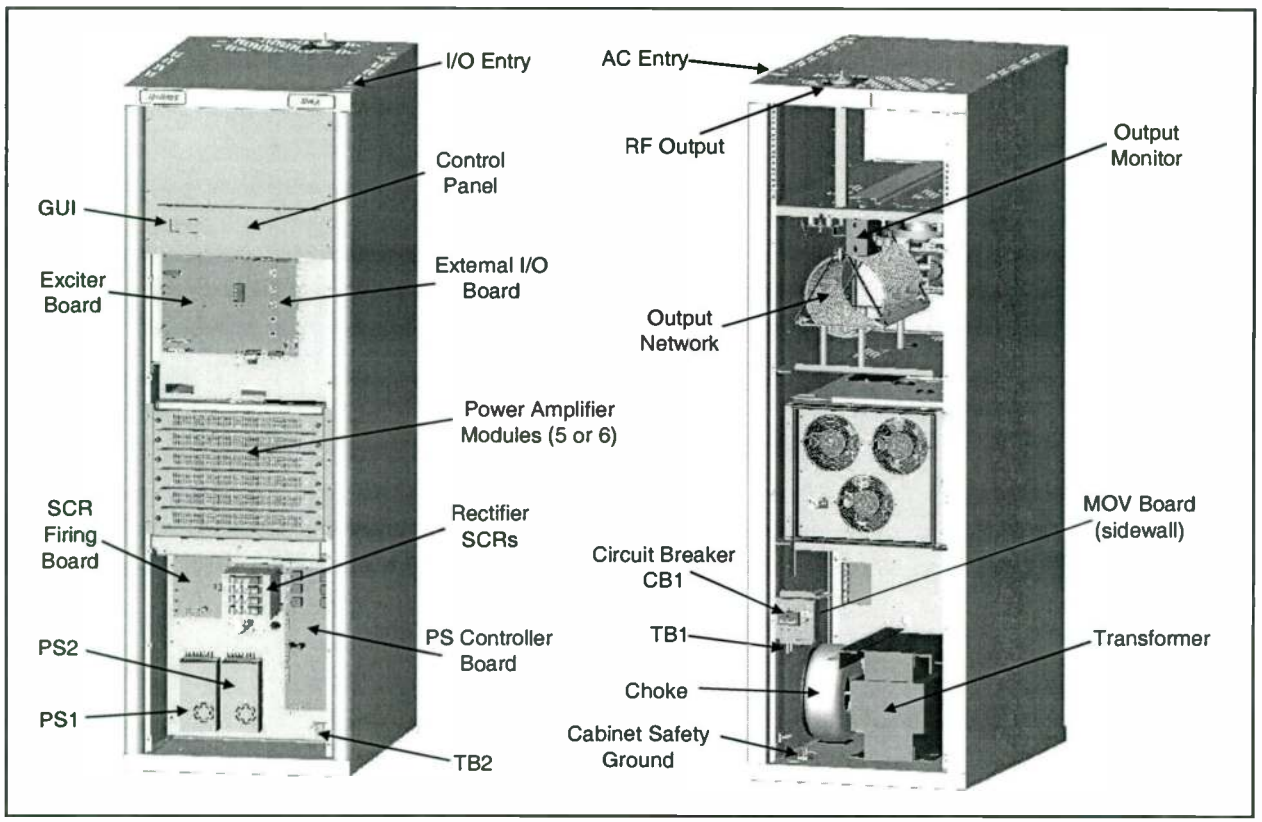


Figure 2-1
Front and Rear Views of DAX Transmitter with Panels Removed

WARNING: Disconnect primary power prior to servicing.

To facilitate proper installation and initial checkout, this data and the technical manual should be carefully studied to obtain a thorough understanding of the principles of operation, circuitry, nomenclature, and performance characteristics.

The transmitter installation is accomplished in the following order:

1. Transmitter placement
2. Air System and Cooling
3. Grounding
4. Power Supply connections
5. RF Connections
6. Transmitter Wiring
7. Initial Checkout

When necessary, refer to drawing titled Cabinet Outline in your drawing package for important DIMENSIONS, WEIGHT, AIR FLOW, and ELECTRICAL information.

2.3.1 Transmitter placement

The DAX-5/DAX-6 shipment consists of:

- DAX Transmitter Cabinet
- Factory Test Data packet
- Dummy Module
- Hot-Swap Key
- (2) I/O cable RFI torroids
- WAGO Connector Insertion Tool
- EMI Immunity Kit
- OPTIONAL:
    - DEXSTAR Exciter
    - Uninterruptable Power Supply (UPS)
    - ePAL - Audio Interface & Synchronization Unit
    - Cable kit

Review the Overall drawings to determine the size and placement of the transmitter at your location.

2.3.1.1 Transmitter Cabinet Positioning

The transmitter should be located to permit adequate maintenance access and sufficient ventilation. The grounding strap between the transmitter and the station earth ground must be properly connected before AC power wiring is attached to transmitter (see "2.3.3.2 Grounding Connections" on page 2-6).

CAUTION:
UNIT MUST NOT BE DROPPED. TWO TO THREE PEOPLE MINIMUM ARE NEEDED TO REMOVE THE CABINET FROM THE PALLETS.

If the transmitter is to be positioned into a predetermined wall opening, be sure to allow for any final leveling needed when figuring the wall opening dimensions.

2.3.2 Air System And Cooling

Refer to the DAX-5/DAX-6 Cabinet Outline Drawing, for information on air flow CFM, heat dissipation and duct work dimensions.

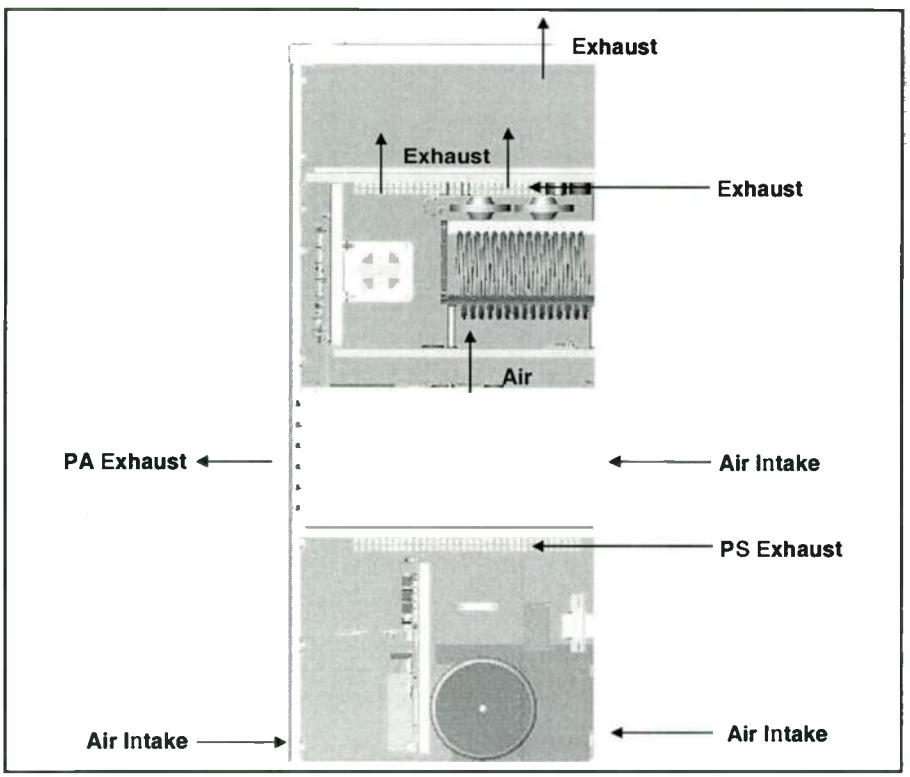


Figure 2-2
DAX Cooling Air Flow Diagram - (Front of DAX is left)

WARNING: Disconnect primary power prior to servicing.

Cooling air for the transmitter enters through the back of the Cabinet and exhausts through the front and top of the cabinet. If an exhaust duct is used, static pressure in the duct must be neutral or slightly negative. Static pressure for air intake at the rear of the transmitter must be neutral or slightly positive. The exhaust grills opening on the top of the transmitter must not be restricted. This is an important consideration when a wall will be installed along the front of the transmitter.

2.3.3 Grounding

2.3.3.1 Grounding Basics

The importance of a good grounding system and lightning protection can hardly be overemphasized for reasons of personnel safety, protection of the equipment, and equipment performance. The following is only a brief overview.

Lightning and transient energy via the power line or tower connections can impose serious threats to your personal safety as well as damage the equipment. For these reasons you should have a good protective earthing system to divert these forms of energy to earth ground. Proper grounding of the equipment also guards against electrical shock hazards that would exist if the equipment failed in a way which put a hazardous voltage on the chassis.

A good grounding system should include substantial grounding at the tower base using copper ground rods and/or a buried copper ground screen, with copper strap used to connect the tower base to earth ground. A low impedance will help carry lightning current directly into the ground instead of into your building. Additionally, coax shield(s) should be electrically connected to and exit the tower as near to the bottom as practical to minimize the lightning voltage potential carried by the coax into your building.

For multiple coax, a single point of entry into the building is best, with all connected to a common grounding plate (or bulkhead panel) having a low impedance connection to the building perimeter ground. Wide copper straps should be used for making the connection from the common grounding plate to earth ground.

A common grounding plate is also the best location for coaxial surge protectors for sensitive equipment such as an STL receiver. Ideally, this plate should also be the entry point for all signal lines, and serve as a single point ground for AC power surge protection.

A good ground system should include perimeter grounding of the transmitter building using copper ground rods and copper strap. There should also be a copper strap running from tower ground to the building perimeter ground.

Good grounding and shielding will help keep stray RF current to a minimum. RF interference usually shows up in one of several ways, intermittent problems with digital

or remote control circuits, audio feedback or high pitched noise. Even a small amount of non-shielded wire makes a very efficient antenna for RF and transient energy. If RF is allowed into the audio equipment, it can be rectified and may show up as noise or feedback. Wire and cable shields should normally be connected at both ends to the equipment chassis, audio cables should have the shield connected to ground on one side only.

2.3.3.2 Grounding Connections

A ground strap attachment point, E10, is located on the left rear floor (as viewed from the rear) of the cabinet. Use this connection when utilizing a single point grounding system, attaching your ground strap to this common grounding point. Route a 2" copper strap underneath the DAX up through the slot, and secure to the grounding point.

A grounding stud (considered part of E10) is also provided near the AC input connections on the lower left sidewall of the transmitter. Use this connection for the power line safety ground. See Section 2.3.4 for details of installation.

2.3.4 Power Supply Connections

The entrance for AC power cable is a 2" x 2" square hole covered by a steel plate with a circular opening, located near the rear-right top (as viewed from the front of DAX) of the cabinet. This entry provides a channel, routing the cable directly to a sidewall exit near the circuit breaker CB1 terminals in the lower section of the DAX transmitter.

AC power may also be routed up from underneath the DAX via a circular hole in the floor of the transmitter. This hole is located just behind (as viewed from the rear of the DAX) the ground strap system and E10 Safety Ground.

2.3.4.1 3 Phase AC Connections

The AC input is connected to the power supply at the circuit breaker CB1. See wiring diagram 843-5573-003 for details.

STEP 1 Feed AC cable through entry opening

STEP 2 Pull into cabinet from exit opening

STEP 3 Strip wires

STEP 4 Remove cover over CB1 by removing 2 screws and sliding cover off

STEP 5 Attach 3 phase wires to CB1 top terminals as shown below

WARNING: Disconnect primary power prior to servicing.

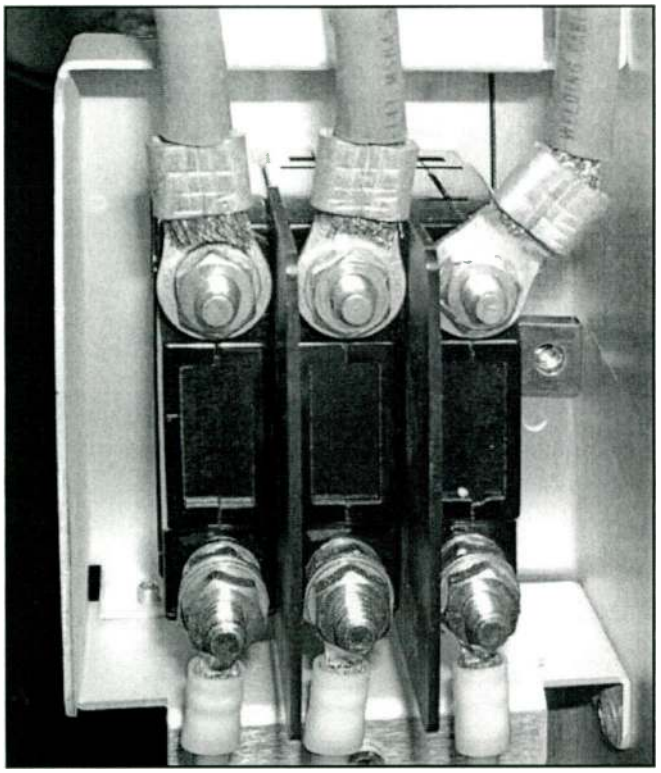


Figure 2-3
3 Phase Connections to CB1

STEP 6 Attach green neutral wire to E10 stud for safety ground (see Figure 2-4 on page 2-8)

STEP 7 Replace CB1 cover

WARNING: Disconnect primary power prior to servicing.

2.3.4.2 Single Phase AC Connections

STEP 1 Feed AC cable through entry opening

STEP 2 Pull into cabinet from exit opening

STEP 3 Strip wires

STEP 4 Remove cover over CB1 by removing 2 screws and sliding cover off

STEP 5 Attach single phase wires to CB1 top terminals as follows:

- **Line** to terminal **closest** to sidewall
- **Neutral** to terminal **farthest** from sidewall

STEP 6 Replace CB1 cover

STEP 7 Attach ground wire to E10 stud for safety ground (see Figure 2-4 on page 2-8)

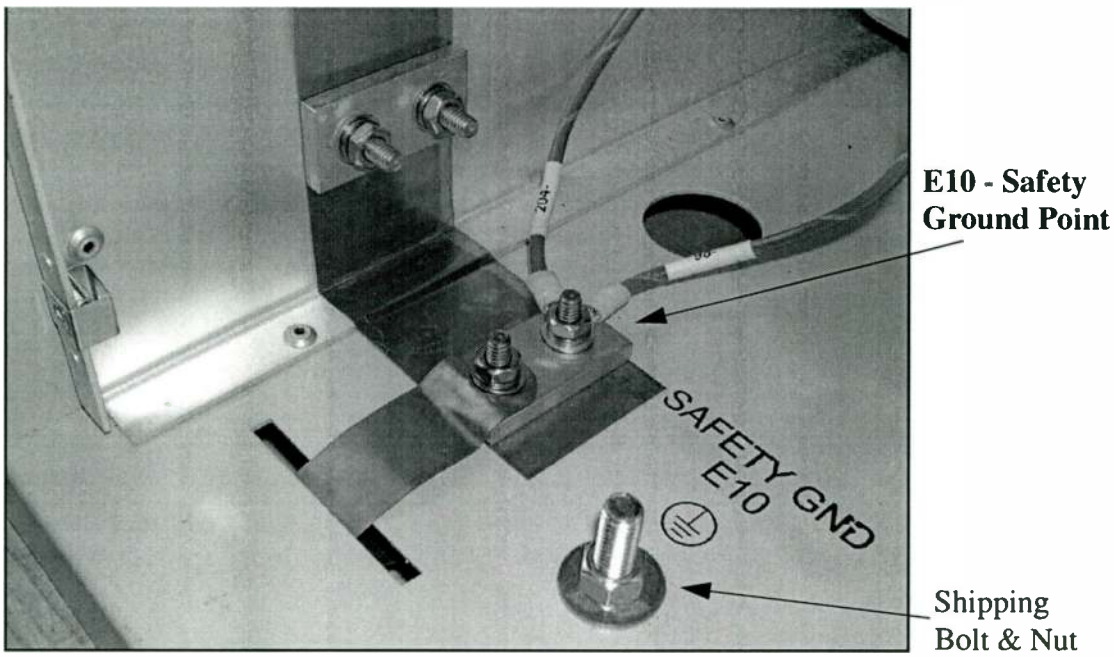


Figure 2-4
E10 Safety Ground

WARNING: Disconnect primary power prior to servicing.

2.3.4.3 Transformer Tapping

If necessary, transformer T1 taps are made according to the following table to attain the desired match to line conditions. Also see Figure 2-5 and Figure 2-6 below for further reference.

Table 2-1 AC Line Connections: Normal, +5%, -5%

Line Condition	Single Phase		3 Phase		
	Neutral	Line	Phase A	Phase B	Phase C
Normal	0	240	PH-A 208 PH-C 0	PH-B 208 PH-A 0	PH-C 208 PH-B 0
+5%	+5%	240	PH-A 208 PH-C +5%	PH-B 208 PH-A +5%	PH-C 208 PH-B +5%
-5%	-5%	240	PH-A 208 PH-C -5%	PH-B 208 PH-A -5%	PH-C 208 PH-B -5%

WARNING: Disconnect primary power prior to servicing.

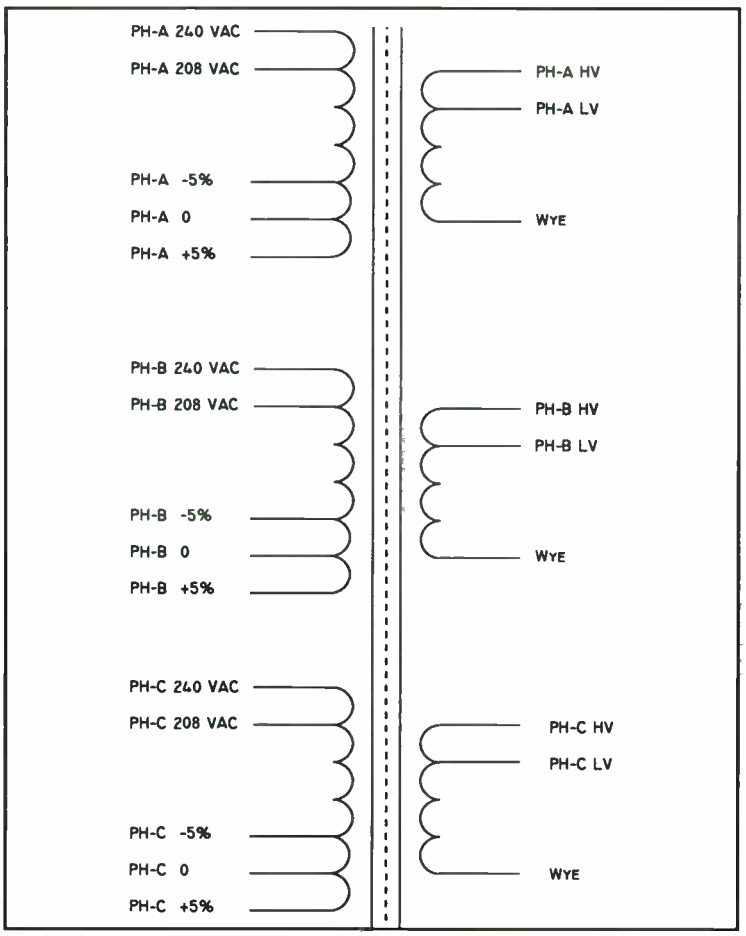


Figure 2-5
3 Phase Transformer Schematic

WARNING: Disconnect primary power prior to servicing.

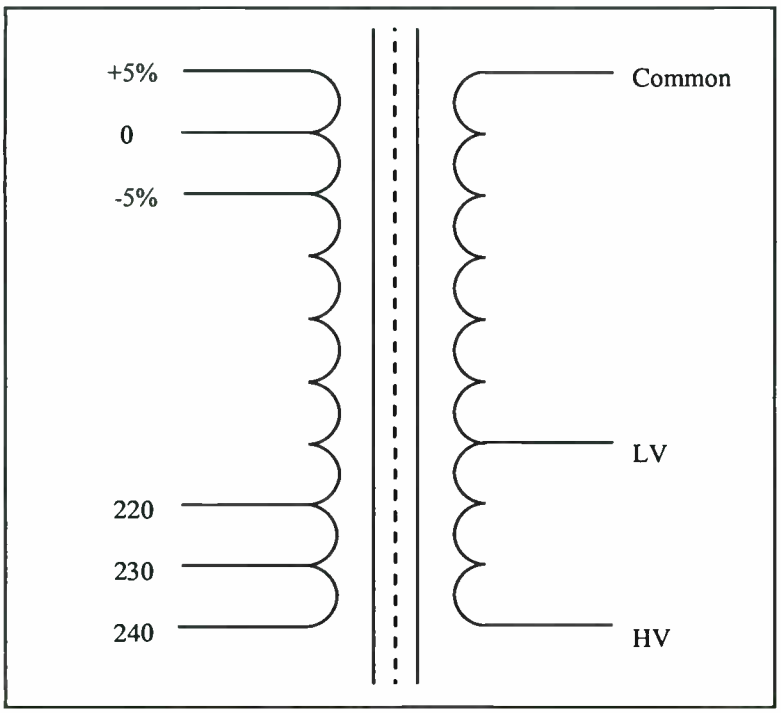


Figure 2-6
Single Phase Transformer Schematic

2.3.5 RF Connections

NOTE:
Place a piece of cardboard over exhaust holes in top of cabinet when working with small hardware that could fall through during installation.

Carefully connect the output transmission line from the antenna to the 7/8 EIA flange located on the top rear of the cabinet.

2.3.6 Transmitter I/O Wiring

NOTE:
To meet CE requirements, the included EMI Immunity Kit will need to be installed at this point (see installation documentation included with the EMI Immunity Kit package).
The EMI Immunity Kit provides CE compliance for the RFI immunity test level condition of 10 VRMS as defined in EN 301 489-1[1], but can also be used for non-CE installations requiring improved shielding for high RF environments.

The entrance for I/O cabling is a 2" x 2" square hole covered by a steel plate with a circular opening, located on the front-right top (as viewed from the front of DAX) of the cabinet. This entry provides a channel, routing the wires directly to a center right-

sidewall exit near the remote terminals on the External I/O board. See Figure 2-7 on page 2-15 for a view of the connections on the right side of this board.

Also, there is a circular hole in the floor of the transmitter that can channel I/O cabling up and into a lower right-sidewall exit. This can be used for routing the I/O signal wiring up from underneath the DAX transmitter, then up to the External I/O board connectors.

For additional wiring required for any extra equipment that may be mounted in the upper cavity there are two more openings just to the left (as viewed from the front of DAX) of the exhaust holes near the rear on the DAX transmitter's top. These may be used as desired for other installation needs.

2.3.6.1 WAGO Connector Operation

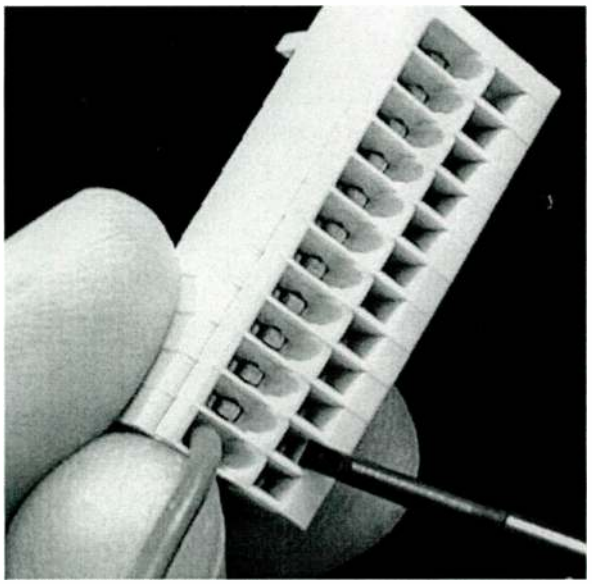
The DAX transmitter utilizes the WAGO 733-series connectors for remote terminal connections. Follow the procedure below to facilitate a quick and secure hook up for your I/O signal cables.

STEP 1 Prepare cables by removing 1/4" of jacket

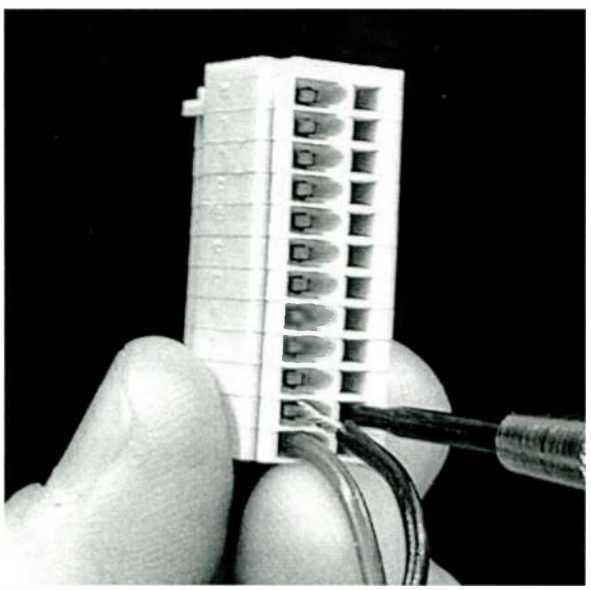
STEP 2 Twist exposed wire ends

NOTE:
Do not solder these wire ends. The WAGO connector works best with unsoldered strand-type wire.

STEP 3 Locate the supplied tool, or a narrow insertion tool (small jewelers screwdriver) and the included female connector blocks



STEP 4 Press the tool tip completely into the hole associated with the pin # to be connected (NOTE: There is also corresponding slots on the side of connector block where a small screwdriver may be used to momentarily press in while inserting the wire)

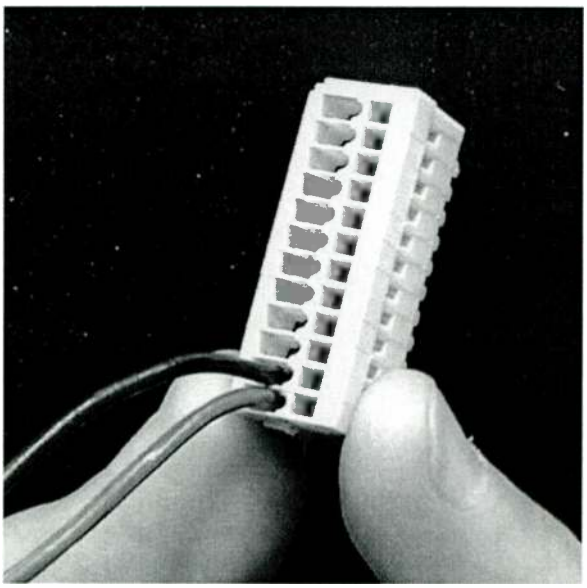


STEP 5 Carefully press the wire into the corresponding receptacle

STEP 6 Remove tool

STEP 7 Examine connection for security

WARNING: Disconnect primary power prior to servicing.



STEP 8 Repeat for all WAGO 733-series connections

WARNING: Disconnect primary power prior to servicing.

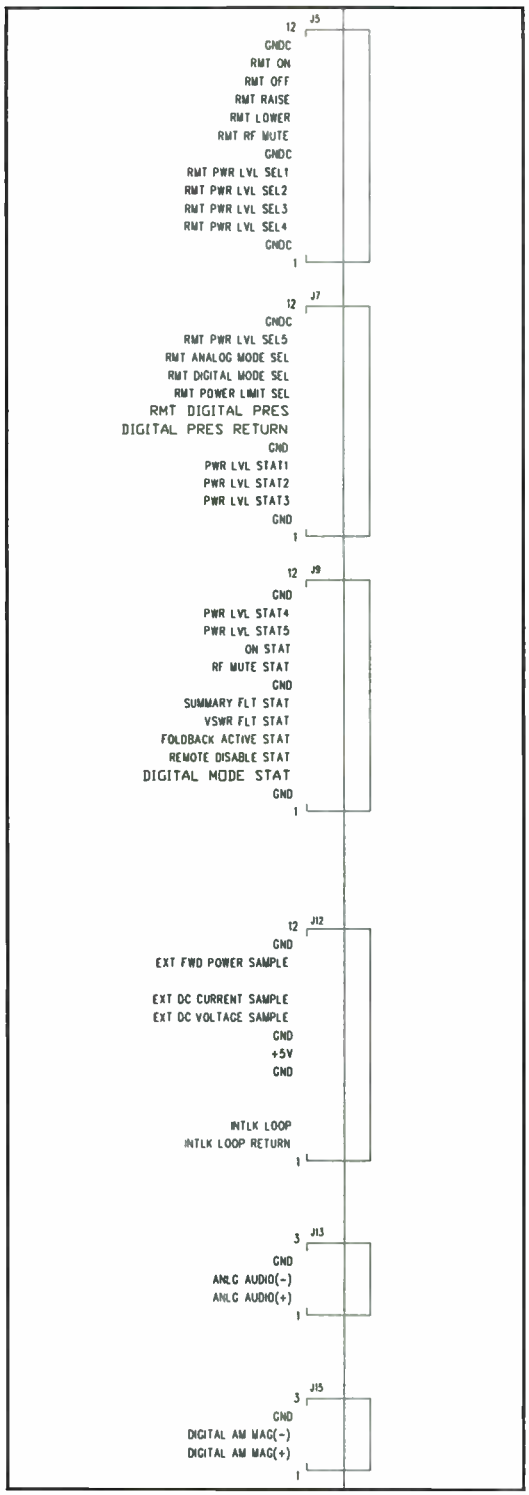


Figure 2-7
External I/O Board Remote Connections

WARNING: Disconnect primary power prior to servicing.

2.3.6.2 Basic Connections

NOTE:
It is recommended that any *remote* control or status connections be made only *after* the transmitter has been initially turned on and operation verified. However, the Interlock loop will need to be satisfied in order for the DAX to be able to be turned on (See "2.3.6.5 Interlock Loop Connections" on page 2-18).

The following procedures refer to the External I/O board which is located behind the Controller/External I/O panel on the front of the DAX. To perform these connections this panel will need to be removed.

NOTE:
Torroid cores are provided for I/O cabling coming in to the DAX for RFI rejection. Route all audio cables through (and around one time) one core. Route all command and status cables through (and around one time) the other provided core.

2.3.6.2.1 Analog Audio

Once the analog audio cable is exiting into the DAX, connect it to the J13 WAGO block, ANLG AUDIO, on the External I/O board: Audio(+) to J13-1, Audio(-) to J13-2, and ground to J13-3.

2.3.6.3 Digital Connections

For IBOC operation, the following connections and settings will need to be made. Once these are complete the DAX will need to be put into IBOC mode via the front panel control (see "3.3.4 Digital Mode Selection" on page 3-8).

2.3.6.3.1 Digital Phase Input

Route the IBOC phase output (from A11J5 AM PHASE OUT on the DEXSTAR exciter) to the J14 BNC connector, DIGITAL PHASE INPUT, on the External I/O board.

2.3.6.3.2 Digital Magnitude Input

Route the IBOC Mag cable (from A13J14 AM MAG OUT on the DEXSTAR exciter) to the J15 WAGO block, Digital AM MAG on the External I/O board: MAG(+) to J15-1, MAG(-) to J15-2, and ground to J15-3.

2.3.6.3.3 Bessel Filter Input Bandwidth Select

For digital operation be sure S2, S3, and S4 switches, located on the Exciter/Controller board, all have the #1 switch in the up position, and the rest down. This is for full 50 kHz bandwidth operation required for domestic IBOC broadcast. Narrow-mode AM utilized in countries other than the USA will find the other filter settings useful to match their system.

NOTE:
In Table 2-2 below, the number indicates the only switch to be in the UP position. The other 3 positions *on each switch* will all be in the DOWN position.

Table 2-2 Bessel Filter Bandwidth Switch Settings

Desired Input Bandwidth	S2	S3	S4
50 kHz	1	1	1
10 kHz	2	2	2
9 kHz	3	3	3
4.5 kHz	4	4	4

2.3.6.3.1 RMT Digital Present Input

For digital operation the DAX transmitter will need verification that the digital exciter is indeed online. If your system includes the optional DEXSTAR and ePAL combination, this will be a +5V signal from the ePAL Exciter Interface output A1J2-10 applied to J7-7 on the External I/O board. DIGITAL PRES RETURN, J7-6, must be used as the return for the +5V from the ePAL, and be connected directly to an *ePAL ground.*

If this signal is not available for your installation, the RMT Digital Present, J7-7, must be tied to "+5V" at J12-6 on the External I/O board, and the Digital Present Return line must be connected to a GNDC on the External I/O.

NOTE:
If this line is not held high, the DAX transmitter will revert to Analog mode, and Digital mode will not be allowed. If this line goes low temporarily, Digital mode must be re-selected (see "3.3.4 Digital Mode Selection" on page 3-8).

2.3.6.4 External Carrier or 10 MHz Reference Use

To use an externally generated carrier signal or 10 MHz reference signal, route the cable to BNC connectors J11 for the external carrier or J10 for the 10 MHz reference on the External I/O board. External carrier or 10 MHz reference must then be enabled via the VT100 screen per the procedure below (See "6.2.2 Using VT100 for Metering, Status & Configuration" on page 6-3, for accessing the page 4 VT100 configuration screen).

Follow this procedure to enable or disable either of these signal inputs:

STEP 1 Initiate VT100 programming and navigate to page 4

STEP 2 Type either "o" for 10 MHz Reference, or "p" for Carrier, to toggle the selection between Internal or External for that signal

STEP 3 Selected action takes place within 1 second

2.3.6.5 Interlock Loop Connections

For normal operation the interlock relay must be closed creating a +12Vdc loop. If the loop opens, a sense line to the PS Controller goes below a 10V threshold and the DAX will mute and be de-energized to an Off condition. This loop is provided at J12 on the External I/O board as INTLK LOOP, J12-2; and INTLK LOOP RETURN, J12-1.

NOTE:
If no external interlock loop is used, a shorting jumper wire must be placed across J12-2 to J12-1 in order for the DAX transmitter to operate.

2.4 Initial Turn On

Each transmitter is thoroughly checked out during factory final test but some adjustments may be required during installation due to shipping, variations in primary power, antenna systems, or transmission line differences.

NOTE:
Any remote or extended control connections should be connected only after the transmitter is checked out and fully operational.

Refer to the Factory Test Data Sheets supplied with the transmitter for typical meter readings. The transmitter was checked into a 50-ohm resistive load at the Factory.

Follow these steps to bring the DAX transmitter online for the first time:

STEP 1 If not already done, replace any doors and panels that had been removed during previous steps

STEP 2 Activate the AC mains source to the transmitter

STEP 3 Turn on the low voltage power supply breaker, CB1, located in the rear of the transmitter cabinet

STEP 4 Verify that the GUI display on the Front Panel is active, and the red LED above the OFF button is lit or blinking

STEP 5 Press and hold the OFF button for >2 seconds (control reset)

STEP 6 Simultaneously press and hold both RAISE and LOWER buttons for 5 seconds (for no RF power output with ON command)

STEP 7 Press ON button

STEP 8 Verify fan operation

STEP 9 Press the RAISE button to slowly ramp up RF power to desired level (this will be a temporary level setting)

STEP 10 Verify correct transmitter operation

STEP 11 Proceed to section "3.3 Normal Operation" on page 3-3 in the third chapter of this manual for detailed operational information

WARNING: Disconnect primary power prior to servicing.

2.5 Remote I/O Connections

Once the DAX transmitter has been turned on for the first time and correct operation has been verified, remote connections may be made. Using the following tables, Figure 2-7 on page 2-15, and the supplied schematic package, configure the DAX remote I/O to match the requirements of your interface equipment.

NOTE:
Torroid cores are provided for I/O cabling coming in to the DAX to for RFI rejection. Route all audio cables through (and around one time) one core. Route all command and status cables through (and around one time) the other provided core.

Table 2-3 Remote Command Inputs and Functions

J(*n*)	COMMAND NAME	ACTIVE	FUNCTION
J5-11	RMT On	Low Pulse	Turns DAX on with low pulse
J5-10	RMT Off	Low Pulse	Turns DAX off with low pulse
J5-9	RMT Raise	Low Pulse	Raises power with low pulse
J5-8	RMT Lower	Low Pulse	Lowers power with low pulse
J5-7	RMT RF Mute	Low State	Mutes DAX while active
J5-5	RMT PWR LVL SEL1	Low Pulse	Selects Power Level 1 with low pulse
J5-4	RMT PWR LVL SEL2	Low Pulse	Selects Power Level 2 with low pulse
J5-3	RMT PWR LVL SEL3	Low Pulse	Selects Power Level 3 with low pulse
J5-2	RMT PWR LVL SEL4	Low Pulse	Selects Power Level 4 with low pulse
J7-11	RMT PWR LVL SEL5	Low Pulse	Selects Power Level 5 with low pulse
J7-10	RMT Analog Mode SEL	Low Pulse	Selects Analog Mode with low pulse
J7-9	RMT Digital Mode SEL	Low Pulse	Selects Digital Mode with low pulse
J7-8	RMT Power Limit SEL	Low State	Lowers power to pre-set level while active
J7-7	RMT DIGITAL PRESent	High State	DEXSTAR operational while active
J5-12	GNDC	-	Command return
J5-6	GNDC	-	Command return

Table 2-3 Remote Command Inputs and Functions

J(*n*)	COMMAND NAME	ACTIVE	FUNCTION
J5-1	GNDC	-	Command return
J7-12	GNDC	-	Command return
J7-6	DIGITAL PRESent RETURN	-	RMT Digital Present command return See 2nd Note below

NOTE:
The Remote Commands are referenced to the customer ground, which is allowed to float 30V above or below the system ground. *It is recommended to connect all Command signal returns to a GNDC connection.* All remote commands are optically isolated and have a 10mA nominal sink current. The maximum allowed voltage is 30V; the minimum is -2V. With the exception of RMT OFF and RMT RF MUTE, all remote commands are disabled when operating in Remote Disable. The majority of commands are momentary and must be pulled to their active level for a minimum of 200 mS to be registered. *However, RMT RF Mute and RMT Power Limit SEL are steady-state active* low *signals, while RMT Digital Present is a steady-state active* high *signal.*

NOTE:
Digital Present Return must be connected to a DEXSTAR/ePAL ground. If RMT Digital Present is not being used, this return line must be connected to GNDC.

