TECHNICAL MANUAL
888-2498-001

DEXSTAR™ IBOC Exciter

DEXSTAR™ IBOC Exciter

T.M. No. 888-2498-001

Rev. K
04-18-2005

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.

Manual Revision History

DEXSTAR™

REV.	DATE	ECN	Pages Affected
A	12/10/2002		Released
B	04/29/2003	49193	Replaced Title page, MRH1/MRH2, Section II
C	05/02/2003	49253	Replaced entire manual
D	06/19/2003	49449	Replaced Title page, MRH1/MRH2 and all of Section III
E	11/12/2003	49789	Replaced Title page, MRH1/MRH2, all of Sections III and IV.
F	01/29/2004	49947	Replaced Title page, MRH1/MRH2, all of Sections I, II and III.
G	02/09/2004	49965	Replaced Title page, MRH-1/MRH-2, all of Sections II, III and V.
H	05/24/2004	50272	Replaced Title page, MRH-1/MRH-2, all of section II, III, IV, V..
J	03/21/2005	51175	Replaced Title Page, MRH-1/MRH-2, all of section V.
K	04/18/2005	51278	Replaced Title Page, MRH-1/MRH-2, all of section II.

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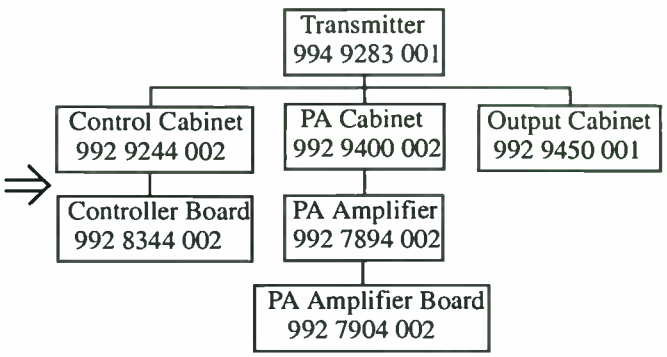
Guide to Using Harris Parts List Information

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 UTILISED 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.

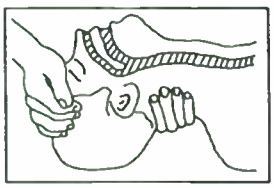
TREATMENT OF ELECTRICAL SHOCK

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

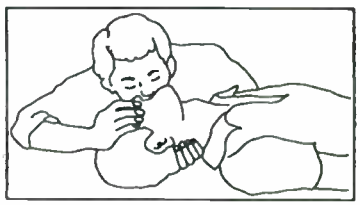
IF UNCONSCIOUS,
OPEN AIRWAY



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

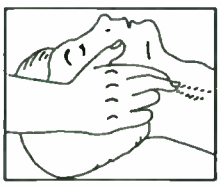
(B) BREATHING

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

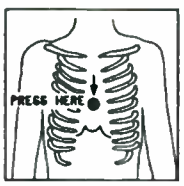
CHECK
CAROTID PULSE



IF PULSE ABSENT,
BEGIN ARTIFICIAL
CIRCULATION

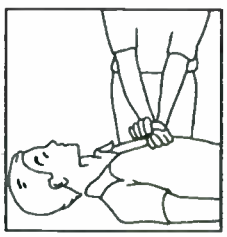
(C) CIRCULATION

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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WARNING: Disconnect primary power prior to servicing.

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WARNING: Disconnect primary power prior to servicing.

Section 1 Introduction/ Specifications

1

1.1 Introduction

This technical manual describes the Harris DEXSTAR™ Exciter and the program audio link called the ePAL™. This manual contains information needed to install, operate and service both.

This manual contains the following sections:

- Section 1: Introduction/Specifications, identifies the versions of the product available and the possible options, and provides specifications.
- Section 2: Installation/Initial Turn-on, details the procedures to receive, install and prepare the Exciter for use, up through the initial turn-on of the equipment.
- Section 3: Operators Guide, describes operation of the equipment and is intended to be the primary section referenced by operating personnel.
- Section 4: Overall System Theory, is included to help service personnel to understand the inner workings of the Exciter.
- Section 5: Maintenance/Alignments-Adjustments, lists and explains alignments and adjustments which might be required once it leaves the Harris Broadcast factory.
- Section 6: Troubleshooting, is included as a servicing aid, to be used along with Sections 4 and 5 by qualified service personnel to identify and correct an equipment malfunction.
- Section 7: Parts List, a comprehensive listing of the components which may be needed for replacement.

1.2 Features/Benefits

- Permits a smooth transition from analog AM or FM broadcasts to a fully digital In-band, On-channel (IBOC) transmission.

WARNING: Disconnect primary power prior to servicing.

1.3 General Description

The Harris DEXSTAR™ Exciter is an In-Band, On-Channel Digital Audio Broadcasting Exciter designed to allow broadcasters the ability to broadcast digital signals over their current existing AM or FM channel while still maintaining their current service. Over their current radio frequencies, broadcasters can transmit their current analog signals and new higher quality digital signals simultaneously.

The Harris DEXSTAR Exciter is based off the iBiquity Digital version of IBOC called HD Radio™ and provides for enhanced sound fidelity, improved reception and new wireless data services. iBiquity Digital's audio compression technique, High Definition Codec (HDC™) uses advanced signal processing and psycho acoustic modeling to interpret human hearing and eliminate redundancies in the audio signal, thus compressing the signal.

The DEXSTAR exciter offers improvements over the reference exciter with RF and control sections and a user friendly interface menu screen and an internal GPS receiver.

The Harris system normally consists of two components; the DEXSTAR Exciter and the optional Program Audio Link called the ePAL™. The ePAL has the primary functions of generation, distribution and switching signals for the exciter. First it receives the 44.1kHz AES pulse from the active Exciter for audio rate conversion. Second it distributes the 44.1kHz AES, AES transmitter audio and DAB audio. Third, it handles switching of the audio signal for the analog Exciter.

The ePAL™ is configurable to control up to 2 FM DEXSTAR and 2 Analog FM Exciters (Digit CD Exciters for example). These Exciters will be bank-switched, meaning that DEXSTAR A and Digit A or DEXSTAR B and Digit B will be driving the transmitter. Switching can occur automatically or manually. For AM the ePAL™ handles only one DEXSTAR. The ePAL handles switching out failed FM Exciters, for AM the ePAL handles RF source switching to keep the transmitter on-air. It also synchronizes the audio feeds, distributes the audio and has a rate converter which synchronizes the AES audio to a 44.1kHz clock based off the GPS clock.

The DEXSTAR contains a Main Computer board, Digital Upconverter, an RF upconverter (for FM only), serial interface card, CD ROM, hard drive, Audio cards and GPS receiver, a VGA Display and a station Interface (Exciter Cotnroller).

The ePAL contains audio bypass switches, several distribution amplifiers and an AES rate converter.

1.4 Performance Specifications

See Sales Brochure at the end of this manual for a listing of the Performance Specifications for the Harris DEXSTAR Exciter.

DexStar™ Specification

1.	RF output	Output	FM 88 – 108 MHz at 0dbm ± 0.25dB 50 ohm Female BNC connector
2.	Down Converter	Input	50 ohm Female BNC connector (not currently used)
3.	AM		AM 550 – 1700 kHz
4.	Phase	Output	AM 550 – 1700 kHz 3-10V adjustable 50 ohm Female BNC connector
5.	10 MHz	Output	10 MHz GPS 8 dBm 50 ohm Female BNC connector
6.	10 MHz	Output	10 MHz GPS 8 dBm 50 ohm Female BNC connector
7.	1 PPS	Output	1 Pulse per Second 0 to 5V 50 ohm Female BNC connector
8.	1 PPS	Output	1 Pulse per Second 0 to 5V 50 ohm Female BNC connector
9.	GPS Antenna	Input	Global Positioning Satellite Antenna Input with +5V DC on center conductor 50 ohm Female TNC connector
10.	Monitor	Output	User selectable from Exciter GUI AES3 Data 110 ohm Balanced Male XLR connector
11.	DAB Audio	Input	Digital Audio Broadcast Audio Input AES3 Data 110 ohm Balanced Female XLR connector
12.	TX Audio Delayed	Output	Delayed Transmit Audio AES3 Data 110 ohm Balanced Male XLR connector
13.	TX audio	Input	Transmit Audio Input AES3 Data 110 ohm Balanced Female XLR connector
14.	44.1 kHz	Output	44.1 kHz Reference 0 to 5V 110 ohm Balanced Male XLR connector
15.	44.1 kHz	Output	44.1 kHz Reference 0 to 5V 110 ohm Balanced Male XLR connector
16.	Phase	Output	AM 550 to 1700 kHz 0 to 5V 110 ohm Balanced Male XLR connector
17.	Magnitude	Output	AM Transmit Audio magnitude 110 ohm Balanced Male XLR connector user adjustable to +10dBm.
18.	Master Controller	I/O	Interface to Z master controller
19.	ePAL control and status	I/O	Interface to ePAL
20.	Remote control	Output	12 Isolated Station Outputs 25 pin D connector
21.	Remote control	Input	12 Isolated Station Inputs 15 pin D connector
22.	Com A	Bi-Directional	RS-232 Connection 9 pin D connector
23.	Com B	Bi-Directional	RS-232 9 pin D connector
24.	Ethernet	Bi-Directional	RJ45
25.	USB	Bi-Directional	
26.	Mouse	Bi-Directional	DIN
27.	Keyboard	Bi-Directional	DIN
28.	Power	Input	90-135 or 180-265 VAC 47-63 Hz 250 watts

NOTE:
Specifications subject to change without notice.

WARNING: Disconnect primary power prior to servicing.

Figure 1-1 Front view of DEXSTAR™ and ePAL™

WARNING: Disconnect primary power prior to servicing.

WARNING: Disconnect primary power prior to servicing.

Section 2 Installation & Initial Turn-On

2

2.1 Introduction

This section contains information for the installation of the Harris DEXSTAR™ Exciter and ePAL™ audio interface and synchronization unit. This section also assists in pre-operational checks.

NOTE:
This DEXSTAR™ can be utilized and configured for several different applications. Customer specific requirements will necessitate using this information to determine the specific installation needed. While several different configurations are discussed here, your installation may vary slightly for these depending on site requirements.

2.2 Unpacking

Carefully unpack the exciter and perform a visual inspection to ensure that no apparent damage was incurred during shipment. Retain the shipping materials until it has been determined that the unit is not damaged. The contents of the shipment should be as indicated on the packing list. If the contents are incomplete or if the unit is damaged electrically or mechanically, notify the carrier and HARRIS CORPORATION, Broadcast Systems

2.3 Returns and Exchanges

Damaged or undamaged equipment should not be returned unless written approval and a Return Authorization is received from HARRIS CORPORATION, Broadcast Systems. Special shipping instructions and coding will be provided to assure proper handling. Complete details regarding circumstances and reasons for return are to be included in the request for return. Custom equipment or special order equipment is not returnable. In those instances where return or exchange of equipment is at the request of

the customer, or convenience of the customer, a restocking fee will be charged. All returns will be sent freight prepaid and properly insured by the customer. When communicating with HARRIS CORPORATION, Broadcast Systems, specify the HARRIS Order Number or Invoice Number.

2.4 Air Cooling Requirements

This Harris DEXSTAR™ is designed to operate in an unobstructed environment with a maximum inlet air temperature of 48°C. Refer to the Outline Drawing in the schematic package for information on air requirements.

NOTE:
"Clean" air is required. No salt air, polluted air, or sulfur air can be tolerated. A closed air system is recommended in these environments; that is, an air conditioned room that recirculates, and properly filters the room air. No outside air is to be brought into the transmitter room.

2.5 Installation

Prior to installation, this Technical Manual should be carefully studied to obtain a thorough understanding of the principles of operation, circuitry and nomenclature. This will facilitate proper installation and initial checkout.

The DEXSTAR takes 4 rack units (7 inches) and the ePAL™ takes 2 rack units (3.5 inches).

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

The Exciter installation is accomplished in the following order:

1. Rack placement
2. Visual Inspection
3. Configuration
4. Interconnect wiring
5. Input connections

6. Output connections
7. Initial checkout.

2.5.1 Rack Placement

Set the rack in place on a level surface near power and signal cables. Either or both sidewalls of the rack may be placed against a wall or other equipment. Complete access is through the front and rear.

2.5.2 Visual Inspection

Be sure to check the connection of all cables and wires in the rack. Ensure the interconnecting cables between the equipment are properly attached.

2.5.3 Hardware Configuration

Configuration consists of both hardware and software configuration for your particular application.

2.6 DEXSTAR™

The Harris DEXSTAR™ is configurable to perform in a number of different installations. Depending on whether it is used in an AM site or an FM site and whether it is used in high-level or low-level combining. Configuration of the Exciter is controlled on the front panel screens, see the operation section for screens.

See the drawing package for external wiring details for particular applications.

2.6.1 Networking Configuration

The DEXSTAR™ operation system is a Linux® system. Any external connection must be in compliance with their standard configuration. Examples would be a Network connection, Ethernet 10M/100M. The Exciter can operate from a static IP address or use dynamic host configuration protocol (DHCP) and allow a computer to control the Exciter while viewing the screens remotely. Also included is an off network configuration which consists of a preset static IP address (10.10.10.10), a default net mask (255.255.255.0) and a gateway (10.10.10.13).

It is highly recommended to utilize qualified I.T. personnel to properly configure your specific connection. Also it is recommended to use an external firewall to protect against unauthorized control of the Exciter.