Table 2-4 Remote Status Outputs and Functions

J(*n*)	STATUS NAME	ACTIVE	FUNCTION
J7-4	PWR LVL STAT1	Low State	Power Level 1 Selected when active
J7-3	PWR LVL STAT2	Low State	Power Level 2 Selected when active
J7-2	PWR LVL STAT3	Low State	Power Level 3 Selected when active
J9-11	PWR LVL STAT4	Low State	Power Level 4 Selected when active
J9-10	PWR LVL STAT5	Low State	Power Level 5 Selected when active
J9-9	On STAT	Low State	Transmitter On when active
J9-8	RF Mute STAT	Low State	Transmitter in Mute condition when active
J9-6	Summary FLT STAT	Low State	Transmitter in Fault condition when active
J9-5	VSWR FLT STAT	Low State	VSWR Fault is present when active
J9-4	Foldback Active STAT	Low State	Transmitter in Foldback when active

Table 2-4 Remote Status Outputs and Functions

J(*n*)	STATUS NAME	ACTIVE	FUNCTION
J9-3	Remote Disable STAT	Low State	Remote Control disabled when active
J9-2	Digital Mode STAT	Low State	Digital Mode enabled when active
J7-5	GND	-	Status return
J7-1	GND	-	Status return
J9-12	GND	-	Status return
J9-7	GND	-	Status return
J9-1	GND	-	Status return

NOTE:
The **Remote Statuses** are referenced to the transmitter ground. *It is recommended to connect all Status signal returns to a GND connection.* The maximum allowed voltage on the remote status lines is 30V, the minimum is -2V. The remote status lines can sink 100mA. All status lines are steady-state active low (sinking current when active).

Table 2-5 Analog Status Outputs and Functions

J(*n*)	STATUS NAME	ACTIVE	FUNCTION
J12-11	EXT FWD Power Sample	Analog Range = 0 - 4Vdc	Rated Nameplate Power = 3.0Vdc
J12-9	EXT DC Current Sample	Analog Range = 0 - 4Vdc	45A = 3.0Vdc
J12-8	EXT DC Voltage Sample	Analog Range = 0 - 4Vdc	260Vrms = 3.0Vdc
J12-6	+5Vdc Supply	-	+5V current-limited source (relative to GND) for external purposes

NOTE:

The **Analog Statuses** are linearly scaled DC voltage representations of their corresponding signals.

2.6 Mod Monitor Setup

To properly interface the DAX transmitter with a modulation monitor across the 5 power levels, each power level must have a corresponding Mod Monitor Level setting. These settings will need to be adjusted, *after the power levels have been set (see "3.3.3.3 To Set Desired RF Power Output Level" on page 3-5)*, to correctly drive the mod monitor input. This is done via the GUI or by using the VT100 serial programming capability.

2.6.1 Via Front Panel GUI

The following steps will take you to the Mod Monitor Setup screens:

STEP 1 Connect mod monitor to J4 on the External I/O board

STEP 2 Select Power Level 1 (see "3.3.3.2 Selecting Power Levels 1 - 5" on page 3-5)

STEP 3 Pressing the INFO button takes you to the submenu screen

STEP 4 Select **SETUP** SUBMENU using the UP or DOWN buttons

STEP 5 Press ENTER and scroll down to bring up below screen

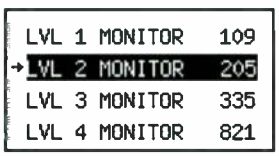


Figure 2-8 Mod Monitor Setup Screen

STEP 6 Scroll to desired level to edit

STEP 7 Press ENTER to highlight that line

STEP 8 While observing the mod monitor, use up/down arrows to adjust the MONITOR output to the level required

STEP 9 Press ENTER to store value

STEP 10 Repeat steps 2 - 9 (except change to the next desired power level in Step 2, and at Step 6 scroll to select the next Mod Monitor Level) for each desired Mod Monitor Level adjustment

NOTE:
If power levels are re-programmed, the Mod Monitor Levels will also need to be re-programmed for accurate modulation monitoring using the correct input drive.

WARNING: Disconnect primary power prior to servicing.

2.6.2 Via VT100

See "6.2.2 Using VT100 for Metering, Status & Configuration" on page 6-3, for accessing the page 4 VT100 configuration screen for the following procedure.

STEP 1 Connect mod monitor to J4 on the External I/O board

STEP 2 Select Power Level 1 (see "3.3.3.2 Selecting Power Levels 1 - 5" on page 3-5)

STEP 3 Initiate VT100 programming and navigate to page 4

STEP 4 Type the letter "f" for Mod Monitor Level 1

STEP 5 While observing the mod monitor, use up/down arrows to adjust the Mod Monitor output to the level required

STEP 6 Press ENTER to store value

STEP 7 Repeat steps 2 - 6 (except change to the next desired power level in Step 2, and at Step 4 type the corresponding letter for the next Mod Monitor Level) for each desired Mod Monitor Level adjustment

NOTE:
If power levels are re-programmed, the Mod Monitor Levels will also need to be re-programmed for accurate modulation monitoring using the correct input drive.

2.7 Power Limit Setup

The DAX transmitter can be remotely forced to a predetermined power level via the Remote Power Limit Select I/O line, J7-8 on the External I/O board. To set that value use the following procedures.

2.7.0.1 Via Front Panel GUI

STEP 1 Press the INFO button to navigate to the submenu screen

STEP 2 Select **SETUP** SUBMENU using the UP or DOWN buttons

STEP 3 Press ENTER to bring up below screen

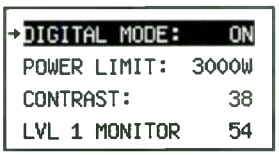


Figure 2-9 Setup Screen

STEP 4 Scroll to POWER LIMIT and press ENTER

STEP 5 Adjust the level, in Watts, to the desired value using the UP or DOWN buttons

STEP 6 Press ENTER to store that value

2.7.1 Via VT100

See "6.2.2 Using VT100 for Metering, Status & Configuration" on page 6-3, for accessing the page 4 VT100 configuration screen for the following procedure.

STEP 1 Initiate VT100 programming and navigate to page 4

STEP 2 Type the letter "t" for Remote Power Limit

STEP 3 Use the keyboard's up/down arrows to adjust the value in Watts to the level required

STEP 4 Press ENTER to store value

2.8 Jumper and Potentiometer Listing

NOTE:
Harris utilizes the letter 'R' as a designator for all resistors including potentiometers.

The following table lists pertinent jumpers and potentiometers, and provides their corresponding designator value and function within each board in the DAX transmitter.

Table 2-6 DAX Jumpers and Potentiometers Listing

JP/R (*n*)	NAME	Location	FUNCTION
JP1	Select either green or red Front Panel LED during remote disable	External I/O	1-2 = Green @ remote disable 2-3 = Red @ remote disable
JP2	Ref. 10MHz input impedance select: 50 or 10k Ohms	External I/O	Short (in) = 50 Ohms Open (removed) = 10k Ohms
JP3	RF Carrier input impedance select: 50 or 10k Ohms	External I/O	Short (in) = 50 Ohms Open (removed) = 10k Ohms
JP4	(+) Input impedance select	External I/O	Short (in) = 600 Ohms Open (removed) = 20k Ohms
JP5	(-) Input impedance select	External I/O	Short (in) = 600 Ohms Open (removed) = 20k Ohms
JP6	IBOC Phase input impedance select: 50 or 10k Ohms	External I/O	Short (in) = 50 Ohms Open (removed) = 10k Ohms
R107	AC Low Trip Adjust	External I/O	AC Low Trip Adjust - Factory use only
JP1	Back-up 10MHz clock reference select	Exciter Controller	1-2 = Clock reference 1 2-3 = Clock reference 2
JP2	Back-up 10MHz clock reference select	Exciter Controller	1-2 = Clock reference 1 2-3 = Clock reference 2
R25	RF SAMPLE	Exciter Controller	Sets RF Sample level (TP10)
R32	PDM ADJ	Exciter Controller	Sets PDM Sample level (TP13) - Factory use only
R37	IBOC MAG GAIN ADJUST	Exciter Controller	Sets IBOC Mag level for A/D converter input (TP22) - Adjust for proper sidebands.
R39	AUDIO GAIN ADJUST	Exciter Controller	Sets analog audio level for A/D converter input (TP22) - Adjust for 95% modulation at 10 dBm audio input.
R43	+VS_DTG	Exciter Controller	Dead Time Generator voltage adjustment (TP29 - 1V per 100kHz of Carrier) - Factory use only

Table 2-6 DAX Jumpers and Potentiometers Listing

JP/R (*n*)	NAME	Location	FUNCTION
R44	2nd HARMONIC	Exciter Controller	Nulls 2nd harmonic and balances Bridge A/B (TP27/ TP28) - Factory use only
R45	BRIDGE A/B	Exciter Controller	Sets dead time on Bridge A/B for 65nS ±3nS (TP27/TP28) - Factory use only
R56	RFL POWER	Exciter Controller	Sets reflected power trip point (TP30)
JP1	PA2_TO_PA1_INTLK	Motherboard	Set 1-2 to continue interlock onto next PA
JP2	PA3_TO_PA2_INTLK	Motherboard	Set 1-2 to continue interlock onto next PA

Section 3 Operation

3

3.1 Introduction

This section contains typical operational procedures and information pertaining to the function of the DAX-5/DAX-6 Digital AM Transmitter. All of the information in this section assumes the transmitter is in proper working order.

3.2 Front Panel Functions and Displays

The Front Panel of the DAX transmitter is the control center for normal operational commands.

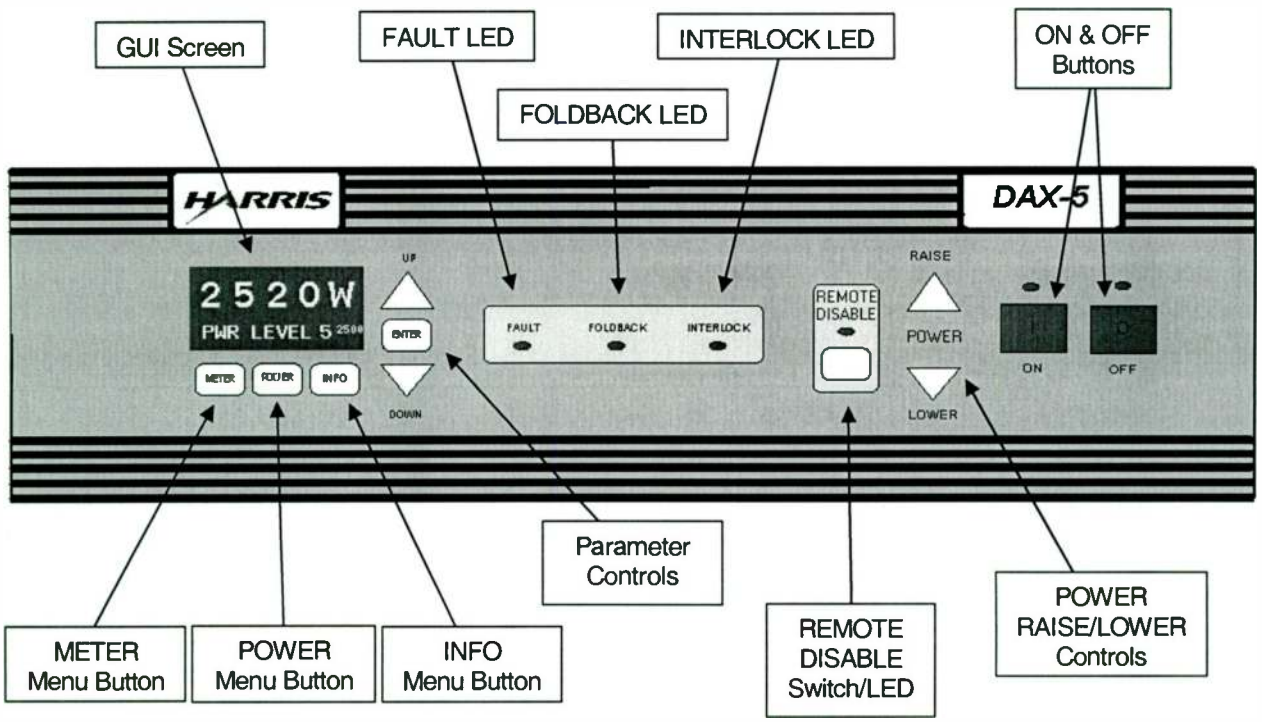


Figure 3-1
DAX Front Panel

WARNING: Disconnect primary power prior to servicing.

3.2.1 GUI Screen

Software-driven, 4-line LCD for metering and diagnostics textual display.

3.2.2 METER, POWER, INFO Menu Switches

Pressing one of these three buttons will take you to the next layer of menus for extensive metering, status information, and configurable parameters. Once within one of these menus, the UP, ENTER, and DOWN controls are used to maneuver through them.

3.2.3 UP, ENTER, DOWN - Parameter Controls

These are the navigation buttons for selecting and maneuvering through layers and parameters for status and editing capabilities within the METER, POWER, and INFO menus.

3.2.4 FAULT, FOLDBACK, INTERLOCK LED Indications

LED indicators for Fault, Foldback, and Interlock conditions of the DAX transmitter.

3.2.5 REMOTE DISABLE Switch and LED

A press of this switch disables all remote control of the DAX transmitter. This can be set by a jumper to be either green or red in the disabled condition, according to user preference.

3.2.6 RAISE, LOWER - Power Level Controls

For quick fine adjustments of RF power level. Press and hold RAISE to reach up to 15% over preset value, or press and hold LOWER to decrease the power to as low as zero Watts RF.

3.2.7 ON Switch with LED Indication

To turn the transmitter on, press this button. Press and hold to clear faults.

3.2.8 OFF Switch with LED Indication

To turn the transmitter off, press this button. Press and hold to clear faults. Blinking LED indicates the DAX has been faulted OFF.

3.3 Normal Operation

NOTE:
It is important that the operator be aware of normal transmitter operation and performance, and note any changes or fault indications. Changes in operation may indicate a need for maintenance or corrective action before more serious problems develop.

3.3.1 Daily Pre-Operational Checkout

Before normal daily turn-on, review the following areas of the transmitter;

a. Check the transmitter maintenance log to make sure that maintenance performed on the transmitter, or any abnormal conditions, do not restrict the operation of the transmitter.

b. Ensure the transmitter RF output is connected to the proper load or antenna/pattern.

c. Check the User Interface panel on the front of the transmitter for any abnormal indications.

NOTE:
A voltage reading is considered normal if it is within ±5% of its stated value.

When the preoperational checkout has been performed and no problems are present, the transmitter is ready to turn on.

3.3.2 Transmitter Turn-On

NOTE:
Although most functions available on the Front Panel are also accessible via VT100, the following information describes procedures utilizing only the Front Panel controls. For common settings available via VT100 see "3.5.1 VT100 Setup" on page 3-12.
For calibration and alignment procedures using VT100 see "5.5.1 VT100 Calibrations and Alignments" on page 5-7.
For troubleshooting and deep metering and status abilities see "6.2.2 Using VT100 for Metering, Status & Configuration" on page 6-3.

View the GUI screen to verify correct power level is selected than press ON. Within 4 seconds the DAX transmitter should be outputting selected RF power, and all indications normal.

The default screen indicates the current power in Watts, along with the currently selected power level and looks similar to below.

Figure 3-2 Main (default) Screen

3.3.3 Common Control Selections & Routine Metering

This section covers the most common uses of the GUI.

The following symbols for the DAX transmitter GUI screen apply throughout all levels of menus.

▲ - More parameters available by pressing the UP button only
▼ - More parameters available by pressing the DOWN button only
◆ - Current Selection: More parameters available by pressing either the UP or DOWN buttons
→ - Selection: More parameters available within this function upon ENTER press

3.3.3.1 Adjusting GUI Display Contrast

To adjust the contrast of the GUI display to compensate for viewing angle or ambient light conditions, follow the procedure below.

STEP 1 Press the INFO button to navigate to the submenu screen

STEP 2 Select **SETUP** SUBMENU using the UP or DOWN buttons

STEP 3 Press ENTER to bring up below screen

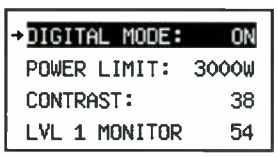


Figure 3-3 Setup Screen

STEP 4 Scroll to CONTRAST and press ENTER

STEP 5 Adjust the display to desired contrast

STEP 6 Press ENTER to store that value

3.3.3.2 Selecting Power Levels 1 - 5

DAX transmitters will be preset at the factory to the customer specified Power Levels 1 - 5. If the power levels have not been specified, the factory defaults are:

Table 3-1 Default Power Levels

Power Level	DAX-1/1R	DAX-3	DAX-5	DAX-6
1	200W	500W	1000W	1000W
2	400W	1000W	2000W	2000W
3	600W	1500W	3000W	3000W
4	800W	2000W	4000W	5000W
5	1000W	3000W	5000W	6000W

To change to a different pre-set Power Level, follow these steps:

STEP 1 Starting from the Main screen, press the POWER menu button to highlight the PWR LEVEL number on the bottom line of GUI

Figure 3-4 Power Level Highlighted View

STEP 2 Using the UP and DOWN select your choice of Power Level 1 through Power Level 5 (note level range 'preview' in small numbers to the right)

STEP 3 Once selected, hit ENTER to make that power level active

3.3.3.3 To Set Desired RF Power Output Level

Once the exact desired power levels for your station have been determined, use the following procedure to configure as many of the 5 available presets as needed.

Power Level Range settings are where the DAX transmitter is programmed to run in a preferred *range* that optimizes the performance and minimizes the distortion through software and hardware alignment of power supply system and RF power output. After the 'Range' is set, the actual RF power output may need to be adjusted to match your requirements.

NOTE:
This procedure requires 2 separate sets of steps (Power Level Range: Steps 1 - 8, and Actual RF Power Output: Steps 9 - 13) for *each* power level desired.

STEP 1 Press the INFO button to take you to below screen

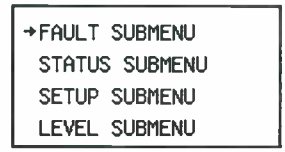


Figure 3-5 INFO Screen

STEP 2 Select **LEVEL** SUBMENU using the UP or DOWN buttons

STEP 3 Press ENTER to bring up below screen

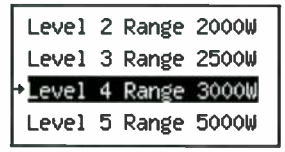


Figure 3-6 Level Range Screen

STEP 4 Select desired Power Level Range value using the UP or DOWN buttons

STEP 5 Press ENTER to select

STEP 6 Adjust range using the UP or DOWN buttons

STEP 7 Press ENTER to accept range value for that power level

STEP 8 Repeat STEP 4 through STEP 7 for remaining Power Levels

Next time that power level is active the DAX will operate within that range.

Once the Power Level Ranges have been set for the Power Levels 1 - 5, continue with the procedure below to set the actual RF power output:

STEP 9 Press the POWER button to return to main screen

STEP 10 Select the desired Power Level 1 - 5 (see "3.3.3.2 Selecting Power Levels 1 - 5" on page 3-5)

STEP 11 Raise or lower the RF power by using the RAISE or LOWER buttons on the front panel

WARNING: Disconnect primary power prior to servicing.

STEP 12 After the desired power value has been attained using one of these buttons, press and hold ENTER for >3 seconds (wait for reverse video to flash, indicating value is saved) to store the setting for that Power Level

STEP 13 Repeat steps 10-12 for the remaining desired power levels

NOTE:
For optimum performance it is best to *program* the desired power level range, as shown above. Then to make small temporary power level changes, use the RAISE or LOWER buttons (as long as ENTER is not pressed and held at this time, this level will only be temporary - once another power level is selected this power level will revert to its stored preset value).

3.3.3.4 Metering

Pressing METER takes you to a level of menus designed to quickly determine common operating variables.

NOTE:
All meter readings are +/- 5%.

- FWD PWR: Forward power in Watts
- RFLD PWR: Reflected power in Watts
- VSWR: Current voltage standing wave ratio (Example: 1.17 indicates a 1.17:1 VSWR ratio)
- DC VOLT: B+ voltage
- DC CURR: B+ current in Amps
- +12V, -12V: 12 volt power supplies voltage
- +48V: +48 volt power supply voltage

To view these screens (sample shown below) simply press METER:

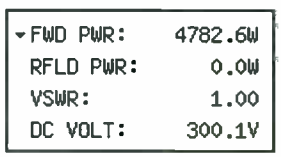


Figure 3-7 Sample of METER Status

3.3.3.5 Status Screens via INFO Button

For less routine information, a set of "Status" menus is available via the INFO menu.

- **Frequency:** RF Carrier frequency
- **EXC HW:** Exciter/Controller board hardware version
- **EXTIO HW:** External I/O board hardware version
- **SW REV:** Control software version

The following steps will take you to the above listed statuses:

STEP 1 Pressing the INFO button takes you to submenu screen

STEP 2 Select **STATUS** SUBMENU using the UP or DOWN buttons

STEP 3 Press ENTER to bring up below screen

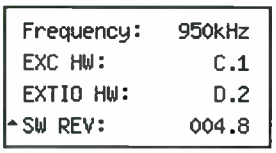


Figure 3-8 Status Screen

3.3.4 Digital Mode Selection

Use the following procedure to navigate to the Setup screen to edit your IBOC mode selection:

STEP 1 Pressing the INFO button takes you to submenu screen

STEP 2 Select **SETUP** SUBMENU using the UP or DOWN buttons

STEP 3 Press ENTER to bring up below screen

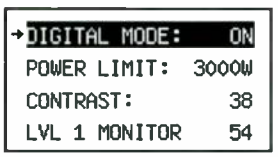


Figure 3-9 Setup Screen

STEP 4 Use the UP and DOWN to select DIGITAL MODE

STEP 5 Once selected, use the ENTER button to toggle the Digital mode on or off according to your system

3.4 Emergency Operation

In the unlikely event of a DAX transmitter malfunction, the Front Panel indications, GUI screen, individual board indications, and VT100 protocol should quickly assist the technician in determining a probable cause.

Depending on the Front Panel indications, early steps in troubleshooting a DAX transmitter failure can be based on one or more of the following:

3.4.1 No Front Panel LEDs or GUI

1. Reset CB1
2. Check AC Mains

3.4.2 FAULT LED Illuminated

If the Fault LED is illuminated, this is an indication of a currently active fault.

1. If FAULT LED is lit continuously, proceed to following section
2. To clear the Fault Log, see STEP 5 of the following procedure

3.4.2.1 Viewing the Fault Log

NOTE:
Detailed fault descriptions, explanations and troubleshooting tips can be found in Section 6 starting at "6.4 Fault Log Listing" on page 6-27.

The DAX controller stores 75 fault listings and operates with the first in first out (FIFO) of data overflow. In other words, the fault log will only contain the last 75 faults. It is highly unlikely that there would ever be 75 faults to be listed, but it is possible if the fault log had not been reset for a very long period and/or there was many nuisance fault trips, that the early faults would be 'pushed out' by the more recent faults - never totalling more than 75.

NOTE:
Most recent fault will be displayed as the topmost listing. TIME shown is elapsed time since the fault occurred. This will be accurate unless there has since been an AC power failure.

STEP 1 Pressing the INFO button takes you to submenu screen

STEP 2 Select **FAULT** SUBMENU using the UP or DOWN buttons

STEP 3 Press ENTER to bring up a screen similar to below

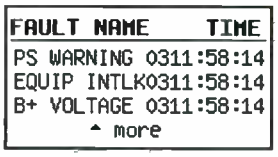


Figure 3-10 Fault Log Screen

STEP 4 If more than three faults are present ("▲ more" or "more ▼" will be seen on bottom line of GUI), they can be viewed by scrolling using the UP or DOWN buttons

STEP 5 To clear the Fault Log, from this screen, press and hold the ENTER button for >2 seconds

3.4.3 GUI Screen or Front Panel Buttons Unresponsive

If the DAX transmitter or GUI screen appears to not be responding to button pushes it is possible the controller has had a glitch, and needs to be reset. The following steps may be taken to return control to the control panel.

NOTE:
If the 1st step is unsuccessful, then procede to the next step until control is restored.

- Press and hold the ON button for greater than 2 seconds
- Remove the front panel and press Reset switch S5 on the Exciter/Controller board
- Turn off CB1, then turn back on

3.4.4 Foldback

A Foldback routine lowers the RF Power output in attempt to reduce VSWR.

If 3 VSWR hits occur within a 5 second period the internal foldback mode will be initiated. When initiated the foldback routine will be foldback the power output 10%. From this point, the same conditions (3 trips/ 5 seconds) will cause the output power to be progressively folded back in 10% decrements. Once 20% of TPO is reached, continuing foldback conditions will cause the transmitter to be faulted off.

While foldback is in progress, and if no additional VSWR foldback hits occur within a 4 minute period, the exciter will begin raising power back up through the same levels.

NOTE:
During this active foldback state any ON or RAISE/LOWER command, or a fault reset will clear any foldback condition and the previous power output level will be restored. However, if high a VSWR situation continues, the foldback routine will repeat. If this is the case, the cause of the VSWR should be corrected before continuing normal DAX operation.

3.5 Common Settings Via VT100

The following screens describe the Operator-specific pages of the VT100 interface.

3.5.1 VT100 Setup

For all meter readings and programming including and beyond the front panel abilities, the VT100 is the emulation method used to interface a computer with the DAX transmitter. ***Any* parameter accessable on the front panel GUI can also be viewed and modified via VT100**. By using a PC and terminal application of your choice (such as HyperTerminal) connected to the ***COM 2 port (J16)*** on the External I/O board with a serial cable with DB-9 connector, you'll have access to the VT100 screens.

This section outlines the steps necessary to physically connect, start the terminal program, electronically handshake with, navigate the VT100 screens, and perform edits.

STEP 1 Turn transmitter off

STEP 2 Connect RS-232 comm port 2 (J16) on External I/O board to your PC

STEP 3 Turn transmitter on

STEP 4 Start terminal program (such as HyperTerminal) with following settings

- Bits Per Second = 57600
- Data Bits = 8
- Parity = None
- Stop Bits = 1
- Flow Control = None
- Emulation = VT100

STEP 5 Call, or hit "Enter" twice to initiate handshake

To navigate around the VT100 Screens:

- Left/Right arrows to page back/forward
- Up/Down arrows to move cursor within page

To edit a numerical entry:

STEP 1 Type the line number or letter in parenthesis - *do NOT hit "Enter"*

STEP 2 Use up/down arrow keys to increase/decrease numerical value

STEP 3 Press the "Enter" key to store that entry

- EXAMPLE: To change the Forward Power Range of Power Level 4 to 2800W; on page 2 of the VT100 screens, type "4", then use your keyboard's up or down arrow keys to reach 2800. Then hit "Enter" on your keyboard to store.

To toggle (turn on/off) a command:

STEP 1 Type the corresponding number or letter in parenthesis - *do NOT hit "Enter"*

- EXAMPLE: To mute the DAX; on page 2 of the VT100 screens, type the letter "e". Type "e" again to unmute the transmitter.

STEP 2 Type the same number or letter again to toggle that command

3.5.2 VT100 - Page 1

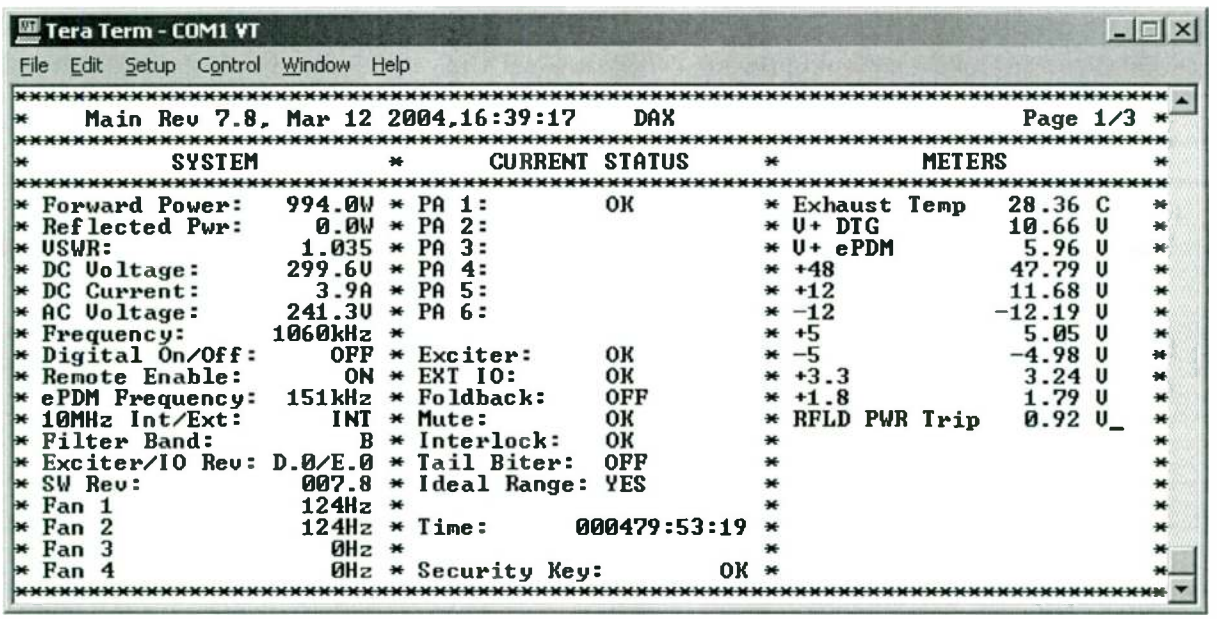


Figure 3-11
VT100 Page 1 View

3.5.2.1 SYSTEM

Forward Power: Transmitter output power measured using an RF detector on the Output Monitor board. Forward power is limited to 115% of rated power.

Reflected Pwr: Reflected power to the transmitter measured using a detector on the Output Monitor board. *Instantaneous* reflected trip point is factory set to 100W per PA module.

VSWR: Voltage standing wave ratio. Example: 1.009 reading indicates 1.009:1 ratio.

DC Voltage: High voltage power supply (B+) voltage measured via B+ Sample board. Voltage range is 100V – 300V and varies with power level setting.

DC Current: High voltage power supply DC current measured using the shunt in the HVPS. No calibration required. Nominal DC current is approximately 4.5A per kW with program modulation.

AC Voltage: High voltage power supply transformer SECONDARY AC voltage measured on Power Supply Controller board. Nominal secondary voltage for **DAX-5 & DAX-6** is 260Vrms for 3 phase, 265Vrms for single phase.

Nominal secondary for **DAX-1 & DAX-3** is 240Vrms. Trip points are set to +13%/-18%.

Frequency: Transmitter Carrier frequency.

Digital On/Off: Indication of audio input mode. If ON: DIGITAL AM MAG and DIGITAL PHASE INPUTs are being used as source of audio and carrier. When OFF: ANLG AUDIO input and either internal or external RF Carrier are being used as source of audio and carrier.

Remote Enable: Indicates either ON: Remote enabled, or OFF: Remote disabled.

ePDM Frequency: Indicates the PDM frequency utilized in the transmitter. This frequency is dependent on carrier frequency with the range being 150kHz – 200kHz.

10MHz Int/Ext: INT: Indicates that either the internal +/- 2 PPM 10MHz oscillator is used as the frequency reference. EXT: Indicates that an externally supplied 10MHz reference oscillator is being used via the 10MHz INPUT.

Filter Band: Indicates whether Band A, B, or C filter board is installed on the Exciter/Controller. The frequency bands are set:

- Band A – 529kHz – 759kHz
- Band B – 760kHz – 1109kHz
- Band C – 1110kHz – 1705kHz

Exciter/IO Rev: Indicates the board revisions for the Exciter/Controller board / External I/O board.

SW Rev: Indicates the present software revision installed in the transmitter Exciter/ Controller board.

Fan 1, 2, 3, 4: Indicates the actual fan speed of the transmitter cooling fans. Normal operation is approximately 100Hz. Fault occurs below 80 Hz.

3.5.2.2 CURRENT STATUS

PA 1 - 6: Indication of PA module status. Possible indications are: NA (Not Available) indicating PA module not installed, OK indicating no faults present on PA module, or FAULT.

Exciter: Indication of Exciter/Controller board status. Status can be OK or FAULT.

EXT IO: Indication of External I/O board status. Status can be OK or FAULT.

Foldback: ON: Indicates the transmitter has lowered output power due to high reflected power (VSWR) in the transmitter. OFF: Normal operation.

Mute: When MUTE is displayed, indicates the output power of the transmitter has been muted. OK indicates normal operation.

Interlock: When INTLK is displayed, indicates either an internal PA interlock, output monitor interlock, or external interlock is present. OK indicates normal operation.

Tail Biter: Tail Biter is an optional distortion reduction technique utilized in the transmitter. When ON, indicates this option is installed. Status is ON or OFF.

Ideal Range: The HVPS in the transmitter is varied to optimize the dynamic range of the enhanced PDM circuitry. When the DAX is operating in this optimum dynamic range, a YES indication is displayed.

If NO is displayed, reset the power level via the procedure outlined in section "3.3.3.3 To Set Desired RF Power Output Level" on page 3-5.

Time: The total-time meter of the transmitter is shown in hours:minutes:seconds in this display. The time presented indicates the time that the transmitter is powered (AC mains energized and CB1 turned on), *NOT transmitter ON time.*

Security Key: NA indicates the optional Security Key is not installed on the PA Motherboard. When installed, the Security Key enables advanced correction, digital mode operation, and distortion reduction techniques in the transmitter. Display is NA or OK.

3.5.2.3 METERS

Exhaust Temp: Temperature measured on the Output Monitor board. Temperature Fault (OM TEMP) occurs at 62° C.

V+ DTG: Dead Time Generator adjustment voltage measured on the Exciter/Controller. This voltage directly corresponds to the transmitter carrier frequency setting. Scaling is 1V per 100kHz.

V+ ePDM: Enhanced PDM adjustment voltage measured on the Exciter/Controller. This voltage directly corresponds to the ePDM frequency. V+ePDM = (F_{ePDM} – 150kHz)*(2/50kHz) + 6

+48: DC voltage used to drive the PA chopper FETs, Exciter/Controller DTG, Output Monitor circuitry, and cooling fans. Monitoring of fault condition is set at +/-10%.

+12: DC control voltage used for the PA modules, External I/O, Exciter/Controller, and Output Monitor circuitry. Monitoring of fault condition is set at +/-10%.

-12: DC control voltage used for the PA modules, External I/O, Exciter/Controller, and Output Monitor circuitry. Monitoring of fault condition is set at +/-10%.

+5: DC logic voltage used for the External I/O, and Exciter/Controller boards. Monitoring of fault condition is set at +/-10%.

-5: DC voltage used for the Exciter/Controller board. Monitoring of fault condition is set at +/-10%.

+3.3: DC logic voltage used for the External I/O, and Exciter/Controller boards. Monitoring of fault condition is set at +/-10%.

+1.8: DC logic voltage used for the External I/O, and Exciter/Controller boards. Monitoring of fault condition is set at +/-10%.

RFLD PWR Trip: Reflected power trip adjustment voltage set on the Exciter/Controller. When set up correctly, this voltage corresponds to a reflected power trip of 100W (peak) per PA.

3.5.3 VT100 - Page 2

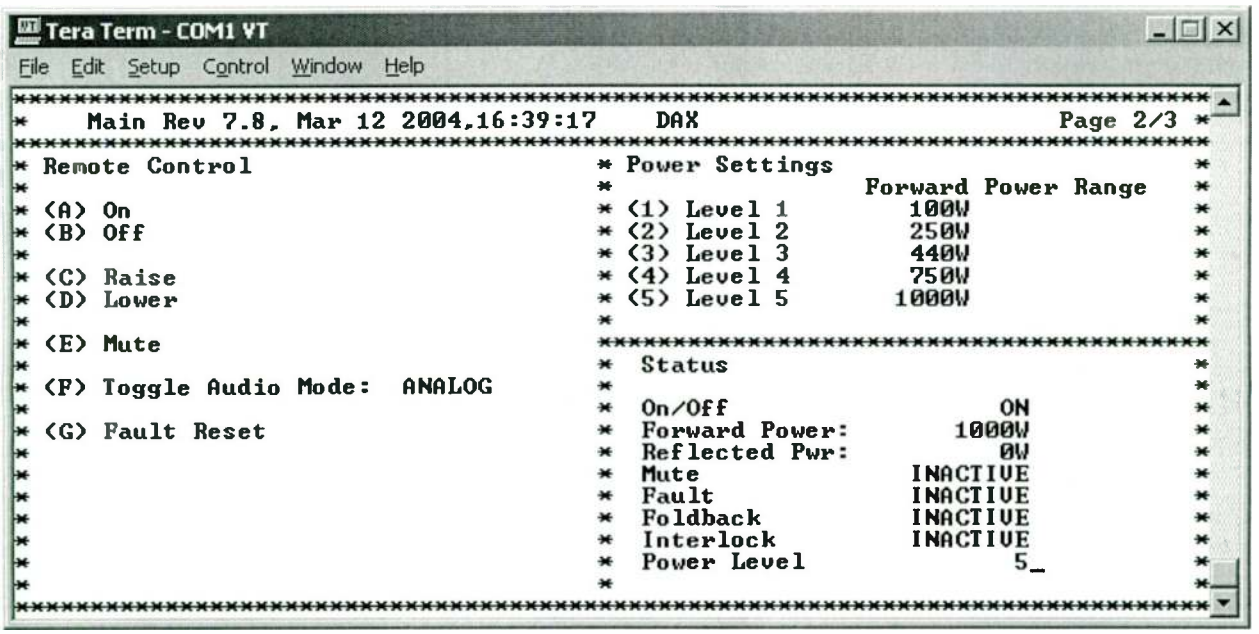


Figure 3-12
VT100 Page 2 View

3.5.3.1 Remote Control

NOTE:
All remote functions with the exception of **(B)** Off and **(E)** Mute are ignored when the transmitter user interface Remote Enable is OFF.

(A) On: Pressing '**A**' will turn the transmitter ON.

(B) Off: Pressing '**B**' will turn the transmitter OFF.

(C) Raise: Pressing '**C**' will raise the output power of the transmitter.

(D) Lower: Pressing '**D**' will lower the output power of the transmitter.

(E) Mute: Pressing '**E**' will mute the transmitter.

(F) Toggle Audio Mode: Pressing '**F**' will change the audio input mode selection from ANALOG to DIGITAL and vise versa.

(G) Fault Reset: Pressing '**G**' will reset any faults present in the transmitter.

WARNING: Disconnect primary power prior to servicing.

(H) Primary PA *(DAX-1R only)*: Allows switching of on-air PA module. **'A'** selects bottom PA as primary, **'B'** selects top PA as primary.

NOTE:
The actual switching of PAs does not take place until the DAX transmitter is restarted, which can simply be pushing the ON button while the transmitter is running.

3.5.3.2 Power Settings

(1) Level 1: Pressing **'1'** changes the transmitter power setting to Level 1.

(2) Level 2: Pressing **'2'** changes the transmitter power setting to Level 2.

(3) Level 3: Pressing **'3'** changes the transmitter power setting to Level 3.

(4) Level 4: Pressing **'4'** changes the transmitter power setting to Level 4.

(5) Level 5: Pressing **'5'** changes the transmitter power setting to Level 5.

NOTE:
To set the Power Level *range* see "3.3.3.3 To Set Desired RF Power Output Level" on page 3-5

3.5.3.3 Status

On/Off: Indicates status of transmitter for remote. Display is either ON or OFF.

Forward Power: Indicates transmitter output power.

Reflected Pwr: Indicates transmitter reflected power.

Mute: When ACTIVE is displayed, indicates the output power of the transmitter has been muted. INACTIVE indicates normal operation.

Fault: When ACTIVE, indicates a fault present on the transmitter.