2.6.1.0.1 Change VNC Password

When accessing the Exciter remotely, through a Ethernet connection you should change the factory password to a secure one. Starting with IRSS versions 2.1.2, the VNC password can be conveniently changed on the System/System Setup/Mode Control page. For earlier versions follow this procedure.

For earlier version, to change the VNC password use a keyboard connected to J8;

First press "<ctl><alt>F2"

Login as "cust" using the password "password" in the appropriate box.

At the prompt, type, "vncpasswd" and enter your new password twice.

Copy this new password to the working directory inserting your irss version in place of the X.X.X in the line below:

```
cp /cust/.vnc/passwd /usr/dab/irss-X.X.X/bin/tx/
vnc_passwd.sh
```

The new password overwrites the old one.

Type "exit."

Press "<ctl><alt>F7" when done will return you to the GUI screen.

2.6.1.0.2 Change Telnet Password

To change the Telnet password use a keyboard connected to J8. To change the password for the "cust" user, you need to first log in as cust (customer) using the default password of "password.". Then use the linux command "passwd," then change the default password by filling in the appropiate passwords in the < ... > areas.

First press "<ctl><alt>F2"

Login as "cust" using the password "password" in the appropriate box.

At the prompt, type, "passwd"

(current) UNIX password: <current password>, enter.

New UNIX password: <new password>, enter.

Retype new UNIX password:<new password>,enter.

passwd:all authentication tokens updates successfully

Type "exit."

Press "<ctl><alt>F7" when done will return you to the GUI screen.

2.6.1.1 Port configuration for LAN control

Depending on the type of service connection to the Exciter used, these ports must be opened up to allow use. It is recommended to change the default passwords before opening up these ports for you security. Qualified I.T. personnel should make these changes.

Table 2-1 Port configuration

Service	Ports	Notes
VNC	5810 and 5910	www.realvnc.com
Web browser	80	
SSH	22	preferred over TelNet
TelNet	23	
ftp	21	

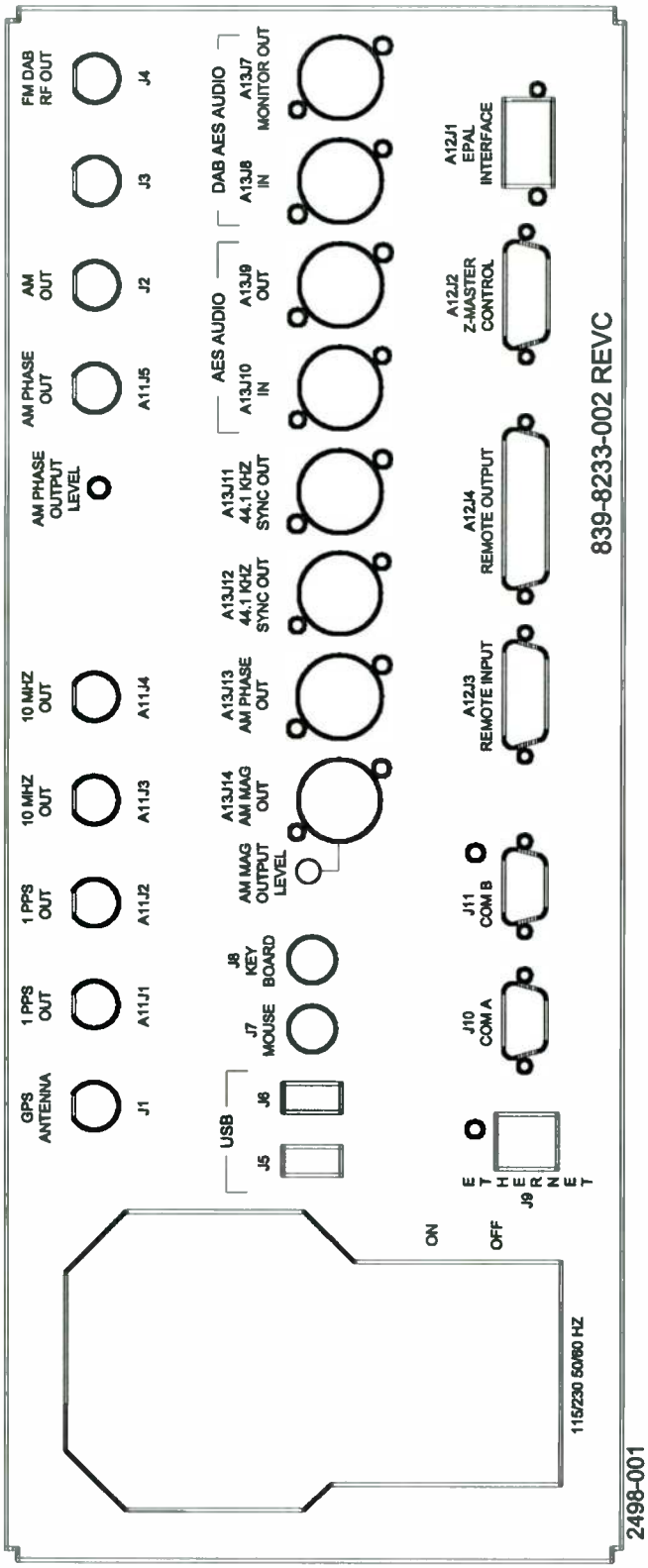


Figure 2-1 DEXSTAR Exciter rear panel

WARNING: Disconnect primary power prior to servicing.

Table 2-2 DEXSTAR rear connector

#	Type	Description	Goes to/comes from	Notes
J1	TNC	Antenna	GPS antenna	
A11J1	BNC	1 PPS Out	NC	NC
A11J2	BNC	1 PPS Out	NC	NC
A11J3	BNC	10 Mhz OUT	NC	NC
A11J4	BNC	10 Mhz OUT	NC	NC
A11J5	BNC	AM phase OUT	to Transmitter RF input	AM transmitters only
J2	BNC	IF/AM Out	NC	for testing purposes
J3	BNC	blank		
J4	BNC	FM DAB RF Out	To transmitter RF IN	To FM transmitter RF input
J5	USB	USB		Standard USB
J6	USB	USB		Standard USB
J7	DIN	Mouse	From mouse	PS/2 compatible
J8	DIN	Key Board	From keyboard	PS/2 compatible
A13J14	Male XLR	AM MAG Out	To transmitter analog audio input	AM transmitters only
A13J13	Male XLR	AM Phase Out	To transmitter RF input	AM transmitters only balanced version of A11J5 (not currently used on Harris Transmitters)
A13J12	Male XLR	44.1Khz Sync Out	To ePAL™ 44.1kHz Sync IN 1 for primary Exciter Sync IN 2 for secondary Exciter	Refer to Exciter rack wiring diagram
A13J11	Male XLR	44.1Khz Sync Out		Refer to Exciter rack wiring diagram
A13J10	Female XLR	AES Audio IN	From ePAL™ Audio DA OUT 1	If distribution amplifier is needed
A13J9	Male XLR	AES Audio OUT	To Exciter switch A/B IN	To ePAL™ sync source IN

WARNING: Disconnect primary power prior to servicing.

Table 2-2 DEXSTAR rear connector

#	Type	Description	Goes to/comes from	Notes
A13J8	Female XLR	IBOC AES Audio IN	DAB AES Audio DA OUT	Refer to Exciter rack wiring diagram
A13J7	Male XLR	DAB Audio Monitor OUT		For audio monitoring only, selectable
J9	RJ45	Ethernet	Customer network connection	Full or 1/2 duplex. 10/100 Mbps network speed.
J10	9-pin D	COM A	Data input connection	For PAD data
J11	9-pin D	COM B	Neustar serial connection	
A12J3	15-pin D	Remote Input	For UPS and other user Inputs	Refer to Exciter rack wiring diagram and table below for pin-out
A12J4	25-pin D	Remote Output	Remote output connection	See table below
A12J2	15-pin D	Z Master Control	Platinum Z interface	Refer to Exciter rack wiring diagram for pin-out
A12J1	4-pin WAGO	ePAL™ Interface	To ePAL™ Exciter interface	Refer to Exciter rack wiring diagram for pin-out

2.6.2 AC Voltage Selection

Once the site voltage has been checked, verify that the exciter(s) are set for the proper input AC voltage. For verification, the selected voltage should be visible next to the AC power cord connection on the rear of the exciter. Before connecting input AC voltage for the first time, check the service voltage and the rear power cord connection to make sure the correct voltage has been selected.

Since the DEXSTAR Exciter is based off a computer, powering up the exciter is equivalent to booting up a computer. An uninteruptalbe power supply (UPS) is highly recommended to minimize down time due to a power outage.

2.6.3 GPS antenna

Using a suitable GPS antenna, special care must be taken when routing antenna cable near sources of potential interference, like a voltage source, high frequency antenna couplers and transmission equipment.

The antenna mounting location should be free of any object that might obstruct satellite visibility with in 10 degrees of the horizon. Mount with the connector pointing down and use weather proof sealer.

Connect an active antenna that operates on a 5 volt, 50 ohm source to the GPS antenna connection. The GPS receiver must have at least 15dB net of antenna gain. Cable selection should not be longer than the maximum length specified in table 2-2. For longer cable runs, it may be necessary to use an in-line amplifier and/or low loss cable or a special GPS down/up converter system. Refer to the chart for popular cable types that can be used for your installation.

Table 2-3 Delay and maximum length for common cable types

Cable type	Delay Value	Maximum Length
RG-58	4.36 ns/m (1.33 ns/ft.)	75 ft. (23m)
RG-213	4.99 ns/m (1.52 ns/ft.)	125 ft. (38m)
RG-59	4.00 ns/m (1.22 ns.ft)	150 ft. (45m)
RG-8	3.90 ns/m (1.19 ns/ft.)	250 ft. (75m)

Signal delay through the cable must be compensated at the Exciter to accurately align the receiver to the GPS system. Set the antenna delay on the GUI following this path: System/System configuration/GPS Configuration.

2.6.4 AES3 audio input

The AES3 audio input to the Exciter is connected to A13J8. This AES audio must be at 44.1kHz. The ePAL has a rate converter for this purpose. A DAB Audio Processor can be inserted in the AES Audio path before the Exciter input. If two Dexstar Exciters are being used (in FM applications), the processed AES audio should go through the Distribution Amplifier in the ePAL.

2.6.5 IBOC DAB RF output

Depending on site configuration, whether you are combining at a high level or a low level, the DAB IBOC output connects to one of two different points.

a. For high-level combining, where a separate transmitter is used to amplify the DAB signal, the FM DAB RF output connects to the IBOC transmitters' input.

b. For common amplification, the FM DAB RF output connects to one input of a coupler and feed a common transmitter.

2.6.6 Exciter Remote Control

Remote control inputs connect to a 15 pin D connector A12J3, refer to the pin-out below. The REMOTE_CONTROL_DISABLE is software enabled from the GUI, Exciter Control page.

The device connected to these inputs must be capable of sinking 9ma to pull the pin to ground. The input voltage must stay between 30V and -0.7V and are normally +5 VDC or ground. The User Input ground is a floating ground and is clamped to a maximum of +/-30V differential by using a Zener diode on the Exciter Controller board connected between the User Input ground and chassis ground.

Table 2-4 Exciter Remote Inputs A12J3

Pin No.	Description	
1	DIVERSITY_DELAY_RAMP_UP	TTL ACTIVE LOW, starts the audio diversity delay ramp up
2	REMOTE_WARM_BOOT	TTL ACTIVE LOW, forces an application restart
3	REMOTE_COLD_BOOT	TTL ACTIVE LOW, forces a reset of the Pentium processors
4	REMOTE_DIGITAL_ON	TTL ACTIVE LOW, turns Digital carriers ON
5	REMOTE_DIGITAL_OFF	TTL ACTIVE LOW, turns Digital carriers OFF
6	REMOTE_NIGHT	TTL ACTIVE LOW, loads NIGHT group delay parameters
7	REMOTE_DAY	TTL ACTIVE LOW, loads DAY group delay parameters
8	DIVERSITY_DELAY_ RAMP_DOWN	TTL ACTIVE LOW, starts the audio diversity delay ramp down
9	UPS_ON_BATTERY	TTL ACTIVE LOW * THIS CONNECTION MUST BE MADE FOR EXCITER TO OPERATE.
10	GND	This ground can float above or below the board ground by at most 30V. Protection is provided to limit the voltage differential to this value.
11	GND	
12	GND	
13	GND	
14	GND	
15	GND	

Remote control outputs leave the Exciter on a 25 pin D connector A12J4, refer to the pin out table listed below. These outputs are capable of sinking 120ma. Maximum ON resistance at 120ma is 35 ohms, maximum power dissipation in each driver is 500mW. These outputs are pulled up to an isolated +5V; they may be connected to an "input" that is pulled up to a maximum open circuit voltage of 24v with out driver damage. These outputs are protected against overvoltage conditions by a 30V zener diode connected to the User Control output ground. The User Control output ground is clamped to a maximum of +/- 30V differential by a bi-directional zener diode connected between the User Output ground and chassis ground. The four analog outputs are driven by op amps capable of driving the output voltage to within 50mV of the positive and negative (ground) supply rails. The analog outputs are capable of sourcing 12ma at 0V and 9.5ma at 5V.