Foldback: When ACTIVE, indicates the transmitter has lowered output power due to high reflected power. INACTIVE is normal operation.

Interlock: When ACTIVE, indicates either a PA interlock or external interlock condition is present. INACTIVE is normal operation.

Power Level: Indicates the Power Level selected. Displays **1, 2, 3, 4,** or **5.**

3.5.4 VT100 - Page 3

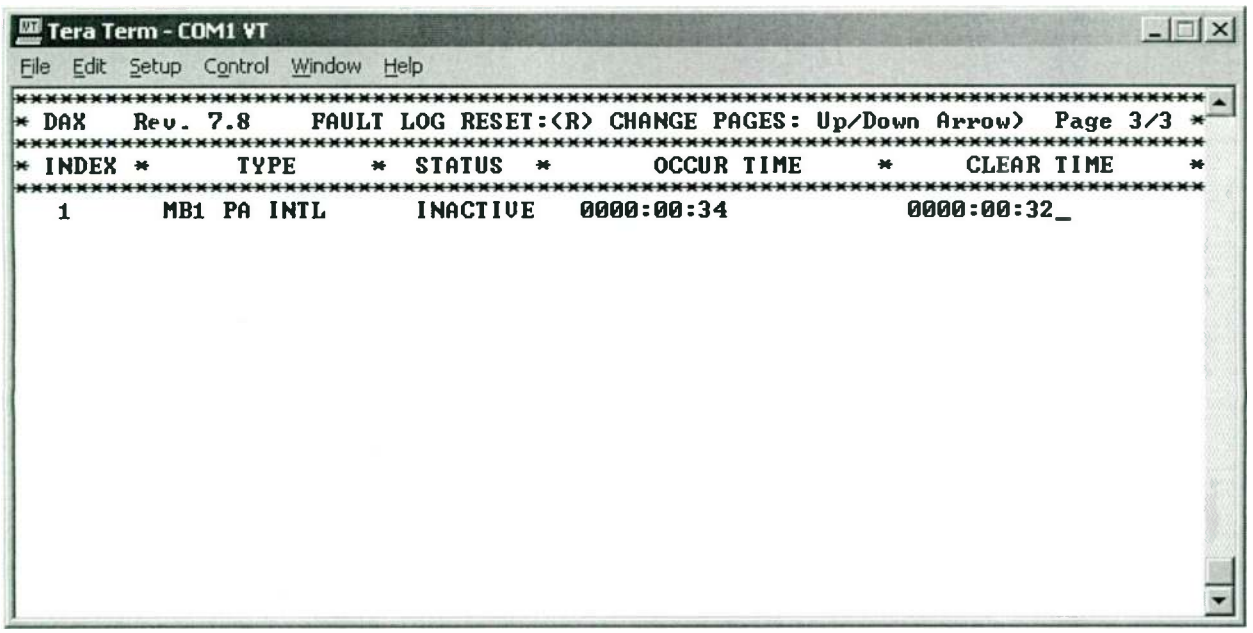


Figure 3-13
VT100 Page 3 View - Fault Log

NOTE:
See "6.4 Fault Log Listing" on page 6-27 to view the complete listing of possible DAX transmitter faults. This table also includes a description of each fault and an explanation of the transmitter's response to the fault.

INDEX – Up to 75 faults can be logged into the circular fault log. When 75 has been reached the oldest fault will be discarded when a new fault occurs.

TYPE – Indicates the name of the fault logged.

STATUS – Indicates whether the fault is still present (ACTIVE), or is no longer present (INACTIVE).

OCCUR TIME – Logs when the fault occurred relative to the present time. Example: If the occur time is 0002:10:00 the fault occurred 2 hours and 10 minutes ago.

CLEAR TIME - Logs when the fault cleared relative to the present time. Ex. If the clear time is 0002:01:00 the fault occurred 2 hours and 1 minutes ago.

Note that pressing '**R**' resets the fault log. Pressing UP/DOWN arrow keys scroll thru the fault log.

Section 4 Theory of Operation

4

4.1 Introduction

This section provides block diagram level theory to assist the technician in understanding and troubleshooting the transmitter.

System level, subsystems, and assemblies all fall under the following headings:

- Control
- RF
- Power Supply

4.2 Control

4.2.1 Exciter/Controller

The Exciter/Controller board performs the following functions:

4.2.1.1 DSP

The DSP for the Exciter performs the supervisory, and adaptive correction algorithms. Upon reset or power up of a factory configured board, the DSP boots from memory, verifies configuration, configures the FPGA, initializes configuration registers in the FPGA.

4.2.1.2 Synthesizer

The synthesizer in the exciter is uses a Numerically Controlled Oscillator (NCO) to develop the carrier frequency in the absence of an external carrier input. Either an internal 10MHz precision oscillator or an external 10MHz input can be used as the reference and the internal/external clock reference is software selectable.

4.2.1.3 Field Programmable Gate Array (FPGA)

The Field Programmable Gate Array FPGA on the Exciter will perform all the real time processing of the input serial data, all correction functions, control the turn on/off of the PA modules, provide status information to the DSP, and distribute the Audio and PDM clock to the PDM drive circuitry.

4.2.1.4 Audio Input Data Analog/IBOC

Input audio data is received from the external interface board with an input level of +/- 10Vdc maximum, and is selectable between analog and IBOC paths as well as AC or DC coupling. The audio data is filtered, scaled, converted to digital, and input to the FPGA for processing. Scaling of the audio is performed with an adjustable pot, controlling the gain of the input, with a gain range of 0 to +2Vdc maximum at the input to the A/D.

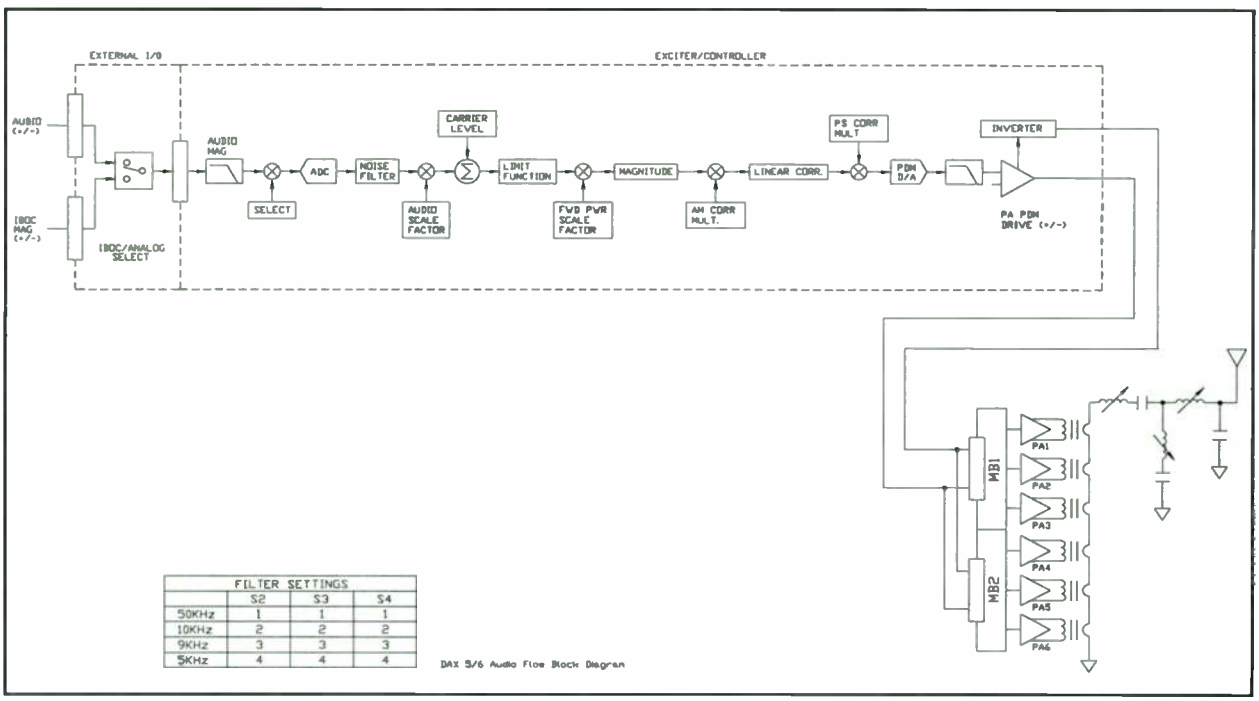


Figure 4-1
Audio Flow Block Diagram

4.2.1.5 Analog Power Supply Sense Input

To compensate for amplitude fluctuations due to power supply variation, the 300Vdc power supply is sensed and used as an amplitude scale factor.

4.2.1.6 Frequency Dependent Filter Board

A single printed circuit board is comprised of 3 separate filters of the same frequency band. The NCO output filter, RF carrier input filter, and RF sample input filter will provide the necessary frequency dependent protection.

4.2.2 External I/O

The External I/O board provides the primary interface between the transmitter and the customer via the remote parallel interface and the front panel, and also provides several key technical features to the system. The primary mode of system communication will be through a serial bus to the Exciter/Controller.

4.2.2.1 Audio Inputs

The analog and IBOC audio are multiplexed through a DPST relay, which is controlled through the IBOC/AN_SEL signal. After the audio is multiplexed it is sent through a low pass filter with a jumper selected cutoff frequency of 10kH, 9kHz, 4.5kHz, or 50kHz (see Table 2-2 on page 2-17 for configuration jumper settings).

4.2.2.2 Modulation Monitor

An output sample is sent to the External I/O from the Output Monitor at 4.4Vrms (at 6kW carrier terminated into a 50Ω load).

4.2.2.3 RS232 Interface

There are two RS232 ports on the External I/O, and both transmit and receive lines are controlled through the Exciter/Controller.

4.2.2.4 Low Voltage Power Supplies

Control voltages for the system are sent from the power supplies to the External I/O through a 15 pin D sub-connector. These control voltages are filtered and then distributed to the Exciter/Controller and the Output Monitor.

4.3 RF

The DAX is an advanced PDM (APDM) transmitter, utilizing enhancements of technology to minimize legacy PDM limitations while maximizing its strengths.

The following drawing shows the RF flow for the DAX transmitter:

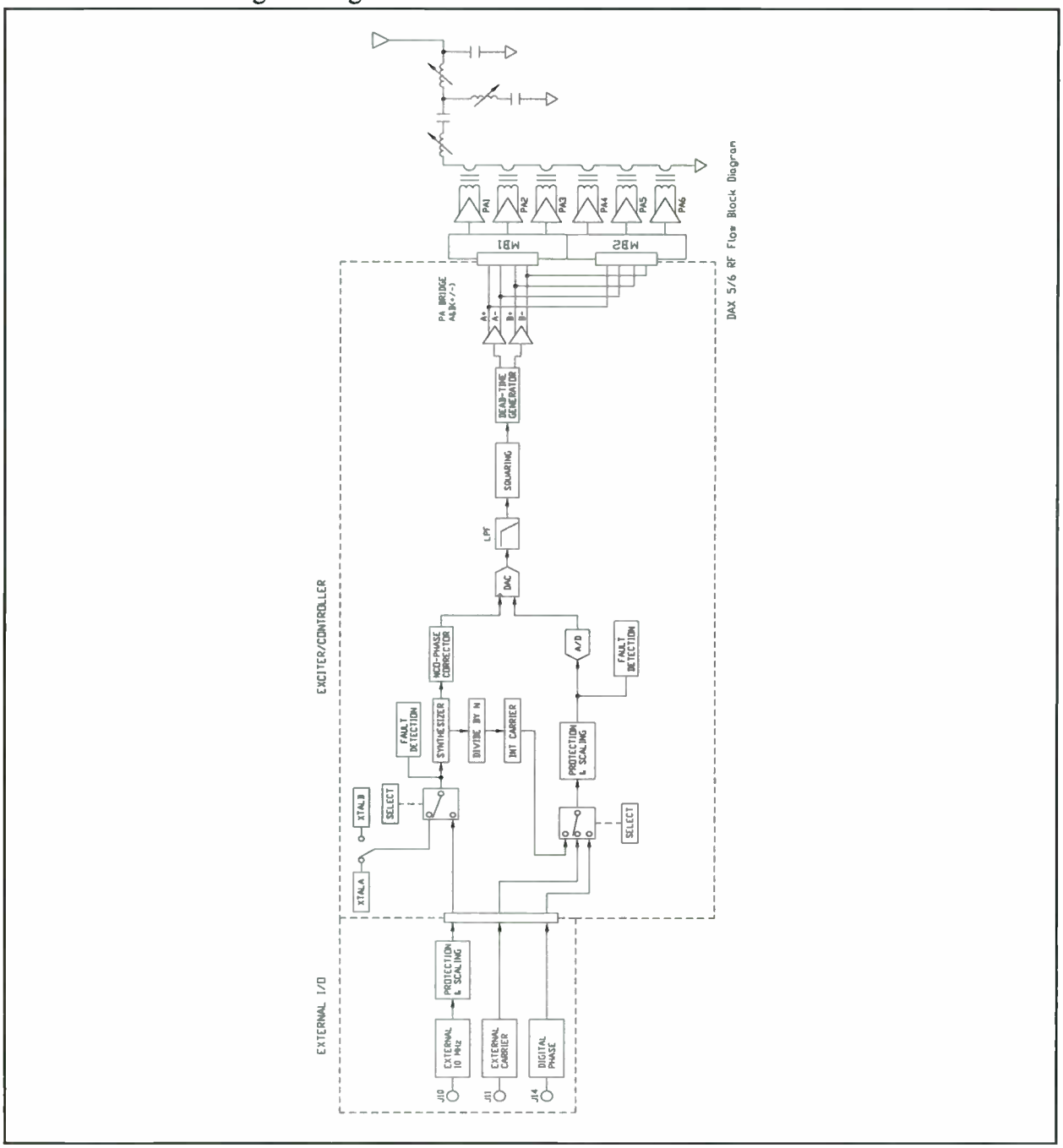


Figure 4-2
DAX RF Flow Block Diagram

WARNING: Disconnect primary power prior to servicing.

4.3.1 PA Module

4.3.1.1 General Information

Carrier frequency : 529kHz to 1705kHz
PA output carrier power : 1000W + 15% max.
Maximum output power : 6000W peak.
Modulator switching frequency is 150kHz to 200kHz (synchronous with the carrier frequency).

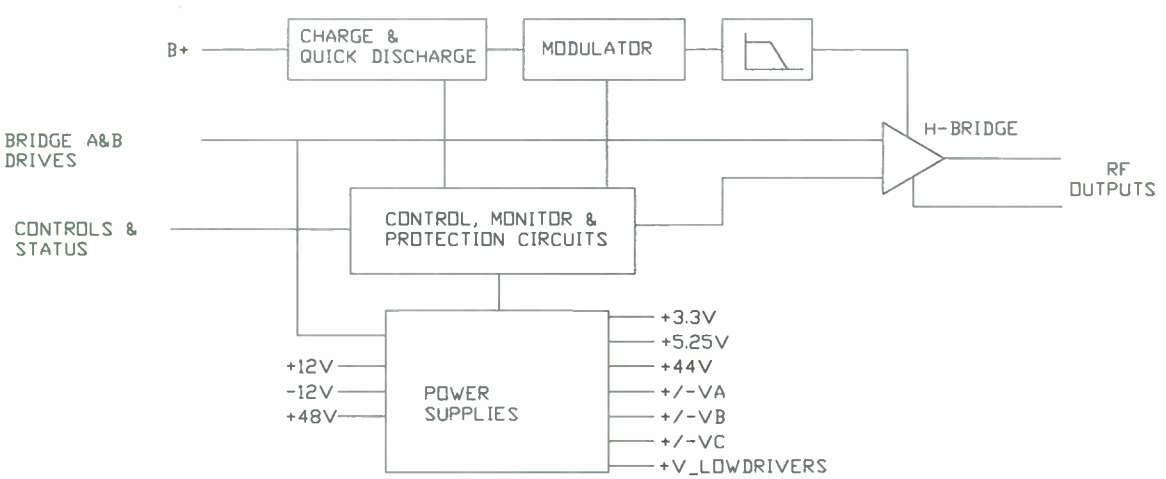


Figure 4-3 PA Module Block Diagram

4.3.2 Motherboard

The DAX transmitter motherboards are the backplane for the PA modules to transfer the PA output to the RF output via series combining.

4.4 Power Supply System

The power supply system provides all DC power for the transmitter. The DC power for the RF power amplifiers (B+) is provided in two controller-selected DC voltage levels: 212Vdc, and 300Vdc. The RF power amplifiers will only be powered from one of these selectable voltage levels at a time. The transmitter's control system will select which DC power level is used to power the RF amplifiers. Depending on the transmitter output power setting, the control system will adjust the 212Vdc supply between 80Vdc and 212Vdc in order to optimize the transmitter's RF performance at lower power levels.

The power supply system also provides the following fixed low voltage supplies: +48Vdc, +12Vdc and -12Vdc.

DAX-5 / DAX-6 POWER SUPPLY SYSTEM

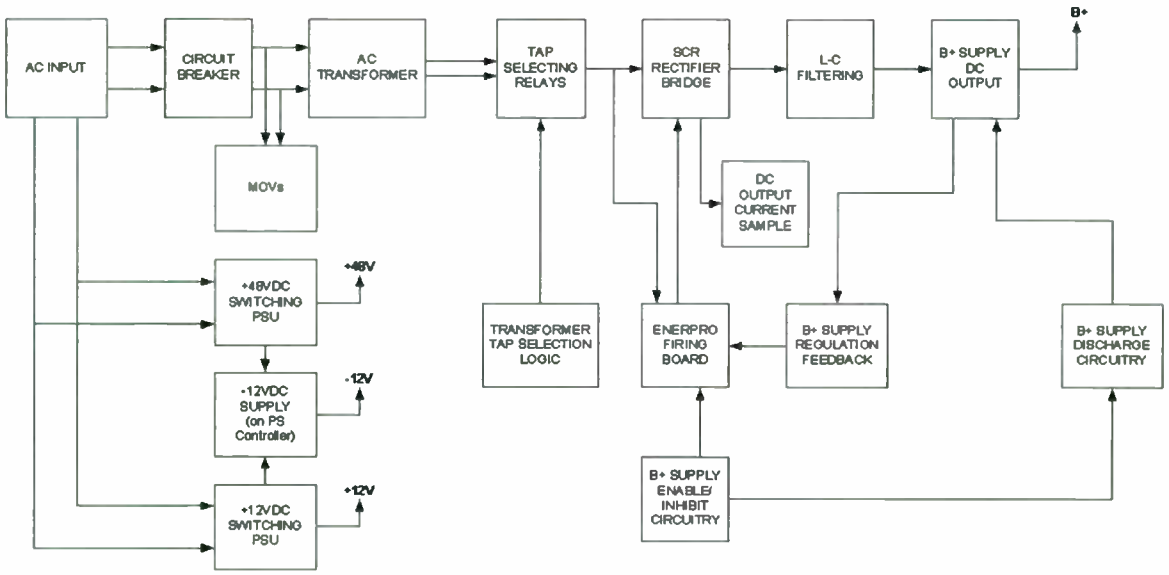


Figure 4-4 Power Supply System Block Diagram

4.4.1 RF PA Power Supply (B+)

The RF PA power supply (also referred to as the B+ supply) provides power to the power amplifier circuitry. The operation of the B+ supply is outlined below.

WARNING: Disconnect primary power prior to servicing.

4.4.1.1 AC Mains Input and Transformer Primary

SINGLE-PHASE MODELS

The AC input of the B+ power supply for single-phase models is configured to be powered from 220, 230, or 240VAC. Three taps on the primary of the input transformer allow the selection of the correct AC mains voltage input. +/-5% taps are provided on the transformers AC input in order to accommodate installations with low or high AC line voltages.

THREE-PHASE MODELS

The AC input of the B+ power supply for three-phase models is configured to be powered from 208/240VAC. Taps on the primary of the input transformer allow the selection of the correct AC mains voltage input. +/-5% taps are provided on the transformers AC input in order to accommodate installations with low or high AC line voltages.

4.4.1.2 AC Mains Input Protection

SINGLE-PHASE MODELS

The AC mains input of the single-phase B+ supply is protected from over-current by an 80A circuit breaker. This circuit breaker also acts as the transmitter's AC mains ON/OFF switch. The AC mains input of the single-phase transmitter is protected from voltage surges and spikes by MOVs connected between line to neutral, line to ground, and from neutral to ground.

THREE-PHASE MODELS

The AC mains input of the three-phase B+ supply is protected from over-current by a 50A circuit breaker for 208/240VAC installations, and a 25A circuit breaker for 380VAC installations This circuit breaker also acts as the transmitter's AC mains ON/OFF switch. The AC mains input of the three-phase transmitter is protected from voltage surges and spikes by MOVs connected between line to line, line to ground, line to neutral, and from neutral to ground.

4.4.1.3 Transformer Secondary

SINGLE-PHASE MODELS

The secondary of the AC input transformer has two Controller-selected taps, allowing the power supply to provide two DC voltage outputs. The two DC output voltages provided are +212V, and +300V.

NOTE:
Depending on the transmitter output power setting, the control system will adjust this 212Vdc supply between 212Vdc and 80Vdc in order to optimize the transmitter's RF performance at lower power levels.

A 40A SPDT relay is used to connect the appropriate secondary tap to the full-wave SCR bridge rectifier, with only one secondary tap selected at a time. This relay is actuated via a MOSFET controlled by the FPGA main controller.

THREE-PHASE MODELS

The transformer secondary for the DAX three-phase models has three sets of two taps, which are connected to the three-phase SCR full-wave bridge rectifier through relays. This tap selection provides two selectable DC voltage outputs: +212V, and +300V.

NOTE:
Depending on the transmitter output power setting, the control system will adjust this 212Vdc supply between 212Vdc and 80Vdc in order to optimize the transmitter's RF performance at lower power levels.

The appropriate secondary taps, selected via three 40A SPDT relays, are routed to the three-phase full wave SCR bridge-rectifier. The relays are actuated via MOSFETs, controlled by the FPGA main controller.

4.4.1.4 SCR Rectifier

SINGLE-PHASE MODELS

The selected transformer secondary tap feeds a full-wave bridge rectifier, which contains two SCRs, two rectifier diodes, and one free-wheeling diode. The free-wheeling diode provides an electrical path for inductive turn-off currents.

SCR firing control, voltage regulation, and B+ power supply enable/disable functions are provided by a vendor supplied PCB. The ENERPRO SCR firing board used in this design is the FCRO2100, which also provides the voltage regulation function.

THREE-PHASE MODELS

Thee three selected secondary taps feed a three-phase SCR full-wave bridge rectifier, which contains three SCRs, three rectifier diodes, and a freewheeling diode.

SCR firing control and B+ power supply enable/disable functions are provided by a vendor supplied PCB. The ENERPRO SCR firing board used in this design is the FRS300, which also provides the voltage regulation function.

4.4.1.5 Output Voltage Regulation

The output voltage of the B+ supply is regulated by continuously adjusting the conduction angle of the SCRs in the bridge rectifier. If the DC output voltage sags below a certain level the conduction angle of the SCRs is increased, raising the DC output voltage. If the DC output voltage increases above a certain level the conduction angle of the SCRs decreases, lowering the DC output voltage.

Two DC bus voltages are provided by the Power Supply Controller selecting between two sets of transformer secondary taps; these two taps provide the 300V and 212V (variable between 100Vdc and 212Vdc for low power optimization) DC bus voltages.

The voltage regulation function is made possible by voltage feedback from the DC output of the B+ supply. The DC voltage feedback is provided by a resistive voltage divider, which is changed whenever a different secondary voltage tap is selected. When a different B+ voltage is selected, the multiplexer connects the appropriate voltage divider resistors to the DC output and the correct voltage regulation feedback voltage is sent to the ENERPRO SCR firing board.

4.4.1.5.1 B+ Supply Enable/Disable Functions

The B+ supply is enabled and disabled via a single logic line from the main controller. When the B+ supply is enabled the SCRs begin firing at their minimum conduction angle and progressively fire at greater and greater conduction angles until DC output voltage regulation is achieved; this provides a "soft-start" turn-on characteristic for the B+ supply. When the B+ supply is disabled the SCRs are instantly disabled; this provides the desired "soft-start/instant disable" characteristic for the B+ supply.

4.4.1.6 DC Output Filtering

The rectified AC is filtered with an L-C network in order to provide a low ripple DC output.

4.4.2 Power Supply Controller

The Power Supply Controller Board provides the interface and control functionality for the transmitter's power supply. The Controller Board provides the following functions:

- Receives the power supply logic control signals from the Main Controller
- Provides the interface between the Main Controller, transformer, SCR firing board, and rectifier assembly
- Provides feedback to the Main Controller on power supply faults
- Provides transformer secondary voltage and DC output current samples to the Main Controller
- Provides fuse protection for the rectifiers and DC output components
- Provides over-current protection for the low voltage power supplies (+/-12Vdc, 5Vdc, & +48Vdc)
- Provides power for the cooling fans
- Provides DC bus output voltage regulation
- Provides the DC bus discharge function

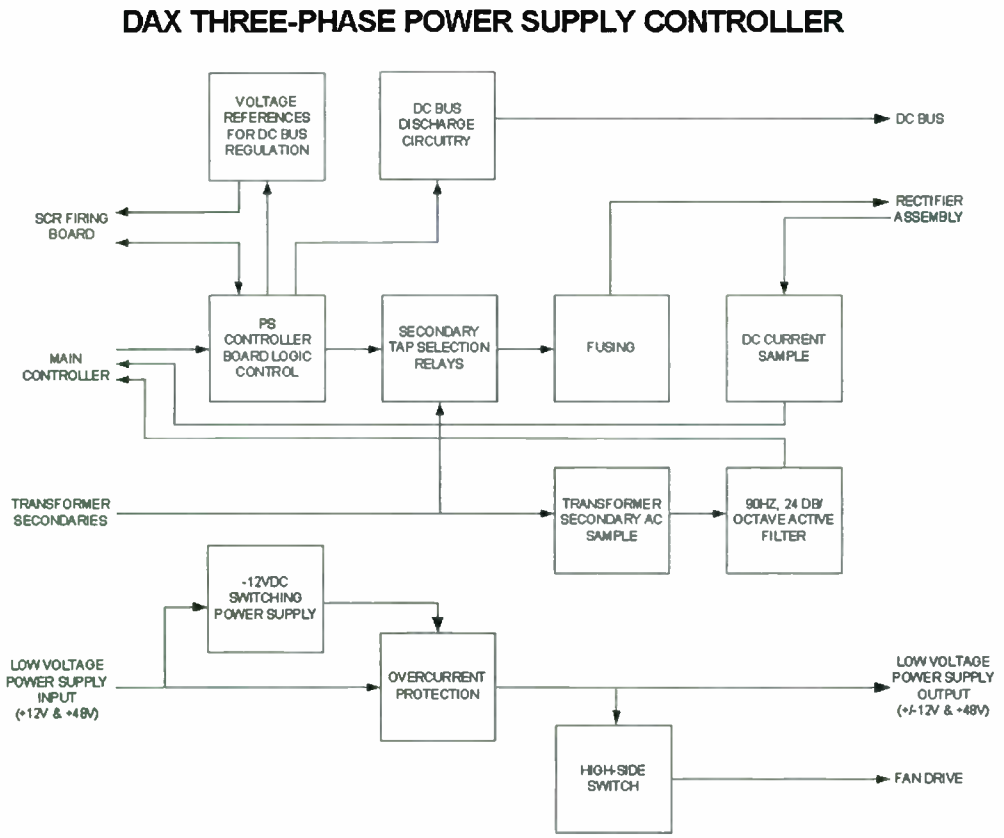


Figure 4-5 3 Phase Power Supply Controller Block Diagram

4.4.2.1 Main Controller Interface

The Power Supply Controller board serves as the control interface between the transmitters Main Controller and the DC power supply. The circuitry on the Power Supply Controller Board allows the Main Controller to select between four DC bus voltages and provides the Main Controller with power supply fault and over-temperature status information, a transformer secondary AC voltage sample, and a DC bus current sample. The power supply is enabled and disabled via commands from the Main Controller.

4.4.2.2 SCR Firing Board Interface

The Power Supply Controller board interfaces with the SCR firing board and provides the SCR enable / disable function and voltage references, which determine the conduction angle of the rectifiers and thus the regulated DC bus voltage. The three-phase Power Supply Controller also provides 31VAC control power to the SCR firing board, and receives a phase loss fault signal from the firing board in the event that an

AC phase is lost or disconnected. A sample of the B+ output is sent to the SCR firing board from the Power Supply Controller to close the voltage regulation loop.

4.4.2.3 Power Supply Fault Status Reporting

The Power Supply Controller board reports AC phase loss, DC discharge fuse failure, transformer over-temperature, and rectifier assembly over-temperature faults to the Main Controller. Rectifier and transformer over-temperature faults, and AC phase loss faults are reported to the Main Controller as a PS_FAULT, and DC discharge fuse failure is reported to the Main Controller as PS_WARNING.

4.4.2.4 Samples to the Main Controller

DC current and AC voltage samples are provided for the DAX Main Controller.

4.4.2.4.1 DC Current Sample

A sample of the power supplies DC output current is taken across a current shunt resistor, which is connected between the negative side of the rectifier assembly and chassis ground. The voltage that is sensed across this resistor is fed into the input of an op-amp and the output voltage scaling of the current sample is adjusted by adjusting the gain of the op-amp. The current sample scaling is 0.04Vdc output / 1A DC input. This current sample is sent to the Main Controller.

4.4.2.4.2 Transformer Secondary Voltage Sample

A sample of the transformers secondary voltage is provided so the Main Controller can determine whether the AC mains is within +10/-15% of the nominal AC line voltage.

4.4.2.5 Over Current Protection

4.4.2.5.1 Rectifier and DC Output Over-current Protection

The rectifier assembly and the DC output wiring and components of the B+ supply are protected from over-current by properly sizing the transformer secondary fusing such that DC over-currents will blow the secondary fusing before rectifier or DC output components are damaged. Semiconductor fuses are employed to provide this protection function.

4.4.2.5.2 Low Voltage Power Supply Over-current Protection

The transmitter power supply system includes low voltage switching power supplies, which provide power for the transmitters control circuitry, fans, and Binary PA's. There are two low voltage power supplies in the system, which provide three DC output voltages: +/-12Vdc and +48Vdc. The table below shows the current requirements for the low voltage power supplies.

Table 4-1 Low Voltage Power Supplies' Current Requirements

Output Voltage	Current Load	Over-Current Protection
+12Vdc	10.9A	15A Slow Blow Fuse
-12Vdc	1.1A	2.5A PTC
+48Vdc	4.1A	7A Slow Blow Fuse

The DC output voltages in the table above are fed from the switching power supplies to the Power Supply Controller Board, where over-current protection is provided for each DC output. The low voltage power supply voltages are then fed to the rest of the transmitter system.

4.4.2.6 DC Discharge Circuit

A DC discharge circuit is used in the power supply in order to discharge the DC bus voltage to a safe level when the power supply receives the "off" command from the main controller. When the power supply receives the command to turn off or switch secondary taps a FET switch connects a bleeder resistor to the DC bus, discharging the DC voltage to approximately 40.5V in 5 seconds.

4.4.2.7 Power Supply System I/O

The power supply system is controlled and monitored via an I/O Data Buss. AC and DC power I/O will be referred to as being on the Power Buss.

Section 5 Maintenance and Alignments

5

5.1 Introduction

This section provides maintenance and alignment information for the DAX transmitter. It is intended to be used by qualified technical service personnel only.

⚠ **CAUTION:**
*DO NOT ATTEMPT TO REMOVE OR REPLACE **ANY** COMPONENTS OR BOARDS WITH POWER APPLIED TO THE TRANSMITTER.*

5.2 Routine Maintenance

Routine maintenance of the DAX transmitter basically consists of inspection, regular cleaning, and monitoring of metrics such as currents, voltages and faults.

5.2.1 Record Keeping

The importance of keeping station performance records cannot be over-emphasized. Logbooks should be maintained for all operation and maintenance activities. These records can provide data for predicting potential problem areas and analyzing equipment malfunctions.

5.2.1.1 Transmitter Logbook

As a minimum performance characteristic, the transmitter should be monitored (using front panel GUI and VT100) and the results recorded in the transmitter logbook at least once a day.

5.2.1.2 Maintenance Logbook

The maintenance logbook should contain a complete description of all maintenance activities required to keep the transmitter operational. A list of maintenance information to be recorded and analyzed to provide a database for a failure reporting system is as follows:

DISCREPANCY
Describe the nature of the malfunction. Include all observable symptoms and performance characteristics.

CORRECTIVE ACTION
Describe the repair procedure used to correct the malfunction.

DEFECTIVE PART(S)
List all parts and components replaced or repaired. Include the following details:

a. COMPONENT TIME IN USE
b. COMPONENT PART NUMBER
c. COMPONENT SCHEMATIC NUMBER
d. COMPONENT ASSEMBLY NUMBER
e. COMPONENT REFERENCE DESIGNATOR

SYSTEM ELAPSED TIME
Total transmitter time on.

NAME OF REPAIRMAN
Person who actually made the repair.

STATION ENGINEER
Indicates chief engineer noted and approved the transmitter repair.

5.2.2 Cleaning

Proper airflow is essential in keeping the transmitter in top working condition. If outside air is brought into the building it should be well filtered to keep dirt out of the building and the transmitter.

5.2.2.1 Cleaning the Air Filter

It is recommended to clean or replace the air filter once a year, or more often if required.

5.3 Configuration

5.3.1 Change Remote Disable LED Color

Depending on the installation requirements, the color of the Remote Disable LED can be altered from the default.

STEP 1 Locate the External I/O board by removing the front panel below the control panel

STEP 2 Locate JP1 and set accordingly

- Green at disabled remote: 1-2
- Red at disabled remote: 2-3

STEP 3 Replace front panel

5.3.2 Bessel Filter Input Bandwidth Select

See the following table to configure the S2, S3, and S4 switches to match the desired input filter bandwidth.

For digital operation be sure S2, S3, and S4 switches, located on the Exciter/Controller board, all have the #1 switch in the up position, and the rest down. This is for full 50 kHz bandwidth operation required for domestic IBOC broadcast. Narrow-mode AM utilized in countries other than the USA will find the other filter settings useful to match their system.

NOTE:
In Table 5-1 below, the number indicates the only switch to be in the UP position. The other 3 positions on each switch will all be in the DOWN position.

Table 5-1 Bessel Filter Bandwidth Switch Settings

Desired Bandwidth	S2	S3	S4
50 kHz	1	1	1
10 kHz	2	2	2
9 kHz	3	3	3
5 kHz	4	4	4

5.3.3 Power Limit Setup

The DAX transmitter can be remotely forced to a predetermined power level via the Remote Power Limit Select I/O line, J7-8 on the External I/O board. To set that value use the following procedures.

5.3.3.1 Via Front Panel GUI

STEP 1 Press the INFO button to navigate to the submenu screen

STEP 2 Select **SETUP** SUBMENU using the UP or DOWN buttons

STEP 3 Press ENTER to bring up below screen

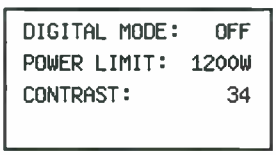


Figure 5-1
Setup Screen

STEP 4 Scroll to POWER LIMIT and press ENTER

STEP 5 Adjust the level, in Watts, to the desired value using the UP or DOWN buttons

STEP 6 Press ENTER to store that value

5.3.3.2 Via VT100

See "5.5.1 VT100 Calibrations and Alignments" on page 5-7 below, particularly the note for accessing the page 4 VT100 configuration screen for the following procedure.

STEP 1 Initiate VT100 programming and navigate to page 4

STEP 2 Type the letter "u" for Remote Power Limit

STEP 3 Use the keyboard's up/down arrows to adjust the value in Watts to the level required

STEP 4 Press "Enter" key to store value

5.4 Software Upgrade Procedure

The following section outlines the steps necessary to update the DAX transmitter with a different version of software than currently installed. As with the VT100 programming, a PC and serial cable with DB-9 connector is required. The PC should have the Harris software update install CD inserted.

IMPORTANT NOTE:
The software update will automatically reset the transmitter during the procedure. This will momentarily take the transmitter off the air. Therefore it is recommended to perform this update with the transmitter OFF.

It is recommended to compare the current software revision with that about to be installed to verify the version you are installing is not already loaded.

STEP 1 Verify software revision via the GUI:

- Pressing the INFO button takes you to submenu screen
- Select **STATUS** SUBMENU using the UP or DOWN buttons
- Press ENTER to bring up below screen

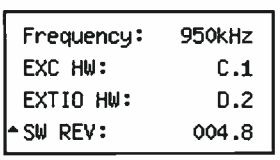


Figure 5-2 Status Screen

NOTE:
The software revision level is also available via the VT100 page 1 (see "6.2.2.1 VT100 - Page 1" on page 6-5).

STEP 2 Turn off transmitter

STEP 3 Connect serial cable from PC to ***COM 1 port (J17)*** on the External I/O board

STEP 4 Find and run HarrisISP.exe on the install CD

STEP 5 Select the appropriate PC comm port connected in STEP 3

STEP 6 Select baud rate of 57600

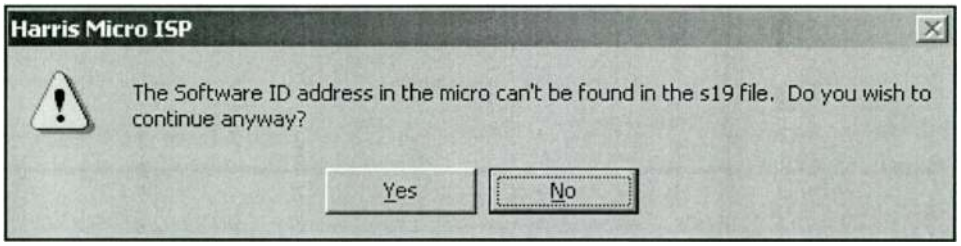
STEP 7 Double click on the microcontroller [0] icon in the upper left corner of screen

STEP 8 Select program file

STEP 9 Using BROWSE, select application file DAX_APP_vvvr.S19 (where "v" represents Version, and "r" represents Revision)

STEP 10 Click on PROGRAM button

STEP 11 If the dialog box shown below opens, click on YES



STEP 12 When file transfer is complete click on the OKAY button (may take up to 10 minutes)

STEP 13 The DAX will then reset

STEP 14 Verify correct sofware revision is now installed following the procedure in STEP 1

STEP 15 Exit the Harris ISP application

WARNING: Disconnect primary power prior to servicing.

5.5 Alignments

5.5.1 VT100 Calibrations and Alignments

For all meter readings and programming including and beyond the front panel abilities, the VT100 is the emulation method used to interface a computer with the DAX transmitter. ***Any* parameter accessable on the front panel GUI can also be viewed and modified via VT100**. By using a PC and terminal application of your choice (such as HyperTerminal) connected to the ***COM 2 port (J16)*** on the External I/O board with a serial cable with DB-9 connector, you'll have access to the VT100 screens.

This section outlines the steps necessary to physically connect, start the terminal program, electronically handshake with, navigate the VT100 screens, and perform edits.