Table 2-5 Exciter Remote Outputs A12J4

Pin No.	Signal	Description
1	DAB_MUTE_STATUS	0-5V, ACTIVE HIGH
2	CRITICAL_FAULT_STATUS	0-5V, ACTIVE HIGH
3	RAMP_STATUS	0-5V, ACTIVE HIGH
4	FM_RF_FWD_PWR	Analog, 0-5V
5	+5V_GND	
6	AM_CARRIER_LEVEL_OUT	Analog, 0-5V
7	+5V_GND	
8	AM_AUDIOMAGNITUDE_LEVEL_OUT	Analog, 0-5V
9	+5V_GND	
10	ANALOG_4_OUT	Analog, 0-5V, CS defined
11	+5V_GND	
12	N/C	
13	DELAY_STATUS	Single ended. Low side tied to USER_GND
14	EXT_DIGITAL_1+_OUT	Outputs have the low side of the solid state relay tied to USER_GND via 10 Ω resistor that may be removed to make the digital output floating. Over voltage protection is between the + and - side of the lines only, not to ground. Current limited to 0.1A by PTC; isolated +5V, REFERENCED TO USER_GND
15	EXT_DIGITAL_1-_OUT	
16	DIGITAL_ON/OFF (+)_OUT	
17	DIGITAL_ON/OFF (-)_OUT	
18	DAY/NIGHT (+)	
19	DAY/NIGHT (-)	
20	WATCH DOG (+)	
21	WATCH DOG (-)	
22	+5V_ISOL1	
23	USER_GND	
24	USER_GND	
25	USER_GND	

2.6.7 Interface connections for stand alone installation

When connecting the DEXSTAR without the Harris Exciter rack to any transmitter, certain connections must be made to enable operation. Refer to Table 2-3 Exciter Remote Inputs A12J3 and Table 2-5 Z-FM Master Controller Interface A12J2 for the required connections. Included in these tables are UPS_ON_BATTERY and the MUTE connections. Both of these must normally be pulled LOW (ground) to allow the Exciter to operate in a stand-alone environment.

- Connecting UPS_ON_BATTERY A12J3-9 to ground at A12J3-10 through 15 will signal the DEXSTAR to keep running. Without this closure the DEXSTAR will automatically shut down, into a sleep mode after two minutes of operation. The DEXSTAR will retart when this connection is closed to ground again.
- Connecting MUTE A12J2-14 to ground A12J2-1 will signal the DEXSTAR to generate the HD signal.

Note that the MUTE line can be configured active HIGH or active LOW. This is done with JP3 on the DEXSTAR A12 Exciter Controller board. Refer to the Exciter Controller shematic for details.

Table 2-6 Z-FM Master Controller Interface A12J2

Pin No.	Signal	Note
1	GND	
2	FORWARD POWER	
3	N/C	
4	N/C	
5	N/C	
6	CRTITICAL FAULT ZFM	
7	N/C	
8	POWER CONTROL	
9	N/C	
10	N/C	
11	N/C	
12	N/C	
13	N/C	
14	MUTE	*Must be connected for stand alone operation.
15	EXCITER 1 ACTIVE	

It is **VERY IMPORTANT** that the AES input be at 44.1kHz *and* be rate synced to the to the DEXSTAR Sync Output A13J11 or J12.

2.6.8 ID3-TAG Receiver Display data

The HD Radio standard includes a Receiver Display which typically is used for Song title and Artist Name. The data packets are generated from the studio audio storage system via ID3-TAG data packets.

Data on this J10 COM A port is 1200 baud, n-8-1 (no parity, 8 bit, 1 stop bit).

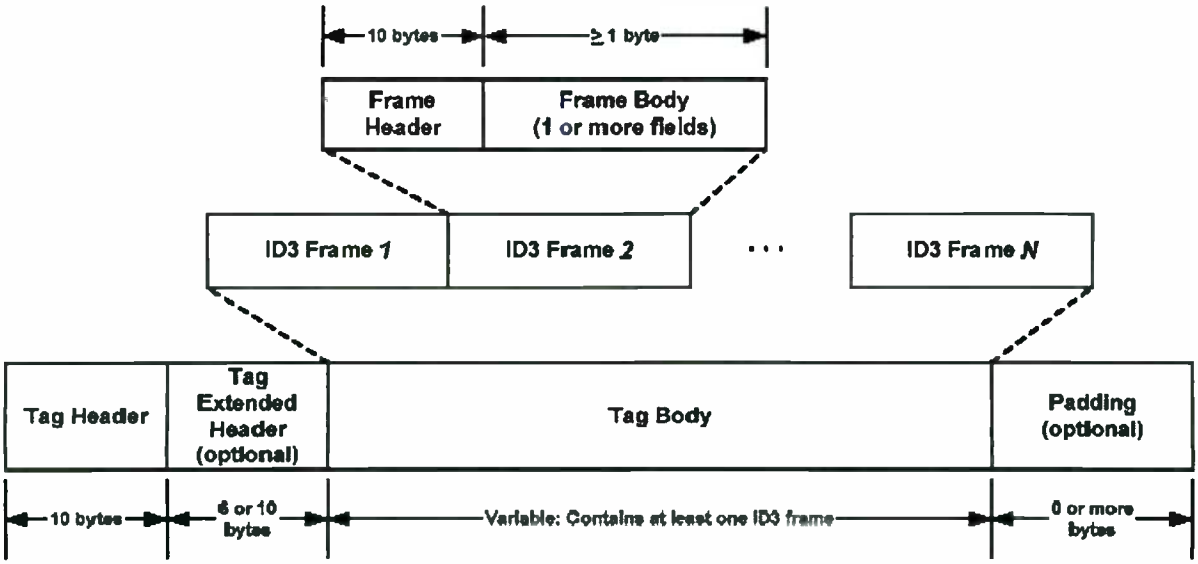


Table 2-7 COM A J10

Pin No.	Signal	Note
1	Received Line Signal Detector	Control, from DCE – RLSD
2	Received Data	Data, from DCE – RD
3	Transmitted Data	Data, to DCE – TD
4	DTE Ready	Control, to DCE – DRT
5	Signal Ground	Ground – SGND
6	DCE Ready	Control, from DCE – DCR
7	Request to Send	Control, from DCE – RTS
8	Clear to Send	Control, from DCE – CTS
9	Ring Indicator	Control, from DCE - RI

2.7 ePAL™

The ePAL™ is also configurable for different applications. Configuration on the ePAL™ is hardware based and will be shipped from the factory configured for your original application. If any replacement is done, verify the jumpers and buttons are in the same position as the item being replaced.

On the rear board, there are jumpers to configure for AM or FM operation. Jumper JP1, JP2, JP3 and JP4 pins 1-2 for FM mode and 3-4 for AM mode.

Single or dual operation is configured with S2-1; OFF for dual exciter mode, ON for single exciter mode.

On the Sample rate converter there are buttons and status switches which must be configured if the converter is being replaced. Status switches 1 and 2 are ON, 3 and 4 are OFF. All red push buttons should be out and the rotary switch pointing to 7.

2.7.1 Interconnect wiring

Due to the flexibility of the system, there are many ways to utilize this equipment. Common connections are listed in the following tables but each installation may be different depending on type of combining, number of transmitters and Exciters. Refer to the block drawings with pin-out detail in section 4 as a simplified explanation. See the drawing package for detailed interconnect information pertaining to your specific application.

2.7.1.1 AES-3 audio input

The ePAL™ accepts AES3 audio (32kHz to 96kHz) and it goes through a rate converter which has an output of 44.1kHz. The DEXSTAR accepts a 44.1kHz AES-3 input signal only.

2.7.1.2 ePAL Output connections

There are several outputs from the ePAL. First are the outputs of the 44.1kHz rate converter which go to analog and DAB audio processors.

The DAB audio path then goes to the DAB Exciter, through a distribution amplifier for dual Exciter FM applications.

The analog audio path goes to the analog audio processor where it is routed slightly differently depending on AM or FM applications. For AM applications, two different outputs from the analog processor will be used. The analog audio output from the processor goes back into the ePAL and is applied to a switch for possible bypassing the delay circuits in the Exciter. The AES output from the AM processor is applied to the DAB Exciter. For FM applications, the analog audio goes through a distribution amplifier and is routed to a bypass switch and also back to the DAB Exciter for delay.

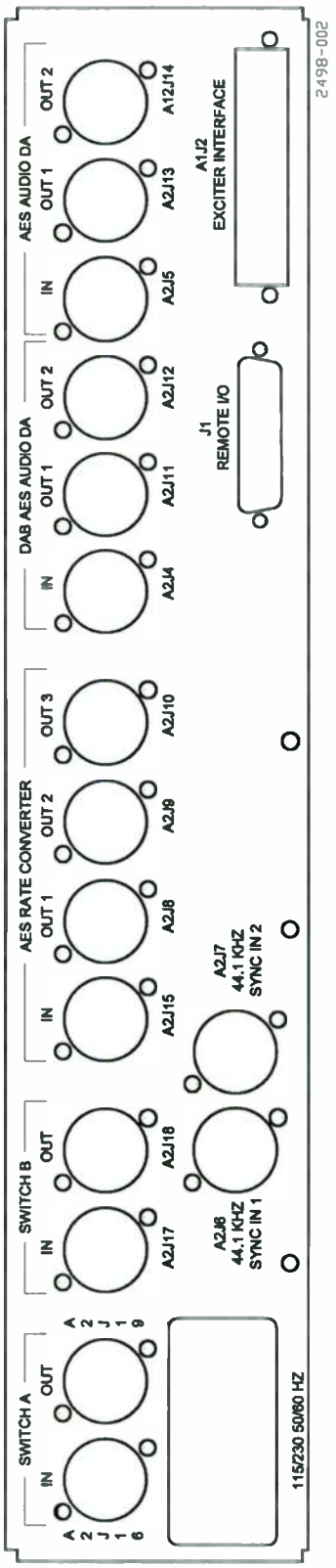


Figure 2-2 ePAL™ rear panel

WARNING: Disconnect primary power prior to servicing.

Table 2-8 ePAL™ rear connectors

#	Type	Description	Goes to/comes from	
A2J16	XLR	Switch A IN	From AES delayed audio OUT	From Exciter 1 in a dual exciter application
A2J19	XLR	Switch A OUT	To FM Exciter AES/EBU INPUT or AM magnitude INPUT	To AM or FM conventional input
A2J17	XLR	Switch B IN	From AES delayed audio OUT	From Exciter 2 in a dual exciter application
A2J18	XLR	Switch B OUT	To FM Exciter AES/EBU INPUT	For combined FM operation, Exciter 2
A2J15	XLR	AES Rate Converter IN	AES Audio IN	AES/EBU input studio feed
A2J8	XLR	AES Rate Converter OUT1	To AES Audio DA IN A2J5 on ePAL™	Insert FM audio processor in this path
A2J9	XLR	AES Rate Converter OUT2	TO DAB AES audio DA IN A2J4 on ePAL™	Insert DAB audio processor in this path
A2J10	XLR	AES Rate Converter OUT3	NC	Spare
A2J4	XLR	IBOC AES Audio DA IN	From AES rate converter OUT 2	For DAB AES distribution amplifier, can insert DAB audio processor
A2J11	XLR	IBOC AES Audio DA OUT 1	To DAB Exciter 1 AES IN	IBOC Exciter 1 input
A2J12	XLR	IBOC AES Audio DA OUT 2	To DAB Exciter 2 AES IN	IBOC Exciter 2 input
A2J5	XLR	FM AES Audio DA IN	From AES rate converter OUT 1A2J8	For AES audio distribution amplifier can insert FM audio processor in this path
A2J13	XLR	FM AES Audio DA OUT1	To IBOC Exciter AES audio IN	For Exciter 1 in a dual exciter application

#	Type	Description	Goes to/comes from	
A2J14	XLR	FM AES Audio DA OUT2	To IBOC Exciter AES audio IN	For Exciter 2 in a dual exciter application
A2J6	XLR	44.1Khz Sync IN 1	From IBOC Exciter 44.1Khz Sync OUT	From Exciter 1 in a dual exciter application
A2J7	XLR	44.1Khz Sync IN 2	From IBOC Exciter 44.1Khz Sync OUT	From Exciter 2 in a dual exciter application
J1	25-pin D	Remote I/O	Customer interface	Refer to ePAL remote I/O table for pin-out
A1J2	12-pin WAGO	Exciter Interface	To Exciter ePAL™ interface	Refer to Exciter rack wiring diagram for pin-out, ePAL AM pinout for a partial AM connection

Table 2-9 ePAL™ remote I/O connector J-1 pin-out

The device connected to these inputs must be capable of sinking 9ma to pull the pin to ground. The outputs are capable of sinking 120ma.

Pin	Signal Name	Type	Description
1	REMOTE AES LOCK RED	TTL	OUTPUT - +5V=ON (MIN. –0.5V, MAX. +5.5V)
2	REMOTE AES LOCK GREEN	TTL	OUTPUT - +5V=ON (MIN. –0.5V, MAX. +5.5V)
3	GND		RETURN
4	SW1 AES SYNC RED	TTL	OUTPUT - +5V=ON (MIN. –0.5V, MAX. +5.5V)
5	SW1 AES SYNC GREEN	TTL	OUTPUT - +5V=ON (MIN. –0.5V, MAX. +5.5V)
6	GND		RETURN
7	SW1 BYPASS RED	TTL	OUTPUT - +5V=ON (MIN. –0.5V, MAX. +5.5V)

8	SW1 OPERATE GREEN	TTL	OUTPUT - +5V=ON (MIN. –0.5V, MAX. +5.5V)
9	GND		RETURN
10	GND		RETURN
11	REMOTE EXCITER TWO OPERATE/BYPASS	TTL	INPUT – NORMALLY +5V BYPASS= 0V, OPERATE = +5V (MIN. –1.5V, MAX. +6.5V)
12	REMOTE EXCITER ONE OPERATE/BYPASS	TTL	INPUT – NORMALLY +5V OPERATE = +5V (MIN. –1.5V, MAX. +6.5V)
13	GND		RETURN
14	SW2 AES SYNC RED	TTL	OUTPUT - +5V=ON (MIN. –0.5V, MAX. +5.5V)
15	SW2 AES SYNC GREEN	TTL	OUTPUT - +5V=ON (MIN. –0.5V, MAX. +5.5V)
16	GND		RETURN
17	SW2 BYPASS RED	TTL	OUTPUT - +5V=ON (MIN. –0.5V, MAX. +5.5V)
18	SW2 OPERATE GREEN	TTL	OUTPUT - +5V=ON (MIN. –0.5V, MAX. +5.5V)
19	GND		RETURN
20	REMOTE MANUAL RED	TTL	OUTPUT - +5V=ON (MIN. –0.5V, MAX. +5.5V)
21	REMOTE AUTO GREEN	TTL	OUTPUT - +5V=ON (MIN. –0.5V, MAX. +5.5V)
22	GND		RETURN
23	REMOTE AUTO/MANUAL	TTL	INPUT – NORMALLY +5V AUTO = +5V (MIN. –1.5V, MAX. +6.5V)
24	REMOTE PRESENT	TTL	INPUT – NORMALLY +5V 0V = REMOTE ENABLE (MIN. –1.5V, MAX. +6.5V)
25	GND		RETURN

Table 2-10 ePal A1J2 AM pin-out

Pin No.	Signal	Description
1	Bypass Relay Control 1	Hold LOW to force bypass and oscillator relay drop
2	Normal Bypass Status 1	
3	Ground	
4	Exciter 1 Active	
5	Bypass Relay Control 2	
6	Normal Bypass Status 2	
7	Ground	
8	Exciter 2 Active	
9	Ground	
10	+5V relay drive	Controls External/Internal Oscillator relay in Transmitter. Operate = 0V, bypass = +5V.
11	Ground	
12	Ground	

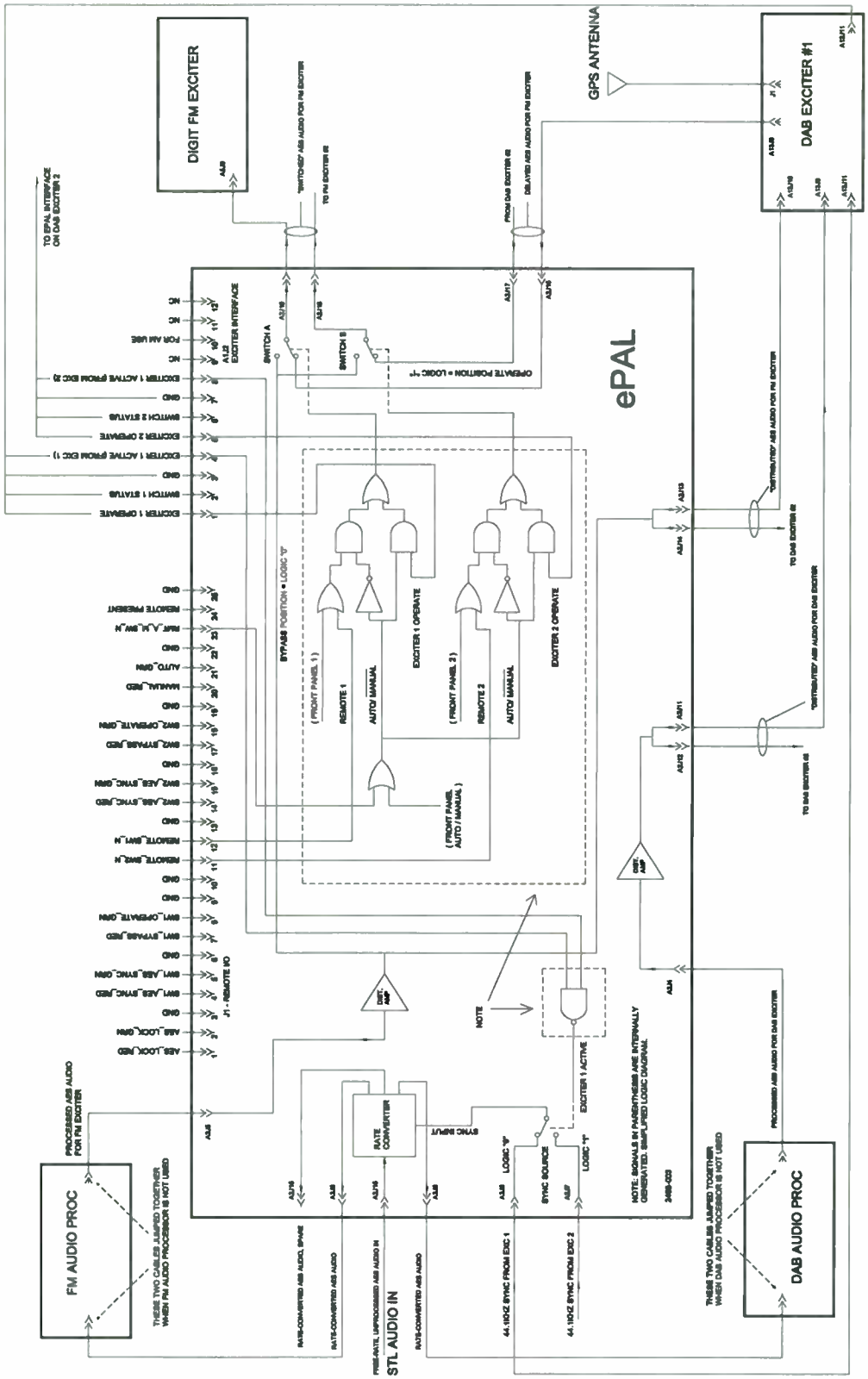


Figure 2-3 Typical FM ePal™ block diagram pinout

WARNING: Disconnect primary power prior to servicing.

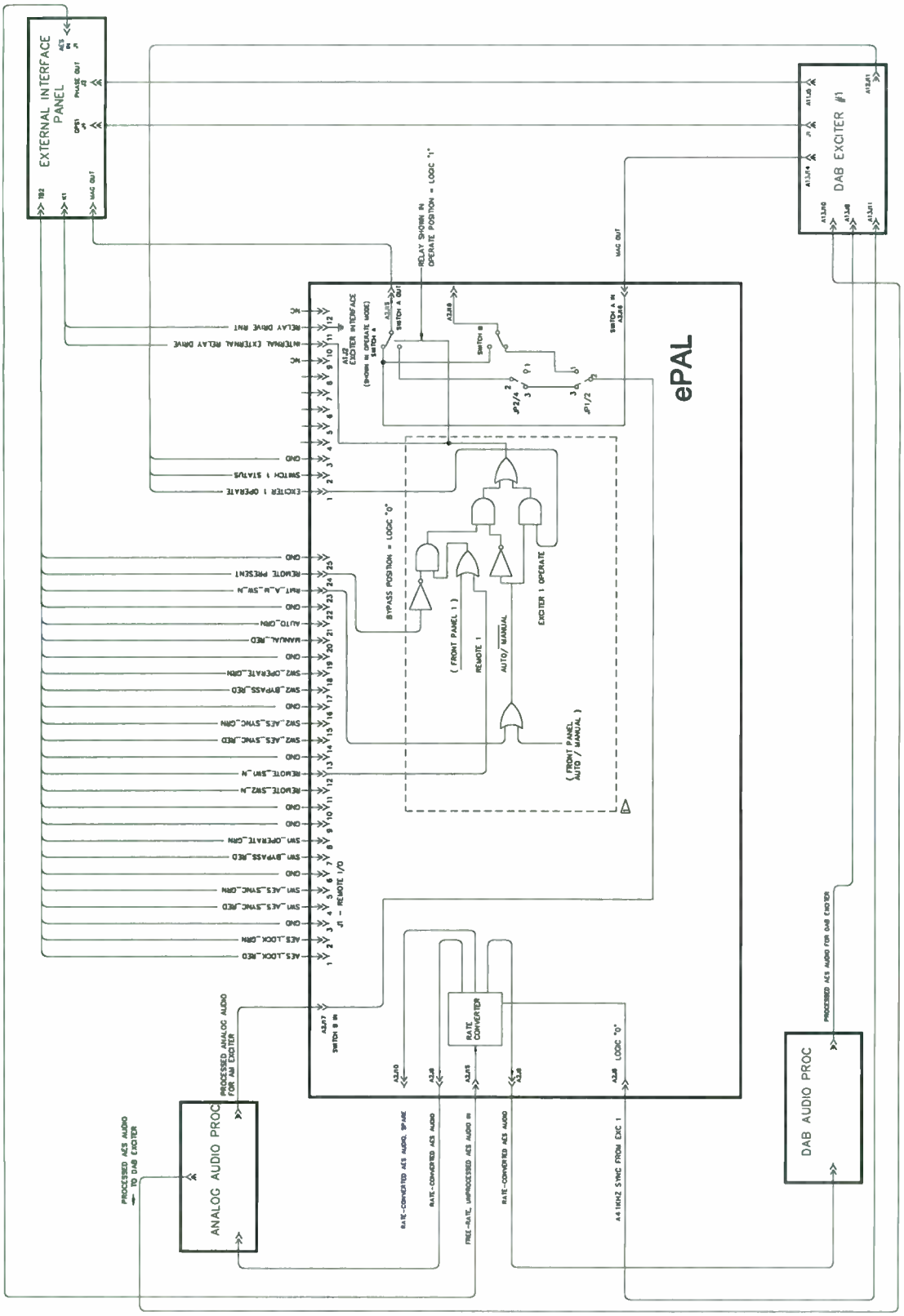


Figure 2-4 Typical AM ePal block diagram pinout

WARNING: Disconnect primary power prior to servicing.

2.8 Initial AM Exciter Setup

Prior to initial turn-on, check and configure the jumpers on the External I/O board for your application. See the drawing package for further details on the jumper settings.

After the jumpers have been configured to your installation, initial setup and turn-on can proceed.

a. Ensure that the Dexstar Exciter is in AM mode by observing the upper right hand corner of the GUI.

b. Set the operating frequency if it has not been done so already.

   1. On the System screens, press the password box and enter the password <1234, enter> on the pop-up keypad.

   2. Enter the System Setup screens, then Station Setup. Enter the desired frequency if different and restart the Exciter.

   3. Verify the frequency at the AM Phase Out, A11J5. Adjust AM Phase output level for approxiamtely 5vpp into 50 ohms.

c. Enter the values in the table for the Exciter Presets on the GUI as follows. These presets are located on the "System, System Setup" screen and the "System, System Setup, AM Setup" screen

Table 2-11 Exciter Presets

Phase Q scale factor	**1.0**
I/Q scale factor	**12000**
Digital Carriers	**OFF**
DC Offset	**-0.7**
Analog gain	**1.25**
Enh. Carrier power	**Normal**
Analog Modulation	**ON**
Analog Audio BW	**Bypass or 8K (see note)**
Magnitude/Phase Delay - DX	**12500 - 13000**
Magnitude/Phase Delay - 3DX	**12300 - 12600**
Magnitude/Phase Delay - DAX	**7000 - 7300**
Magnitude Phase Delay step size	**50**
Upper and Lower SB levels	**0,0**

NOTE:
For 5kHz bandwidth, set the audio processor bandwidth to 5kHz and the DEXTAR bandwidth control to BYPASS. For 8kHz bandwidth, set the internal audio processor bandwidth to 7.5kHz and the DEXSTAR to 8kHz filter mode. The DEXSTAR selections should only be BYPASS or 8kHz. The 5kHz setting on the DEXSTAR is not used, for 5kHz limiting, limit the audio at the processor.

d. Set the Audio Processor output to -2.7 -3.0dBFS. Otherwise the Exciter can possibly be overdriven and result in erroneous drive signals and undesirable phase reversals. This could lead to unwanted spectrum splatter and possible transmitter stress. Note that the Exciter analog level setting is restricted in a following step.

2.8.1 Audio Processor setup

These are the basic setups that need to be made to any audio processor which is in the path. These settings do not affect the station signature sound adjustments.

Table 2-12 Audio Processor Setup

	Analog setting	Digital Setting
Bandwidth	**7.5 kHz or 5 kHz**	
Digital Output	**Analog + Digital -3dBFS**	
Positive Peak	**141% from the Processor-see note.**	**NA**

NOTE:
The analog positive peaks will be limited to 125% in the Exciter, it is desirable to not limit them at the audio processor and allow the Exciter to limit.

2.8.2 System Setup

Perform the following AM Magnitude, Phase and Delay adjustments.

2.8.2.1 AM Magnitude setup

The depth of modulation adjustment (AM Magnitude setup) must be performed before the digital carriers are adjusted since this adjustment affects both the analog and digital carriers.

a. Using a dual channel scope, monitor the transmitter output and the Exciter IF/AM output. Modulate with a 1 kHz tone at -3dBFS from the audio processor. On the "AM System Setup" screen change the numeric value of the Analog Gain until 95% modulation is observed at the IF/AM output port on the Exciter.

b. Make a DC voltage measurement on the balanced line input terminals of the transmitter's audio (magnitude) input. It should be 0.0 volts. If a DC bias is measured, adjust the DC offset on the SDEXSTAR AM Setup screen to obtain 0.0 volts. Normally a bias of 0.0 volts is obtained by setting the DC offset value to between -0.7 and -1.0.