STEP 1 Turn transmitter off

STEP 2 Connect RS-232 comm port 2 (J16) on External I/O board to your PC

STEP 3 Turn transmitter on

STEP 4 Start terminal program (such as HyperTerminal) with following settings

- Bits Per Second = 57600
- Data Bits = 8
- Parity = None
- Stop Bits = 1
- Flow Control = None
- Emulation = VT100

STEP 5 Call, or hit "Enter" twice to initiate handshake

To navigate around the VT100 Screens:

- Left/Right arrows to page back/forward
- Up/Down arrows to move cursor within page

To edit a numerical entry:

STEP 1 Type the line number or letter in parenthesis - *do NOT hit "Enter"*

STEP 2 Use up/down arrow keys to increase/decrease numerical value (with the exception of the Meter Calibration section, where it is required to type in the numerical value)

STEP 3 Press the "Enter" key to store that entry

WARNING: Disconnect primary power prior to servicing.

- EXAMPLE: To change the Forward Power Range of Power Level 4 to 2800W; on page 2 of the VT100 screens, type "4", then use your keyboard's up or down arrow keys to reach 2800. Then hit "Enter" on your keyboard to store.

To toggle (turn on/off) a command:

STEP 1 Type the corresponding number or letter in parenthesis - *do NOT hit "Enter"*

- EXAMPLE: To mute the DAX; on page 2 of the VT100 screens, type the letter "e". Type "e" again to unmute the transmitter.

STEP 2 Type the same number or letter again to toggle that command

To access Page 4 of the VT100 programming:
From page 3, press and hold your keyboard's "Shift" key, then press "1", then press "2", and then press "3". From that point on during this session, you will have access to this page by using the left/right arrow keys to page through all four VT100 screens.

NOTE:
If you are using a non-English keyboard you may need to set the *Keyboard Properties* to **English** from Windows Control Panel: Keyboard for the above procedure to work.

To access page 5 of the VT100 programming:
From page 4, press and hold your keyboard's "**Ctrl**" key, then press "**z**". From that point on during this session, you will have access to this page by using the left/right arrow keys to page through all five VT100 screens.

5.5.2 Forward & Reflected Power Calibrations

This procedure is provided in the event that the power metering of the DAX transmitter needs to be recalibrated. Before starting this process, the DAX should be connected to a PC with the terminal application running and VT100 Page 5 accessed as outlined in section "5.5.1 VT100 Calibrations and Alignments" on page 5-7, above.

IMPORTANT:
The following procedures requires the DAX transmitter to be operated into a known-good 50 Ohm test load, rated at or above the DAX nameplate power output.

NOTE:
An external RF current meter or Wattmeter is required for this procedure.

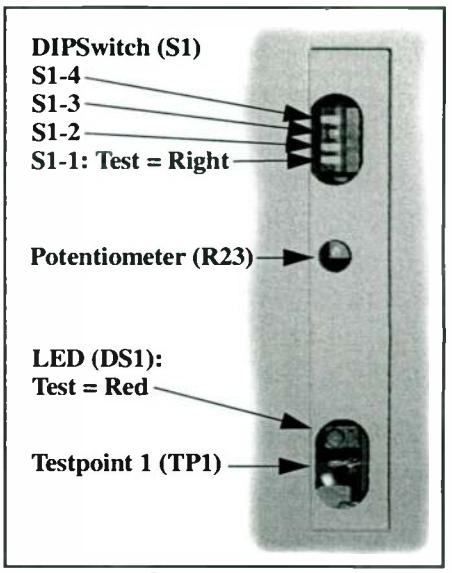
5.5.2.1 Forward Power Setting

The goal here is null the reflected power circuit by using the dipswitches and potentiometer on the Output Monitor board:

STEP 1 Turn on the transmitter and raise power until the DC current reaches 5 Amps for DAX 5/6 (1 Amp for a DAX 1/3) according to front panel GUI meter

STEP 2 Clip a DC Voltmeter to TP1 on the Output Monitor board (shown at right) at the upper rear of the transmitter and begin with the dipswitches all set to the left

STEP 3 Try to locate a null point (a minimum voltage) within the range of the pot



NOTE:
If there is no null point (i.e. the lowest point is at the end of travel of the pot), flip dipswitch S-2 (second up from the bottom) to the right, and try to locate the null again. If there is still no null, flip dipswitch S-3. If there is still no null, flip dipswitch S-4. Once the null is located, center the potentiometer in it.

STEP 4 Set the transmitter to the highest power range setting (typically Power Level 5), and zero the power setting by simultaneously holding the RAISE and LOWER buttons for greater than 3 seconds

STEP 5 Using the front panel RAISE control, raise transmitter output power back up until your external RF current or Watt meter indicates a value that corresponds to the nameplate output power

Table 5-2 STEP 5 Nameplate Power Settings

Model	Watts
DAX-1/1R	1000
DAX-3	3000
DAX-5	5000
DAX-6	6000

STEP 6 On the VT100 page 5, press "3" and then type in the power in Watts, from in STEP 5 above

STEP 7 Press <ENTER> to store the now-calibrated Forward Power Cal. setting

5.5.2.2 Reflected Power Setting

The procedure continues below, now focusing on reflected power calibration and VSWR protection setting:

STEP 8 Turn Reflected Power Trip potentiometer, R56 on the Exciter/Controller board, fully clockwise (CW)

STEP 9 On the VT100 page 5, press "I" and raise the Reflected Power Trip to 800W (for all DAX transmitters) using the up arrow key

STEP 10 Using the front panel LOWER control, lower the transmitter power until the GUI forward power meter indicates 100W per PA (see Table 5-3 below)

Table 5-3 STEP 10 Power Settings

Model	Watts
DAX-1/1R	100
DAX-3	300
DAX-5	500
DAX-6	600

STEP 11 Set the transmitter for Reflected Power Calibration mode by moving S1-1 on the Output Monitor board (bottom switch) to the right. The red LED just below S1 will illuminate (If the transmitter trips off, verify that the Reflected Power Trip in the VT100 is set to 800W, and that R56 on the Exciter/Controller is turned fully CW).

STEP 12 On the VT100 page 5, enter the Reflected Power Cal. value by pressing "5" and then typing the power, in Watts, set in STEP 10 above

STEP 13 Press <ENTER> to store the now-calibrated Reflected Power Cal. setting

STEP 14 Set the Reflected Power Trip point using R56 on the Exciter/Controller board:

- Rotate R56 CCW until the transmitter faults
- Back R56 CW ¼ turn until the transmitter no longer faults (you may have to press the ON button again if the transmitter 3-strike faults OFF during the adjustment)

STEP 15 Return the Output Monitor to normal operating mode by switching S1-1 back to the left (red LED will turn off)

STEP 16 On the VT100 page 5, press "I" and lower the Reflected Power Trip to 70W per PA using the down arrow key (see Table 5-4 below)

Table 5-4 STEP 16 Power Settings

Model	Watts
DAX-1/1R	70
DAX-3	210
DAX-5	350
DAX-6	420

STEP 17 Still on the VT100 page 5, press "4" and increase the Reflected Power Null, using the up arrow, until the *Reflected Power Cal.* reading indicates lowest value possible

STEP 18 Raise the transmitter power to nameplate output power. Verify the transmitter DC Current metering is *approximately* 3.8A per PA with no modulation, as reported on the GUI metering screen (see Table 5-5 below).

Table 5-5 STEP 18 DC Current Settings

Model	Watts	DC Amps
DAX-1/1R	1000	3.8
DAX-3	3000	11.4
DAX-5	5000	19.0
DAX-6	6000	22.8

5.5.2.3 Reset Power Levels:

This last portion of this procedure re-establishes the desired power levels using the newly calibrated metering:

STEP 19 Go to the POWER screen on the transmitter GUI

STEP 20 Select Power Level 1 (see "3.3.3.2 Selecting Power Levels 1 - 5" on page 3-5 for details)

STEP 21 RAISE or LOWER the power to match the *Power Level Range* setting (small numeric value at lower right side of display) for that Power Level

WARNING: Disconnect primary power prior to servicing.

STEP 22 Press and hold the ENTER button on the front panel until the LCD screen reverse video appears to store the power setting for that Power Level

STEP 23 Repeat for each additional power level

This concludes the Forward & Reflecte Power Calibrations procedures.

5.6 Parts Replacement

See Section 7, Replaceable Parts List, for part numbers available for replacement.

5.6.1 Power Supply Controller

The following procedure explains in detail the necessary steps to replace a Power Supply Controller board. It is recommended that the technician read through these instructions prior to proceding with this replacement.

STEP 1 Turn off transmitter

STEP 2 Turn off AC power at CB1

STEP 3 Remove the old Power Supply Controller board

STEP 4 Install the new Power Supply Controller board

STEP 5 Connect a PC to the DAX and set up the VT100 emulation as oulined in section "5.5.1 VT100 Calibrations and Alignments" on page 5-7 above

STEP 6 Turn on transmitter AC power at CB1

STEP 7 Connect an AC voltmeter to the test points labeled "XFMR SECONDARY SAMPLE" (TP11 and TP12) on the Power Supply Controller board and note reading

STEP 8 Call, or hit "Enter" twice to initiate handshake between DAX and PC

STEP 9 Use Left/Right arrow to go to sheet 5 (see "5.5.1 VT100 Calibrations and Alignments" on page 5-7) of the VT100 screens

WARNING: Disconnect primary power prior to servicing.

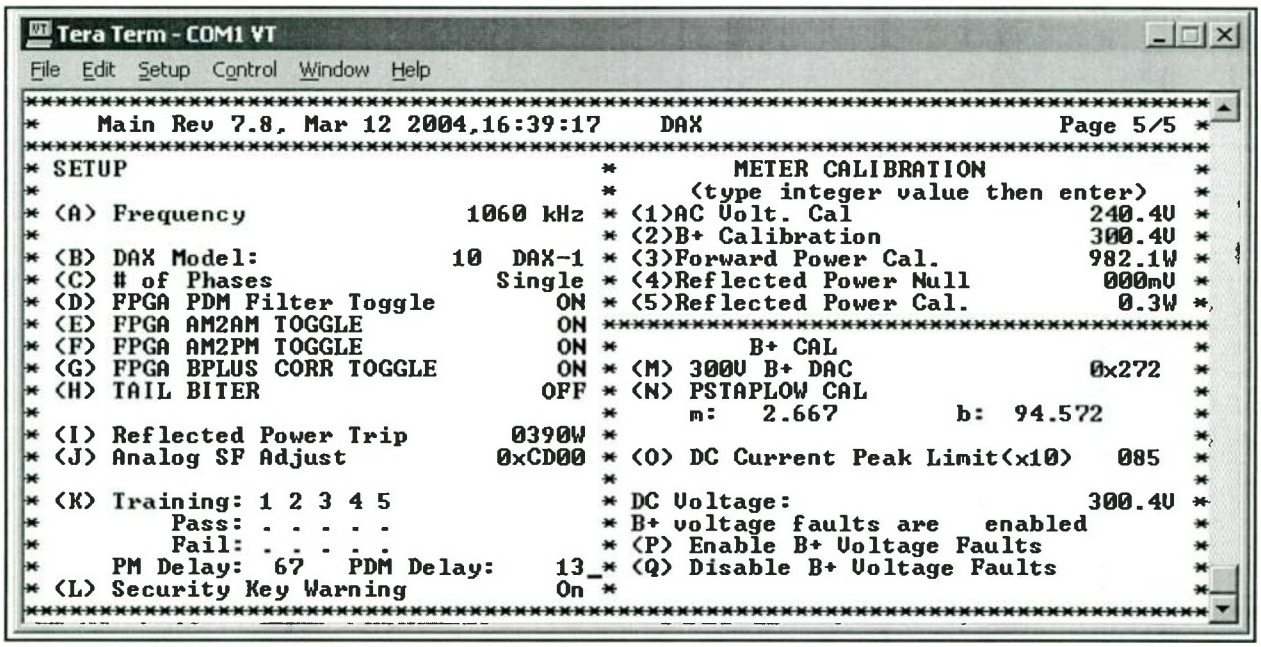


Figure 5-3
VT100 Page 5 View

STEP 10 On sheet 5 of the VT100 screens hit the "1" key

STEP 11 Type in the AC voltage reading from the voltmeter and hit the "Enter" key. The AC voltage is now calibrated.

STEP 12 Turn off transmitter AC power at the circuit breaker

STEP 13 Connect the positive lead of a DC voltmeter to the test point labeled "B+ SAMPLE" (TP20) on the Power Supply Controller Board

STEP 14 Connect the negative lead of the DC voltmeter to a test point labeled "GND" on the Power Supply Controller Board

STEP 15 Turn on transmitter AC power at CB1

STEP 16 On page 5 of the VT100 screens press the "M" key

STEP 17 Use the down arrow key on the keyboard to lower the B+ DAC value about 20 counts

STEP 18 Press the "Enter" key to store this temporary value

STEP 19 Operate the transmitter at the following power level setting:

- DAX-1: 1kW
- DAX-3: 3kW
- DAX-5: 5kW

WARNING: Disconnect primary power prior to servicing.

- DAX-6: 6kW

STEP 20 On sheet 5 of the VT100 screens hit the "M" key

STEP 21 Use the up/down arrow keys on the keyboard to adjust the B+ DAC until the DC voltage reading on the meter of the B+ supply is as close to 300.0V as possible

STEP 22 Press the "ENTER" key to store

STEP 23 Press the "2" key and type the number "300" and press the "Enter" key

STEP 24 With the transmitter still operating, set the transmitter to a power level range that has been pre-set in the "level" menu to the following:

- DAX-1: 400W
- DAX-3: 1300W
- DAX-5: 2500W
- DAX-6: 2500W

NOTE:
(Verify that the number in the lower right-hand corner of the transmitter display reads the number listed above).

STEP 25 While on page 5 of the VT100 screens, press the "N" key and the VT100 screen will display a "WAIT" message

STEP 26 If the "WAIT" message becomes "PASS" press the "Enter" key. If the "WAIT" message becomes a "FAIL" message hit the "N" key again.

NOTE:
If this low-tap calibration fails more than once, there is a problem with the transmitter and a call to Harris Service may be required.

5.6.1.1 -12Vdc Adjustment

STEP 27 Press the METER button and then the up or down arrows to navigate to the below screen

+12V:	11.2V
-12V:	-11.6V
+5V:	5.1V
+48V:	47.9V

Figure 5-4 Meter Screen

STEP 28 On the Power Supply Controller board, adjust R41 (3-phase) or R47 (single-phase) for a -12V (±5%) reading on this screen

5.6.2 SCR Controller Board

The following procedure explains in detail the necessary steps to replace an SCR Controller board. It is recommended that the technician read through these instructions prior to proceding with this replacement.

STEP 1 Turn off transmitter

STEP 2 Turn off AC power at CB1

STEP 3 Remove Enerpro SCR Controller board to be replaced

STEP 4 Install new SCR Controller board

STEP 5 Connect the positive lead of a DC voltmeter to the test point labeled "B+ SAMPLE" (TP20) on the Power Supply Controller board

STEP 6 Connect the negative lead of the DC voltmeter to a test point labeled "GND" on the Power Supply Controller board

STEP 7 Connect a PC to the DAX and set up the VT100 emulation as oulined in section "5.5.1 VT100 Calibrations and Alignments" on page 5-7 above

STEP 8 Turn on transmitter AC power at CB1

STEP 9 Call, or hit "Enter" twice to initiate handshake between DAX and PC

STEP 10 Use Left/Right arrow to go to sheet 5 of the VT100 screens

STEP 11 On page 5 (see "5.5.1 VT100 Calibrations and Alignments" on page 5-7) of the VT100 screens hit the "M" key

STEP 12 Use the down arrow key on the keyboard to lower the B+ DAC value about 20 counts

STEP 13 Press the "Enter" key to store this temporary value

STEP 14 Operate the transmitter at the following power level setting:

- DAX-1: 1kW
- DAX-3: 3kW
- DAX-5: 5kW
- DAX-6: 6kW

STEP 15 On page 5 of the VT100 screens hit the "M" key

STEP 16 Use the up/down arrow keys on the keyboard to adjust the B+ DAC until the DC voltage reading on the meter of the B+ supply is as close to 300.0V as possible

WARNING: Disconnect primary power prior to servicing.

STEP 17 Press the "Enter" key to store

STEP 18 Press the "2" key, type the number "300" and press the "Enter" key

STEP 19 With the transmitter still operating, set the transmitter to a power level range that has been pre-set in the "level" menu to the following:

- DAX-1: 400W
- DAX-3: 1300W
- DAX-5: 2500W
- DAX-6: 2500W

NOTE:
(Verify that the number in the lower right-hand corner of the transmitter GUI display reads the number listed above).

STEP 20 While on page 5 of the VT100 screens, press the "N" key and the VT100 screen will display a "WAIT" message

STEP 21 If the "WAIT" message becomes "PASS" press the "Enter" key. If the "WAIT" message becomes a "FAIL" message hit the "N" key again.

NOTE:
If this low-tap calibration fails more than once, there is a problem with the transmitter and a call to Harris Service may be required.

5.6.3 LVPS Replacement

The following section outlines the steps necessary to replace either of the industrial power supplies: +12Vdc or +48Vdc.

STEP 1 Turn off CB1

STEP 2 Disconnect primary power to the transmitter

STEP 3 Note the yellow-wire numbers as they are currently attached to the power supply terminals

STEP 4 Remove the yellow wires from the power supply terminals

STEP 5 Unscrew the 2 fasteners holding the mounting plate to the wall

STEP 6 Unscrew the power supply to be replaced from the plate

STEP 7 Mount new power supply to plate with the screws from STEP 6

STEP 8 Mount plate to wall with the 2 fasteners from STEP 5

STEP 9 Re-attach yellow wires to corresponding terminals noted

WARNING: Disconnect primary power prior to servicing.

STEP 10 Reconnnect primary power to the transmitter

STEP 11 Turn on CB1

STEP 12 Press the METER button and then the up or down arrows to navigate to the below screen

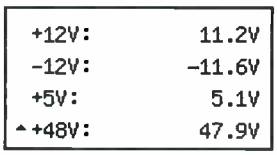


Figure 5-5 Meter Screen

STEP 13 On the replaced power supply, adjust the potentiometer next to green LED and wire terminal on the top of the power supply for a correct voltage (±5%) reading on this screen

STEP 14 Turn DAX transmitter on and observe for correct operation

5.6.4 PA MOSFET

Typically, a MOSFET device will fail as a short circuit. This can be detected by reading the resistance, in-circuit, between the Gate and the Source with an Ohmmeter: A reading of less than 100 Ohms indicates a failed MOSFET.

If it has been determined that a pair or more of MOSFETs needs to be replaced, special attention should be paid to the following issues:

- **Ferrite bead *location and size:*** Please note there are 3 different sized beads strategically installed on certain MOSFET leads. Be sure to replace the correct bead back on the correct lead of the correct MOSFET before soldering.
- **Insulator must be replaced:** There is a small insulator between the MOSFET and the heatsink. It may be easy to overlook or misplace. These insulators should be replaced by new when replacing MOSFETs.
- Beads and insulators are included along with MOSFETs as part of the MOSFET Replacement Kit.

Section 6 Troubleshooting

6

6.1 Introduction

This section is to be used by the service technician to go beyond the steps provided in the Emergency Operation section (in Chapter 3) to troubleshoot a DAX malfunction. Use this along with the provided schematic package for detailed circuit understanding and diagnosis.

NOTE:
Before preceding, see "3.4 Emergency Operation" on page 3-9 for initial steps in restoring a DAX transmitter to operational status in the event of a fault condition.

WARNING:
DISCONNECT PRIMARY POWER PRIOR TO SERVICING THE DAX TRANSMITTER. HIGH VOLTAGE IS PRESENT EVEN WHEN MAIN CIRCUIT BREAKER CB1 IS TURNED OFF.

CAUTION:
DO NOT DISCONNECT, RECONNECT, REMOVE, OR ALTER ANY PC BOARDS WITH AC MAINS POWER CONNECTED TO DAX TRANSMITTER.

CAUTION:
DO NOT OPERATE DAX TRANSMITTER WITH DOORS, SHIELDS OR PANELS REMOVED.

6.2 Diagnostics

A wealth of information is obtainable via the front panel, individual board indications and VT100 parameters to help discern the cause of a failure within the DAX transmitter.

6.2.1 Fault Log

Certain faults are listed for quick reference in Table 6-2 on page 6-27. The most recent fault will be displayed as the topmost listing.

To assist in determining the possible causes of a malfunction, the DAX transmitter stores fault occurrences including the elapsed time since they occurred.

The DAX controller stores 75 fault listings and operates with the first in first out (FIFO) concept of data repletion. In other words, the fault log will only contain the last 75 faults. It is highly unlikely that there would ever be 75 faults to be listed, but it is possible if the fault log had not been reset for a very long period and/or there was many nuisance fault trips, that early faults would be 'pushed out' by the more recent faults - never totalling more than 75.

NOTE:
Upon loss of AC power to the DAX controller after or during a fault condition, fault time information may be incorrect.

6.2.1.1 Viewing the Fault Log

Viewing the Fault Log on the GUI screen can be accomplished y the following procedure:

STEP 1 Pressing the INFO button takes you to below screen

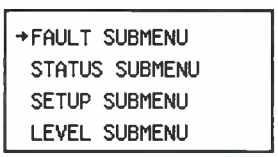


Figure 6-1 INFO Screen

STEP 2 Select **FAULT** SUBMENU using the UP or DOWN buttons

STEP 3 Press ENTER to bring up below screen

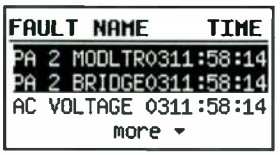


Figure 6-2 Fault Log Screen

STEP 4 If more than three faults are present, they can be viewed by scrolling using the UP or DOWN buttons

6.2.1.2 Fault Log Reset

Once the technician has noted faults, it may be desirable to clear the Fault Log. To do so, from the Fault Log screen press and hold the ENTER button for >2 seconds. The listed faults will highlight and then be permanently deleted.

6.2.2 Using VT100 for Metering, Status & Configuration

For all meter readings and programming including and beyond the front panel abilities, the VT100 is the emulation method used to interface a computer with the DAX transmitter. ***Any* parameter accessable on the front panel GUI can also be viewed and modified via VT100**. By using a PC and terminal application of your choice (such as HyperTerminal) connected to the ***COM 2 port (J16)*** on the External I/O board with a serial cable with DB-9 connector, you'll have access to the VT100 screens.

This section outlines the steps necessary to physically connect, start the terminal program, electronically handshake with, navigate the VT100 screens, and perform edits.

STEP 1 Turn transmitter off

STEP 2 Connect RS-232 comm port 2 (J16) on External I/O board to your PC

STEP 3 Turn transmitter on

STEP 4 Start terminal program (such as HyperTerminal) with following settings

- Bits Per Second = 57600
- Data Bits = 8
- Parity = None
- Stop Bits = 1
- Flow Control = None
- Emulation = VT100

STEP 5 Call, or hit "Enter" twice to initiate handshake

To navigate around the VT100 Screens:

- Left/Right arrows to page back/forward
- Up/Down arrows to move cursor within page

To edit a numerical entry:

STEP 1 Type the line number or letter in parenthesis - *do NOT hit "Enter"*

STEP 2 Use up/down arrow keys to increase/decrease numerical value (with the exception of the Meter Calibration section, where it is required to type in the numerical value)

STEP 3 Press the "Enter" key to store that entry

- EXAMPLE: To change the Forward Power Range of Power Level 4 to 2800W; on page 2 of the VT100 screens, type "4", then use your keyboard's up or down arrow keys to reach 2800. Then hit "Enter" on your keyboard to store.

To toggle (turn on/off) a command:

STEP 1 Type the corresponding number or letter in parenthesis - *do NOT hit "Enter"*

- EXAMPLE: To mute the DAX; on page 2 of the VT100 screens, type the letter "e". Type "e" again to unmute the transmitter.

STEP 2 Type the same number or letter again to toggle that command

To access Page 4 of the VT100 programming:
From page 3, press and hold your keyboard's "Shift" key, then press "1", then press "2", and then press "3". From that point on during this session, you will have access to this page by using the left/right arrow keys to page through all four VT100 screens.

NOTE:
If you are using a non-English keyboard you may need to set the *Keyboard Properties* to **English** from Windows Control Panel: Keyboard for the above procedure to work.

To access page 5 of the VT100 programming:
From page 4, press and hold your keyboard's "**Ctrl**" key, then press "**z**". From that point on during this session, you will have access to this page by using the left/right arrow keys to page through all five VT100 screens.

NOTE:
This section lists, and provides detailed information for, each parameter in the VT100 emulation pages.

6.2.2.1 VT100 - Page 1

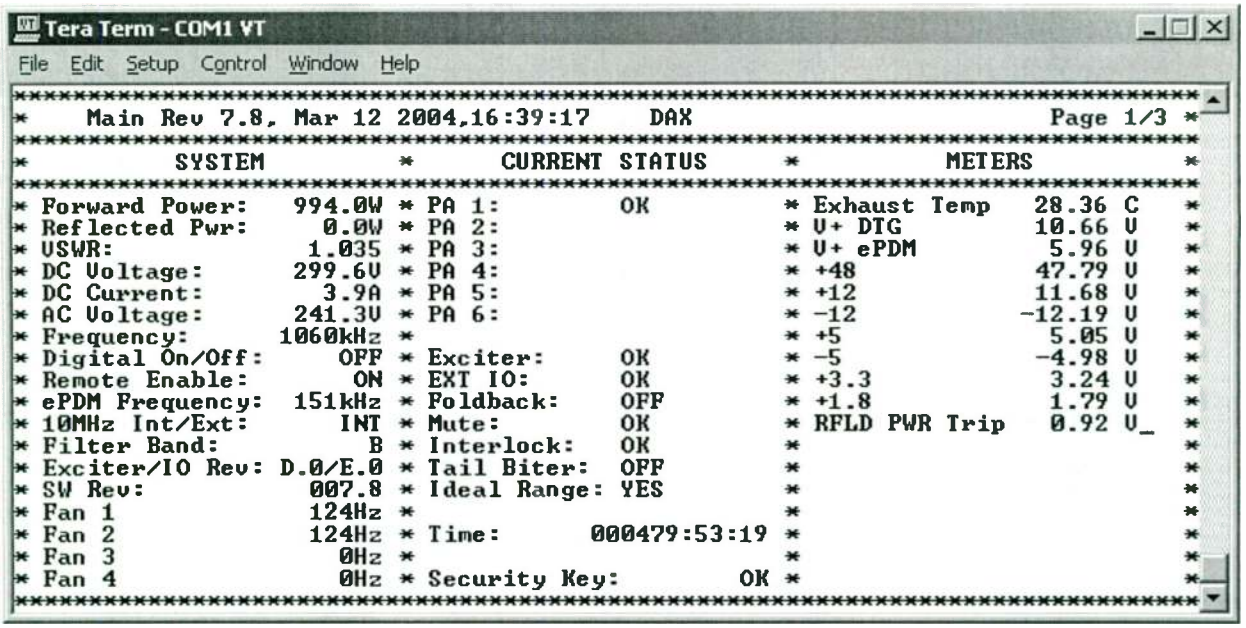


Figure 6-3
VT100 Page 1 View

6.2.2.1.1 SYSTEM

Forward Power: Transmitter output power measured using an RF detector on the Output Monitor board. Forward power is limited to 115% of rated power.

NOTE:
Forward power detector calibration is available using **(3)** on VT100 page 5 (see "6.2.2.5 VT100 - Page 5" on page 6-16).

Reflected Pwr: Reflected power to the transmitter measured using a detector on the Output Monitor board. *Instantaneous* reflected trip point is factory set to 100W per PA module.

NOTE:
Reflected power detector null and calibration is available using **(4)** & **(5)** on VT100 page 5. *Average* reflected power trip is set using **(I)**, also on VT100 page 5, to 70W per PA module (see "6.2.2.5 VT100 - Page 5" on page 6-16).

WARNING: Disconnect primary power prior to servicing.

VSWR: Voltage standing wave ratio. Example: 1.009 reading indicates 1.009:1 ratio.

DC Voltage: High voltage power supply (B+) voltage measured via B+ Sample board. Voltage range is 100V – 300V and varies with power level setting.

NOTE:
DC Voltage calibration is available using **(2)** on VT100 page 5 (see "6.2.2.5 VT100 - Page 5" on page 6-16).

DC Current: High voltage power supply DC current measured using the shunt in the HVPS. No calibration required. Nominal DC current is approximately 4.5A per kW with program modulation.

NOTE:
Instantaneous DC current trip point is factory set to 9.0A per PA module using **(O)** on VT100 page 5 (see "6.2.2.5 VT100 - Page 5" on page 6-16). *Average* DC current fault trip is set to 7.5A per PA module.

AC Voltage: High voltage power supply transformer SECONDARY AC voltage measured on Power Supply Controller board. Nominal secondary voltage for **DAX-1 & DAX-3** is 240Vrms.

Nominal secondary for **DAX-1 & DAX-3** is 240Vrms. Trip points are set to +13%/-18%.

NOTE:
AC Voltage calibration is available using **(1)** on VT100 page 5 (see "6.2.2.5 VT100 - Page 5" on page 6-16).

Frequency: Transmitter Carrier frequency. This is set using **(A)** on VT100 page 5 (see "6.2.2.5 VT100 - Page 5" on page 6-16).

Digital On/Off: Indication of audio input mode. If ON: DIGITAL AM MAG and DIGITAL PHASE INPUTs are being used as source of audio and carrier. When OFF: ANLG AUDIO input and either internal or external RF Carrier are being used as source of audio and carrier.

Remote Enable: Indicates either ON: Remote enabled, or OFF: Remote disabled.

ePDM Frequency: Indicates the PDM frequency utilized in the transmitter. This frequency is dependent on carrier frequency with the range being 150kHz – 200kHz.

10MHz Int/Ext: INT: Indicates that either the internal +/- 2 PPM 10MHz oscillator is used as the frequency reference. EXT: Indicates that an externally supplied 10MHz reference oscillator is being used via the 10MHz INPUT.

Filter Band: Indicates whether Band A, B, or C filter board is installed on the Exciter/ Controller. The frequency bands are set:

- Band A – 529kHz – 759kHz
- Band B – 760kHz – 1109kHz
- Band C – 1110kHz – 1705kHz

Exciter/IO Rev: Indicates the board revisions for the Exciter/Controller board / External I/O board.

SW Rev: Indicates the present software revision installed in the transmitter Exciter/ Controller board.

Fan 1, 2: Indicates the actual fan speed of the transmitter cooling fans. Normal operation is approximately 100Hz. Fault occurs below 80 Hz.

6.2.2.1.2 CURRENT STATUS

PA 1 - 6: Indication of PA module status. Possible indications are: NA (Not Available) indicating PA module not installed, OK indicating no faults present on PA module, or FAULT.

Exciter: Indication of Exciter/Controller board status. Status can be OK or FAULT.

EXT IO: Indication of External I/O board status. Status can be OK or FAULT.

Foldback: ON: Indicates the transmitter has lowered output power due to high reflected power (VSWR) in the transmitter. OFF: Normal operation.

Mute: When MUTE is displayed, indicates the output power of the transmitter has been muted. OK indicates normal operation.

Interlock: When INTLK is displayed, indicates either an internal PA interlock, output monitor interlock, or external interlock is present. OK indicates normal operation.

Tail Biter: Tail Biter is an optional distortion reduction technique utilized in the transmitter. When ON, indicates this option is installed. Status is ON or OFF.

Ideal Range: The HVPS in the transmitter is varied to optimize the dynamic range of the enhanced PDM circuitry. When the DAX is operating in this optimum dynamic range, a YES indication is displayed.

If NO is displayed, reset the power level via the procedure outlined in section "3.3.3.3 To Set Desired RF Power Output Level" on page 3-5.

Time: The total-time meter of the transmitter is shown in hours:minutes:seconds in this display. The time presented indicates the time that the transmitter is powered, *NOT transmitter ON time.*

Security Key: NA indicates the optional Security Key is not installed on the PA Motherboard. When installed, the Security Key enables advanced correction, digital mode operation, and distortion reduction techniques in the transmitter. Display is NA or OK.

6.2.2.1.3 METERS

Exhaust Temp: Temperature measured on the Output Monitor board. Temperature Fault (OM TEMP) occurs at 62° C.

V+ DTG: Dead Time Generator adjustment voltage measured on the Exciter/ Controller. This voltage directly corresponds to the transmitter carrier frequency setting. Scaling is 1V per 100kHz.

V+ ePDM: Enhanced PDM adjustment voltage measured on the Exciter/Controller. This voltage directly corresponds to the ePDM frequency. V+ePDM = (F_{ePDM} – 150kHz)*(2/50kHz) + 6

+48: DC voltage used to drive the PA chopper FETs, Exciter/Controller DTG, Output Monitor circuitry, and cooling fans. Monitoring of fault condition is set at +/-10%.

+12: DC control voltage used for the PA modules, External I/O, Exciter/Controller, and Output Monitor circuitry. Monitoring of fault condition is set at +/-10%.

-12: DC control voltage used for the PA modules, External I/O, Exciter/Controller, and Output Monitor circuitry. Monitoring of fault condition is set at +/-10%.

+5: DC logic voltage used for the External I/O, and Exciter/Controller boards. Monitoring of fault condition is set at +/-10%.

-5: DC voltage used for the Exciter/Controller board. Monitoring of fault condition is set at +/-10%.

+3.3: DC logic voltage used for the External I/O, and Exciter/Controller boards. Monitoring of fault condition is set at +/-10%.

+1.8: DC logic voltage used for the External I/O, and Exciter/Controller boards. Monitoring of fault condition is set at +/-10%.

RFLD PWR Trip: Reflected power trip adjustment voltage set on the Exciter/ Controller. When set up correctly, this voltage corresponds to a reflected power trip of 100W (peak) per PA.

6.2.2.2 VT100 - Page 2

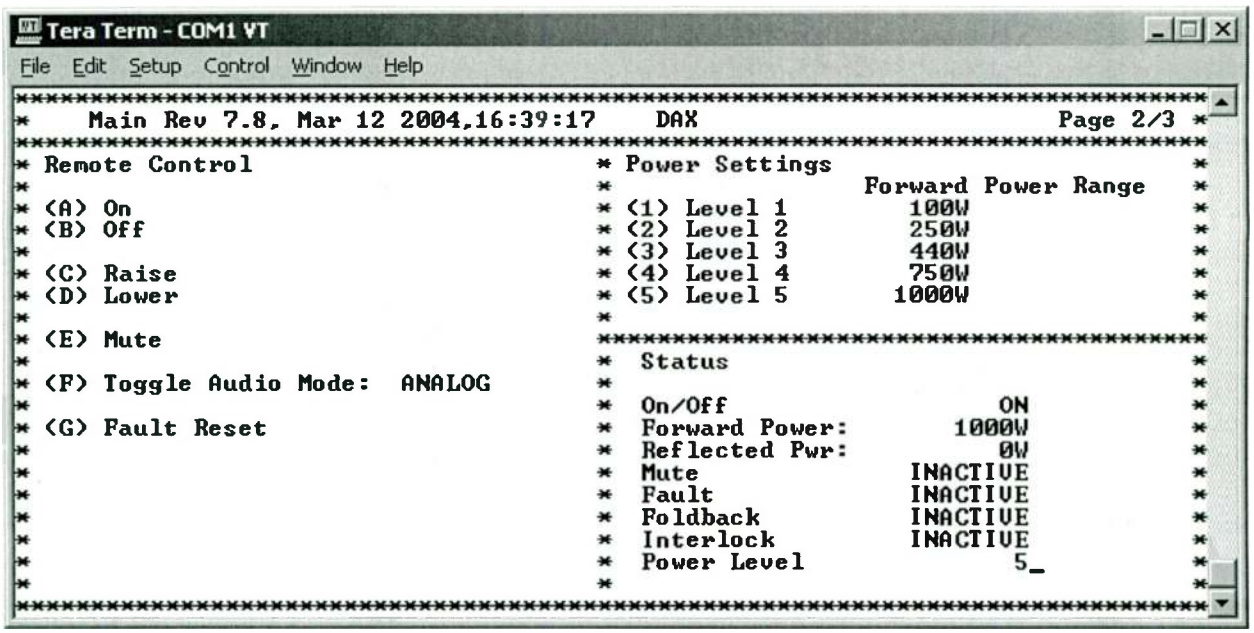


Figure 6-4
VT100 Page 2 View

6.2.2.2.1 *Remote Control*

NOTE:
All remote functions with the exception of **(B)** Off and **(E)** Mute are ignored when the transmitter user interface Remote Enable is OFF.

(A) On: Pressing '**A**' will turn the transmitter ON.

(B) Off: Pressing '**B**' will turn the transmitter OFF.

(C) Raise: Pressing '**C**' will raise the output power of the transmitter.

(D) Lower: Pressing '**D**' will lower the output power of the transmitter.

(E) Mute: Pressing '**E**' will mute the transmitter.

(F) Toggle Audio Mode: Pressing '**F**' will change the audio input mode selection from ANALOG to DIGITAL and vise versa.

(G) Fault Reset: Pressing '**G**' will reset any faults present in the transmitter.

(H) Primary PA *(DAX-1R only)*: Allows switching of on-air PA module. '**A**' selects bottom PA as primary, '**B**' selects top PA as primary.

NOTE:
The actual switching of PAs does not take place until the DAX transmitter is restarted, which can simply be pushing the ON button while the transmitter is running.

6.2.2.2.2 Power Settings

(1) Level 1: Pressing '**1**' changes the transmitter power setting to Level 1.

(2) Level 2: Pressing '**2**' changes the transmitter power setting to Level 2.

(3) Level 3: Pressing '**3**' changes the transmitter power setting to Level 3.

(4) Level 4: Pressing '**4**' changes the transmitter power setting to Level 4.

(5) Level 5: Pressing '**5**' changes the transmitter power setting to Level 5.

NOTE:
To set the Power Level *range* see "6.2.2.4 VT100 - Page 4" on page 6-12

6.2.2.2.3 Status

On/Off: Indicates status of transmitter for remote. Display is either ON or OFF.

Forward Power: Indicates transmitter output power.

Reflected Pwr: Indicates transmitter reflected power.

Mute: When ACTIVE is displayed, indicates the output power of the transmitter has been muted. INACTIVE indicates normal operation.

Fault: When ACTIVE, indicates a fault present on the transmitter.

Foldback: When ACTIVE, indicates the transmitter has lowered output power due to high reflected power. INACTIVE is normal operation.

Interlock: When ACTIVE, indicates either a PA interlock or external interlock condition is present. INACTIVE is normal operation.