CAUTION:
IN THE FOLLOWING STEP, IT IS IMPORTANT NOT TO ALLOW THE SINE WAVE TEST SIGNAL TO OVERMODULATE THE DEXSTAR (AS VIEWED ON A

SCOPE AT THE AM IF OUTOUT) OR THE TRANSMITTER OUTPUT. OVERMODULATION OF AN AM DIGITAL EXCITER CAN CAUSE DROPOUTS OF THE RF DRIVE SIGNAL AND MAY CAUSE FAULTS OR IN SOME CASES, DAMAGE TO THE TRANSMITTER.

c. Set the AM Magnitude pot through the hole on the rear of the Dexstar Exciter so the transmitter's depth of modulation matches that which was observed on the Exciter's IF/AM port (adjusted for 95% in the previous step). Do not adjust the audio gain pot in the transmitter to achieve this alignment. Leaving the transmitter's audio gain pot undisturbed allows correct depth of modulation in back-up/ bypass operation.

NOTE:
In DAX transmitters, if the output of the magnitude pot is set too high coupled with a low input gain of the digital input on the DAX, a condition can be created that casues clipping of the input signal at the DAX input stage. If this occurs, simply lower the output gain of the Magnitude and increase the input gain on the DAX digital input.

d. After matching the modulation levels, run analog program material into the main channel (only) and observe modulation on a scope or analog modulation monitor. You will likely see over modulation. Reduce the Digital I/O level on the audio

processor (NOT the Magnitude pot on the back of the DEXSTAR) to lower than the -3.0dBfs set previously until no overmodulation is observed, with negative peaks at around 95%. It could be as low as -3.7 to -4.0dBfs.

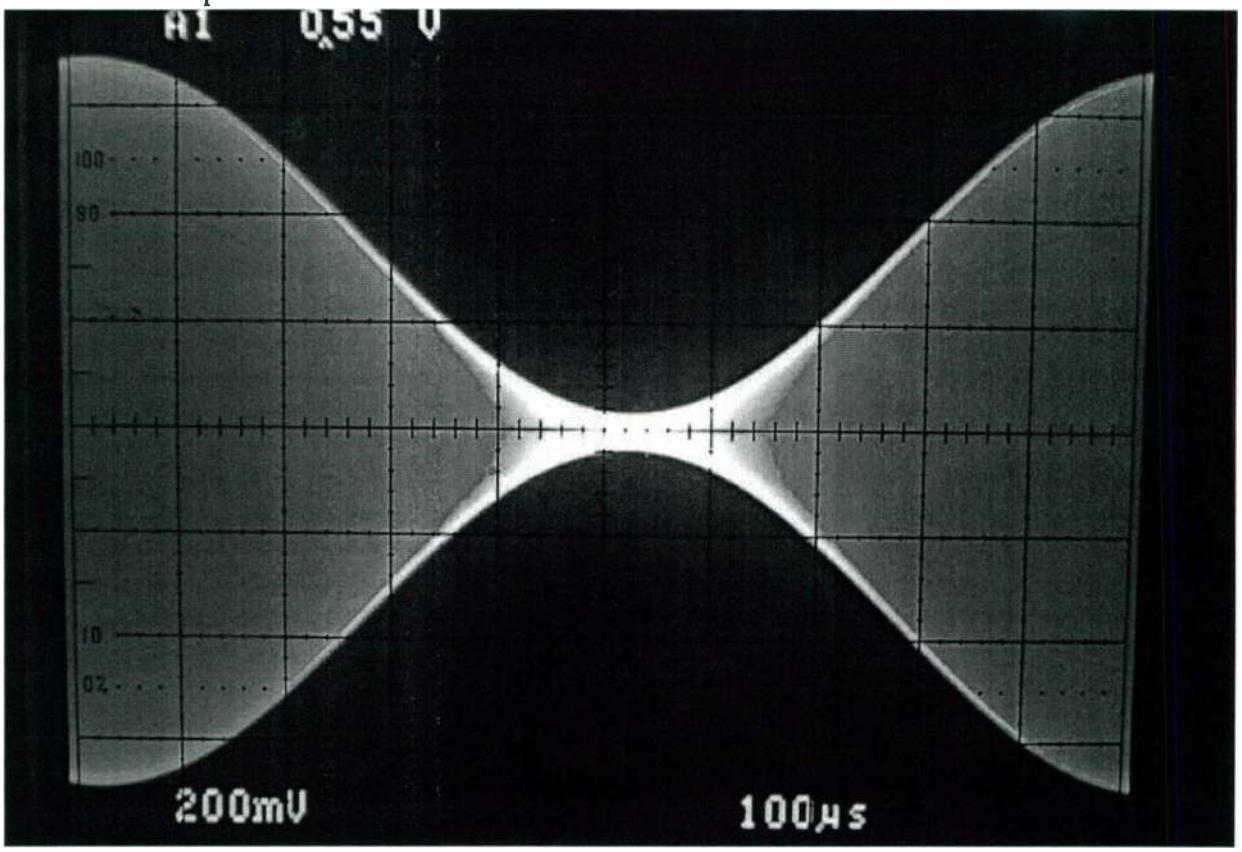
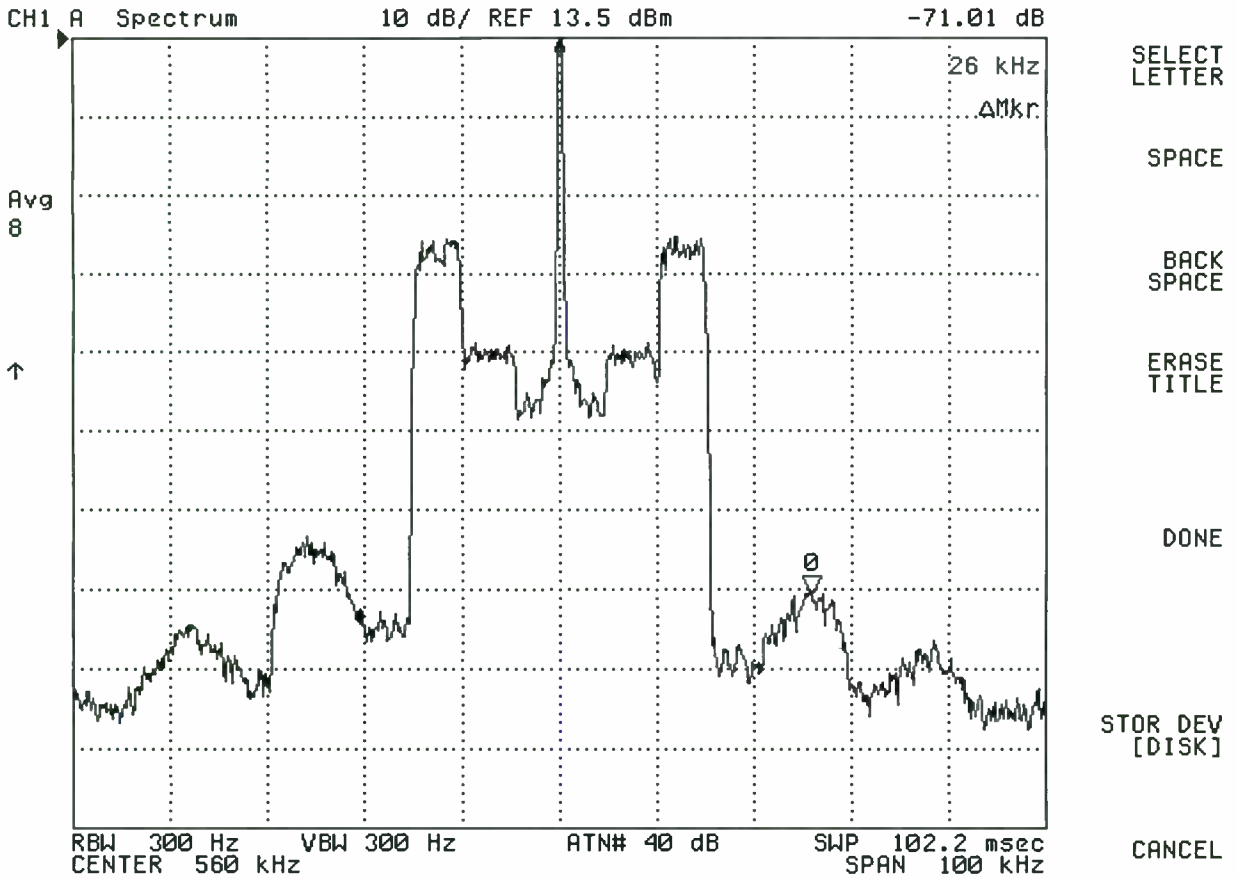


Figure 2-5 95% negative modulation.

e. Turn OFF the analog modulation and turn the Digital carriers on. "System, System setup" screens. On a Spectrum Analyzer, check the primary carrier levels referenced to the analog carrier. If necessary, set the upper and lower sideband levels (Upper/Lower SB lvl) on the "System, System Setup, AM Setup" screen, so the primary carrier levels just to -30.0 dB.

Figure 2-6 100kHz Spectrum



Spectrum Analyzer resolution bandwidth must be set to 300 Hz and span set to 100 kHz and peak detector OFF for proper reference level.

It is recommended that the RF sampling be done external to the transmitter, rather than at the mod monitor sample, or through a capacitive sample on the transmission line to the dummy load.

WARNING: Disconnect primary power prior to servicing.

2.8.2.2 Magnitude/Phase Delay optimization

a. On a Spectrum Analyzer, monitor the "spectral regrowth" area. This is the segment of the spectrum that is double the frequency of the digital carriers, located 20 - 30 kHz above and below the analog carrier. See figure 2-7.

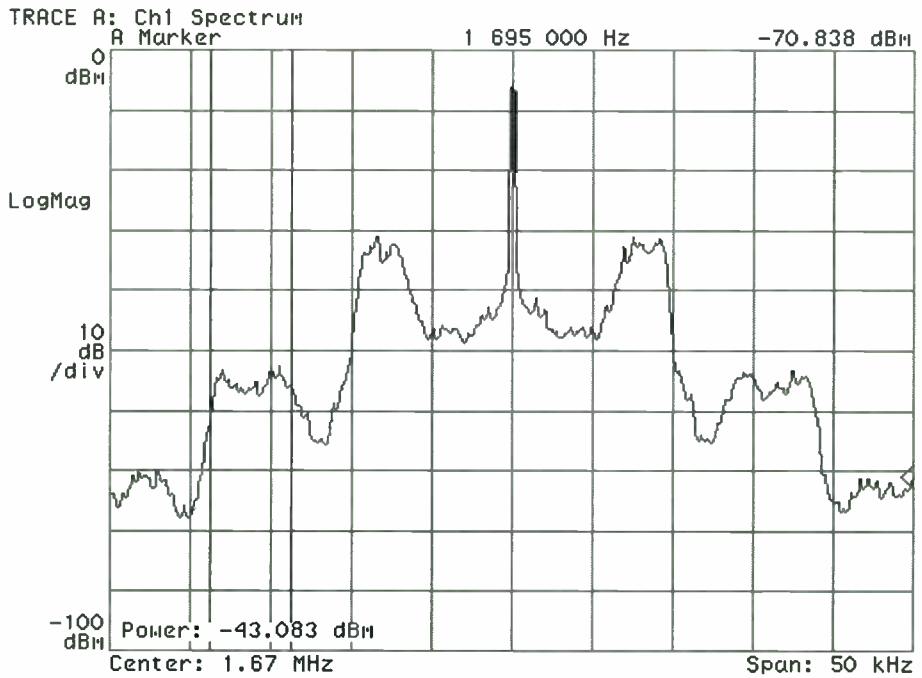


Figure 2-7 AM re-growth before adjustment

b. On the AM System Setup page, adjust the Magnitude/Phase Delay (up/down arrows) until the spectral regrowth is minimized. Recall that the presets are in table 2-11 and the step size set at 50. If necessary, reduce the step size to 10 or less to ensure the delay setting is optimized, about -65 dB below the carrier.

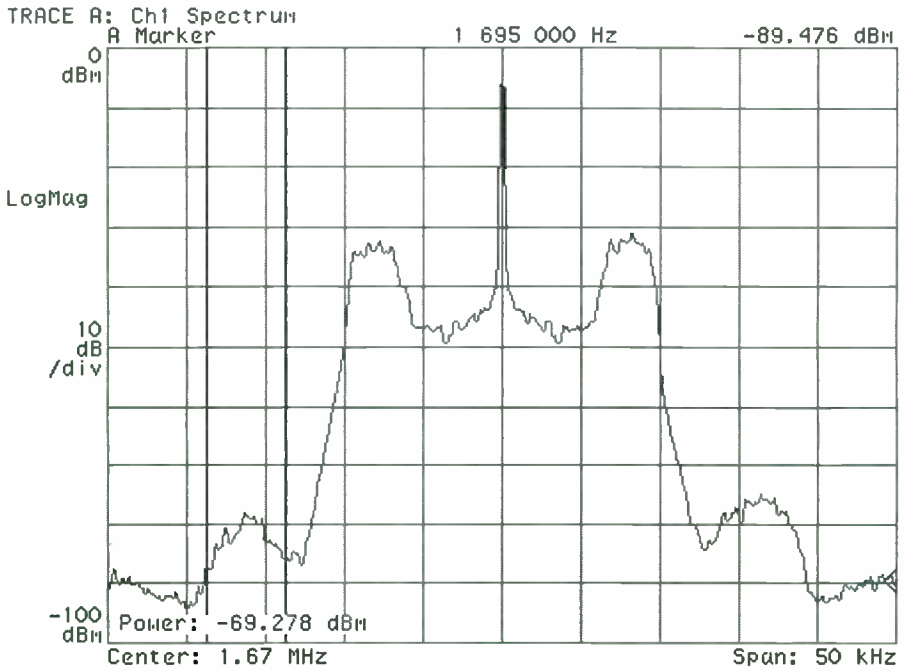


Figure 2-8 AM spectrum after adjustment

2.8.2.3 System verification

Test and record the results of the Analog performance. Note that the tests are to be done with and with out the IBOC carriers ON. With the digital carriers ON, a 5 kHz filter will need to be used on the detected audio sample if not available on the modulation monitor.