Power Level: Indicates the Power Level selected. Displays **1, 2, 3, 4,** or **5.**

6.2.2.3 VT100 - Page 3

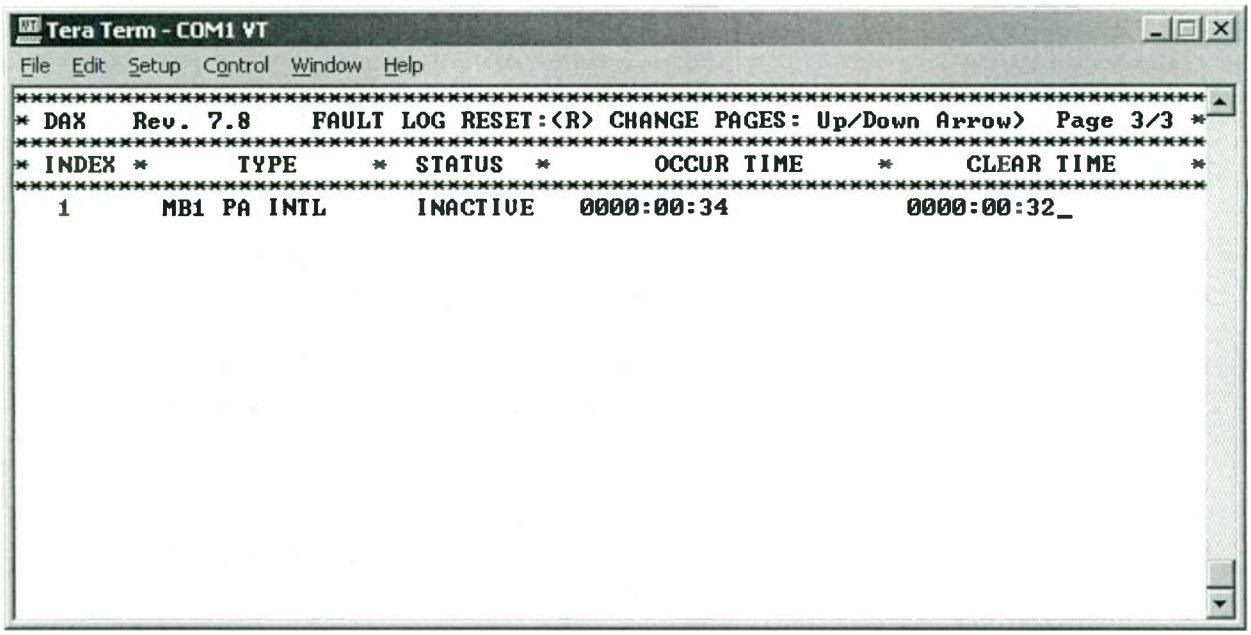


Figure 6-5
VT100 Page 3 View - Fault Log

NOTE:
See "6.4 Fault Log Listing" on page 6-27 of this chapter to view the complete listing of possible DAX transmitter faults. This table also includes a description of each fault and an explanation of the transmitter's response to the fault.

INDEX – Up to 75 faults can be logged into the circular fault log. When 75 has been reached the oldest fault will be discarded when a new fault occurs.

TYPE – Indicates the name of the fault logged.

STATUS – Indicates whether the fault is still present (ACTIVE), or is no longer present (INACTIVE).

OCCUR TIME – Logs when the fault occurred relative to the present time. Example: If the occur time is 0002:10:00 the fault occurred 2 hours and 10 minutes ago.

CLEAR TIME - Logs when the fault cleared relative to the present time. Ex. If the clear time is 0002:01:00 the fault occurred 2 hours and 1 minutes ago.

NOTE:
Note that pressing '**R**' resets the fault log. Pressing UP/DOWN arrow keys scroll thru the fault log.

6.2.2.4 VT100 - Page 4

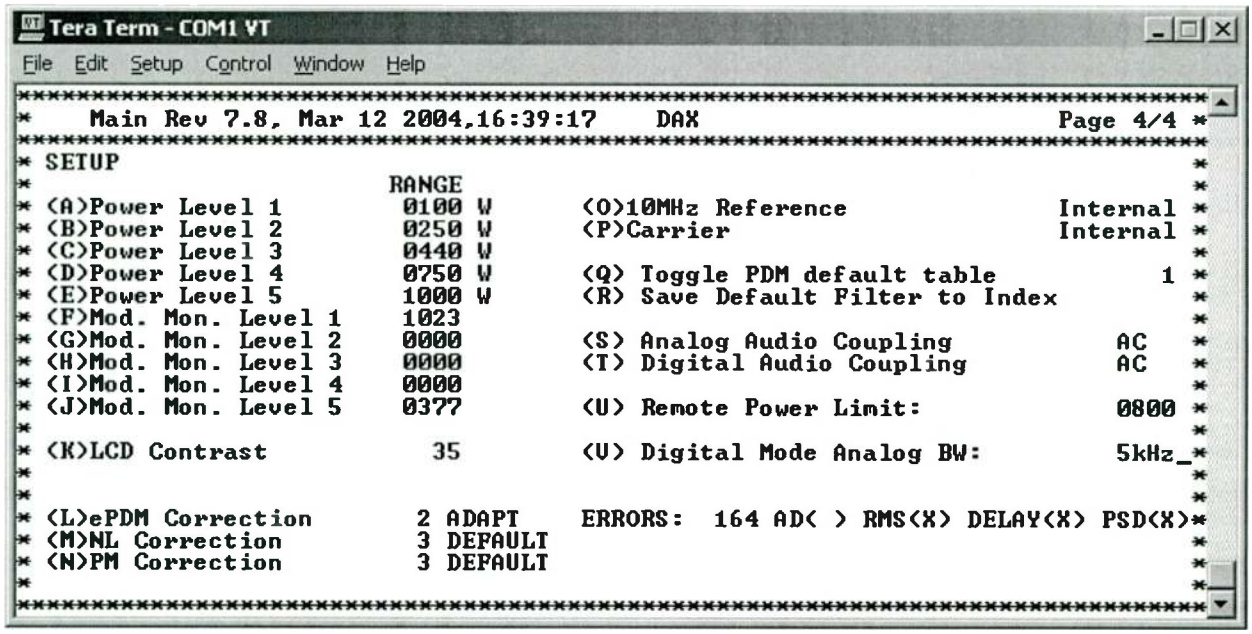


Figure 6-6
VT100 Page 4 View

6.2.2.4.1 SETUP

(A) Power Level 1: Pressing '**A**' will allow the user to raise or lower the desired power range setpoint for Power Level 1 using the UP/DOWN arrow keys.

(B) Power Level 2: Pressing '**B**' will allow the user to raise or lower the desired power range setpoint for Power Level 2 using the UP/DOWN arrow keys.

(C) Power Level 3: Pressing '**C**' will allow the user to raise or lower the desired power range setpoint for Power Level 3 using the UP/DOWN arrow keys.

(D) Power Level 4: Pressing '**D**' will allow the user to raise or lower the desired power range setpoint for Power Level 4 using the UP/DOWN arrow keys.

(E) Power Level 5: Pressing 'E' will allow the user to raise or lower the desired power range setpoint for Power Level 5 using the UP/DOWN arrow keys.

(F) Mod. Mon. Level 1: Pressing 'F' will allow the user to raise or lower the Mod Monitor output signal on the External I/O board BNC connector when the transmitter is ON in Power Level 1. The UP/DOWN arrow keys are used raise/lower the output signal.

(G) Mod. Mon. Level 2: Pressing 'G' will allow the user to raise or lower the Mod Monitor output signal on the External I/O board BNC connector when the transmitter is ON in Power Level 2. The UP/DOWN arrow keys are used raise/lower the output signal.

(H) Mod. Mon. Level 3: Pressing 'H' will allow the user to raise or lower the Mod Monitor output signal on the External I/O board BNC connector when the transmitter is ON in Power Level 3. The UP/DOWN arrow keys are used raise/lower the output signal.

(I) Mod. Mon. Level 4: Pressing 'I' will allow the user to raise or lower the Mod Monitor output signal on the External I/O board BNC connector when the transmitter is ON in Power Level 4. The UP/DOWN arrows are used raise/lower the output signal.

(J) Mod. Mon. Level 5: Pressing 'J' will allow the user to raise or lower the Mod Monitor output signal on the External I/O board BNC connector when the transmitter is ON in Power Level 5. The UP/DOWN arrow keys are used raise/lower the output signal.

(K) LCD Contrast: Pressing 'K' will allow the user to change the contrast of the transmitter LCD interface using the UP/DOWN arrow keys.

(L) ePDM Correction: Pressing 'L' allows the operator to invoke the optional adaptive PDM filter correction when the Security Key is installed. When in ADAPT mode, the Digital Signal Processor (DSP) on the Exciter/Controller monitors key parameters of the transmitter output signal to optimize frequency and amplitude response in addition to keeping a fixed-delay audio path thru the transmitter. Prior to taking any action on the signal, however, the DSP ensures the following:

- AD( ): Signal has not saturated the feedback PDM Sample A/D converter
- RMS( ): Signal has adequate signal amplitude
- DELAY( ): Relative signal delay is within limits
- PSD( ): Signal has adequate frequency content

If any of the above conditions are not satisfied an **X** will be displayed in the associated parenthesis and the equalization filter will remain unchanged. When all conditions are satisfied the ePDM equalization filter is updated.

Selections for ePDM correction are ADAPT, HOLD, DEFAULT, and BYPASS.
ADAPT is the normal run mode of continuous correction
HOLD will stop the filter adaptation and keep the present equalization filter in effect. The equalization filter, however, will be lost on an interruption of AC power.
DEFAULT retrieves the saved PDM filter from the selected non-volatile ePDM Default Table. This filter will be restored upon reapplication of AC power.
BYPASS will disable all ePDM filter correction.

(M) NL Correction: Pressing '**M**' will allow the user to enable (DEFAULT) or disable (BYPASS) transmitter non-linear correction. The NL Correction (also referred to as AM2AM Correction) can only be enabled when the Security Key is installed. The non-linear characteristics of the transmitter are calculated by the DSP during an off-line automated training process invoked by using (**K**) on page 5 of the VT100 (see "6.2.2.5 VT100 - Page 5" on page 6-16).

(N) PM Correction: Pressing '**N**' will allow the user to enable (DEFAULT) or disable (BYPASS) transmitter phase modulation correction. The PM Correction (also referred to as AM2PM Correction)can only be enabled when the Security Key is installed. The phase modulation characteristics of the transmitter are calculated by the DSP during an off-line automated training process invoked by using (**K**) on page 5 of the VT100 (see "6.2.2.5 VT100 - Page 5" on page 6-16).

(O) 10MHz Reference: Pressing '**O**' toggles the frequency reference selection between internal +/- 2 PPM 10MHz oscillator, or an external 10MHz reference oscillator via the 10MHz INPUT connector (BNC) on the External I/O board.

(P) Carrier: Pressing '**P**' toggles the carrier selection for Analog Mode between internal synthesizer, or an external Carrier signal via the CARRIER INPUT connector (BNC) on the External I/O board.

NOTE:
For Digital Mode, an external digital phase signal via the DIGITAL PHASE INPUT connector (BNC) on the External I/O must be used.

(Q) Toggle PDM default table: Pressing '**Q**' steps to the next table of the ePDM filter default tables. 4 tables can be stored and are used when the ePDM Correction is set to the DEFAULT mode.

(R) Save Default Filter to Index: When the ePDM Correction is in ADAPT mode, pressing '**R**' will store the present ePDM equalization filter to the Default Filter table whose index is set by (**Q**) above.

(S) Analog Audio Coupling: Pressing '**S**' will toggle between AC and DC coupling of the input analog audio signal. In Analog mode set to AC coupling for normal operation.

(T) Digital Audio Coupling: Pressing 'T' will toggle between AC and DC coupling of the input DIGITAL AM MAG signal. For IBOC Digital mode set to AC coupling for normal operation.

(U) Remote Power Limit: Remote power limit establishes the maximum output power of the transmitter when the RMT POWER LIMIT SEL input on the External I/O customer interface is active. Pressing 'U' will allow the user to raise or lower the power limit using the UP/DOWN arrow keys.

(V) Digital Mode Analog BW: Digital Mode Analog Bandwidth sets the amount of frequency content required for the adaptive ePDM filter correction to equalize. This setting must match the Analog Modulation bandwidth setting in the DEXSTAR exciter or audio processor. Pressing (V) toggles between 5kHz, 8kHz, and DRM.

IMPORTANT:
This setting is critical for the ePDM Correction to operate properly. Selection of 5kHz, 8kHz or DRM is available, and must be made before the "training" process which is accessed via the VT100 Page 5 (**K**) prompt and described in "6.2.2.5.1 SETUP" on page 6-16 below.

6.2.2.5 VT100 - Page 5

CAUTION:
CHANGING PARAMETERS ON THIS PAGE CAN CAUSE PERMANENT DAMAGE TO THE TRANSMITTER IF SUBSEQUENT PROPER SETUP PROCEDURES ARE NOT PERFORMED.

NOTE:
This section is primarily for informational purposes only. The only parameters that might be altered would be those indicated as part of a procedure described within this manual.

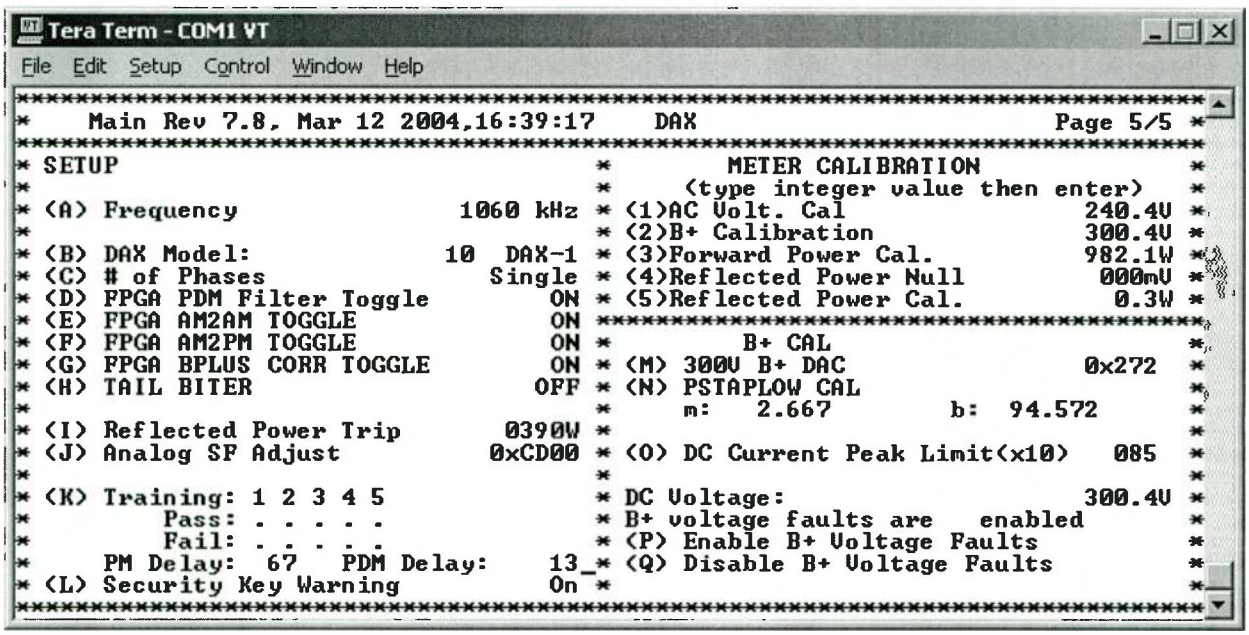


Figure 6-7
VT100 Page 5 View

6.2.2.5.1 SETUP

(A) Frequency: Pressing 'A' will allow the user to raise or lower the desired carrier frequency for the transmitter using the UP/DOWN arrow keys. When the carrier frequency is changed, an output filter alignment, exciter alignment, and potential change of the Exciter/Controller FD Filter Board is required.

WARNING: Disconnect primary power prior to servicing.

(B) DAX Model: Pressing '**B**' will allow the user to change the model of the transmitter using the UP/DOWN arrow keys. Selection of DAX-6, DAX-5, DAX-3, DAX-1, and DAX-1R is available.

(C) # of Phases: Allows the user to specify the transmitter AC input phase as either Single or Three. Changing the # of phases requires the user to recalibrate the Power Supply Low Tap Calibration using (**N**) PSTAPLOW CAL on VT100 page 5 (described below).

(D) FPGA PDM Filter Toggle: Pressing '**D**' allows the user to enable (ON) or disable (OFF) the ePDM Correction equalization filter. This setting, if OFF, overrides any mode setting for ePDM Correction mode on (**L**) ePDM Correction on VT100 page 4 (see "6.2.2.4 VT100 - Page 4" on page 6-12). Normal operation is ON.

(E) FPGA AM2AM TOGGLE: Pressing '**E**' allows the user to enable (ON) or disable (OFF) the NL Correction (also referred to as AM2AM correction). This setting, if OFF, overrides any mode setting for NL Correction mode on (**M**) NL Correction on VT100 page 4 (see "6.2.2.4 VT100 - Page 4" on page 6-12). Normal operation is ON.

(F) FPGA AM2PM TOGGLE: Pressing '**F**' allows the user to enable (ON) or disable (OFF) the PM Correction (also referred to as AM2PM correction). This setting, if OFF, overrides any mode setting for PM Correction mode on (**N**) PM Correction on VT100 page 4 (see "6.2.2.4 VT100 - Page 4" on page 6-12). Normal operation is ON.

(G) FPGA BPLUS CORR TOGGLE: Pressing '**G**' allows the user to enable (ON) or disable (OFF) the HVPS Correction (also referred to as BPLUS Correction). HVPS correction compensates for low frequency ripple and droop on the high voltage power supply. Normal operation is ON.

(H) TAIL BITER: Pressing '**H**' allows the user to enable (ON) or disable (OFF) the optional distortion reduction technique (Tail Biter) utilized in the transmitter. With the Security Key installed, normal operation is ON.

(I) Reflected Power Trip: Pressing '**I**' allows the user to raise or lower the *average* reflected power trip point calculated in the DSP. Factory setting is 70W per PA module. Example: For a DAX-3 transmitter the user should enter 210W.

(J) Analog SF Adjust: Pressing '**J**' allows the user to raise or lower the Analog Scale Factor Adjustment. This adjustment compensates for modulation losses from low power to high power operation. To perform adjustment set the transmitter to lowest power setting and apply 90% modulation using external source or internal test tone generator. Set modulation monitor to 100% level, and verify 90% modulation. Change transmitter power setting to highest power setting, set modulation monitor level to 100%, and adjust Analog SF Adjust using the UP/DOWN arrow keys until 90% modulation is achieved.

(K) Training: 1 2 3 4 5: Pressing **'K'** initiates the automated off-line training sequence for NL (AM to AM) & PM (AM to PM) correction.

NOTE:
Prior to training, the user should have stored the range setpoints for all 5 power levels and terminated the transmitter into a dummy load. The training sequence requires approximately 2-3 minutes to complete.

The training sequence will switch to internal waveform generation mode where a series of different waveforms are modulated, and the output of the transmitter at each power level is evaluated to determine timing delays as well as AM/AM and AM/PM characteristics. For each power level a pass (P) or fail (F) indication will be temporarily displayed. Should a power level fall below the minimum required for reliable adaptation, a B is displayed indicating the particular power level has been bypassed.

PM Delay: xx and **PDM Delay: xx:** This is the correlation delay result for factory troubleshooting use only

(L) Security Key Warning: The Security Key for DAX series transmitters is installed onto the PA Motherboard and allows advanced correction, digital mode, and distortion reduction technique options to be activated. When a Security Key option is installed, the factory setup procedure enables the Security Key Warning (ON). In the event of a Security Key hardware failure the transmitter will display a Security Key 'NA' on VT100 page 1 (see "6.2.2.1 VT100 - Page 1" on page 6-5), but allows the advanced features to remain enabled for a 7 day grace period. Upon expiration of the 7 days, all options are disabled until a valid response from the Security Key is received.

If this is toggled OFF and the Security Key fails there will simply be no GUI notification as the 7 days pass and the options become disabled.

6.2.2.5.2 METER CALIBRATION

(1) AC Volt. Cal: Pressing **'1'** allows the user to enter the Secondary AC voltage (via the numeric keypad) calibration as measured on the HVPS transformer secondary.

(2) B+ Calibration: Pressing **'2'** allows the user to enter the HVPS B+ voltage calibration.

NOTE:
(Q) Disable B+ Voltage Faults, below, allows the B+ fault to be temporarily masked in the event an incorrect calibration is entered and the transmitter will not remain in the ON state.

(3) Forward Power Cal.: Pressing **'3'** allows the user to calibrate the forward power displayed on both the transmitter user interface and the VT100.

(4) Reflected Power Null: Pressing '**4**' allows the user to enter a voltage offset to compensate for any bias voltage present on the reflected power detector. Factory use only

(5) Reflected Power Cal.: Pressing '**5**' allows the user to calibrate the reflected power displayed on both the transmitter user interface and the VT100.

6.2.2.5.3 B+ CAL

(M) 300V B+ DAC: Pressing '**M**' allows the user to adjust the HVPS B+ voltage to 300Vdc when in the high transformer tap. After pressing '**M**' the user can raise or lower the B+ supply voltage using the UP/DOWN arrow keys.

(N) PSTAPLOW CAL: Pressing the '**N**' allows the user to initiate the off-line Power Supply Tap Low Calibration. This calibration allows the DSP to linearize the low tap voltage command.

m: and **b:** Result #s for factory troubleshooting use only.

(O) DC Current Peak Limit(x10): Pressing '**O**' allows the user to adjust the instantaneous DC current trip point. Factory set to 9.0A per PA module.

DC Voltage: Displays the HVPS B+ voltage during B+ calibration.

B+ voltage faults are: Indicates the present B+ fault mask setting. Displays either 'enabled' (normal operation) or 'disabled'(masked, for B+ calibration only).

(P) Enable B+ Voltage Faults: Pressing '**P**' allows the user to re-enable the B+ voltage fault.

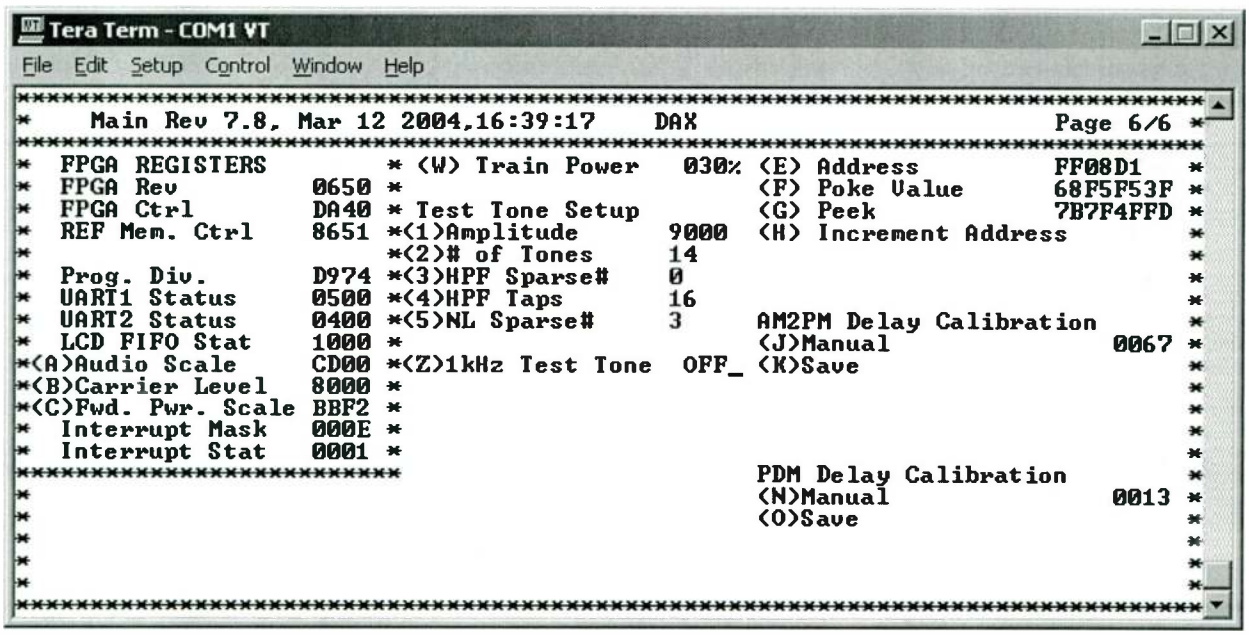
(Q) Disable B+ Voltage Faults: Pressing '**Q**' allows the user to disable the B+ voltage fault. *For use during B+ calibration only.*

NOTE:
This mask will expire upon interruption of AC power, or after 10 minutes of operation.

6.2.2.6 VT100 - Page 6

CAUTION:
CHANGING PARAMETERS ON THIS PAGE CAN CAUSE PERMANENT DAMAGE TO THE TRANSMITTER IF SUBSEQUENT PROPER SETUP PROCEDURES ARE NOT PERFORMED.

NOTE:
This section is primarily for informational purposes only. The only parameters that might be altered would be those indicated as part of a procedure described within this manual.



NOTE:
To access page 6 of the VT100 programming: *From page 5*, press and hold your keyboard's "Ctrl key, then press "z". From that point on during this session, you will have access to this page by using the left/right arrow keys to page through all VT100 screens.

6.2.2.6.1 FPGA REGISTERS

FPGA Rev: Displays the present version, then revision, of the Field Programmable Gate Array (FPGA) firmware.

- Example: 0620 is version 62 revision 0.

FPGA Ctrl: Internal FPGA Control Register. Displayed as an aid in troubleshooting only.

REF Mem. Ctrl: Internal FPGA Reference Memory Controller register. Displayed as an aid in troubleshooting only.

Prog.. Div.: Internal FPGA Programmable Divide register. Displayed as an aid in troubleshooting only.

UART1 Status: Internal FPGA Universal Asynchronous Receiver/Transmitter (UART) register. Displayed as an aid in troubleshooting only.

UART2 Status: Internal FPGA Universal Asynchronous Receiver/Transmitter register. Displayed as an aid in troubleshooting only.

LCD FIFO STAT: Internal FPGA LCD FIFO Status register. Displayed as an aid in troubleshooting only.

(A) Audio Scale: Pressing **'A'** allows the user to increase or decrease the gain applied to the audio A/D input using the UP/DOWN arrow keys. In normal operation this setting is calculated by the DSP to provide consistent modulation across the power levels.

(B) Carrier Level: Pressing **'B'** allows the user to increase or decrease the internal carrier level added to the scaled audio input using the UP/DOWN arrow keys. In normal operation set to 8000.

(C) Fwd. Pwr. Scale: Pressing **'C'** allows the user to raise or lower output power of the transmitter by scaling the FPGA internal audio+DC signal using the UP/DOWN arrow keys. This register is changed using the transmitter user interface Raise and Lower push buttons, serial remote control, or customer I/O raise and lower.

Interrupt Mask: Internal FPGA Interrupt Mask register. Displayed as an aid in troubleshooting only.

Interrupt Stat: Internal FPGA Interrupt Status register. Displayed as an aid in troubleshooting only.

(W) Train Power: Pressing **'W'** allows the user to raise or lower the percentage of the maximum power setting used during the off-line automated NL and PM Correction training using the UP/DOWN arrow keys. In normal operation set to 030%.

6.2.2.6.2 Test Tone Setup

(1) Amplitude: Pressing '**1**' allows the user to raise or lower the level of modulation of the test tones used in the off-line training sequence using the UP/DOWN arrow keys. In normal operation set to 9000.

(2) # of Tones: Pressing '**2**' allows the user to raise or lower the number of test tones used in the off-line training sequence using the UP/DOWN arrow keys. In normal operation set to 14.

(3) HPF Sparse #: Pressing '**3**' allows the user to increase or decrease the length of equalization filter by inserting sparse taps between the filter taps used to estimate the transmitter output filter during the off-line NL and PM Correction training sequence. This equalization filter compensates the RF Sample feedback signal for amplitude and frequency response prior to being used to estimate the NL and PM characteristics. In normal operation set to 0.

(4) HPF Taps: Pressing '**4**' allows the user to increase or decrease the number of digital filter taps used to estimate the output filter response during the off-line NL and PM correction training sequence. In normal operation the HPF Taps are set to:
32 for DAX-5 & 6 models
16 for DAX-1, 3 & 1R models

(5) NL Sparse #: Pressing '**5**' allows the user to increase or decrease the number of sparse taps inserted between the four 5^{th}-order polynomials used to correct the nonlinear characteristics of the transmitter. In normal operation set to 3.

(Z) 1kHz Test Tone: Pressing '**Z**' allows the user to enable the built-in pattern generator which disables the audio input and outputs a 1kHz 90% modulation tone. This tone is typically used to setup the feedback samples on the Exciter/Controller.

(E) Address: Pressing '**E**' allows the user to enter a hexadecimal DSP address used to peek and poke data in the DSP memory map. This feature is used for debug and troubleshooting only and can cause improper operation of transmitter if improperly used.

(F) Poke Value: Pressing '**F**' allows the user to enter a hexadecimal data value to be stored at the DSP address in (**E**) above. This feature is used for debug and troubleshooting only and can cause improper operation of transmitter if improperly used.

(G) Peek: Pressing '**G**' allows the user to read a hexadecimal data value stored at the DSP address in (**E**) above.

(H) Increment Address: Pressing '**H**' increments the hexadecimal DSP address in (**E**) above.

6.2.2.6.3 AM2PM Delay Calibration

(J) Manual: Pressing '**J**' allows the user to adjust the AM/PM (PM Correction) delay in the Exciter/Controller. This delay compensates for the inherently longer delay in the audio path with respect to the carrier delay thru the transmitter and allows the phase correction based on amplitude to re-align with the amplitude at the PA module. Manual delay adjustment is typically not necessary as the DSP calculates the delay during the off-line NL and PM Correction training sequence.

(K) Save: Pressing '**K**' allows the user to save the manual AM2PM delay adjustment made in (**J**) above to non-volatile memory.

6.2.2.6.4 PDM Delay Calibration

(N) Manual: Pressing '**N**' allows the user to adjust the ePDM equalization filter delay in the Exciter/Controller. This delay selects the digital filter tap used to time-correlate the reference memory with the RF Sample memory during ePDM equalization filter estimation. Manual delay adjustment is typically not necessary as the DSP calculates the delay during the off-line NL and PM Correction training sequence and will hold this delay constant.

(O) Save: Pressing '**O**' allows the user to save the manual ePDM delay adjustment made in (**N**) above to non-volatile memory.

6.3 General Troubleshooting Information

6.3.1 Schematics, Wiring and Block Diagrams

The following Harris schematic and signal name conventions apply:

- Active Low = "/" - A signal name preceded by the forward slash is an active low.

Example: /TEMP_FAULT means the Temp Fault signal is active when at a low state (also known as TEMP_FAULT 'not', or TEMP_FAULT 'bar').

- Schematic Continuation - A square block ending point of a named signal, accompanied by a number-forward slash-letter-number is an indication of that signal continuing on to another page of schematic.

Example: AUDIO 14/D1 - Indicates that the AUDIO signal will continue to page 14 of same numbered schematic at a point where the X coordinate 'D' meets the Y coordinate '1'.

- LEDs used to display a given condition when illuminated are designated as DS(*n*), with (*n*) indicating the LED's designator value as shown on the board's schematic and silkscreen.

Example: DS4 is the *Analog Mode Selected* LED, indicating the Analog Mode is currently selected when it is illuminated (External I/O board).

6.3.2 3-Strike Routine

The 3-Strike type fault routine will be started when a certain fault occurs 3 times within a 10 second time frame, or is a constant fault for 10 seconds. Upon this first 'strike' the DAX will temporarily mute, then simultaneously ramp back up to previous power level while starting a 10 second timer. If the fault re-occurs 3 times or continuously during this 10 seconds, a 2nd 'strike' will be issued following the same routine as previously described. If the fault continues during this next 10 second period, the 3-Strike routine will shut the transmitter off, requiring a manual re-start.

NOTE:
A VSWR related 3-Strike Routine is 3 strikes within a 5 second time frame, initiating a foldback routine.

6.3.3 Foldback Routine

For foldback type fault conditions, a 3-Strike routine triggers a 10% power reduction. If the faulting condition continues to exist, a second 3-Strike routine triggers another 10%

power reduction. This series of events will continue until 20% of TPO is reached, at which time the DAX transmitter will be faulted off.

If, at some time during the foldback process - but before the DAX is shut down, the fault condition clears, the transmitter will begin a ramping up process. If the ON, OFF, RAISE or LOWER buttons are pressed the foldback condition will clear.

6.3.4 Turn DAX On With No RF Power Output

Under certain conditions it may be desirable to turn the DAX on with high voltage on but no RF power being output. This will allow for a slow ramp-up of power if necessary.

STEP 1 From either an OFF or ON state, simultaneously press and hold both RAISE and LOWER buttons for 5 seconds

STEP 2 Turn DAX transmitter ON, if OFF

STEP 3 Slowly ramp power back up with short presses of the RAISE button, as needed

6.3.5 On-Air PA Module Service

NOTE:
The following chart shows the theoretical maximum power output levels with 1 failed PA.

Table 6-1 Maximum RF Power Output With 1 Failed PA

Transmitter	Maximum RF Power Output
DAX-5	3680W
DAX-6	4861W

IMPORTANT:
For normal PA module service, it is recommended that the transmitter be temporarily turned OFF before the module is reinserted.

If on-air service is required, follow the on-air module service procedure below to mitigate risk of secondary transmitter damage (if blown fuses have been replaced with new fuses *but the underlying fault conditions still exist on the PA module*, equipment damage will result as the module is being inserted into a transmitter that is ON).

6.3.5.1 Module Replacement: Spare PA Module.

One PA module may be removed temporarily while the transmitter is on-air. Once the key card is inserted a timer starts, allowing 5 minutes of DAX operation. After 5 minutes it will be faulted OFF if a module is not reinserted *and the key card removed.*

STEP 1 A simple DC resistance check must be performed on PA modules prior to insertion into a transmitter while the PA voltage is ON. With an Ohmmeter, check resistance between the PA fuse, F1, and the drain of FET (center pin). A slot is provided in the cover of the PA module to access this point. Ensure resistance is greater than 5k Ohms.

STEP 2 Insert PA module key card in slot BELOW module to be removed - PA Module LED will turn amber

STEP 3 Unscrew right and left thumbscrews

STEP 4 Remove module

STEP 5 Install PA module verified in STEP 1 and tighten thumbscrews

STEP 6 Remove PA module key card

NOTE:
PA module may take up to 45 seconds before soft start is complete and module turns ON.

6.3.5.2 Module Replacement: Spare PA Dummy Module

DAX-1R and DAX-3: For long-term removal of a single PA module (to avoid the transmitter being faulted off after 5 minutes), the supplied 'dummy' module will need to be inserted in place of the removed PA:

NOTE:
Once the key card is inserted a timer starts, allowing 5 minutes of DAX operation. After 5 minutes it will be faulted OFF if a module is not reinserted *and the key card removed.*

STEP 1 Insert provided PA module key card in slot BELOW module to be removed - PA Module LED will turn amber

STEP 2 Unscrew right and left thumbscrews

STEP 3 Remove module

STEP 4 Install Dummy Module and tighten thumbscrews

STEP 5 Remove PA module key card

6.4 Fault Log Listing

Table 6-2 DAX Faults Listing (in alphanumeric order)

NAME	DESCRIPTION	ACTION / INDICATION
+12V	Occurs with any *positive* voltage outside the **+13.2Vdc to +10.8Vdc range**	Transmitter turns off
-12V	Occurs with any *negative* voltage outside the **-13.2Vdc to -10.8Vdc range**	Transmitter turns off
+48V	Occurs with any voltage **above +52.8Vdc or below +43.2Vdc**	Transmitter turns off
+5V	Occurs with any voltage **above +5.5Vdc or below +4.5Vdc**	Transmitter turns off
+1.8V	Occurs with any voltage **above +1.98Vdc or below +1.62Vdc**	Transmitter turns off
+3.3V	Occurs with any voltage **above +3.63Vdc or below +2.97Vdc**	Transmitter turns off
10MHz DUTY	Occurs when the *currently selected* internal 10MHz clock, or external "10MHz Input" is beyond the **40%-60% duty cycle** limit	Transmitter mutes
AC VOLTAGE	HVPS secondary nominal voltage **range of +20%/-30%** has been exceeded **3-phase nominal = 260Vac** **Single-phase nominal = 265Vac**	Transmitter 3-strikes off requiring operator restart
AUDIO + CLIP	Pre-FPGA processor positive overload	Warning indication only - Check input signal level
AUDIO - CLIP	Pre-FPGA processor negative overload	Warning indication only - Check input signal level
AUDIO + OVFLW	Indicates the Audio AD converter has a positive overflow condition (internal math error)	Warning indication only - Check input signal level
AUDIO - OVFLW	Indicates the Audio AD converter has a negative overflow condition (internal math error)	Warning indication only - Check input signal level
B+ VOLTAGE	B+ Voltage: **Fixed 360V overvoltage threshold**, *or* nominal commanded **range of +20%/-30%** has been exceeded	Transmitter 3-strikes off requiring operator restart

WARNING: Disconnect primary power prior to servicing.

Table 6-2 DAX Faults Listing (in alphanumeric order)

NAME	DESCRIPTION	ACTION / INDICATION
CARR. DUTY	Occurs when the *currently selected* internal carrier, or external carrier ("Carrier Input" or "Digital Phase Input") is beyond the **40%-60% duty cycle** limit	Transmitter mutes
DC AMP PEAK	HVPS B+ DC *peak* current has exceeded the **9.0A per PA** factory set trip point	Transmitter 3-strikes off requiring operator restart
DC CURRENT	HVPS B+ *average* current calculated by the DSP has exceeded the **7.5A per PA** limit	Transmitter 3-strikes off requiring operator restart
DTG VOLTAGE	Indicates the Dead Time Generator DC voltage measured on the Exciter/Controller has exceeded the nominal voltage +/-10%. Normal scaling for the DTG is 1V per 100kHz carrier frequency	Transmitter 3-strikes off requiring operator restart
ePDM	Indicates the Advanced Pulse Duration Modulation (APDM) DC voltage measured on the Exciter/Controller has exceeded the nominal voltage +/-10%. Normal voltage scaling for the ePDM signal is: $(F_{ePDM} - 150kHz)*(2/50kHz) + 6$.	Warning only - Operator should reset power levels to attain maximum performance optimization
FAN DRIVE	Occurs if DAX is on, but Fan Drive command not enabled	Transmitter turns off
FAN FAULT	Multiple fan malfunction	Transmitter turns off
FAN WARN	1 or 2 fans malfunction (operating at **<80 Hz**)	Transmitter switches to low power: **44% of nameplate power**
FILTER BRD	Filter board is wrong range for current DAX frequency, or not installed	Transmitter mutes and turns off
KEY FAULT	Indicates Hot-Swap Key has been inserted for greater than 5 minutes	Transmitter turns off
MB(x) KEY IN	Hot-Swap Key is currently inserted for the motherboard (x) indicated	Warning on screen. Illuminates PA Module LED amber (after 5 minutes transmitter turns off)
MB(x) PA INTL	PA interlock condition on the motherboard (x) indicated	Illuminates Interlock LED on Front Panel
OM INTLOCK	Indication of Output Monitor interlock condition	Interlock LED illuminates and DAX is shut off

Table 6-2 DAX Faults Listing (in alphanumeric order)

NAME	DESCRIPTION	ACTION / INDICATION
OM TEMP	Temperature of Output Network has exceeded **62°C threshold**	Transmitter turns off
PA (x) BRIDGE	Faulted RF drive section for PA (x) indicated	Faults OFF PA module - Red LED indication
PA (x) KEY	Hot-Swap key is inserted for PA (x) indicated	PA LED will be amber
PA (x) MODLTR	Modulator output does not match/follow input for PA (x) indicated	Possible blown PA fuse
PA (x) OVRLAP	Bridge signal overlap for PA (x) indicated	Faults OFF PA module - Red LED indication
PA (x) TEMP	PA overtemperature fault for PA (x) indicated	Faults OFF PA module - Red LED indication
PDM + CLIP	Post-FPGA processor overload	Warning indication only - Check input signal level
PK RFLD POWER	*Peak* (instantaneous) reflected power trip **Trips at 100W *per PA Module***	Mutes transmitter, and if continuous initiates Foldback routine
PS FAULT	Summary fault derived from PS Controller faults. Also indication of PS Controller control cable disconnect.	See PS Controller for fault indication LEDs: - Phase loss (3-phase system) - Transformer overtemperature - Rectifier overtemperature
PS WARNING	PS Controller discharge circuit fuse failure	**WARNING:** *DC discharge fuse is blown possible high voltage remaining in cabinet!*
PWR LIMIT	Indicates a command for a power level greater than 115% of TPO has been requested (May be an indication of a failed PA)	Power reduced
REF 10MHz	Indication of a low amplitude "10MHz Input" signal **Threshold is <2.0Vpp**	Transmitter mutes
RF CARRIER	Indication of a low amplitude external RF carrier (*currently selected*: "Carrier Input" or "Digital Phase Input") signal **Threshold is <2.0Vpp**	Mutes transmitter
RLFD POWER	*Averaged* reflected power trip **Trips at 70W *per PA Module***	Mutes transmitter and, if continuous, initiates Foldback routine

WARNING: Disconnect primary power prior to servicing.