WARNING: Disconnect primary power prior to servicing.

Section 3 Operation

3

3.1 Operation, Controls and Indicators

This section contains a brief explanation of the hardware controls and indicators on the front of the DEXSTAR Exciter. Primary control is intuitive through a high-resolution color monitor and a touch screen serving as a Graphical User Interface or GUI. The Exciter and ePAL are shown in the front of the book.

3.2 ePAL™

The ePAL has LEDs and switches on the front panel for indication and operation. The switches functions and LED indications are covered here.

3.2.1 Front panel Buttons

The ePAL has three selector buttons on the front of the unit. Automatic/manual and two Audio path select buttons.

3.2.1.1 Auto/Manual button

When in auto mode, the Exciters have control of the operate/bypass switches located in the ePAL, Main Exciter controls switch A (1), alternate Exciter controls switch B (2).

3.2.1.2 Operate/bypass button

When in Operate mode, the audio will go through the Dexstar's audio diversity delay circuits to the analog exciter. When in audio bypass, there is no delay to the audio signal and the audio simply loops from the rate converter to the analog Exciter.

WARNING: Disconnect primary power prior to servicing.

3.2.2 LED indications

The front panel LEDs indicate the condition of the unit. They will be illuminated green, red, flashing red or green, or alternating red and green. The rate of the flash indicates the condition of the error. They will flash at a 1 Hz rate or at a 1/2 Hz rate, in other words they will flash fast or slow.

3.2.2.1 AES lock LED

The AES lock LED is driven by the rate converter. When AES lock is green, the rate converter is locked to the 44.1kHz sync signal from the active Exciter and has a valid output signal.

If it is red and flashing fast (1 Hz) the rate converter does not have a valid input AES audio signal to the rate converter input (at A2J15). This would indicate a loss of input AES audio.

If it is blinking slow (1 flash every 2 seconds) and alternating red/green, the rate converter is not receiving a valid 44.1 kHz sync pulse from the DEXSTAR Exciter (at A2J7/J8).

3.2.2.2 Operate/bypass LED

Both Exciter 1 and Exciter 2 have this LED. Both indicate the same thing as mentioned above under the switch functions.

Green indicates it is in the Operate mode and the FM Exciter is receiving a diversity delayed signal.

Red indicates it is in Bypass mode and no delay is added to the FM Exciter signal.

3.2.2.3 AES sync LED

Both Exciter 1 and Exciter 2 have this LED. When green, this indicates the rate converter is locked to that DEXSTAR 44.1 kHz sync pulse. As an example, when two DEXSTAR Exciters are connected, only one of these will be green, this indicates which DEXSTAR is supplying the sync pulse to the rate converter.

When the Exciter AES LED is blinking red, this indicates the signal is going to the rate converter but there are problems associated with the rate conversion. Refer to the "AES Lock" blinking rates above for the cause.

When the Exciter AES LED is solid red, this indicates that sync signal is not going to the rate converter.

3.2.2.4 Auto/Manual LED

Auto/manual LED indicates the condition of the Auto/Manual button described above. When in the auto mode, the LED will be illuminated green and the Dexstar has control of the operate/bypass switch.

When in manual mode it will flash red and enable the operate/bypass switches to be controlled by the front panel Operate/bypass buttons and remote I/O inputs.

3.3 DEXSTAR Software

The GUI is a software application used to control and monitor the Exciter. It may be updated at a later date, all information pertaining to loading, updating and operating the GUI software will be supplied at that time.

3.4 Front Panel indicators

The front panel Diagnostics shows the following faults and indicators:

- RF_Mute

ON RED-RF Upconverter is turned OFF (muted)

- Fault

ON RED- Exciter summary fault.

- Temperature

ON RED-Over temperature

- AES Lock

ON GREEN-AES3 audio is locked to a valid AES3 digital audio bit stream and both AES Audio and DAB AES Audio are present.

ON RED-If either AES3 audio or DAB AES audio is not present or is an invalid bitstream.

3.5 Operation, Controls and Indicators

This section contains information on the basic operation and indicators of the DEXSTAR Exciter. Control is intuitive through a high-resolution color monitor and a touch screen. Basic functions are also controlled by push buttons from the front of the ePAL™ unit.

NOTE:
Due to our efforts to constantly improve and update the GUI software, some of the screen pictures shown here may vary slightly from the actual displays on your exciter. However, the basic operation and menu structure will be the same.

3.6 Graphical User Interface (GUI)

The Graphical User Interface or GUI is a high resolution color touch-screen computer running under the Linux® operating system. The GUI is the control and monitoring interface for the Exciter. The GUI allows the information to be displayed in a graphical and numerical form. The information is displayed in a series of screens using color coding and icons to designate control buttons.

3.6.1 Color Coding

For general monitoring purposes:

- **Green** - Okay
- **Yellow** - Warning
- **Red** - Fault

CAUTION:
IF YOU NEED TO SHUT DOWN THE GUI, TO AVOID START-UP PROBLEMS, EXIT THE GUI PROGRAM, USE THE PROPER SHUT DOWN PROCEDURE ON THE SYSTEM SCREEN.

3.6.2 Menu Structure

The screens are arranged in a tree structure, starting with the main menu. Each screen contains a menu for further control and diagnostics. The level 1 screen is:

- Home - Allows access to most other screens directly.

Level 2 screens are the Subsystem Top Level screens:

- Audio Input - Detailed information about the Audio Circuits and operation.
- Modulator - Indicates condition of modulation software.
- RF Upconverter (FM units only). It has power metering, exciter control and quick access to all operator areas.
- Power Supply
- System

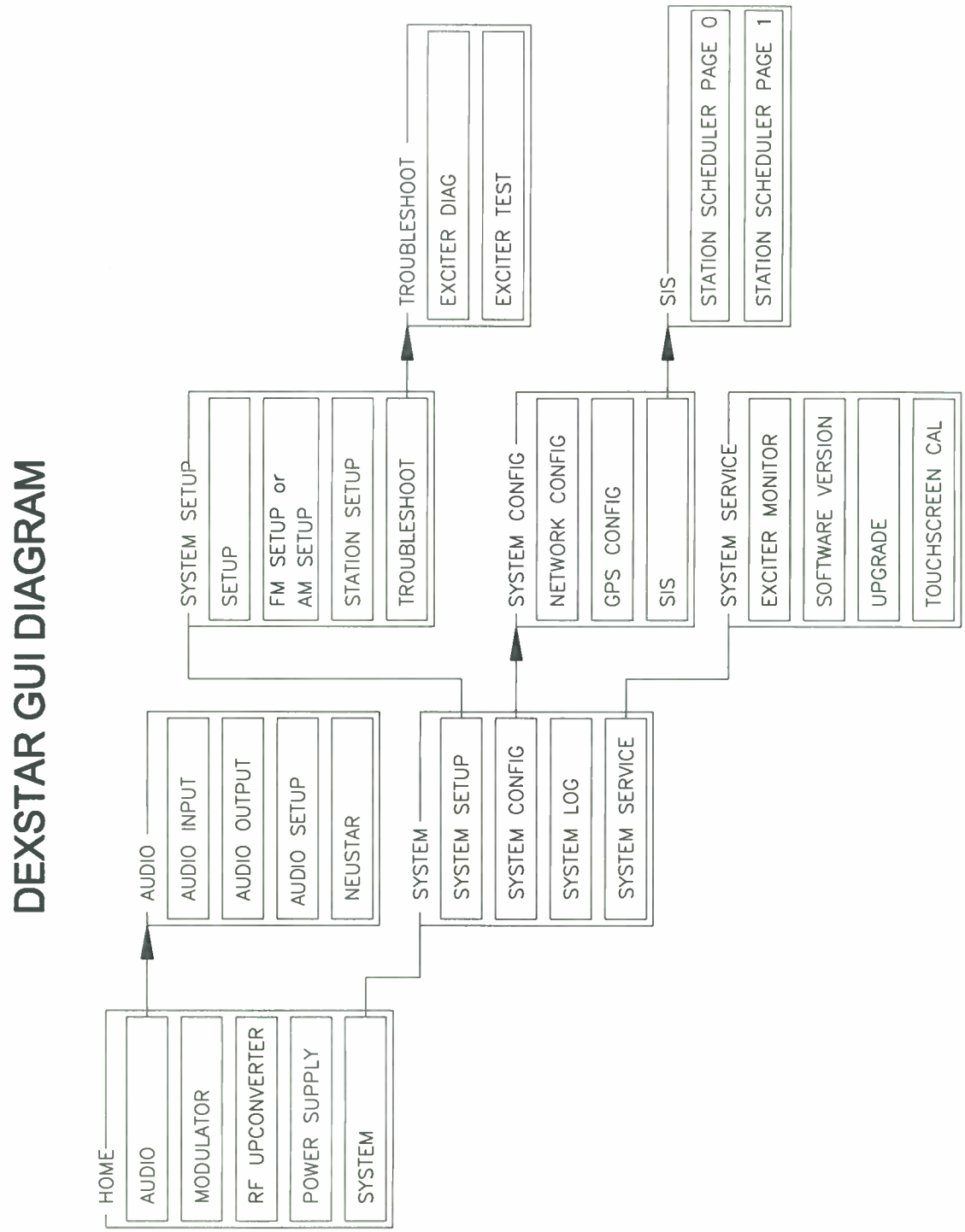


Figure 3-1 GUI Menu tree

WARNING: Disconnect primary power prior to servicing.

3.6.3 Changing numeric values

When it is necessary to change any of the operating parameters of the exciter that is a numeric character, press the window with the number to be changed and a pop-up keypad will appear. At the top will be a window with the numeric value you select on the key pad. If a number is already there when you open the pop-up keypad, press "Clear Entry" (CE) button and key in your desired value and press the "enter" key. The pop-up will go away. To the top left of the window is the range that can be entered for that field.

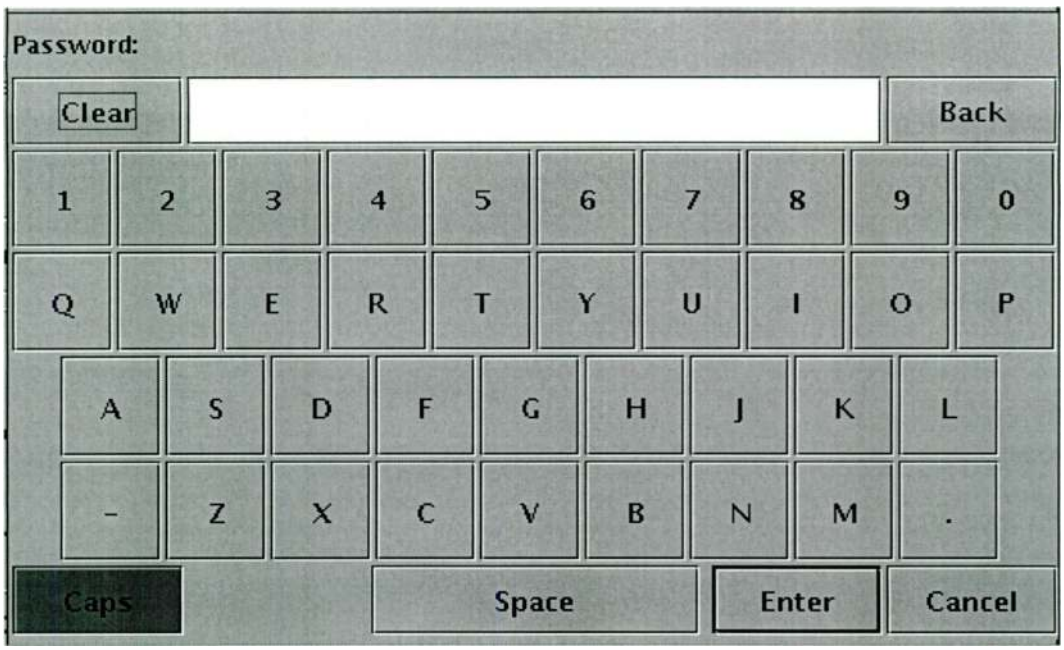


Figure 3-2 Password Key pad

3.7 Starting the GUI

The GUI program is run from the Linux® operating system. The "Exciter Application" loads automatically when the system boots up.

3.8 Home

Screens are arranged in a tree structure starting with the Home page. Each screen under that contains a menu for further control and diagnostics.

From the Home screen all other functional areas can be accessed with soft-touch buttons on the right side. All screens will show the same top two header lines; the top I.D. line showing the name of the Exciter and the second line showing the overall status of the system with DAB ON or OFF, GPS: LOCK or UNLOCK and icons for each of the main functional areas which will turn RED when a fault is present in that functional area. The Home page also shows audio input bargraphs in the center of the screen and additional status windows for modulator status, RF status, Power Supply and System status.

The modulator status will indicate OK or FAULT condition from the motherboard CPU and from the Digital Upconverter.

The RF status reports the input power and output power of the RF Upconverter (in FM IBOC Exciters only). In AM Exciters the AM magnitude level and AM phase level are shown.

The Power supply status shows whether the power supply is OK or in a FAULT condition.

The System status indicates if the transmitter is in operation or standby, If the system is OK or has a summary FAULT, the frequency and mode the Exciter is in.

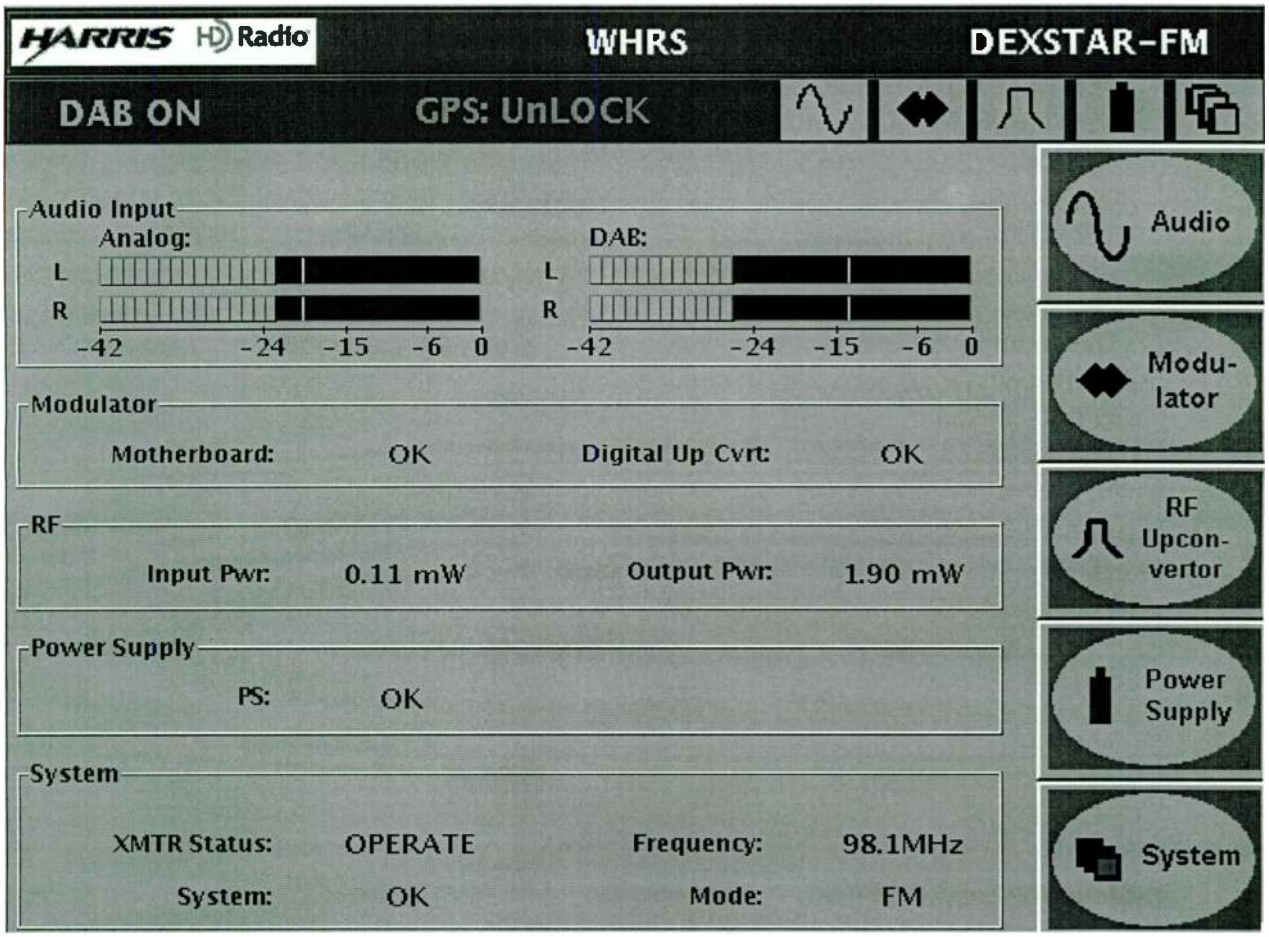


Figure 3-3 Home screen

WARNING: Disconnect primary power prior to servicing.

3.8.1 Audio

This is a group of all audio inputs and selections; input, output, setup and the optional NeuStar if applicable.

3.8.1.1 Audio Input

The audio input screen has bar graphs to show the AES audio input levels and the AES DAB input from the Audio I/O board. To the right of the Audio screen are additional audio and NeuStar screens.

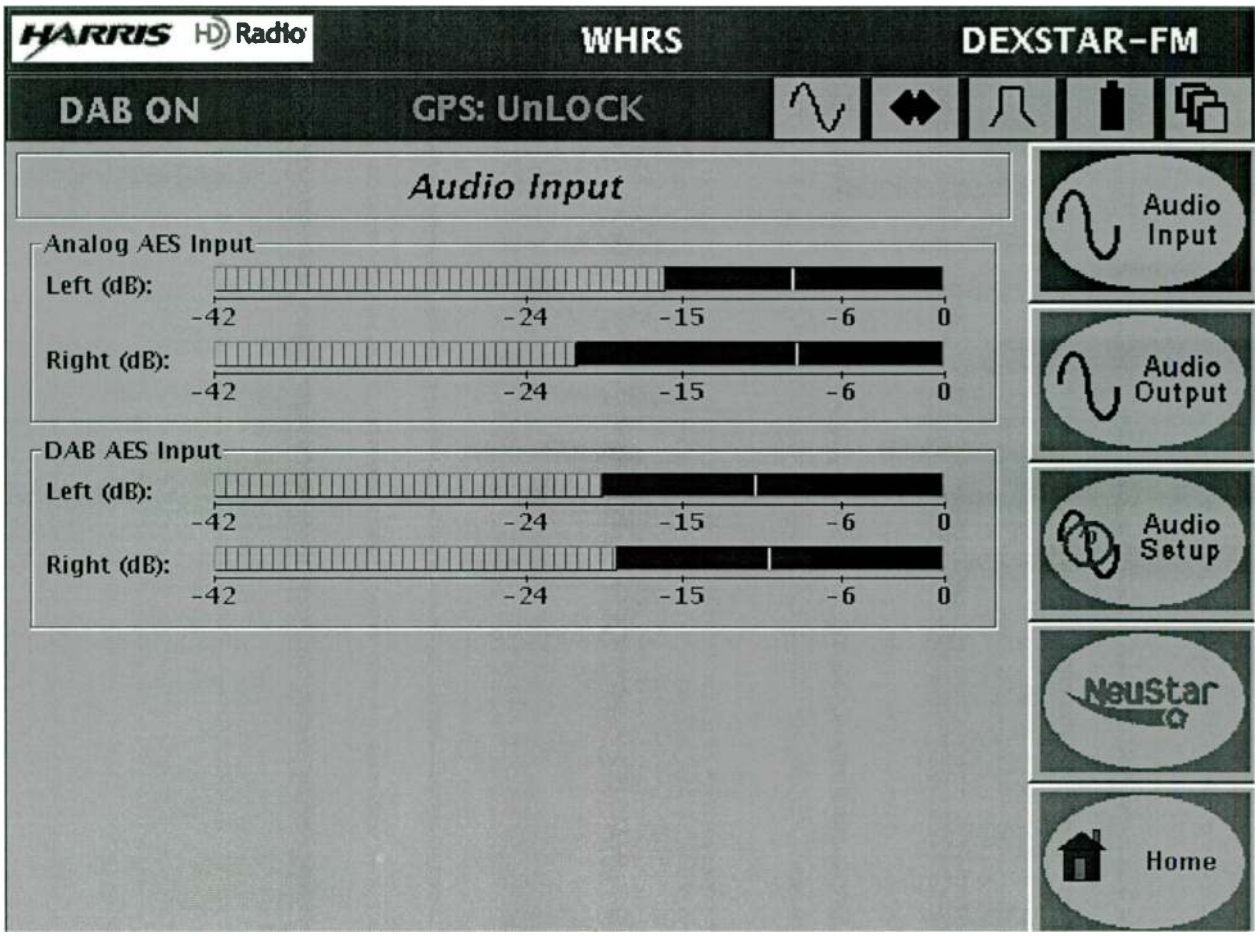


Figure 3-4 Audio Input screen

3.8.1.2 Audio Output

The Audio Output screen is a bargraph and function screen. Hot buttons at the bottom of the screen are provided to select various monitor resources.

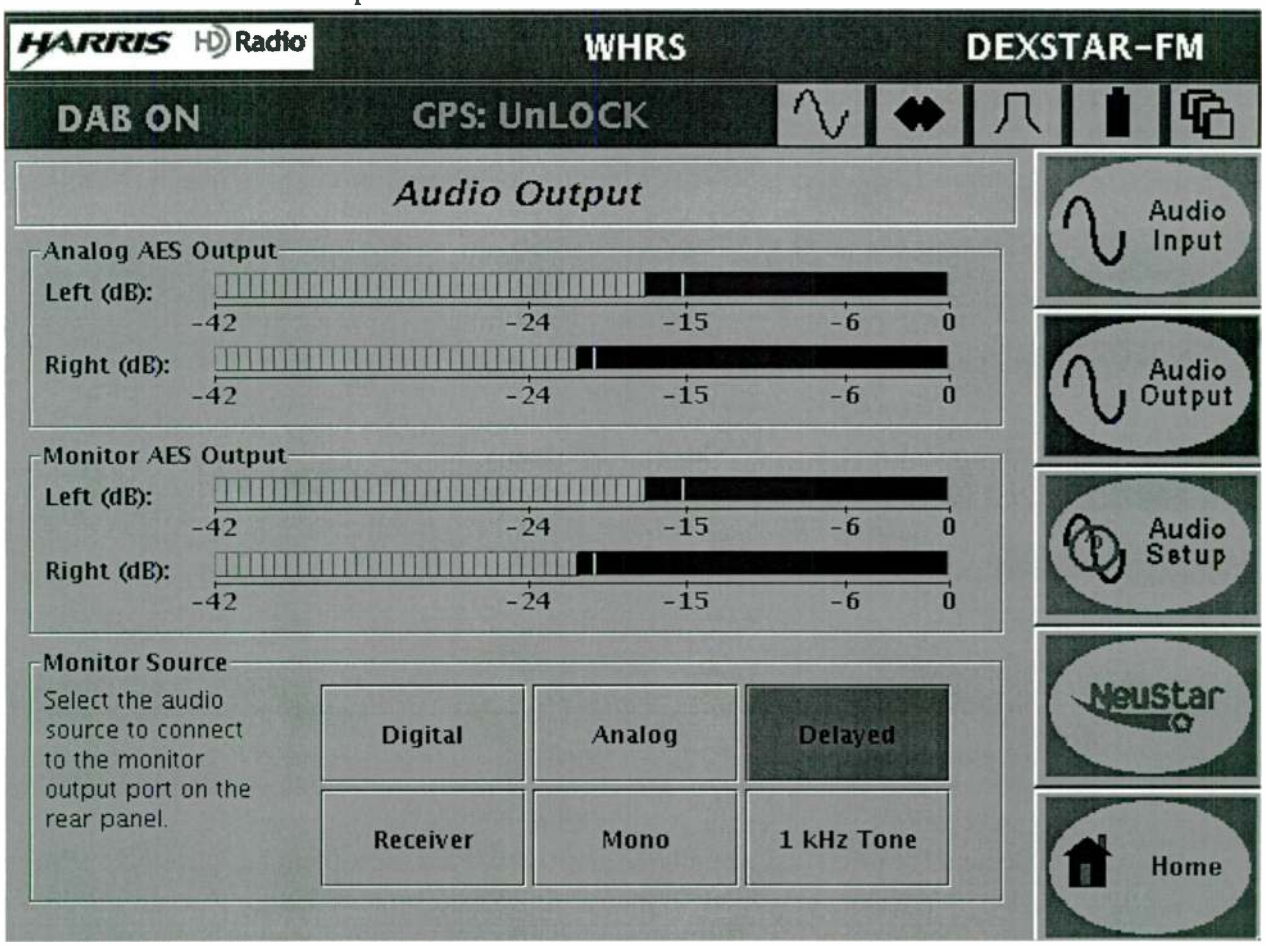


Figure 3-5 Audio Output screen

3.8.1.2.1 Monitor Source select

The Monitor AES Output on the rear of the Exciter and the Monitor bar graphs shown on the Audio Output screen are selectable by the buttons at the bottom of the screen. Select any one of the sources shown to monitor that source and have it appear graphically on the bar graph and be available at the rear panel connector. The 1kHz test tone is for test purposes, see the trouble shooting section for details.

3.8.1.3 Audio Set up

The Audio set up screen controls the amount of time delay of the analog signal relative to the digital signal. The analog signal will be delayed so that the instantaneous signals going through the analog and digital paths will arrive at the receiver at the same time, this will take advantage of the ability of the receivers to switch from digital to analog when the digital signal level gets too low. This prevents the cliff-edge effect (when the digital signal becomes too low to receive) by switching to the analog signal aligned in time and giving the listener slowly degrading analog reception in the fringe areas.

3.8.1.3.1 Operate/Bypass

This mode can be bypassed with the Operate/Bypass buttons. When the ePal is in "AUTO" mode, these buttons can bypass the delay of the audio. Refer to the ePal description for further information. In dual Exciter applications, each Exciter only affects one switch on the ePal (Exciter A or Exciter B).

3.8.1.3.2 Delay Adjust

To set up the Delay Adjustment, use the lower left part of the audio set up screen. Using the Adjust Rate (sec) changes the resolution of the adjustment, from course (1 second, then .1 second..) to fine (.01 sec., .001 sec, .0001 seconds...). Touching this box will produce a pop-up keypad teo key in the resolution in seconds. This further refines the delay in smaller increments/decrements when the more/less (up/down) buttons are pushed. Continue this process starting with course adjustment, up/down working toward fine adjustment (up/down) until the total amount of audio diversity delay of the analog matches the digital. This is a manual adjustment that requires a reference receiver set to dual mode (analog and digital). This may require setup when rebooting the Exciter.