Table 6-2 DAX Faults Listing (in alphanumeric order)

NAME	DESCRIPTION	ACTION / INDICATION
S. KEY FLT	Security Key not present fault (7 day grace period timer has expired)	Turns off 4 performance functions: 1) Low power variable voltage capability (Any Power Level Range setting below 1/2 TPO will revert to 0W RF output) 2) DSP adaptive technology 3) Tail Biter circuitry 4) Digital mode capability
S. KEY WARN	Security Key not present warning	Warning on screen - Begins 7 day timer until Security Key Fault (above) occurs
TRAINING	DC voltage did not stabilize in time	Adaptive capability disabled - Restart suggested to try again
TURNON ERR	Transmitter was commanded to turn on but did not respond	Transmitter will not start - View Fault log

6.5 Power Supply System Troubleshooting

⚠ **WARNING:**
DISCONNECT PRIMARY POWER PRIOR TO SERVICING THE POWER SUPPLY SYSTEM OR THE POWER SUPPLY CONTROLLER BOARD.

This section is to further assist the technician in troubleshooting a probable power supply system malfunction. Refer to the DAX schematic package and the AC/DC Flow Block Diagrams, Figure 6-8 on page 6-31.

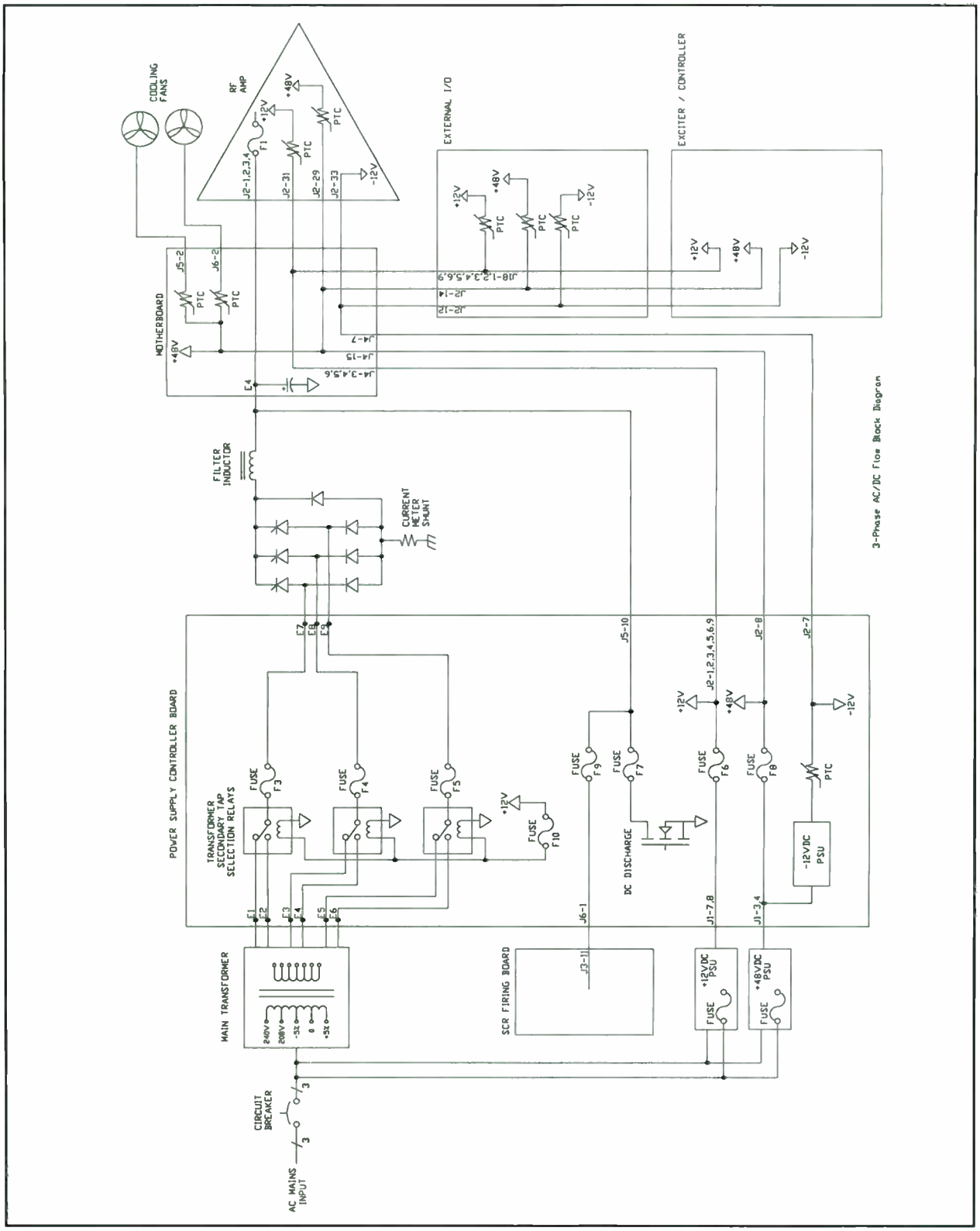


Figure 6-8
3-Phase AC/DC Flow Block Diagram

WARNING: Disconnect primary power prior to servicing.

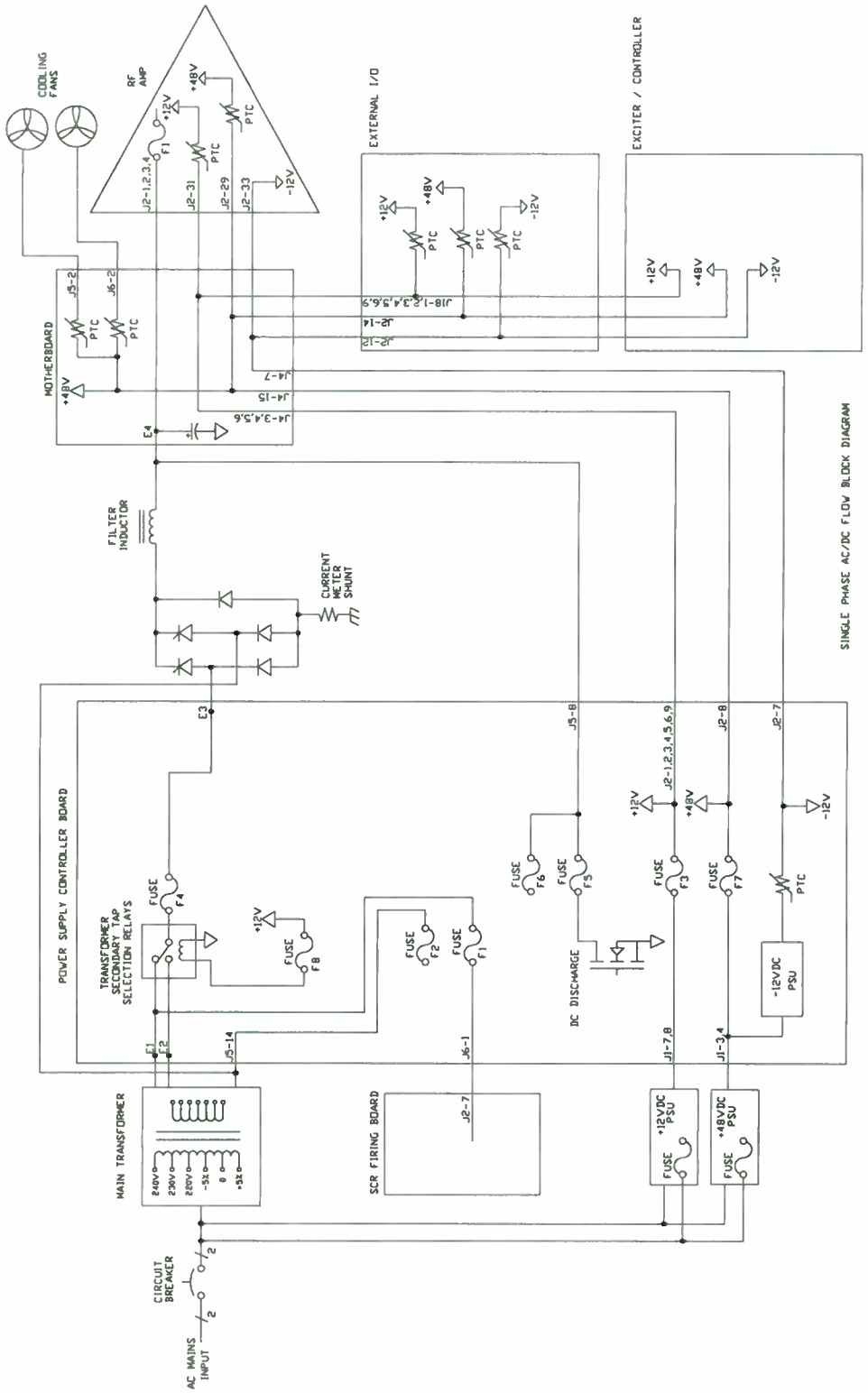


Figure 6-9
Single Phase AC/DC Flow Block Diagram

WARNING: Disconnect primary power prior to servicing.

6.6 PA Troubleshooting

This section is to further assist the technician in troubleshooting a probable RF power malfunction. Refer to the DAX schematic package. For PA Module removal see "6.3.5 On-Air PA Module Service" on page 6-25 above.

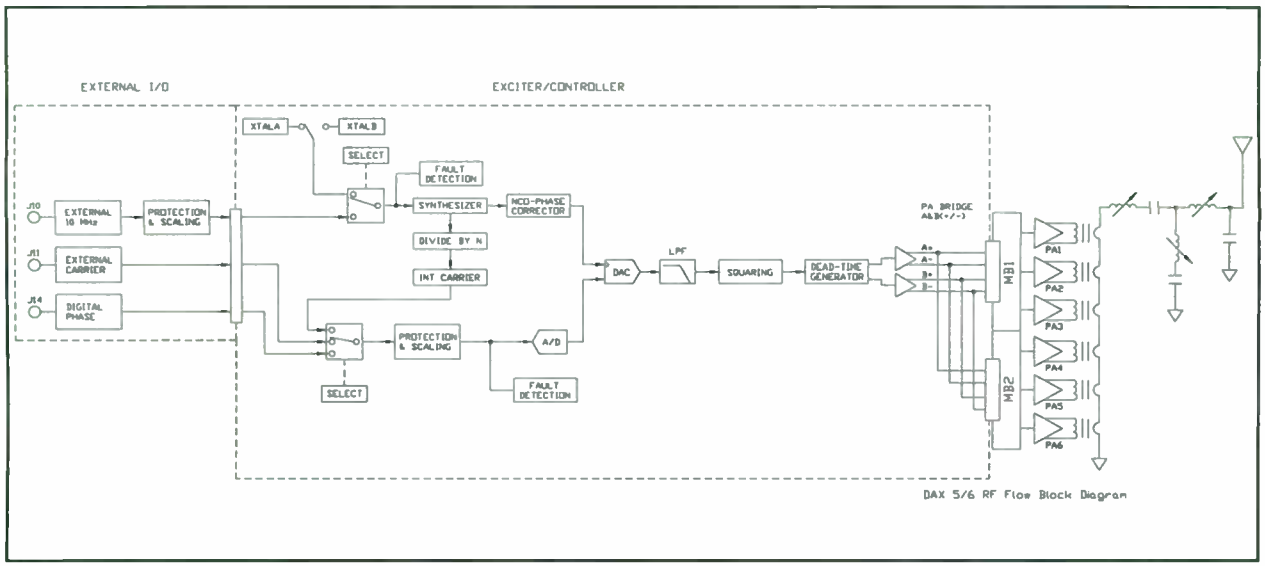


Figure 6-10
RF Flow Diagram

6.6.1 PA Module Faults

Green - Indicates the PA is on
Amber - Indicates the Hot-Swap key is installed (to remove a PA)
Red - Indicates a PA module fault

6.6.2 MOSFET Replacement

If it has been determined that a PA module has failed due to a shorted MOSFET, see "5.6.4 PA MOSFET" on page 5-18 for important details.

6.7 Audio Troubleshooting

This section provides a block diagram to assist the technician in troubleshooting a possible audio signal malfunction. Refer to the DAX schematic package and Figure 6-11.

WARNING: Disconnect primary power prior to servicing.

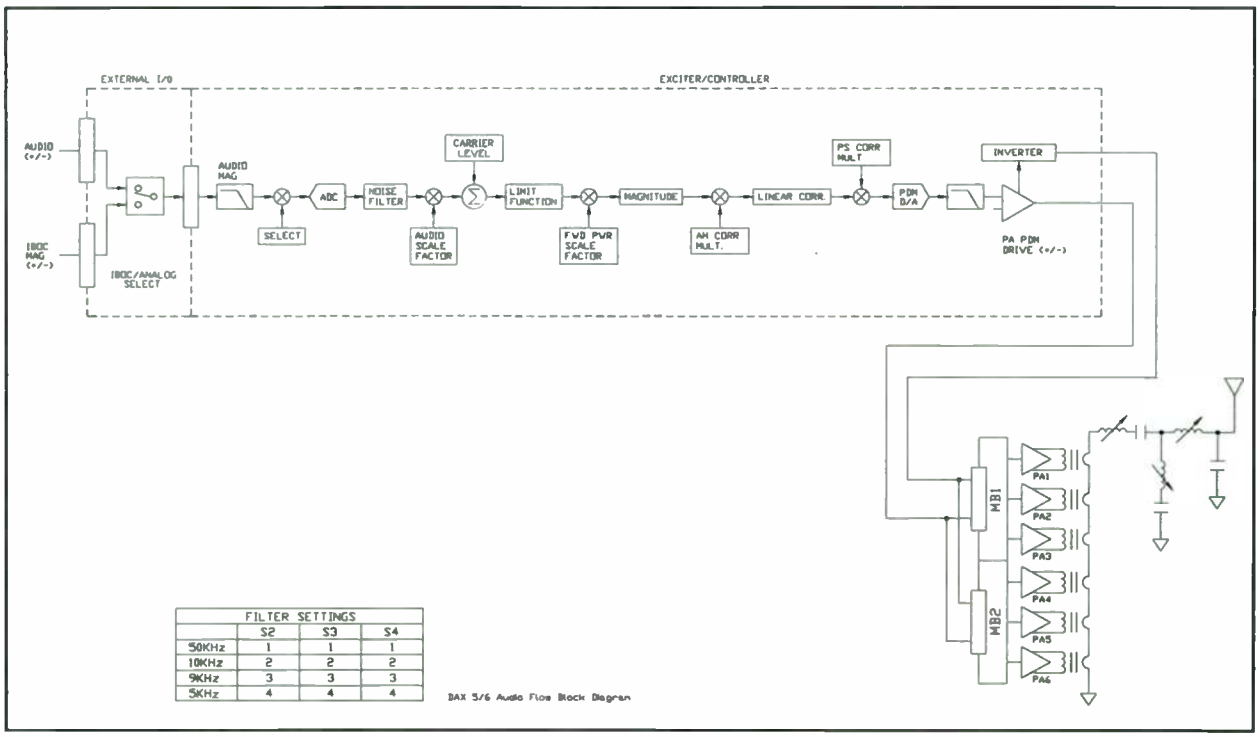


Figure 6-11
Audio Flow Diagram

6.8 Exciter/Controller Troubleshooting

If pressing the ON or OFF button for 5 seconds, and pressing switch S5 has not resolved a possible control problem, take the following steps to reseat the Filter Board.

STEP 1 Turn off CB1

STEP 2 Remove AC Mains power

STEP 3 Remove front panel if not already removed

STEP 4 Carefully but firmly reseat filter board

STEP 5 Reapply power

STEP 6 Test

6.8.0.1 Board LED Indications

LED indicators on the Exciter include the following:

WARNING: Disconnect primary power prior to servicing.

Reset: Red – Indicates that the board is in a Reset condition

Mute: Red – Mute condition

FPGA: Red – Indicates that the FPGA is not configured

+3.3V FLT: Red – Indicates that the +3.3V supply is not active

+1.8V FLT: Red – Indicates that the +1.8V supply is not active

6.9 Testpoint Listing

The following table lists the *pertinent* testpoints and LEDs for each board of the DAX transmitter and provides its function and nominal value when applicable.

NOTE:
Ground testpoints are not listed, however, be sure to use correct ground type if multiple ground types are noted.

Table 6-3 DAX Testpoint & LED Information Table
(All voltages listed are ±5%)

On Board...	Name	TP(*n*) or LED	Function, Display and/or (Comment) or (Related Potentiometer)	Nominal Value
External I/O	AC LOW TRIP	TP6	Factory threshold adjust for AC Low Trip (R107)	2.88Vdc ±0.05V
External I/O	+4.096VREF	TP7	Onboard regulation - zener	+4.096 Vdc
External I/O	(-) AUDIO (+) AUDIO	TP10 TP11	Audio input level Audio input level	< 12V < 12V
External I/O	+12V	TP12 DS5	Onboard regulation - zener Green LED illuminates to indicate +12V supply present	+12Vdc
External I/O	-12V	TP14 DS6	Onboard regulation - zener Green LED illuminates to indicate -12V supply present	-12Vdc

Table 6-3 DAX Testpoint & LED Information Table
(All voltages listed are ±5%)

On Board...	Name	TP(*n*) or LED	Function, Display and/or (Comment) or (Related Potentiometer)	Nominal Value
External I/O	+28V	TP15 DS7	Onboard regulation - zener Green LED illuminates to indicate +28V supply present	+28Vdc
External I/O	+48V	TP16 DS8	Input from LVPS Green LED illuminates to indicate +48V supply present	+48Vdc
External I/O	+5V	TP17 DS9	Onboard regulation - IC Green LED illuminates to indicate +5V supply present	+5Vdc
External I/O	DC VOLT ADJ	TP19	Power supply control signal Set by Exciter/Controller board (Varies with RF power output level)	0 - 9Vdc
External I/O	+3.3V	TP20 DS10	Onboard regulation - IC Green LED illuminates to indicate +3.3V supply present	+3.3Vdc
External I/O	INTLK	DS1	Red LED illuminates to indicate open Interlock loop	
External I/O	IBOC Mode Selected	DS3	Green LED illuminates to indicate IBOC Mode is currently selected	
External I/O	Analog Mode Selected	DS4	Green LED illuminates to indicate Analog Mode is currently selected	
Exciter Controller	DDS CLK	TP1	High frequency master synthesizer clock - 21.280 MHz to 42.240 MHz (depending on carrier frequency)	TTL
Exciter Controller	PM 4FC CLK	TP2	Phase modulated 4x carrier frequency clock - Drives the RF Carrier reconstruction D/A and has the AM/ PM correction applied	TTL
Exciter Controller	PM RF CARR ANLG	TP5	Phase Modulated RF Carrier - Reconstructed RF Carrier out of the D/A and reconstruction filter	1 - 2Vpp

Table 6-3 DAX Testpoint & LED Information Table
(All voltages listed are ±5%)

On Board...	Name	TP(*n*) or LED	Function, Display and/or (Comment) or (Related Potentiometer)	Nominal Value
Exciter Controller	PM RF CARR TTL	TP6	Phase Modulated RF Carrier TTL - Digital signal which is the output of the zero crossing detector. This input to the detector is the Phase Modulated RF Carrier Analog.	TTL
Exciter Controller	CARR ANLG	TP7	Carrier Analog - Low pass filtered input RF Carrier. This can originate either from the Digital Phase input, External RF Carrier Input, or the internal synthesizer.	1 - 2Vpp
Exciter Controller	CAR TTL	TP9	Carrier TTL - This is the multiplexed signal used as the RF Carrier. The sources are listed above.	TTL
Exciter Controller	RF SAMPLE	TP10	Set to 2Vpp at full power - 95% modulation (R25)	2Vpp
Exciter Controller	CLK 4FC	TP11	Clock 4x carrier frequency - Master sampling clock used to drive all the A/Ds and the PDM D/A	TTL
Exciter Controller	PDM1	TP12	PDM Sample 1 - Analog sample of the modulation filter from the power amplifier modules on motherboard #1	Varies w/ number of amps on
Exciter Controller	PDM ANLG	TP13	Set to 2Vpp at full power 95% modulation, will have 1Vdc offset (R32)	2Vpp
Exciter Controller	PDM/RF SAMPLE	TP14	PDM/RF Sample - Multiplexed signal drives the Sample A/D converter.	2Vpp
Exciter Controller	+VS PDM	TP15	Positive Supply voltage for the PDM integrator. 10nS pulse width will equate to: *+VS_PDM = [(ePDM Frequency - 150KHz) * 40mV] + 6V*	See formula
Exciter Controller	PDM2	TP16	PDM Sample 2 - Analog sample of the modulation filter from the power amplifier modules on motherboard #2	Varies w/ number of amps on
Exciter Controller	PDM ANLG	TP18	Precorrected Audio + DC analog signal (modulation dependent)	5Vpp max

Table 6-3 DAX Testpoint & LED Information Table
(All voltages listed are ±5%)

On Board...	Name	TP(*n*) or LED	Function, Display and/or (Comment) or (Related Potentiometer)	Nominal Value
Exciter Controller	PDM TTL	TP19	10 nS PDM on time (measured with power off)	TTL
Exciter Controller	PDM INV TTL	TP21	Inverse and delayed version of the PDM TTL signal used to drive the tailbiter circuit in the PAs	TTL
Exciter Controller	AUDIO	TP22	Set Audio Gain pot to get 95% modulation at 10 dBm input (~1.44V) (R39/R37)	0 - 2Vdc
Exciter Controller	B+	TP24	Scaled version of the B+ power supply. This signal drives the B+ A/D used for power supply correction.	0 - 2Vdc
Exciter Controller	PA BRIDGE MUTED A	TP25	These Bridge signals will be inactive if a mute condition exists which could cause the RF Bridge signals to be off frequency	TTL
Exciter Controller	PA BRIDGE MUTED B	TP26		
Exciter Controller	PA BRIDGE ACTIVE A	TP27	Monitor of Bridge signals to PA (65nS (+/- 3 nS) dead time between A/B) (R45)	TTL
Exciter Controller	PA BRIDGE ACTIVE B	TP28		
Exciter Controller	+VS DTG	TP29	Sets Dead Time Generator Voltage - 1V per 100 kHz of Carrier (R43)	See formula
Exciter Controller	RFL POWER	TP30	400W reflected power foldback point (R56)	0 - 4.095Vdc
Exciter Controller	MUTE	DS2	Red LED illuminates to indicate DAX transmitter is in a Mute condition	
PA Module	PDM_DRIVE	TP2	PDM drive level	TTL
PA Module	PDM_INV	TP3	PDM inverted drive level	TTL
PA Module	PA ON/OFF	TP4	PA on command indicated by steady-state active low	Low
PA Module	5.25V	TP5	Onboard regulation - IC	5.25Vdc
PA Module	BRIDGE_A	TP6	Bridge A present	TTL

Table 6-3 DAX Testpoint & LED Information Table
(All voltages listed are ±5%)

On Board...	Name	TP(*n*) or LED	Function, Display and/or (Comment) or (Related Potentiometer)	Nominal Value
PA Module	MODULATOR _FAULT	TP8	Modulator fault indication with steady-state active high	High
PA Module	BRIDGE_FAULT	TP9	Bridge fault indication with steady-state active high	High
PA Module	+12V	TP11	Input from LVPS	+12.0Vdc
PA Module	PA_READY	TP12	PA is enabled for use indication with steady-state active high	High
PA Module	BRIDGE_B	TP13	Bridge B present	TTL
PA Module	TEMP	TP15	Temperature fault indication with steady-state active high	Fault = High
PA Module	OVERLAP	TP16	Deadband overlap fault indicated	Fault = High
PA Module	HIGH_DRV	TP17	Chopper high drive level	0-60Vdc
PA Module	LOW_DRV	TP18	Chopper low drive level	0-12Vdc
PA Module	+VC	TP19	Floating supply	>9Vdc
PA Module	+VB	TP20	Floating supply	>9Vdc
PA Module	V_PULSE_XFMR	TP21	Pulse transformer voltage level	4.8Vdc
PA Module	-VC	TP22	Floating supply	>9Vdc
PA Module	+VA	TP23	Floating supply	>9Vdc
PA Module	-VA	TP24	Floating supply	>9Vdc
PA Module	-VB	TP25	Floating supply	>9Vdc
PA Module	PA ON PA FAULT	DS1	PA On = green LED Key Inserted = Amber PA Fault = red LED (on front of PA module)	
Output Monitor	TEST	TP1 DS1	Testpoint to tune for null at test Red LED illuminates to indicate Test mode	Lowest possible Vdc value
3-phase PS Controller	AC SAMPLE	TP1	Input AC sample from transformer secondary	7VAC

WARNING: Disconnect primary power prior to servicing.

Table 6-3 DAX Testpoint & LED Information Table
(All voltages listed are ±5%)

On Board...	Name	TP(*n*) or LED	Function, Display and/or (Comment) or (Related Potentiometer)	Nominal Value
3-phase PS Controller	DC CURRENT SAMPLE	TP2	DC representation of current	0.0 - +1.6 Vdc
3-phase PS Controller	FILTERED AC SAMPLE	TP3	Filtered AC sample	5.5VAC
3-phase PS Controller	FAN DRIVE	TP4	Active when PAs are on	+48Vdc
3-phase PS Controller	+48V	TP5	Input from +48V power supply	+48Vdc
3-phase PS Controller	+12V	TP6	Input from +12V power supply	+12Vdc
3-phase PS Controller	+5V	TP7	Onboard regulation - IC	+5Vdc
3-phase PS Controller	-12V	TP8	From onboard switching supply	-12Vdc
3-phase PS Controller	+9V REFERENCE	TP10	Special reference voltage for U5 digital Virtual Tap selection switch	+9Vdc
3-phase PS Controller	VREF	TP11	Virtual Tap selection reference voltage	0.7 - 1.8 +Vdc
3-phase PS Controller	XFMR SECONDARY SAMPLE	TP12 TP13	AC phase A and phase B high voltage tap input samples. Measured across TP12 and TP13.	240VAC
3-phase PS Controller	RECTIFIER OVERTEMP	TP14	Over-temperature fault from rectifier indicated by steady-state active low	+5Vdc
3-phase PS Controller	TRANSFORMER OVERTEMP	TP15	Over-temperature fault from transformer indicated by steady-state active low	+5Vdc
3-phase PS Controller	CURRENT SHUNT	TP16 TP17	Negative and positive Current Shunt inputs	0 - 25mV
3-phase PS Controller	B+ SAMPLE B+ VOLTAGE PRESENT	TP18 DS5	B+ sample Blinking Red LED to indicate B+ power supply is present	80 - 300 Vdc
3-phase PS Controller	+31V	TP20	Onboard regulation - zener	+31Vdc

WARNING: Disconnect primary power prior to servicing.

Table 6-3 DAX Testpoint & LED Information Table
(All voltages listed are ±5%)

On Board...	Name	TP(*n*) or LED	Function, Display and/or (Comment) or (Related Potentiometer)	Nominal Value
3-phase PS Controller	PHASE LOSS	DS1	Red LED illuminates to indicate loss of an AC phase (from the SCR firing board)	
3-phase PS Controller	PS WARNING	DS2	Red LED illuminates to indicate blown discharge fuse. WARNING: THIS INDICATES THE POSSIBILITY OF HIGH VOLTAGE REMAINING IN CABINET WHEN DAX IS TURNED OFF!	
3-phase PS Controller	PS FAULT	DS3	Red LED illuminates to indicate summary Power Supply fault	
3-phase PS Controller	PS OVERTEMP	DS4	Red LED illuminates to indicate Power Supply over-temperature fault	
1-phase PS Controller	FILTERED AC SAMPLE	TP2	Filtered AC sample	5.5VAC
1-phase PS Controller	AC SAMPLE	TP3	Input AC sample from transformer secondary	7VAC
1-phase PS Controller	DC CURRENT SAMPLE	TP4	DC representation of current	0.0 - +1.6 Vdc
1-phase PS Controller	FAN DRIVE	TP5	Active when PAs are on	+48Vdc
1-phase PS Controller	+48V	TP6	Input from +48V power supply	+48Vdc
1-phase PS Controller	+12V	TP7	Input from +12V power supply	+12Vdc
1-phase PS Controller	-12V	TP8	From onboard switching supply	-12Vdc
1-phase PS Controller	+5V	TP9	Onboard regulation - IC	+5Vdc
1-phase PS Controller	XFMR SECONDARY SAMPLE	TP11 TP12	Transformer secondary low tap sample. Measured across TP12 and TP13.	240VAC

Table 6-3 DAX Testpoint & LED Information Table
(All voltages listed are ±5%)

On Board...	Name	TP(*n*) or LED	Function, Display and/or (Comment) or (Related Potentiometer)	Nominal Value
1-phase PS Controller	VOLTAGE FEEDBACK	TP13	Virtual Tap selection reference voltage	2 - 3Vdc
1-phase PS Controller	B+ SAMPLE B+ VOLTAGE PRESENT	TP20 DS3	B+ sample Blinking Red LED to indicate B+ power supply is present	80 - 300 Vdc
1-phase PS Controller	RECTIFIER OVERTEMP	TP14	Over-temperature fault from rectifier indicated by steady-state active low	Fault = 0Vdc
1-phase PS Controller	TRANSFORMER OVERTEMP	TP15	Over-temperature fault from transformer indicated by steady-state active low	Fault = 0Vdc
1-phase PS Controller	CURRENT SHUNT	TP16 TP17	Negative and positive Current Shunt inputs	0 - 25mV
1-phase PS Controller	SIGNAL HIGH	TP18	Variable reference control loop voltage	0 - 12Vdc
1-phase PS Controller	PS WARNING	DS1	Red LED illuminates to indicate blown discharge fuse. WARNING: THIS INDICATES THE POSSIBILITY OF HIGH VOLTAGE REMAINING IN CABINET WHEN DAX IS TURNED OFF!	
1-phase PS Controller	PS OVERTEMP	DS2	Red LED illuminates to indicate Power Supply over-temperature fault	

Section 7
Parts List

7

7.1 Parts List

Replaceable Parts List Index

WARNING: Disconnect primary power prior to servicing.

Table 7-1 XMTR, AM, DAX-5/6 - 994 9825 001 (J)

Harris PN	Description	Qty	UM	Reference Designators
2000000000000001787	FD PARTS 760KHZ - 798KHZ	0	EA	OPTIONAL FD PARTS PACKAGE (1 REQD)
2000000000000001788	FD PARTS 1110KHZ - 1139KHZ	0	EA	OPTIONAL FD PARTS PACKAGE (1 REQD)
2000000000000001789	KIT, 5KW, 1-PHASE, 60HZ	0	EA	OPTIONAL POWER SUPPLY, PA PACKAGE (1 REQD)
2000000000000001790	KIT, 6KW, 1-PHASE, 60HZ	0	EA	OPTIONAL POWER SUPPLY, PA PACKAGE (1 REQD)
992 9994 005	PWA, EXCITER/CONTROLLER	0	EA	OPTIONAL SPARE, SOLD SEPERATELY, NOT INCLUDED IN ANY OF THE KITS
992 9994 009	PWA, PA MODULE	0	EA	OPTIONAL SPARE. NOTE: IS INCLUDED IN OPTIONAL SPARE BOARDS KIT WHEN ORDERED.
992 9994 035	FD PARTS 530KHZ - 557KHZ	0	EA	OPTIONAL FD PARTS PACKAGE (1 REQD)
992 9994 036	FD PARTS 558KHZ - 586KHZ	0	EA	OPTIONAL FD PARTS PACKAGE (1 REQD)
992 9994 037	FD PARTS 587KHZ - 617KHZ	0	EA	OPTIONAL FD PARTS PACKAGE (1 REQD)
992 9994 038	FD PARTS 618KHZ - 650KHZ	0	EA	OPTIONAL FD PARTS PACKAGE (1 REQD)
992 9994 039	FD PARTS 651KHZ - 684KHZ	0	EA	OPTIONAL FD PARTS PACKAGE (1 REQD)
992 9994 040	FD PARTS 685KHZ - 720KHZ	0	EA	OPTIONAL FD PARTS PACKAGE (1 REQD)
992 9994 041	FD PARTS 721KHZ - 758KHZ	0	EA	OPTIONAL FD PARTS PACKAGE (1 REQD)
992 9994 042	FD PARTS 759KHZ	0	EA	OPTIONAL FD PARTS PACKAGE (1 REQD)
992 9994 043	FD PARTS 799KHZ - 840KHZ	0	EA	OPTIONAL FD PARTS PACKAGE (1 REQD)
992 9994 044	FD PARTS 841KHZ - 884KHZ	0	EA	OPTIONAL FD PARTS PACKAGE (1 REQD)
992 9994 045	FD PARTS 885KHZ - 930KHZ	0	EA	OPTIONAL FD PARTS PACKAGE (1 REQD)
992 9994 046	FD PARTS 931KHZ - 978KHZ	0	EA	OPTIONAL FD PARTS PACKAGE (1 REQD)
992 9994 047	FD PARTS 979KHZ - 1029KHZ	0	EA	OPTIONAL FD PARTS PACKAGE (1 REQD)
992 9994 048	FD PARTS 1030KHZ - 1083KHZ	0	EA	OPTIONAL FD PARTS PACKAGE (1 REQD)
992 9994 049	FD PARTS 1084KHZ - 1109KHZ	0	EA	OPTIONAL FD PARTS PACKAGE (1 REQD)
992 9994 050	FD PARTS 1140KHZ - 1198KHZ	0	EA	OPTIONAL FD PARTS PACKAGE (1 REQD)
992 9994 051	FD PARTS 1199KHZ - 1260KHZ	0	EA	OPTIONAL FD PARTS PACKAGE (1 REQD)
992 9994 074	FD PARTS 1261KHZ - 1325KHZ	0	EA	OPTIONAL FD PARTS PACKAGE (1 REQD)
992 9994 075	FD PARTS 1326KHZ - 1394KHZ	0	EA	OPTIONAL FD PARTS PACKAGE (1 REQD)
992 9994 076	FD PARTS 1395KHZ - 1466KHZ	0	EA	OPTIONAL FD PARTS PACKAGE (1 REQD)
992 9994 077	FD PARTS 1467KHZ - 1542KHZ	0	EA	OPTIONAL FD PARTS PACKAGE (1 REQD)
992 9994 078	FD PARTS 1543KHZ - 1622KHZ	0	EA	OPTIONAL FD PARTS PACKAGE (1 REQD)
992 9994 079	FD PARTS 1623KHZ - 1706KHZ	0	EA	OPTIONAL FD PARTS PACKAGE (1 REQD)

WARNING: Disconnect primary power prior to servicing.

992 9994 107	KIT, 5KW, SINGLE PHASE	0	EA	OPTIONAL POWER SUPPLY, PA PACKAGE (1 REQD)
992 9994 117	KIT, SPARE BDS,3-PH 208/240VAC	0	EA	OPTIONAL SPARE BOARDS KIT
992 9994 118	KIT, SPARE BDS, 5KW,3PH,380VAC	0	EA	OPTIONAL SPARE BOARDS KIT
992 9994 119	KIT, SPARE PARTS, 1-PH	0	EA	OPTIONAL SPARE PARTS KIT
992 9994 120	KIT,SPARE PRTS,3-PH 208/240VAC	0	EA	OPTIONAL SPARE PARTS KIT
992 9994 121	KIT, SPARE PARTS, 3-PH, 380VAC	0	EA	OPTIONAL SPARE PARTS KIT
992 9994 122	KIT,SPARE FUSE & SEMICOND,1-PH	0	EA	OPTIONAL SPARE FUSE KIT
992 9994 123	KIT,SPARE FUSE & SEMICOND,3-PH	0	EA	OPTIONAL SPARE FUSE KIT
992 9994 124	KIT, SPARE BDS, DAX 6, 1-PHASE	0	EA	OPTIONAL SPARE BOARDS KIT
992 9994 125	KIT,SPAR BD,DAX 6,3PH,208-240V	0	EA	OPTIONAL SPARE BOARDS KIT
992 9994 126	KIT, SPAR BD, DAX 6,3PH,380VAC	0	EA	OPTIONAL SPARE BOARDS KIT

Table 7-2 KIT, 5KW, 1-PHASE, 60HZ - 200000000000001789 (C)

Harris PN	Description	Qty	UM	Reference Designators
2000000000000000270	CAPACITOR TRAY	1	EA	
2000000000000000276	COVER, CAPACITOR	1	EA	
2000000000000000295	CAP, 60UF 330VAC 10%	6	EA	
335 0236 000	WASHER SHOULDER 6	2	EA	
358 3797 000	PLATE, END COVER (283, 2-COND)	2	EA	2#TB1
358 3845 000	SPACER, .500" DIA X .375" LG	2	EA	
384 1155 000	SCR, BRIDGE 40A, 1-PHASE	1	EA	A9
384 1171 000	SCR, ST180S12P0V	1	EA	
398 0592 000	FUSE, 50A 700V, 14 X 51MM CART	1	EA	F8
472 1817 000	XFMR, PWR RECTIFIER, 1-PHASE	1	EA	T1
524 0383 000	CAP 8,200 UF 400VDC 20%	1	EA	C1
540 1600 201	RES 100 OHM 3W 5%	1	EA	R2
542 1738 000	RES, 100 OHM 100W 10%	1	EA	R1
606 1003 000	CKT BREAKER, 2-POLE 80A 277V	1	EA	CB1
610 1253 000	MALE CONNECTOR, 4C,	1	EA	J2P2
612 1451 000	FEMALE CONNECTOR, 4C	1	EA	J2P2
614 0793 000	TERM BLOCK,3C MODULAR 281	2	EA	2#TB1
614 0794 000	JUMPER, 2-POLE STEP-DOWN 283	2	EA	#TB1
614 0930 000	TERM BLK, 2C MODULAR 283	2	EA	2#TB1
735 0041 000	FIRING BD, 1-PH RECT, 60HZ	1	EA	A8
917 2574 007	PWR SUPPLY CBL, SINGLE PHASE	1	EA	
917 2574 011	COVER, CKT BRKR	1	EA	
917 2574 048	5KW COMBINER CABLE (W10)	1	EA	W10
917 2574 058	CABLE, 1 PHASE PWR FACTOR CORR	1	EA	
922 1344 024	RUBBER PAD	1	EA	
922 1344 033	COPPER STRAP	2	EA	1#A9-A10,1#A9-SHUNT
939 8234 040	BRACKET, CAPACITOR	1	EA	
939 8234 041	PLATE, AIR BLOCK	1	EA	
939 8234 054	COVER, CAPACITOR	1	EA	
939 8234 063	BRACKET, CROWBAR	1	EA	
943 5573 008	REAR PANEL, PA ENCLOSURE	1	EA	
943 5573 036	REAR PANEL	1	EA	
943 5573 047	BLANK PANEL, PA	1	EA	
943 5573 077	PLATE, BOTTOM, 5KW	1	EA	
992 8553 010	PWA, MOV-AC 187-264 VAC	1	EA	A7
992 9994 020	PWA, PS CONTROLLER, 1-PH	1	EA	A10
992 9994 057	PWA, MOTHERBOARD, 5KW	1	EA	A2
992 9994 058	PWA, MOTHERBOARD, 5KW	1	EA	A1

Table 7-3 PWA, MOV-AC 187-264 VAC - 992 8553 010 (B1)

Harris PN	Description	Qty	UM	Reference Designators
2960345000A	*TUBING, SHRINKABLE 3/4	0.5	FT	NOTE: CUT 6 PIECES 1 IN EACH FOR 560-0023-000 & 560-0036-000
560 0023 000	MOV, 300WVAC, 165J, 20MM DISC	4	EA	RV10,RV12,RV16,RV17
560 0036 000	MOV, 150WVAC, 80J, 20MM DISC	2	EA	RV7,RV20
610 1066 000	CONN, .25 FASTON PC MOUNT	4	EA	A,B,C,N
839 8115 031	SCH, MOV-AC PROTECTOR	0		
839 8115 033	PWB, MOV-AC PROTECTOR,	1		

Table 7-4 PWA, PS CONTROLLER, 1-PH - 992 9994 020 (K)

Harris PN	Description	Qty	UM	Reference Designators
055 0100 005	*THERMAL COMPOUND, 8OZ JAR	0	EA	USE ON Q1, Q3, U10
20000000000000006	XFMR, PWR, 14VCT, 1.6VA PC MT	1	EA	T1
300 1536 000	SCR, 6-32 X 1/4	3	EA	1/Q1,1/Q3,1/U10
300 1538 000	SCR, 6-32 X 3/8	1	EA	1/Q9
304 0089 000	NUT, HEX 6-32	4	EA	1/Q1,1/Q3,1/Q9,1/U10
312 0047 000	WASHER, SPLIT-LOCK 6	4	EA	1/Q1,1/Q3,1/Q9,1/U10
350 0105 000	RIVET 3/16 ALUM .126/.25	8	EA	2/XF5,2/XF6,2/XF7,2/XF8
354 0309 000	TERM SOLDER	21	EA	TP1,TP2,TP3,TP4,TP5,TP6,TP7,TP8,TP9,TP10,TP11,TP12,TP13,TP14,TP15,TP16,TP17,TP18,TP19,TP20,TP21
354 0905 000	TERMINAL, SCREW 10-32, 30A	3	EA	E1,E2,E3
358 3861 001	POST, SLIDE LOCK ASSY, 4-40	2	EA	2X/J2,2XJ3
380 0645 000	XSTR, IRF530 ESD	1	EA	Q6
380 0773 000	XSTR FET BS170 N-CHL ESD	4	EA	Q2,Q4,Q7,Q8
380 0804 000	N-MOSFET IRFP22N50A ESD	1	EA	Q9
380 0825 000	XSTR, P-MOSFET, IRF5210 ESD	1	EA	Q5
380 0828 000	N-MOSFET, IRFB33N15D ESD	2	EA	Q1,Q3
382 0184 000	IC, 340T-5/7805 +5V REG ESD	1	EA	U10
382 0415 000	IC, 324 ESD	1	EA	U11
382 0428 000	IC, LM358 ESD	1	EA	U9
382 0463 000	IC, 4051/14051 ESD	1	EA	U1
382 0656 000	IC, 7405 ESD	1	EA	U5
382 0774 000	IC 74HC14 ESD	1	EA	U6
382 1070 000	IC, ILQ-1 OPTO-ISOLATOR ESD	1	EA	U13
382 1128 000	IC OVR VOLT SEN MC3423 ESD	1	EA	U12
382 1218 000	IC 1007 ESD	1	EA	U4
382 1598 000	IC 74AC00 ESD	1	EA	U7
382 1649 000	IC AD620 ESD	1	EA	U2
382 1653 000	IC IR2113 ESD	1	EA	U8
382 1708 000	IC, UC3825 ESD	1	EA	U3
384 0205 000	DIODE SILICON 1N914/4148 ESD	4	EA	CR15,CR17,CR21,CR34
384 0253 000	RECTIFIER 1N4007 ESD	1	EA	CR26
384 0720 000	TRANSZORB 1N6377 15V 5W ESD	3	EA	CR22,CR23,CR36
384 0780 000	LED, RED ESD	2	EA	DS1,DS2
384 0803 000	RECT MUR-120 200V ESD	1	EA	CR16
384 0986 000	LED, RED BLINKING, T-1-3/4 ESD	1	EA	DS3
384 1159 000	DIODE,SCHOTTKY, 50SQ100 ESD	4	EA	CR27,CR28,CR29,CR30
384 1163 000	DIODE, 40EPS12 ESD	1	EA	CR39
386 0078 000	ZENER, 1N4734A 5.6V ESD	1	EA	CR32
386 0082 000	ZENER, 1N4744A 15V 1W 5% ESD	2	EA	CR31,CR33
386 0083 000	ZENER, 1N4742A 12V ESD	4	EA	CR1,CR2,CR12,CR13
386 0123 000	ZENER, 1N4732A 4.7V ESD	2	EA	CR4,CR11
386 0135 000	ZENER, 1N4733A 5.1V ESD	8	EA	CR6,CR7,CR9,CR10,CR18,CR19,CR20,CR24

WARNING: Disconnect primary power prior to servicing.

386 0148 000	ZENER, 1N4743A 13V ESD	4	EA	CR8,CR35,CR37,CR38
386 0404 000	ZENER, 1N4758A 56V ESD	1	EA	CR25
386 0412 000	ZENER, DUAL 18V 3W ESD	1	EA	CR14
398 0087 000	FUSE, SLOW CART 5A 250V	2	EA	F1,F2
398 0089 000	FUSE, SLOW CART 7A 125V	1	EA	F9
398 0368 000	FUSE, CART 2A 600V	1	EA	F6
398 0585 000	FUSE, FAST 1A 250VAC	1	EA	F3
398 0598 000	FUSE, SLOW, 3AG, 15 AMP, 32V	1	EA	F4
398 0621 000	FUSE, FAST 3A 600V	1	EA	F7
402 0129 000	CLIP, 1/4 DIA FUSE	8	EA	2/XF1,2/XF2,2/XF4,2/XF9
402 0220 000	CLIP, FUSE 13/32 DIA, SOLDER	6	EA	2/XF5,2/XF6,2/XF7
402 0226 000	FUSECLIP, 9/16" DIA	2	EA	2/XF8
404 0904 000	SOCKET, SIP 2C	1	EA	1/XF3
404 0907 000	HEATSINK TO-218/247 2.0" HT	1	EA	XQ9
404 0908 000	HEATSINK, VERTICAL, TO-220	3	EA	XQ1,XQ3,XU10
410 0446 000	THERMAL INTERFACE, TO-247	1	EA	XQ9
494 0218 000	CHOKE, WIDE BAND 2.5 TURN	1	EA	RFC1
494 0441 000	CHOKE RF PWR 82UH 4.8A	1	EA	L2
494 0514 000	IND, 1.0MH 15% 5 AMP	1	EA	L1
506 0231 000	CAP .0015UF 63V 5%	1	EA	C44
506 0232 000	CAP, 0.01UF 100V 5%	4	EA	C2,C28,C70,C75
506 0233 000	CAP, 0.1UF 63V 5%	36	EA	C1,C3,C5,C6,C7,C11,C18,C20,C23,C24,C26,C27,C30,C35,C46,C49,C50,C54,C55,C57,C59,C64,C66,C72,C73,C74,C76,C77,C79,C80,C81,C82,C83,C84,C88,C89
506 0236 000	CAP, 0.0047UF 100V 5%	1	EA	C47
506 0240 000	CAP, 0.033UF 100V 5%	1	EA	C36
506 0242 000	CAP, 0.068UF 63V 5%	1	EA	C48
506 0244 000	CAP, 0.22UF 63V 5%	3	EA	C10,C14,C17
506 0309 000	CAP, 0.220UF 630V 5%	2	EA	C86,C87
516 0084 000	CAP DISC .02UF 600V	1	EA	C78
516 0516 000	CAP 1UF 100V 20%	11	EA	C9,C12,C13,C15,C16,C21,C22,C31,C32,C38,C42
516 0725 000	CAP 1.0UF 50V 20%	15	EA	C4,C25,C29,C33,C34,C37,C39,C41,C45,C53,C56,C63,C65,C67,C68
516 0771 000	CAP 33PF 5% 100V C0G	1	EA	C40
522 0545 000	CAP 10UF 100V 20%	2	EA	C71,C85
522 0548 000	CAP 10UF 50V 20%	1	EA	C61
522 0554 000	CAP 4.7UF 50V 20%	1	EA	C19
522 0590 000	CAP 470UF 25V 20%	4	EA	C8,C43,C52,C60
522 0592 000	CAP 100UF 20% 25VDC	1	EA	C51
522 0656 000	CAP 330 UF 25V 20%	3	EA	C58,C62,C69
540 1600 103	RES 12 OHM 3W 5%	1	EA	R73
540 1600 118	RES 51 OHM 3W 5%	2	EA	R46,R52
540 1600 201	RES 100 OHM 3W 5%	1	EA	R74
540 1600 401	RES 10K OHM 3W 5%	3	EA	R57,R62,R67
540 1600 408	RES 20K OHM 3W 5%	1	EA	R80
540 1600 418	RES 51K OHM 3W 5%	1	EA	R75
540 1600 501	RES 100K OHM 3W 5%	2	EA	R72,R79
546 0313 000	RES 50 OHM 5W 5%	1	EA	R56
548 0345 000	RES 15K OHM 7W 1%	1	EA	R78
548 2346 000	RES 68.1K OHM 3W 1%	1	EA	R49
548 2347 000	RES 110K OHM 3W 1%	1	EA	R32
548 2351 000	RES, 301K OHM 3/4W 0.1%	5	EA	R22,R27,R28,R29,R34
548 2360 000	RES, 2.5K OHM 1/8W 0.1 %	2	EA	R19,R42
548 2400 001	RES 1 OHM 1/2W 1%	2	EA	R36,R54

WARNING: Disconnect primary power prior to servicing.

548 2400 101	RES 10 OHM 1/2W 1%	2	EA	R20,R51
548 2400 134	RES 22.1 OHM 1/2W 1%	3	EA	R10,R58,R71
548 2400 137	RES 23.7 OHM 1/2W 1%	1	EA	R35
548 2400 201	RES 100 OHM 1/2W 1%	9	EA	R5,R7,R8,R11,R14,R38,R40,R41,R45
548 2400 247	RES 301 OHM 1/2W 1%	1	EA	R30
548 2400 301	RES 1K OHM 1/2W 1%	5	EA	R15,R16,R24,R26,R48
548 2400 305	RES 1.1K OHM 1/2W 1%	1	EA	R31
548 2400 330	RES 2K OHM 1/2W 1%	5	EA	R6,R9,R12,R13,R43
548 2400 332	RES 2.1K OHM 1/2W 1%	1	EA	R60
548 2400 339	RES 2.49K OHM 1/2W 1%	1	EA	R65
548 2400 347	RES 3.01K OHM 1/2W 1%	2	EA	R18,R76
548 2400 359	RES 4.02K OHM 1/2W 1%	1	EA	R21
548 2400 361	RES 4.22K OHM 1/2W 1%	1	EA	R33
548 2400 385	RES 7.5K OHM 1/2W 1%	1	EA	R64
548 2400 401	RES 10K OHM 1/2W 1%	13	EA	R2,R3,R4,R23,R39,R50,R53,R59,R61,R68, R69,R70,R77
548 2400 434	RES 22.1K OHM 1/2W 1%	1	EA	R25
548 2400 468	RES 49.9K OHM 1/2W 1%	1	EA	R66
548 2400 539	RES 249K OHM 1/2W 1%	1	EA	R17
548 2400 601	RES 1MEG OHM 1/2W 1%	1	EA	R63
550 0934 000	POT 500 OHM 1/2W 10%	1	EA	R47
560 0121 011	POSISTOR 1.1 AMP 60VDC DISC	1	EA	R1
560 0121 018	POSISTOR 2.5 AMP 60VDC DISC	1	EA	R44
578 0036 000	RELAY, SPDT, 12V, 40A	1	EA	K1
610 1106 000	HDR, 8PIN, 1ROW, STRT,POL	1	EA	J1
610 1107 000	HDR,12PIN,1ROW,STRT,POL	1	EA	J6
610 1108 000	HDR,14PIN,1ROW,STRT,POL	1	EA	J5
610 1145 000	HDR, 6PIN, 1ROW, STRT,POL	1	EA	J4
610 1411 002	PLUG D STRT 15C METAL SHELL	1	EA	J3
612 2139 002	RECP D STRT 15C METAL SHELL	1	EA	J2
843 5572 211	SCH, PS CONTROLLER, 1-PH	0		
843 5572 213	PWB, PS CONTROLLER, 1-PH	1		

Table 7-5 PWA, MOTHERBOARD, 5KW - 992 9994 057 (C)

Harris PN	Description	Qty	UM	Reference Designators
302 0108 000	SCR, 6-32 X 1/2	4	EA	2#T1,2#T2
314 0005 000	WASHER, SPLIT-LOCK 6	4	EA	2#T1,2#T2
335 0059 000	WASHER NYLON .150 ID	4	EA	2#T1,2#T2
335 0236 000	WASHER SHOULDER 6	4	EA	2#T1,2#T2
354 0819 000	SOLDER LUG STRT .312" H	1	EA	J11
354 0905 000	TERMINAL, SCREW 10-32, 30A	2	EA	E3,E4
358 3861 001	POST, SLIDE LOCK ASSY, 4-40	2	EA	
522 0528 000	CAP 470UF 63V 20%	1	EA	C12
522 0567 000	CAPACITOR 8200 MFD 16V	1	EA	C8
524 0381 000	CAP, 470UF 400V 20% SNAP-MT	7	EA	C7,C9,C10,C11,C13,C14,C15
548 2400 201	RES 100 OHM 1/2W 1%	5	EA	R6,R7,R8,R9,R10
560 0121 011	POSISTOR 1.1 AMP 60VDC DISC	2	EA	R4,R11
610 0900 000	HEADER 3 CKT STRAIGHT	4	EA	JP1,JP2,JP3,JP4
610 0982 000	*HDR 26C VERT 2ROW TOP LATCH	1	EA	J2
610 1043 000	*HDR 40C VERT 2ROW TOP LATCH	1	EA	J1
610 1334 000	HDR, 3C 1ROW STRAIGHT	2	EA	J5,J6
610 1434 002	*PLUG D RT ANG 15C MET SHELL	1	EA	J4
612 1184 000	SHUNT JUMPER 0.1" CENTERS	4	EA	1/JP1,1/JP2,1/JP3,1/JP4
612 2128 000	RECP, EDGECARD 36 POS	6	EA	XA1J1,XA1J2,XA2J1,XA2J2,XA3J1,XA3J 2
612 2175 002	*RECP D RT ANG 15C MET SHELL	1	EA	J3

620 0700 000	*RECPT, MALE SMB,PC MOUNT	2	EA	J8,J9
843 5572 121	SCH, MOTHERBOARD	0		
843 5572 123	PWB, MOTHERBOARD	1		
922 1344 014	TRANSFORMER	2	EA	T1,T2
922 1344 039	EXTENSION, SCREW TERMINAL	1	EA	#E3

Table 7-6 PWA, MOTHERBOARD, 5KW - 992 9994 058 (C)

Harris PN	Description	Qty	UM	Reference Designators
302 0108 000	SCR, 6-32 X 1/2	6	EA	2/T1,2/T2,2/T3
314 0005 000	WASHER, SPLIT-LOCK 6	6	EA	2/T1,2/T2,2/T3
335 0059 000	WASHER NYLON .150 ID	6	EA	2/T1,2/T2,2/T3
335 0236 000	WASHER SHOULDER 6	6	EA	2/T1,2/T2,2/T3
354 0819 000	SOLDER LUG STRT .312" H	1	EA	J11
354 0905 000	TERMINAL, SCREW 10-32, 30A	2	EA	E3,E4
358 3861 001	POST, SLIDE LOCK ASSY, 4-40	2	EA	
522 0528 000	CAP 470UF 63V 20%	1	EA	C12
522 0567 000	CAPACITOR 8200 MFD 16V	1	EA	C8
524 0381 000	CAP, 470UF 400V 20% SNAP-MT	7	EA	C7,C9,C10,C11,C13,C14,C15
548 2400 201	RES 100 OHM 1/2W 1%	5	EA	R6,R7,R8,R9,R10
560 0121 011	POSISTOR 1.1 AMP 60VDC DISC	2	EA	R4,R11
610 0900 000	HEADER 3 CKT STRAIGHT	4	EA	JP1,JP2,JP3,JP4
610 0982 000	*HDR 26C VERT 2ROW TOP LATCH	1	EA	J2
610 1043 000	*HDR 40C VERT 2ROW TOP LATCH	1	EA	J1
610 1334 000	HDR, 3C 1ROW STRAIGHT	2	EA	J5,J6
610 1434 002	*PLUG D RT ANG 15C MET SHELL	1	EA	J4
612 1184 000	SHUNT JUMPER 0.1" CENTERS	4	EA	1/JP1,1/JP2,1/JP3,1/JP4
612 2128 000	RECP, EDGECARD 36 POS	6	EA	XA1J1,XA1J2,XA2J1,XA2J2,XA3J1,XA3J2
612 2175 002	*RECP D RT ANG 15C MET SHELL	1	EA	J3
620 0700 000	*RECPT, MALE SMB,PC MOUNT	2	EA	J8,J9
843 5572 121	SCH, MOTHERBOARD	0		
843 5572 123	PWB, MOTHERBOARD	1		
922 1344 014	TRANSFORMER	3	EA	T1,T2,T3
922 1344 039	EXTENSION, SCREW TERMINAL	1	EA	#E3

Table 7-7 KIT, 6KW, 1-PHASE, 60HZ - 2000000000000001790 (C)

Harris PN	Description	Qty	UM	Reference Designators
20000000000000270	CAPACITOR TRAY	1	EA	
20000000000000276	COVER, CAPACITOR	1	EA	
20000000000000295	CAP, 60UF 330VAC 10%	6	EA	
335 0236 000	WASHER SHOULDER 6	2	EA	
358 3744 000	CARD GUIDE 8"LG,	2	EA	#PA MODULE
358 3797 000	PLATE, END COVER (283, 2-COND)	2	EA	2#TB1
358 3845 000	SPACER, .500" DIA X .375" LG	2	EA	
384 1155 000	SCR, BRIDGE 40A, 1-PHASE	1	EA	A9
384 1171 000	SCR, ST180S12P0V	1	EA	
398 0592 000	FUSE, 50A 700V, 14 X 51MM CART	1	EA	F8
430 0291 000	FAN, 48VDC 280CFM, 6" DIA	1	EA	B4
472 1817 000	XFMR, PWR RECTIFIER, 1-PHASE	1	EA	T1
524 0383 000	CAP 8,200 UF 400VDC 20%	1	EA	C1
540 1600 201	RES 100 OHM 3W 5%	1	EA	R2
542 1738 000	RES, 100 OHM 100W 10%	1	EA	
606 1003 000	CKT BREAKER, 2-POLE 80A 277V	1	EA	CB1
610 1253 000	MALE CONNECTOR, 4C,	1	EA	J2P2
612 1451 000	FEMALE CONNECTOR, 4C	1	EA	J2P2
614 0793 000	TERM BLOCK,3C MODULAR 281	2	EA	2#TB1
614 0794 000	JUMPER, 2-POLE STEP-DOWN 283	2	EA	#TB1

614 0930 000	TERM BLK, 2C MODULAR 283	2	EA	2#TB1
735 0041 000	FIRING BD, 1-PH RECT, 60HZ	1	EA	A8
917 2574 007	PWR SUPPLY CBL, SINGLE PHASE	1	EA	
917 2574 011	COVER, CKT BRKR	1	EA	
917 2574 049	6KW CABLES (W10)	1	EA	W10
917 2574 058	CABLE, 1 PHASE PWR FACTOR CORR	1	EA	
922 1344 024	RUBBER PAD	1	EA	
922 1344 033	COPPER STRAP	2	EA	1#A9-A10,1#A9-SHUNT
939 8234 040	BRACKET, CAPACITOR	1	EA	
939 8234 054	COVER, CAPACITOR	1	EA	
939 8234 063	BRACKET, CROWBAR	1	EA	
943 5573 006	BOTTOM PLATE	1	EA	
943 5573 036	REAR PANEL	1	EA	
943 5573 082	REAR PANEL, PA ENCLOS, 4 FANS	1	EA	
992 8553 010	PWA, MOV-AC 187-264 VAC	1	EA	A7
992 9994 014	PWA, MOTHERBOARD	2	EA	A1,A2
992 9994 020	PWA, PS CONTROLLER, 1-PH	1	EA	A10

Table 7-8 PWA, PA MODULE - 992 9994 009 (W)

Harris PN	Description	Qty	UM	Reference Designators
000 0000 010	B/M NOTE:	3		DWGC34,L4,R69 DO NOT INSTALL AT THIS TIME
250 0557 000	LED INTERCONNECT LEADS	1	EA	LED ASSY
300 1484 000	SCR, 4-40 X 1/4	4	EA	XU24,XU25,XU26,XU27
300 1486 000	SCR, 4-40 X 3/8	1	EA	1/XQ12
302 0104 000	SCR, 6-32 X 1/4	1	EA	LED BRACKET
302 0105 000	SCR, 6-32 X 5/16	1	EA	1/U30
302 0106 000	SCR, 6-32 X 3/8	11	EA	1/CR80,1/Q13,1/Q14,1/Q15,1/Q16,1/Q17,1/Q18,1/Q19,1/Q20,1/Q21,1/Q22
302 0108 000	SCR, 6-32 X 1/2	7	EA	7/PCB
302 0374 000	SCR, 6-32 X 3/8	8	EA	4/COVER,4/HEATSINK
304 0087 000	NUT, HEX 4-40	5	EA	XQ12,XU24,XU25,XU26,XU27
310 0012 000	WASHER FLAT 6	7	EA	7/PCB
312 0045 000	WASHER, SPLIT-LOCK 4	5	EA	XQ12,XU24,XU25,XU26,XU27
314 0005 000	WASHER, SPLIT-LOCK 6	8	EA	1/LED BRACKET,7/PCB
328 0074 000	WASHER, STEEL COMPRESSION	12	EA	CR80,Q13,Q14,Q15,Q16,Q17,Q18,Q19,Q20,Q21,Q22,U30
335 0292 000	SPACER, NYLON, LED MOUNTING	1	EA	LED ASSY
358 3837 000	CARD GUIDE, SNAP-IN	6	EA	COVER
380 0653 000	XSTR, NPN MPS6602 ESD	2	EA	Q8,Q9
380 0804 000	N-MOSFET IRFP22N50A ESD	10	EA	Q13,Q14,Q15,Q16,Q17,Q18,Q19,Q20,Q21,Q22
380 0830 000	N-MOSFET IRFP450A ESD	1	EA	Q12
382 1647 000	IC UC3710T ESD	6	EA	U24,U25,U26,U27,U28,U29
382 1654 000	IC TC622EAT ESD	1	EA	U30
384 0808 000	LED, BICOLOR, RED-GREEN ESD	1	EA	LED ASSY
384 1154 000	DIODE, RECT, 30EPH06 ESD	2	EA	CR14,CR80
398 0556 000	FUSE, FAST 8 AMP 600V	1	EA	F1
402 0194 000	CLIP FUSE BRONZE	2	EA	2/F1
404 0513 000	HEAT SINK PA1-1CB	1	EA	XQ12
404 0908 000	HEATSINK, VERTICAL, TO-220	4	EA	XU24,XU25,XU26,XU27
404 0926 000	HEATSINK, PA	1	EA	
406 0539 000	CLIP, MOUNTING, LED LENS,CLEAR	1	EA	LED ASSY
410 0446 000	THERMAL INTERFACE, TO-247	11	EA	CR80,Q13,Q14,Q15,Q16,Q17,Q18,Q19,Q20,Q21,Q22

414 0280 000	FERRITE TOROID, LINER	10	EA	G/Q13,G/Q14,G/Q15,G/Q16,G/Q17,G/Q18,G/Q19,G/Q20,G/Q21,G/Q22 WHERE G= GATE LEAD
414 0343 000	FERRITE TOROID, 0.155 OD	2	EA	D/Q13,D/Q22 WHERE D IS THE DRAIN MIDDLE LEG
414 0347 000	CORE, TOROID, 4.14 MM OD	8	EA	D/Q14,D/Q15,D/Q16,D/Q17,D/Q18,D/Q19,D/Q20,D/Q21 WHERE D=DRAIN LEAD MIDDLE LEG
506 0308 000	CAP, 0.180UF 630V 5%	2	EA	C63,C65
506 0309 000	CAP, 0.220UF 630V 5%	3	EA	C34,C66,C119
506 0311 000	CAP, 0.033UF 1000V 5%	2	EA	C31,C68
506 0316 000	CAP 0.068UF 400V 5%	2	EA	C106,C107
508 0583 000	CAPACITOR, .15UF 600VDC	1	EA	C46
516 0081 000	CAP, DISC .01UF 1KV 20%	1	EA	C35
522 0658 000	CAP, 220UF 400V 20%, SNAP-MT	5	EA	C58,C64,C71,C79,C97
560 0121 007	POSISTOR 0.5 AMP 60VDC DISC	1	EA	R25
574 0543 000	RELAY, SPDT 12VDC 20A/10A	1	EA	K1
604 0852 000	SW, RKR DIP 4-SPST	1	EA	S1
610 1334 000	HDR, 3C 1ROW STRAIGHT	1	EA	J1
843 5572 001	SCH, PA MODULE	0		
922 1344 004	INDUCTOR ASSY	4	EA	L8,L9,L16,L17
922 1344 005	INDUCTOR ASSY	1	EA	L6
922 1344 006	BRACKET, LED	1	EA	
943 5573 001	BASE PLATE, PA MODULE	1	EA	
943 5573 002	COVER, PA MODULE	1	EA	
992 9994 010	*PWA, PA MODULE, SMT	1	EA	

Table 7-9 PWA, MOTHERBOARD - 992 9994 014 (G)

Harris PN	Description	Qty	UM	Reference Designators
302 0108 000	SCR, 6-32 X 1/2	6	EA	1/T1,1/T2,1/T3,2/T1,2/T2,2/T3
314 0005 000	WASHER, SPLIT-LOCK 6	6	EA	1/T1,1/T2,1/T3,2/T1,2/T2,2/T3
335 0059 000	WASHER NYLON .150 ID	6	EA	1/T1,1/T2,1/T3,2/T1,2/T2,2/T3
335 0236 000	WASHER SHOULDER 6	6	EA	1/T1,1/T2,1/T3,2/T1,2/T2,2/T3
354 0819 000	SOLDER LUG STRT .312" H	1	EA	J11
354 0905 000	TERMINAL, SCREW 10-32, 30A	2	EA	E3,E4
358 3861 001	POST, SLIDE LOCK ASSY, 4-40	2	EA	1/J3,1/J4
522 0528 000	CAP 470UF 63V 20%	1	EA	C12
522 0567 000	CAPACITOR 8200 MFD 16V	1	EA	C8
524 0381 000	CAP, 470UF 400V 20% SNAP-MT	7	EA	C7,C9,C10,C11,C13,C14,C15
548 2400 201	RES 100 OHM 1/2W 1%	5	EA	R6,R7,R8,R9,R10
560 0121 011	POSISTOR 1.1 AMP 60VDC DISC	2	EA	R4,R11
610 0900 000	HEADER 3 CKT STRAIGHT	4	EA	JP1,JP2,JP3,JP4
610 0982 000	*HDR 26C VERT 2ROW TOP LATCH	1	EA	J2
610 1043 000	*HDR 40C VERT 2ROW TOP LATCH	1	EA	J1
610 1334 000	HDR, 3C 1ROW STRAIGHT	2	EA	J5,J6
610 1434 002	*PLUG D RT ANG 15C MET SHELL	1	EA	J4
612 1184 000	SHUNT JUMPER 0.1" CENTERS	4	EA	1/JP1,1/JP2,1/JP3,1/JP4
612 2128 000	RECP, EDGECARD 36 POS	6	EA	XA1J1,XA1J2,XA2J1,XA2J2,XA3J1,XA3J2
612 2175 002	*RECP D RT ANG 15C MET SHELL	1	EA	J3
620 0700 000	*RECPT, MALE SMB,PC MOUNT	2	EA	J8,J9
843 5572 121	SCH, MOTHERBOARD	0		
843 5572 123	PWB, MOTHERBOARD	1		
922 1344 007	TRANSFORMER	3	EA	T1,T2,T3
922 1344 039	EXTENSION, SCREW TERMINAL	1	EA	#E3

WARNING: Disconnect primary power prior to servicing.

Table 7-10 PWA, EXCITER/CONTROLLER - 992 9994 005 (G)

Harris PN	Description	Qty	UM	Reference Designators
000 0000 010	B/M NOTE:	1		DWGU11 PARTS NOT INSTALLED
444 3032 000	TCXO, 10 MHZ, +5VDC	1	EA	U4
522 0588 000	CAP 100UF 25V 20% NP	1	EA	C170
610 0900 000	HEADER 3 CKT STRAIGHT	2	EA	JP1,JP2
610 1043 000	*HDR 40C VERT 2ROW TOP LATCH	2	EA	J14,J16
610 1069 000	HEADER 9 PIN SINGLE ROW	1	EA	J5
610 1133 000	*HDR 14C VERT 2ROW TOP LATCH	1	EA	J13
610 1295 000	HDR, 2C 1ROW STRAIGHT	1	EA	J1
610 1327 000	HDR, 24C 2ROW STRAIGHT	1	EA	J10
610 1420 000	PLUG, 68C RT ANGLE	1	EA	J4
612 1184 000	SHUNT JUMPER 0.1" CENTERS	2	EA	1/JP1,1/JP2
612 2213 000	RECP, 24C 2ROW, RT ANG, EDGE	1	EA	J3
620 0700 000	*RECPT, MALE SMB,PC MOUNT	4	EA	J6,J7,J8,J11
817 2574 044	SW/FW DAX	0		
843 5572 100	SPEC, EXCITER/CONTROLLER	0		
843 5572 101	SCH, EXCITER/CONTROLLER	0		
992 9994 004	PWA, EXCITER/CONTROLLER, SMT	1	EA	

Table 7-11 BASIC, DAX AM XMTR - 992 9994 018 (AM)

Harris PN	Description	Qty	UM	Reference Designators
026 6010 003	GROMMET STRIP, 0.125	2	FT	
041 1310 001	GASKET, RUBBER	5	FT	#PA ENCLOSURE
20000000000000255	SUPPORT, CONTROL PANEL	1	EA	#A4
20000000000000317	INSTALLATION ACCESSORIES	1	EA	
20000000000000245	FINGER GUARD	1	EA	
300 1584 000	SCR, 10-32 X 1-1/2	2	EA	#SPARK GAP
304 0045 000	NUT CAP 10-32 BRASS	2	EA	#SPARK GAP
304 0098 000	NUT, HEX 10-32	3	EA	#SPARK GAP
312 0049 000	WASHER, SPLIT-LOCK 10	2	EA	#SPARK GAP
320 3257 000	BOLT, CARRIAGE, 3/8-16 X 4.5	1	EA	#CHOKE
335 0294 000	WASHER, FLAT, NEOPRENE	24	EA	
354 0003 000	LUG #10 RING RED 22-18AWG	2	EA	#CHOKE
354 0386 000	TERM, LOCKING #10 RING	1	EA	
358 0003 000	BRACKET RESISTOR MTG	2	EA	#R1
358 1974 000	SPEED NUT 10-32	86	EA	#16 PA MODULE,#16 REAR PANEL,#54 FRONT PANEL
358 2589 000	FLAT CABLE MOUNT	4	EA	
358 3248 000	CLIP, SPRING	1	EA	
358 3562 000	SPRING CLIP 0.75 DIA	2	EA	#GROUND STICK
358 3637 000	PLATE, END STOP, DIN RAIL MTG	2	EA	2#TB1
358 3744 000	CARD GUIDE 8"LG,	10	EA	#PA MODULE
358 3816 000	PLATE, END COVER (281-FUSE)	2	EA	2#TB1
358 3837 000	CARD GUIDE, SNAP-IN	12	EA	6#DUMMY PA,6#PA ENCLOSURE
358 3853 000	CARD GUIDE, 6.0"L, 0.080"SLOT	2	EA	#PA KEY
358 3872 000	PLUG, WHITE 1.50 DIA HOLE	2	EA	#BOTTOM AC INPUT,#BOTTOM CONTROL IN
396 0261 000	DISPLAY, LCD BLUE	1	EA	
398 0552 000	FUSE, SLOW CARTRIDGE, 10A 250V	2	EA	2#TB1
410 0019 000	INSULATOR ROUND NS5W 0316	8	EA	
410 0022 000	INSULATOR ROUND NS5W0332	4	EA	
414 0302 000	CORE, FERRITE	1	EA	
424 0019 000	GROMMET 1 IN. MTG D.	2	EA	
424 0025 000	GROMMET 9/16 MTG DIA	1	EA	
424 0360 000	GROMMET 1-3/4 MTG DIA	2	EA	
424 0410 000	GROMMET 1.38 MTG DIA	4	EA	
430 0291 000	FAN, 48VDC 280CFM, 6" DIA	3	EA	B1,B2,B3

WARNING: Disconnect primary power prior to servicing.

430 0292 000	FAN GUARD, 6.14" DIA.	3	EA	#B1-B3
448 0868 000	AIR FILTER 14 X 20 X .88	1	EA	
464 0349 000	TOOL, ADJUSTMENT	1	EA	
492 0883 000	IND, TOROID, 12.5MH 72A	1	EA	L1
494 0516 000	CHOKE, 25,000 UH 65MA	1	EA	L4
516 0204 000	CAP, RF, 100PF 5KV 10% N750	1	EA	A5C4
516 0413 000	CAP, RF, 10PF 7.5KV 10% NPO	1	EA	A5C5
614 0964 000	TERM BLK, 2C MODULAR FUSED	2	EA	2#TB1
620 1906 000	END TERM, 7/8 EIA FLANGE	1	EA	
638 0039 000	SHUNT, METER 75A 50MV	1		
646 1353 000	NAMEPLATE, XMTR EQUIPMENT	1		
646 1698 000	NAMEPLATE, DOMED, HARRIS LOGO	1	EA	
646 1714 000	OVERLAY, DAX	1		A4
646 1715 000	NAMEPLATE, DAX	1		
736 0376 000	PSU, SW, 240W +12VDC	1	EA	PS2
736 0377 000	PSU, SW, 240W +48VDC	1	EA	PS1
813 4999 027	STDOFF 6-32X5/8 1/4 HEX	1		
817 2150 037	GROUNDING PLATE	3		
843 5572 043	PWB, KEY CARD	1		
843 5572 053	PWB, SHORTING MODULE	1		#DUMMY PA
917 2517 032	STANDOFF, PANEL	4	EA	#CONT/EXT I/O PANEL
917 2517 310	SPACER, .5 X DIA .715 LG	16	EA	8#A1,8#A2
917 2558 079	PATENT LABEL- AM XMTRS	1	EA	
917 2574 002	CABLES, CONTROL	1.0	EA	
917 2574 005	ACCESS PLATE	2	EA	
917 2574 006	SPACER, PWB / XFMR	1	EA	#A5A1
922 1344 016	PANEL, PWB MTG	1	EA	
922 1344 017	BUSBAR	1	EA	
922 1344 018	PANEL, ACCESS, TOP LEFT	1	EA	
922 1344 022	HATSECTION, PS	1	EA	
922 1344 024	RUBBER PAD	1	EA	#L1
922 1344 025	RAIL, TB1	1	EA	#TB1
922 1344 026	SHIM	1	EA	#A1
922 1344 027	SPACER, DISPLAY	4	EA	#A4
922 1344 028	INDUCTOR LEAD	1	EA	
922 1344 030	BLOCK, TERMINAL	1	EA	#E2
922 1344 031	STUD	2	EA	#E2
922 1344 038	BRACKET, SHUNT	2	EA	#SHUNT
922 1344 040	BRACKET	1	EA	
922 1344 042	STRAP, RF	1	EA	
922 1344 046	SPACER	3	EA	1#PA KEY,2#A7
922 1344 052	BRACKET, GROUND	1	EA	
938 4203 025	ASSY GROUND HOOK	1	EA	
939 8234 003	PANEL, CAP MTG	1	EA	
939 8234 004	HOUSING, PWB	1	EA	
939 8234 006	BRACKET, CB MTG	1	EA	
939 8234 008	BRACKET, PS PANEL MTG	2	EA	
939 8234 010	HINGE	1	EA	#PA ENCLOSURE
939 8234 013	INDUCTOR LEAD	2	EA	
939 8234 014	BRACKET, GASKET	2	EA	
939 8234 015	COVER, FIRING BOARD	1	EA	
939 8234 016	COVER, CKT BRKR CONN	1	EA	#CB1
939 8234 021	INNER CONDUCTOR	1	EA	
939 8234 022	BOX	1	EA	
939 8234 029	INDUCTOR LEAD	1	EA	
939 8234 030	TRAY, CABLE	1	EA	
939 8234 043	STIFFENER	1	EA	
939 8234 044	BRACKET, GROUND, PA	1	EA	
939 8234 045	BRACKET, TUNER	2	EA	

WARNING: Disconnect primary power prior to servicing.

939 8234 046	BUSBAR	1	EA	
939 8234 051	TEMPLATE, CAPACITOR	1	EA	
943 4237 001	COIL, VAR 17VC 1644	1	EA	L2
943 5573 002	COVER, PA MODULE	1	EA	#DUMMY PA
943 5573 004	PLATE, CARD GUIDE, LEFT	1	EA	
943 5573 005	PLATE, CARD GUIDE, RIGHT	1	EA	
943 5573 007	COVER, PA ENCLOSURE	1	EA	
943 5573 009	DIVIDER WALL, PA ENCLOSURE	1	EA	
943 5573 031	INNER PANEL, RIGHT	1	EA	
943 5573 032	INNER PANEL, LEFT	1	EA	
943 5573 033	SHELF, LOWER	1	EA	
943 5573 034	SHELF, CONTROL	1	EA	
943 5573 035	SHELF, TOP	1	EA	
943 5573 037	PANEL, PS	1	EA	
943 5573 038	CHANNEL, AC-IN	1	EA	
943 5573 039	CHANNEL, CONTROL-IN	1	EA	
943 5573 040	ACCESS PANEL, PS	1	EA	
943 5573 041	ACCESS PANEL, CONTROL	1	EA	
943 5573 042	ACCESS PANEL, MATCHING NETWORK	1	EA	
943 5573 044	FILTER FRAME	1	EA	
943 5573 046	GROUND STRAP	1	EA	
943 5573 050	CONTROL, I/O PANEL	1	EA	
943 5573 051	COVER, PS CONTROLLER	1	EA	
943 5573 054	COIL ASSY	1	EA	
943 5573 055	PANEL, CONTROL / EXTERNAL I/O	1	EA	
943 5573 056	BOX, OUTER CONDUCTOR	2	EA	
943 5573 057	COVER, RECTIFIER	1	EA	
943 5573 058	REAR PANEL, TOP	1	EA	
943 5573 076	BOX, FILTER	1	EA	
943 5573 078	COVER, TOROID	1	EA	
943 5573 079	BASE PLATE, DUMMY PA	1	EA	#DUMMY PA
952 9234 001	CHASSIS, PA ENCLOSURE	1	EA	
952 9234 002	WELDMENT, CABINET	1	EA	
992 9994 005	PWA, EXCITER/CONTROLLER	1	EA	A1
992 9994 030	PWA, OUTPUT MONITOR	1	EA	A5A1
992 9994 055	PWA, SECURITY KEY	1	EA	
992 9994 056	PWA, B+ SAMPLE TERM BOARD	1	EA	A6A4
992 9994 106	PWA, RF SAMPLE DIVIDER	1	EA	A5A2
026 6010 002	GROMMET STRIP, 0.090	5	FT	

Table 7-12 *PWA, EXTERNAL I/O - 992 9994 016 (G)

Harris PN	Description	Qty	UM	Reference Designators
358 3861 001	POST, SLIDE LOCK ASSY, 4-40	3	EA	1/J2,1/J18,1/J19
382 1705 000	IC, TPS75733 ESD	1	EA	U49
384 0935 000	SCR, MCR265-8 ESD	1	EA	Q14
560 0121 004	POSISTOR 0.25 AMP 60VDC DISC	1	EA	R18
566 0037 000	CONVERTER, DC/DC 5V .75W ESD	1	EA	U16
578 0026 000	RELAY DPDT 12VDC 2 AMP	3	EA	K1,K2,K3
610 0877 000	HDR, STR, 2 PIN, SQ	5	EA	JP2,JP3,JP4,JP5,JP6
610 0900 000	HEADER 3 CKT STRAIGHT	1	EA	JP1
610 1424 003	HDR, 3C 1ROW RT ANGLE	2	EA	J13,J15
610 1424 012	HDR, 12C 1ROW RT ANGLE	4	EA	J5,J7,J9,J12
610 1434 002	*PLUG D RT ANG 15C MET SHELL	1	EA	J18
610 1453 000	HDR, 20C 1ROW, RT ANGLE	1	EA	J3
612 1184 000	SHUNT JUMPER 0.1" CENTERS	6	EA	1/JP1,1/JP2,1/JP3,1/JP4,1/JP5,1/JP6
612 1499 001	D RECEPTACLE 9C RT ANGLE METAL	1	EA	J16
612 2139 001	RECP D STRT 9C METAL SHELL	1	EA	J17
612 2153 000	RECP, 68C RT ANGLE	1	EA	J6

WARNING: Disconnect primary power prior to servicing.

612 2156 003	PLUG, 3C 1ROW VERTICAL	2	EA	P/J13,P/J15 CONNECTOR PLUGS INTO CONNECTOR ON BOARD
612 2156 012	PLUG, 12C 1ROW VERTICAL	4	EA	P/J5,P/J7,P/J9,P/J12 CONNECTOR PLUGS INTO CONNECTOR ON BOARD
612 2175 002	*RECP D RT ANG 15C MET SHELL	2	EA	J2,J19
620 0700 000	*RECPT, MALE SMB,PC MOUNT	1	EA	J1
620 1677 000	RECEPTACLE, PC MT, BNC	5	EA	J4,J8,J10,J11,J14
843 5572 110	SPEC, EXTERNAL I/O	0		
843 5572 111	SCH, EXTERNAL I/O	0		
992 9994 017	*PWA, EXTERNAL I/O, SMT	1	EA	

Table 7-13 PWA, OUTPUT MONITOR - 992 9994 030 (J)

Harris PN	Description	Qty	UM	Reference Designators
354 0881 000	TERM, MALE, 250 QC, RT ANGLE	1	EA	J5
358 2635 000	CABLE TIE, PUSH MOUNT SNAP IN	3	EA	3/T1
358 3861 001	POST, SLIDE LOCK ASSY, 4-40	1	EA	1/J1
382 0593 000	IC TL072ACP ESD	2	EA	U1,U2
382 0707 000	IC, LM335AZ ESD	1	EA	Q1
382 1679 000	IC, LM317 ESD	1	EA	U3
384 0205 000	DIODE SILICON 1N914/4148 ESD	6	EA	CR2,CR8,CR10,CR11,CR12,CR14
384 0321 000	*DIODE 5082-2800 ESD	2	EA	CR7,CR9
384 0882 000	LED, RED, RT ANGLE MTG ESD	1	EA	DS1
386 0053 000	ZENER, 1N4746 18V ESD	3	EA	CR1,CR4,CR5
386 0082 000	ZENER, 1N4744A 15V 1W 5% ESD	2	EA	CR3,CR6
386 0406 000	ZENER, 1N4757A 51V ESD	2	EA	CR15,CR16
386 0472 000	DIODE, TVS 39V 600W ESD	1	EA	CR13
494 0239 000	CHOKE, WIDE BAND 2.5 TURN	1	EA	RFC1
494 0333 000	CHOKE RF 220UH	1	EA	L1
494 0414 000	CHOKE RF 390UH	1	EA	L2
500 0883 000	CAP, MICA, 4700PF 500V 5%	1	EA	C13
500 0902 000	CAP, MICA, 3300PF 500V 5%	1	EA	C15
516 0453 000	CAP .1UF 100V 20% X7R	7	EA	C2,C3,C5,C6,C8,C11,C17
516 0484 000	CAP 0.1UF 100V 10%	1	EA	C14
516 0533 000	CAP .01UF 10% 50V X7R	1	EA	C10
516 0970 000	CAP 390PF 5% 100V C0G	2	EA	C4,C7
522 0550 000	CAP 100UF 25V 20%	2	EA	C1,C12
522 0573 000	CAP 47UF 63V 20%	1	EA	C9
540 1600 210	RES 240 OHM 3W 5%	1	EA	R20
540 1600 213	RES 330 OHM 3W 5%	2	EA	R8,R24
540 1600 215	RES 390 OHM 3W 5%	2	EA	R1,R14
548 2400 117	RES 14.7 OHM 1/2W 1%	1	EA	R25
548 2400 134	RES 22.1 OHM 1/2W 1%	3	EA	R2,R3,R22
548 2400 230	RES 200 OHM 1/2W 1%	1	EA	R27
548 2400 293	RES 909 OHM 1/2W 1%	1	EA	R5
548 2400 301	RES 1K OHM 1/2W 1%	5	EA	R11,R15,R18,R28,R31
548 2400 312	RES 1.3K OHM 1/2W 1%	1	EA	R4
548 2400 330	RES 2K OHM 1/2W 1%	1	EA	R29
548 2400 343	RES 2.74K OHM 1/2W 1%	1	EA	R26
548 2400 356	RES 3.74K OHM 1/2W 1%	1	EA	R21
548 2400 366	RES 4.75K OHM 1/2W 1%	2	EA	R13,R16
548 2400 401	RES 10K OHM 1/2W 1%	3	EA	R6,R9,R12
548 2400 466	RES 47.5K OHM 1/2W 1%	2	EA	R10,R17
548 2400 489	RES 82.5K OHM 1/2W 1%	2	EA	R7,R19
550 0951 000	TRIMPOT 200 OHM 1/2W 10%	1	EA	R23
578 0026 000	RELAY DPDT 12VDC 2 AMP	1	EA	K1
604 1244 000	SW, DIP, 4 SPST, SIDE ACTUATED	1	EA	S1
610 0877 000	HDR, STR, 2 PIN, SQ	2	EA	JP1,JP2
610 0933 000	JUMPER, PWB TEST POINT	1	EA	TP1

WARNING: Disconnect primary power prior to servicing.

612 2175 002	*RECP D RT ANG 15C MET SHELL	1	EA	J1
620 3200 000	RECP, RT ANGLE, MCX	1	EA	J2
843 5572 031	SCH, OUTPUT MONITOR	0		
843 5572 033	PWB, OUTPUT MONITOR	1		
922 1344 020	TRANSFORMER	1	EA	T1

Table 7-14 PWA, B+ SAMPLE TERM BOARD - 992 9994 056 (B)

Harris PN	Description	Qty	UM	Reference Designators
354 0819 000	SOLDER LUG STRT .312" H	1	EA	J1
494 0196 000	CHOKE RF 100UH	2	EA	L1,L3
494 0198 000	CHOKE RF 10MH	2	EA	L2,L4
506 0232 000	CAP, 0.01UF 100V 5%	1	EA	C2
506 0242 000	CAP, 0.068UF 63V 5%	1	EA	C1
540 1600 213	RES 330 OHM 3W 5%	1	EA	R2
540 1600 417	RES 47K OHM 3W 5%	10	EA	R1,R3,R4,R5,R6,R7,R8,R9,R10,R11
620 0700 000	*RECPT, MALE SMB,PC MOUNT	1	EA	J2
843 5572 171	SCH, B+ SAMPLE TERM BOARD	0		
843 5572 173	PWB, B+ SAMPLE TERM BOARD	1		

Table 7-15 PWA, RF SAMPLE DIVIDER - 992 9994 106 (B)

Harris PN	Description	Qty	UM	Reference Designators
516 0894 000	CAP 1500PF 5% 100V C0G	1	EA	C1
610 1413 000	HDR, 2 PIN RT ANGLE	1	EA	J2
612 1507 000	CONN SMA FEMALE BULKHEAD	1	EA	J1
843 5572 181	SCH, RF SAMPLE DIVIDER	0		
843 5572 183	PWB, RF SAMPLE DIVIDER	1		

Table 7-16 KIT, 5KW, SINGLE PHASE - 992 9994 107 (K)

Harris PN	Description	Qty	UM	Reference Designators
2000000000000000270	CAPACITOR TRAY	1	EA	
2000000000000000276	COVER, CAPACITOR	1	EA	
2000000000000000295	CAP, 60UF 330VAC 10%	6	EA	
335 0236 000	WASHER SHOULDER 6	2	EA	
358 3797 000	PLATE, END COVER (283, 2-COND)	2	EA	2#TB1
358 3845 000	SPACER, .500" DIA X .375" LG	2	EA	
384 1155 000	SCR, BRIDGE 40A, 1-PHASE	1	EA	A9
384 1171 000	SCR, ST180S12P0V	1	EA	
398 0592 000	FUSE, 50A 700V, 14 X 51MM CART	1	EA	F8
472 1817 000	XFMR, PWR RECTIFIER, 1-PHASE	1	EA	T1
524 0383 000	CAP 8,200 UF 400VDC 20%	1	EA	C1
540 1600 201	RES 100 OHM 3W 5%	1	EA	R2
542 1738 000	RES, 100 OHM 100W 10%	1	EA	R1
606 1003 000	CKT BREAKER, 2-POLE 80A 277V	1	EA	CB1
610 1253 000	MALE CONNECTOR, 4C,	1	EA	J2P2
612 1451 000	FEMALE CONNECTOR, 4C	1	EA	J2P2
614 0793 000	TERM BLOCK,3C MODULAR 281	2	EA	2#TB1
614 0794 000	JUMPER, 2-POLE STEP-DOWN 283	2	EA	#TB1
614 0930 000	TERM BLK, 2C MODULAR 283	2	EA	2#TB1
735 0041 001	FIRING BD, 1-PH RECT, 50HZ	1	EA	A8
917 2574 007	PWR SUPPLY CBL, SINGLE PHASE	1	EA	
917 2574 011	COVER, CKT BRKR	1	EA	
917 2574 048	5KW COMBINER CABLE (W10)	1	EA	W10
917 2574 058	CABLE, 1 PHASE PWR FACTOR CORR	1	EA	
922 1344 024	RUBBER PAD	1	EA	
922 1344 033	COPPER STRAP	2	EA	1#A9-A10,1#A9-SHUNT
939 8234 040	BRACKET, CAPACITOR	1	EA	
939 8234 041	PLATE, AIR BLOCK	1	EA	

WARNING: Disconnect primary power prior to servicing.

939 8234 054	COVER, CAPACITOR	1	EA	
939 8234 063	BRACKET, CROWBAR	1	EA	
943 5573 008	REAR PANEL, PA ENCLOSURE	1	EA	
943 5573 036	REAR PANEL	1	EA	
943 5573 047	BLANK PANEL, PA	1	EA	
943 5573 077	PLATE, BOTTOM, 5KW	1	EA	
992 8553 010	PWA, MOV-AC 187-264 VAC	1	EA	A7

Table 7-17 KIT, 5KW, 3-PHASE, 208/240VAC - 992 9994 108 (D)

Harris PN	Description	Qty	UM	Reference Designators
358 3797 000	PLATE, END COVER (283, 2-COND)	3	EA	3#TB1
384 1156 000	SCR, BRIDGE 40A, 3-PHASE	1	EA	A9
472 1818 000	XFMR, PWR RECTIFIER, 3-PHASE	1	EA	T1
542 1730 000	RES, 200 OHM 100W, 10%	1	EA	R1
606 1002 000	CKT BREAKER, 3-POLE 50A 480V	1	EA	CB1
614 0793 000	TERM BLOCK,3C MODULAR 281	3	EA	3#TB1
614 0794 000	JUMPER, 2-POLE STEP-DOWN 283	3	EA	#TB1
614 0930 000	TERM BLK, 2C MODULAR 283	3	EA	3#TB1
735 0040 000	FIRING BD, 3-PH RECT, 50/60HZ	1	EA	A8
917 2574 008	PWR SUPPLY CBL, THREE PHASE	1	EA	
917 2574 048	5KW COMBINER CABLE (W10)	1	EA	W10
922 1344 033	COPPER STRAP	4	EA	1#A9-SHUNT,3#A9-A10
939 8234 041	PLATE, AIR BLOCK	1	EA	
943 5573 008	REAR PANEL, PA ENCLOSURE	1	EA	
943 5573 036	REAR PANEL	1	EA	
943 5573 047	BLANK PANEL, PA	1	EA	
943 5573 077	PLATE, BOTTOM, 5KW	1	EA	
992 8553 011	PWA, MOV-AC 176-264 VAC	1	EA	A7
992 9994 019	PWA, PS CONTROLLER, 3-PH	1	EA	A10
992 9994 057	PWA, MOTHERBOARD, 5KW	1	EA	A2

Table 7-18 PWA, MOV-AC 176-264 VAC - 992 8553 011 (C)

Harris PN	Description	Qty	UM	Reference Designators
2960345000A	*TUBING, SHRINKABLE 3/4	0.667	FT	NOTE: CUT 8 PIECES 1 IN EACH FOR 560-0023-000
560 0023 000	MOV, 300WVAC, 165J, 20MM DISC	8	EA	RV1,RV2,RV3,RV4,RV5,RV6,RV10,RV12
610 1066 000	CONN, .25 FASTON PC MOUNT	3	EA	A,B,C
839 8115 031	SCH, MOV-AC PROTECTOR	0		
839 8115 033	PWB, MOV-AC PROTECTOR,	1		

Table 7-19 PWA, PS CONTROLLER, 3-PH - 992 9994 019 (P)

Harris PN	Description	Qty	UM	Reference Designators
000 0000 010	B/M NOTE:	3		DWGC99,C100,C104
300 1536 000	SCR, 6-32 X 1/4	3	EA	1/Q1,1/Q5,1/U1
300 1538 000	SCR, 6-32 X 3/8	1	EA	1/Q8
302 0062 000	SCR, 4-40 X 1.25	1	EA	1/L2
304 0089 000	NUT, HEX 6-32	4	EA	1/Q1,1/Q5,1/Q8,1/U1
306 0003 000	NUT, HEX 4-40	1	EA	1/L2
310 0003 000	WASHER, FLAT NO. 4	2	EA	2/L2
312 0047 000	WASHER, SPLIT-LOCK 6	4	EA	1/Q1,1/Q5,1/Q8,1/U1
314 0003 000	WASHER, SPLIT-LOCK 4	1	EA	1/L2
350 0105 000	RIVET 3/16 ALUM .126/.25	10	EA	2/XF3,2/XF4,2/XF5,2/XF7,2/XF9
354 0309 000	TERM SOLDER	21	EA	TP1,TP2,TP3,TP4,TP5,TP6,TP7,TP8,TP9,TP10,TP11,TP12,TP13,TP14,TP15,TP16,TP17,TP18,TP19,TP20,TP21
354 0905 000	TERMINAL, SCREW 10-32, 30A	9	EA	E1,E2,E3,E4,E5,E6,E7,E8,E9
358 3861 001	POST, SLIDE LOCK ASSY, 4-40	2	EA	1/J2,1/J3

WARNING: Disconnect primary power prior to servicing.

380 0645 000	XSTR, IRF530 ESD	2	EA	Q2,Q4
380 0773 000	XSTR FET BS170 N-CHL ESD	2	EA	Q6,Q7
380 0804 000	N-MOSFET IRFP22N50A ESD	1	EA	Q8
380 0825 000	XSTR, P-MOSFET, IRF5210 ESD	1	EA	Q3
380 0828 000	N-MOSFET, IRFB33N15D ESD	2	EA	Q1,Q5
382 0184 000	IC, 340T-5/7805 +5V REG ESD	1	EA	U1
382 0415 000	IC, 324 ESD	1	EA	U10
382 0428 000	IC, LM358 ESD	1	EA	U9
382 0463 000	IC, 4051/14051 ESD	1	EA	U5
382 0656 000	IC, 7405 ESD	1	EA	U3
382 0772 000	IC 74HC10 ESD	1	EA	U8
382 0774 000	IC 74HC14 ESD	1	EA	U7
382 1070 000	IC, ILQ-1 OPTO-ISOLATOR ESD	1	EA	U11
382 1218 000	IC 1007 ESD	1	EA	U12
382 1649 000	IC AD620 ESD	1	EA	U4
382 1653 000	IC IR2113 ESD	1	EA	U6
382 1708 000	IC, UC3825 ESD	1	EA	U2
384 0205 000	DIODE SILICON 1N914/4148 ESD	4	EA	CR29,CR31,CR39,CR40
384 0253 000	RECTIFIER 1N4007 ESD	3	EA	CR10,CR33,CR34
384 0720 000	TRANSZORB 1N6377 15V 5W ESD	4	EA	CR8,CR9,CR23,CR24
384 0780 000	LED, RED ESD	4	EA	DS1,DS2,DS3,DS4
384 0803 000	RECT MUR-120 200V ESD	1	EA	CR11
384 0986 000	LED, RED BLINKING, T-1-3/4 ESD	1	EA	DS5
384 1159 000	DIODE,SCHOTTKY, 50SQ100 ESD	4	EA	CR25,CR26,CR27,CR28
386 0082 000	ZENER, 1N4744A 15V 1W 5% ESD	2	EA	CR21,CR35
386 0083 000	ZENER, 1N4742A 12V ESD	4	EA	CR18,CR19,CR20,CR22
386 0135 000	ZENER, 1N4733A 5.1V ESD	8	EA	CR2,CR3,CR4,CR5,CR16,CR17,CR30,CR32
386 0148 000	ZENER, 1N4743A 13V ESD	3	EA	CR1,CR6,CR7
386 0404 000	ZENER, 1N4758A 56V ESD	1	EA	CR15
386 0412 000	ZENER, DUAL 18V 3W ESD	3	EA	CR12,CR13,CR14
386 0440 000	ZENER, 1N5339B 5.6V 5W 5% ESD	3	EA	CR41,CR42,CR43
398 0089 000	FUSE, SLOW CART 7A 125V	1	EA	F8
398 0368 000	FUSE, CART 2A 600V	1	EA	F7
398 0585 000	FUSE, FAST 1A 250VAC	2	EA	F1,F2
398 0596 000	FUSE, 40A 600V, FAST CART	3	EA	F3,F4,F5
398 0598 000	FUSE, SLOW, 3AG, 15 AMP, 32V	1	EA	F6
398 0621 000	FUSE, FAST 3A 600V	1	EA	F9
402 0129 000	CLIP, 1/4 DIA FUSE	4	EA	2/XF6,2/XF8
402 0220 000	CLIP, FUSE 13/32 DIA, SOLDER	10	EA	2/XF3,2/XF4,2/XF5,2/XF7,2/XF9
404 0904 000	SOCKET, SIP 2C	2	EA	XF1,XF2
404 0907 000	HEATSINK TO-218/247 2.0" HT	1	EA	XQ8
404 0908 000	HEATSINK, VERTICAL, TO-220	3	EA	XQ1,XQ5,XU1
410 0446 000	THERMAL INTERFACE, TO-247	1	EA	XQ8
494 0218 000	CHOKE, WIDE BAND 2.5 TURN	1	EA	RFC1
494 0441 000	CHOKE RF PWR 82UH 4.8A	1	EA	L2
494 0514 000	IND, 1.0MH 15% 5 AMP	1	EA	L1
506 0231 000	CAP .0015UF 63V 5%	1	EA	C46
506 0232 000	CAP, 0.01UF 100V 5%	4	EA	C34,C47,C80,C83
506 0233 000	CAP, 0.1UF 63V 5%	41	EA	C1,C2,C3,C4,C5,C13,C14,C18,C19,C20,C21,C22,C27,C28,C31,C40,C41,C49,C50,C52,C53,C55,C57,C58,C61,C62,C63,C64,C66,C67,C69,C71,C72,C77,C81,C82,C86,C87,C88,C102,C103
506 0236 000	CAP, 0.0047UF 100V 5%	1	EA	C48
506 0240 000	CAP, 0.033UF 100V 5%	1	EA	C36
506 0242 000	CAP, 0.068UF 63V 5%	1	EA	C51

WARNING: Disconnect primary power prior to servicing.

506 0244 000	CAP, 0.22UF 63V 5%	3	EA	C25,C32,C33
506 0245 000	CAP, 0.33UF 63V 5%	1	EA	C95
506 0246 000	CAP, 0.47UF 63V 5%	2	EA	C94,C96
506 0262 000	CAP, 0.047UF 100V 5%	2	EA	C97,C98
516 0067 000	CAP DISC .003UF 1KV 20%	1	EA	C101
516 0081 000	CAP, DISC .01UF 1KV 20%	1	EA	C93
516 0084 000	CAP DISC .02UF 600V	1	EA	C84
516 0516 000	CAP 1UF 100V 20%	11	EA	C6,C7,C8,C10,C11,C16,C17,C29,C30,C38, C44
516 0725 000	CAP 1.0UF 50V 20%	14	EA	C23,C24,C35,C37,C43,C45,C54,C56,C59,C 60,C73,C74,C75,C85
516 0771 000	CAP 33PF 5% 100V C0G	1	EA	C42
522 0545 000	CAP 10UF 100V 20%	2	EA	C78,C92
522 0548 000	CAP 10UF 50V 20%	1	EA	C12
522 0554 000	CAP 4.7UF 50V 20%	1	EA	C15
522 0590 000	CAP 470UF 25V 20%	4	EA	C9,C26,C39,C76
522 0592 000	CAP 100UF 20% 25VDC	1	EA	C70
522 0656 000	CAP 330 UF 25V 20%	3	EA	C65,C68,C79
540 1600 118	RES 51 OHM 3W 5%	2	EA	R56,R62
540 1600 401	RES 10K OHM 3W 5%	3	EA	R66,R71,R73
540 1600 418	RES 51K OHM 3W 5%	1	EA	R82
546 0313 000	RES 50 OHM 5W 5%	1	EA	R78
548 0345 000	RES 15K OHM 7W 1%	1	EA	R81
548 2351 000	RES, 301K OHM 3/4W 0.1%	4	EA	R59,R64,R76,R77
548 2360 000	RES, 2.5K OHM 1/8W 0.1 %	2	EA	R68,R70
548 2400 101	RES 10 OHM 1/2W 1%	2	EA	R19,R45
548 2400 134	RES 22.1 OHM 1/2W 1%	1	EA	R7
548 2400 137	RES 23.7 OHM 1/2W 1%	1	EA	R38
548 2400 201	RES 100 OHM 1/2W 1%	9	EA	R9,R11,R12,R13,R28,R29,R49,R57,R61
548 2400 243	RES 274 OHM 1/2W 1%	1	EA	R46
548 2400 247	RES 301 OHM 1/2W 1%	1	EA	R36
548 2400 301	RES 1K OHM 1/2W 1%	6	EA	R18,R20,R25,R31,R32,R65
548 2400 316	RES 1.43K OHM 1/2W 1%	1	EA	R5
548 2400 330	RES 2K OHM 1/2W 1%	6	EA	R8,R10,R50,R51,R55,R60
548 2400 339	RES 2.49K OHM 1/2W 1%	1	EA	R74
548 2400 347	RES 3.01K OHM 1/2W 1%	2	EA	R14,R16
548 2400 355	RES 3.65K OHM 1/2W 1%	1	EA	R30
548 2400 361	RES 4.22K OHM 1/2W 1%	1	EA	R40
548 2400 367	RES 4.87K OHM 1/2W 1%	1	EA	R15
548 2400 368	RES 4.99K OHM 1/2W 1%	1	EA	R17
548 2400 385	RES 7.5K OHM 1/2W 1%	1	EA	R75
548 2400 401	RES 10K OHM 1/2W 1%	17	EA	R2,R3,R4,R6,R22,R24,R26,R35,R43,R47,R 48,R52,R53,R54,R58,R67,R72
548 2400 407	RES 11.5K OHM 1/2W 1%	1	EA	R37
548 2400 418	RES 15K OHM 1/2W 1%	1	EA	R86
548 2400 430	RES 20K OHM 1/2W 1%	2	EA	R23,R87
548 2400 434	RES 22.1K OHM 1/2W 1%	1	EA	R63
548 2400 443	RES 27.4K OHM 1/2W 1%	1	EA	R27
548 2400 444	RES 28K OHM 1/2W 1%	1	EA	R21
548 2400 450	RES 32.4K OHM 1/2W 1%	1	EA	R33
548 2400 468	RES 49.9K OHM 1/2W 1%	1	EA	R34
548 2400 501	RES 100K OHM 1/2W 1%	1	EA	R83
548 2400 530	RES 200K OHM 1/2W 1%	1	EA	R39
548 2400 547	RES 301K OHM 1/2W 1%	1	EA	R42
548 2400 593	RES 909K OHM 1/2W 1%	1	EA	R85
548 2400 601	RES 1MEG OHM 1/2W 1%	2	EA	R69,R84

WARNING: Disconnect primary power prior to servicing.

550 0934 000	POT 500 OHM 1/2W 10%	1	EA	R41
560 0121 005	POSISTOR 0.3 AMP 60VDC DISC	1	EA	R80
560 0121 011	POSISTOR 1.1 AMP 60VDC DISC	1	EA	R1
560 0121 018	POSISTOR 2.5 AMP 60VDC DISC	1	EA	R44
578 0036 000	RELAY, SPDT, 12V, 40A	3	EA	K1,K2,K3
610 1106 000	HDR, 8PIN, 1ROW, STRT,POL	1	EA	J1
610 1107 000	HDR,12PIN,1ROW,STRT,POL	1	EA	J6
610 1108 000	HDR,14PIN,1ROW,STRT,POL	1	EA	J5
610 1172 000	HDR, 2PIN,1ROW,STRT,POLAR	1	EA	J4
610 1411 002	PLUG D STRT 15C METAL SHELL	1	EA	J3
612 2139 002	RECP D STRT 15C METAL SHELL	1	EA	J2
843 5572 201	SCH, PS CONTROLLER, 3-PH	0		
843 5572 203	PWB, PS CONTROLLER, 3-PH	1		

Table 7-20 KIT, 5KW, 3-PHASE, 380VAC - 992 9994 109 (G)

Harris PN	Description	Qty	UM	Reference Designators
20000000000000001531	XFMR, 500VA, 1:2 STEP-UP, 1-PH	1	EA	T2
20000000000000001673	COVER, TRANSFORMER	1	EA	#T2
358 3797 000	PLATE, END COVER (283, 2-COND)	3	EA	3#TB1
384 1156 000	SCR, BRIDGE 40A, 3-PHASE	1	EA	A9
472 1822 000	XFMR, PWR RECTIFIER, 3-PHASE	1	EA	T1
542 1730 000	RES, 200 OHM 100W, 10%	1	EA	
606 1102 000	CB, 3 POLE, 30 AMP 277/480VAC	1	EA	CB1
614 0793 000	TERM BLOCK,3C MODULAR 281	3	EA	3#TB1
614 0794 000	JUMPER, 2-POLE STEP-DOWN 283	3	EA	#TB1
614 0930 000	TERM BLK, 2C MODULAR 283	3	EA	3#TB1
735 0040 000	FIRING BD, 3-PH RECT, 50/60HZ	1	EA	A8
917 2574 008	PWR SUPPLY CBL, THREE PHASE	1	EA	
917 2574 048	5KW COMBINER CABLE (W10)	1	EA	W10
917 2574 063	PS 380VAC DAX 5/6	1	EA	
922 1344 033	COPPER STRAP	4	EA	1#A9-SHUNT,3#A9-A10
939 8234 041	PLATE, AIR BLOCK	1	EA	
939 8234 071	BRACKET, CB MTG.	1	EA	
939 8234 073	SHIELD, BREAKER	1	EA	
943 5573 008	REAR PANEL, PA ENCLOSURE	1	EA	
943 5573 047	BLANK PANEL, PA	1	EA	
943 5573 077	PLATE, BOTTOM, 5KW	1	EA	
943 5573 113	REAR PANEL	1	EA	
992 8553 013	PWA, MOV-AC 380-415	1	EA	A7
992 9994 019	PWA, PS CONTROLLER, 3-PH	1	EA	A10

Table 7-21 PWA, MOV-AC 380-415 - 992 8553 013 (A)

Harris PN	Description	Qty	UM	Reference Designators
2960345000A	*TUBING, SHRINKABLE 3/4	1	FT	NOTE: CUT 8 PEICES 1 INCH EACH FOR RV1, 2, 3, 4, 5, 6, 10, 12
560 0042 000	MOV, 510WVAC, 190J, 20MM DISC	8	EA	RV1,RV2,RV3,RV4,RV5,RV6,RV10,RV12
610 1066 000	CONN, .25 FASTON PC MOUNT	3	EA	A,B,C
839 8115 031	SCH, MOV-AC PROTECTOR	0		
839 8115 033	PWB, MOV-AC PROTECTOR,	1		

Table 7-22 KIT, 6KW, SINGLE PHASE - 992 9994 110 (K)

Harris PN	Description	Qty	UM	Reference Designators
20000000000000000270	CAPACITOR TRAY	1	EA	
20000000000000000276	COVER, CAPACITOR	1	EA	
20000000000000000295	CAP, 60UF 330VAC 10%	6	EA	
335 0236 000	WASHER SHOULDER 6	2	EA	
358 3744 000	CARD GUIDE 8"LG,	2	EA	#PA MODULE

WARNING: Disconnect primary power prior to servicing.

358 3797 000	PLATE, END COVER (283, 2-COND)	2	EA	2#TB1
358 3845 000	SPACER, .500" DIA X .375" LG	2	EA	
384 1155 000	SCR, BRIDGE 40A, 1-PHASE	1	EA	A9
384 1171 000	SCR, ST180S12P0V	1	EA	
398 0592 000	FUSE, 50A 700V, 14 X 51MM CART	1	EA	F8
430 0291 000	FAN, 48VDC 280CFM, 6" DIA	1	EA	B4
472 1817 000	XFMR, PWR RECTIFIER, 1-PHASE	1	EA	T1
524 0383 000	CAP 8,200 UF 400VDC 20%	1	EA	C1
540 1600 201	RES 100 OHM 3W 5%	1	EA	R2
542 1738 000	RES, 100 OHM 100W 10%	1	EA	
606 1003 000	CKT BREAKER, 2-POLE 80A 277V	1	EA	CB1
610 1253 000	MALE CONNECTOR, 4C,	1	EA	J2P2
612 1451 000	FEMALE CONNECTOR, 4C	1	EA	J2P2
614 0793 000	TERM BLOCK,3C MODULAR 281	2	EA	2#TB1
614 0794 000	JUMPER, 2-POLE STEP-DOWN 283	2	EA	#TB1
614 0930 000	TERM BLK, 2C MODULAR 283	2	EA	2#TB1
735 0041 001	FIRING BD, 1-PH RECT, 50HZ	1	EA	A8
917 2574 007	PWR SUPPLY CBL, SINGLE PHASE	1	EA	
917 2574 011	COVER, CKT BRKR	1	EA	
917 2574 049	6KW CABLES (W10)	1	EA	W10
917 2574 058	CABLE, 1 PHASE PWR FACTOR CORR	1	EA	
922 1344 024	RUBBER PAD	1	EA	
922 1344 033	COPPER STRAP	2	EA	1#A9-A10,1#A9-SHUNT
939 8234 040	BRACKET, CAPACITOR	1	EA	
939 8234 054	COVER, CAPACITOR	1	EA	
939 8234 063	BRACKET, CROWBAR	1	EA	
943 5573 006	BOTTOM PLATE	1	EA	
943 5573 036	REAR PANEL	1	EA	
943 5573 082	REAR PANEL, PA ENCLOS, 4 FANS	1	EA	
992 8553 010	PWA, MOV-AC 187-264 VAC	1	EA	A7

Table 7-23 KIT, 6KW, 3-PHASE, 208/240VAC - 992 9994 111 (D)

Harris PN	Description	Qty	UM	Reference Designators
358 3744 000	CARD GUIDE 8"LG,	2	EA	#PA MODULE
358 3797 000	PLATE, END COVER (283, 2-COND)	3	EA	3#TB1
384 1156 000	SCR, BRIDGE 40A, 3-PHASE	1	EA	A9
430 0291 000	FAN, 48VDC 280CFM, 6" DIA	1	EA	B4
472 1818 000	XFMR, PWR RECTIFIER, 3-PHASE	1	EA	T1
524 0383 000	CAP 8,200 UF 400VDC 20%	1	EA	C1
542 1738 000	RES, 100 OHM 100W 10%	1	EA	R1
606 1002 000	CKT BREAKER, 3-POLE 50A 480V	1	EA	CB1
614 0793 000	TERM BLOCK,3C MODULAR 281	3	EA	3#TB1
614 0794 000	JUMPER, 2-POLE STEP-DOWN 283	3	EA	#TB1
614 0930 000	TERM BLK, 2C MODULAR 283	3	EA	3#TB1
735 0040 000	FIRING BD, 3-PH RECT, 50/60HZ	1	EA	A8
917 2574 008	PWR SUPPLY CBL, THREE PHASE	1	EA	
917 2574 049	6KW CABLES (W10)	1	EA	W10
922 1344 024	RUBBER PAD	1	EA	
922 1344 033	COPPER STRAP	4	EA	1#A9-SHUNT,3#A9-A10
939 8234 040	BRACKET, CAPACITOR	1	EA	
939 8234 054	COVER, CAPACITOR	1	EA	
943 5573 006	BOTTOM PLATE	1	EA	
943 5573 036	REAR PANEL	1	EA	
943 5573 082	REAR PANEL, PA ENCLOS, 4 FANS	1	EA	
992 8553 011	PWA, MOV-AC 176-264 VAC	1	EA	A7

WARNING: Disconnect primary power prior to servicing.

Table 7-24 KIT, 6KW, 3-PHASE, 380VAC - 992 9994 112 (G)

Harris PN	Description	Qty	UM	Reference Designators
20000000000000001531	XFMR, 500VA, 1:2 STEP-UP, 1-PH	1	EA	T2
20000000000000001673	COVER, TRANSFORMER	1	EA	#T2
358 3744 000	CARD GUIDE 8"LG,	2	EA	#PA MODULE
358 3797 000	PLATE, END COVER (283, 2-COND)	3	EA	3#TB1
384 1156 000	SCR, BRIDGE 40A, 3-PHASE	1	EA	A9
430 0291 000	FAN, 48VDC 280CFM, 6" DIA	1	EA	B4
472 1822 000	XFMR, PWR RECTIFIER, 3-PHASE	1	EA	T1
524 0383 000	CAP 8,200 UF 400VDC 20%	1	EA	C1
542 1738 000	RES, 100 OHM 100W 10%	1	EA	R1
606 1102 000	CB, 3 POLE, 30 AMP 277/480VAC	1	EA	CB1
614 0793 000	TERM BLOCK,3C MODULAR 281	3	EA	3#TB1
614 0794 000	JUMPER, 2-POLE STEP-DOWN 283	3	EA	#TB1
614 0930 000	TERM BLK, 2C MODULAR 283	3	EA	3#TB1
735 0040 000	FIRING BD, 3-PH RECT, 50/60HZ	1	EA	A8
917 2574 008	PWR SUPPLY CBL, THREE PHASE	1	EA	
917 2574 049	6KW CABLES (W10)	1	EA	W10
917 2574 063	PS 380VAC DAX 5/6	1	EA	
922 1344 024	RUBBER PAD	1	EA	
922 1344 033	COPPER STRAP	4	EA	1#A9-SHUNT,3#A9-A10
939 8234 040	BRACKET, CAPACITOR	1	EA	
939 8234 054	COVER, CAPACITOR	1	EA	
939 8234 071	BRACKET, CB MTG	1	EA	
939 8234 073	SHIELD, BREAKER	1	EA	
943 5573 006	BOTTOM PLATE	1	EA	
943 5573 082	REAR PANEL, PA ENCLOS, 4 FANS	1	EA	
943 5573 113	REAR PANEL	1	EA	
992 8553 013	PWA, MOV-AC 380-415	1	EA	A7

WARNING: Disconnect primary power prior to servicing.