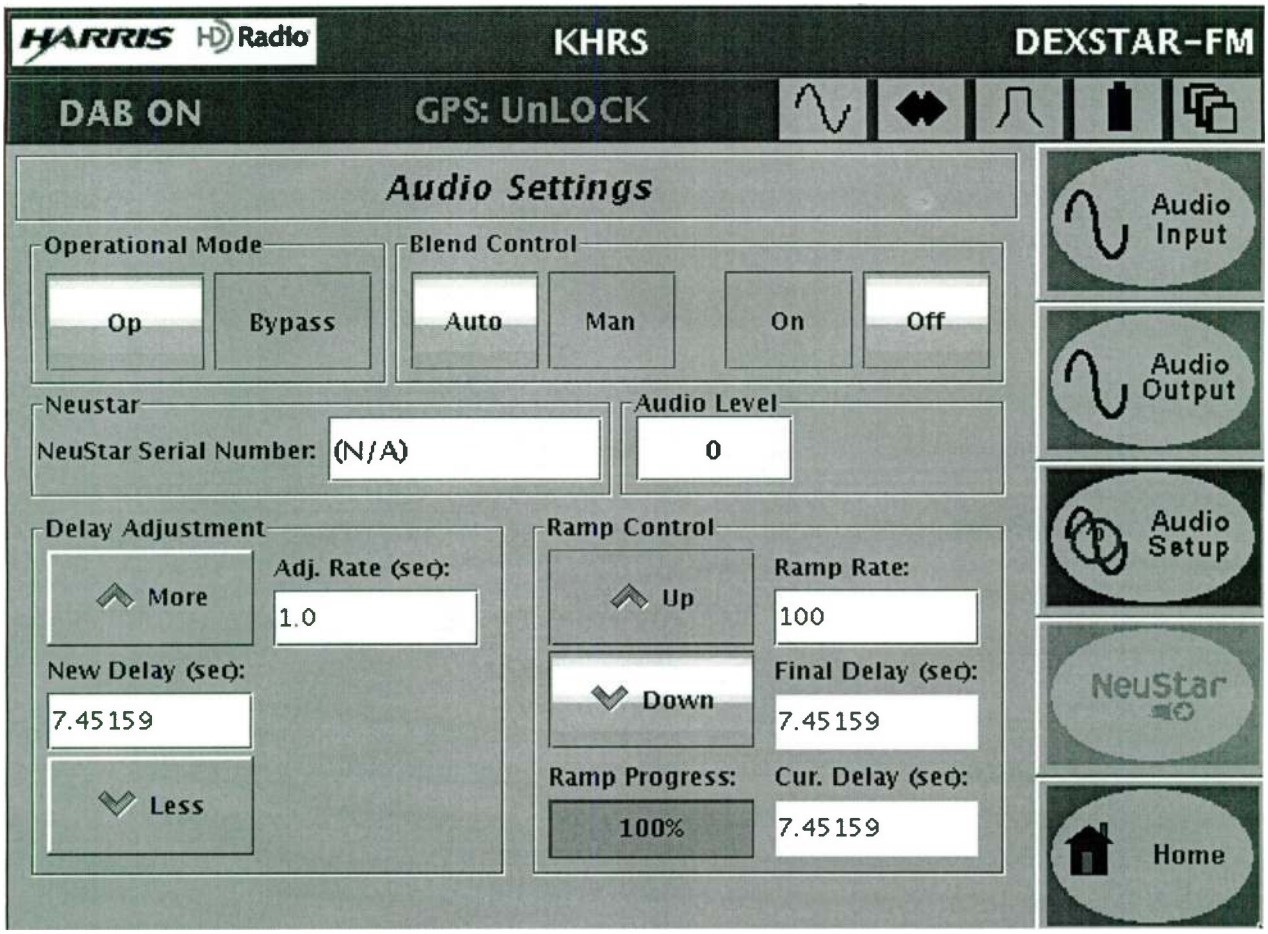


Figure 3-6 Audio Set up screen

3.8.1.3.1 Ramp Control

Then the audio diversity can be, in essence, turned ON and OFF using the Ramp Control buttons. However this does not abruptly turn ON and OFF, it sweeps from 0% to 100% of the selected delay. When Ramp UP is pressed, the delay is incremented ON to 100% of the Final delay setting. When the Ramp DOWN is pressed, the delay will gradually decrease until there is no delay present, or 0% of the selected delay.

The rate of which the total delay changes in Ramp UP or Ramp DOWN mode is established by the selected Ramp RATE pop-up window. One audio sample is added or extracted for every 0 - 1000 audio samples. A rate of 0 would immediately turn the delay ON or OFF, a rate of 1000 would change the slowest, one sample added/extracted per 1000 audio samples. When the delay is to be turned ON, the AUTO UP button will gradually add delay back into the analog chain, at the selected rate, until 100% of the selected delay is in the chain. The default value is 100.

3.8.1.4 NeuStar

The NeuStar button takes you to the screen that controls an optional audio processor/ codec preconditioner that processes the digitized audio for the Dexstar Exciter. This screen controls preset processing, Operate/Bypass and shows level indicators of the audio. Control on this screen, in addition to the preset audio selection include digital and analog audio volume for both inputs and outputs. Refer to the NeuStar product manual for detail on the presets.

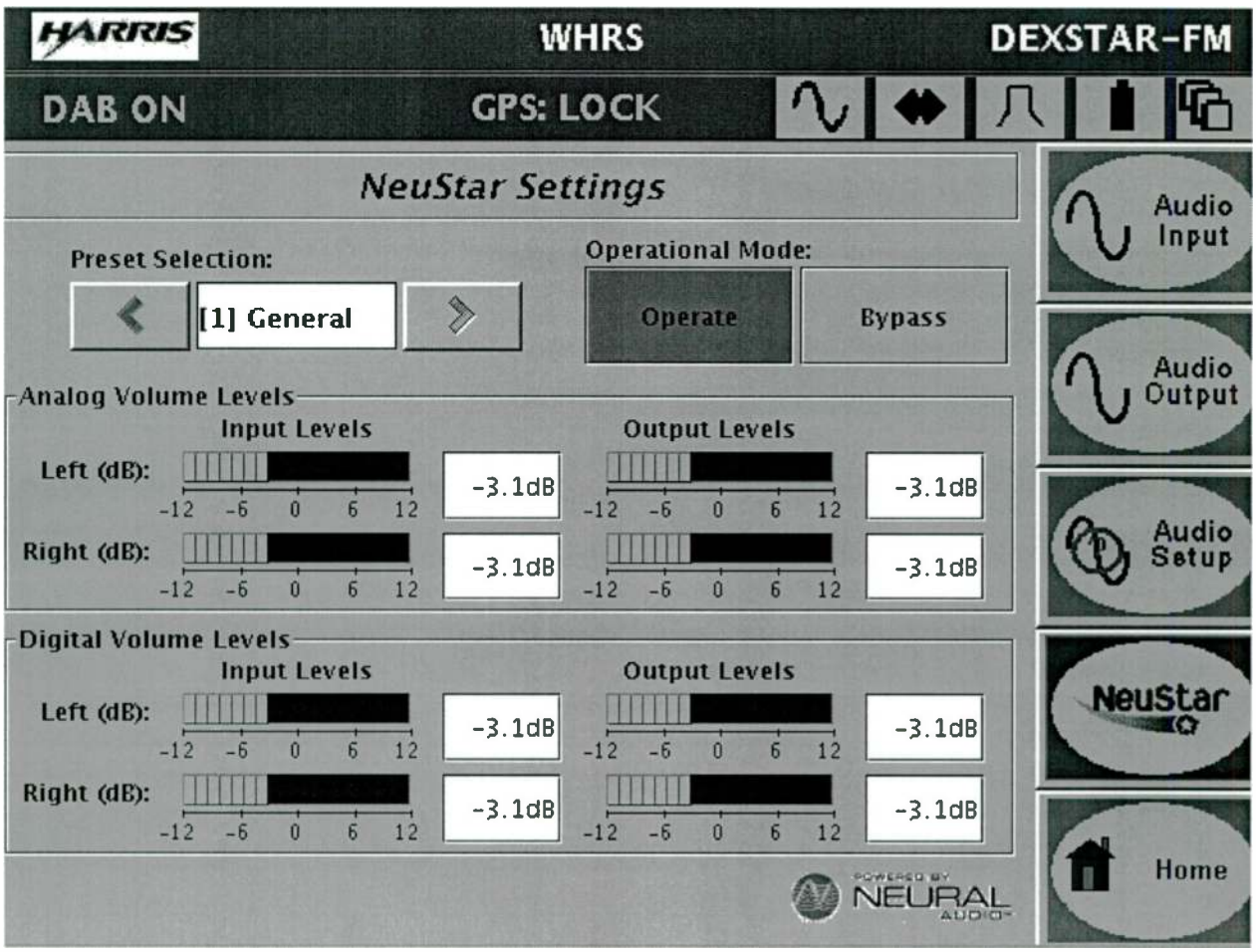


Figure 3-7 NeuStar screen (optional equipment)

3.8.1.4.1 Preset selection

These are recommended settings of processing, select one of the presets that is the best for your audio sound. Custom presets can also be designed for your particular style to create your own custom signature sound.

3.8.1.4.2 Operation mode

The Operate/Bypass will take the NeuStar in or out of the circuit.

3.8.1.4.3 Analog volume level

Analog AES input and output audio are applied to the level indicators and also show up as numeric values on this screen. Touching the numeric box will provide a pop-up keypad for volume control.

3.8.1.4.4 Digital volume levels

Analog AES input and output audio are applied to the level indicators and also show up as numeric values on this screen. Touching the numeric box will provide a pop-up keypad for volume control.

3.8.2 Modulator

The Modulator screen shows status of the Digital Upconvertor and the Motherboard.

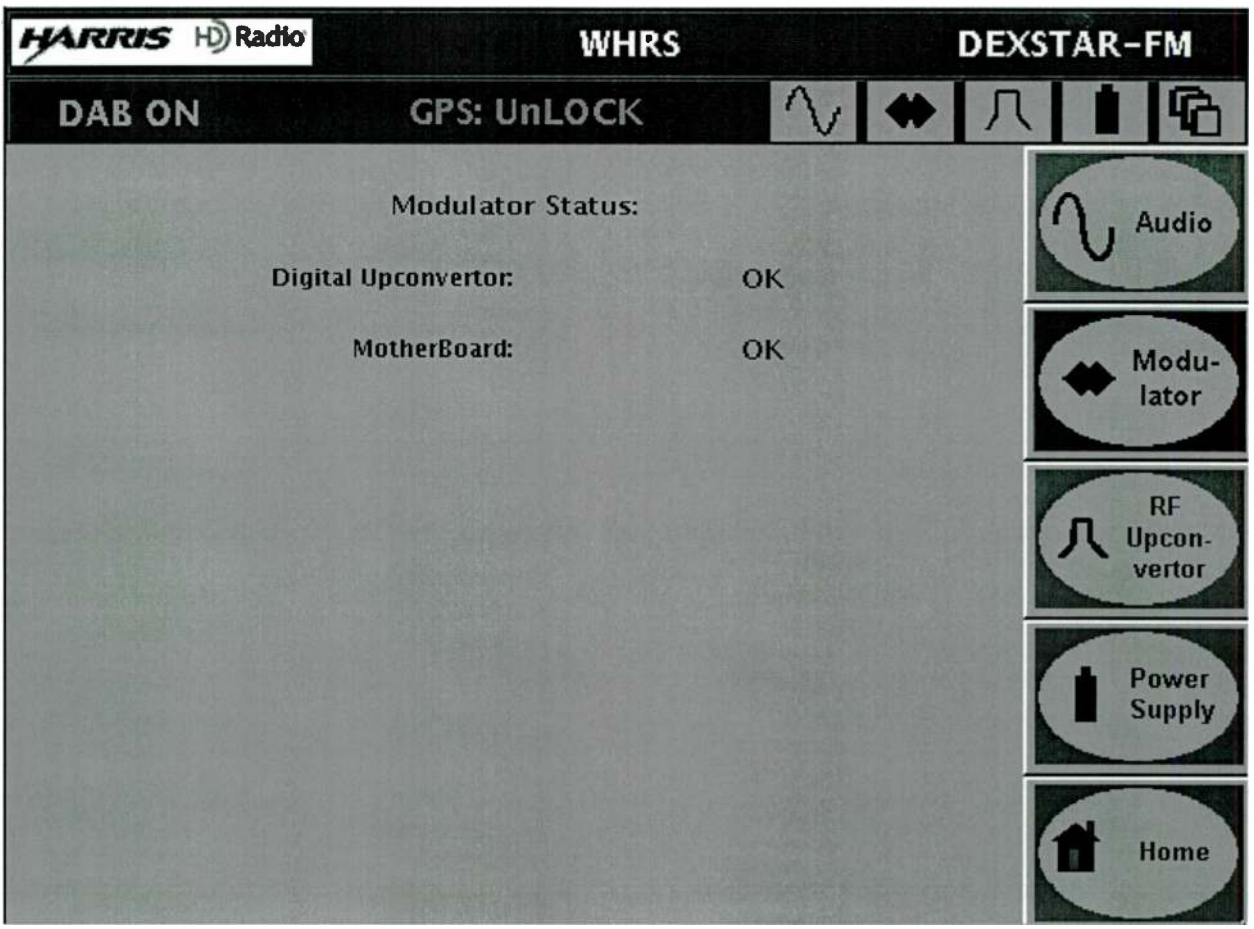


Figure 3-8 Modulator screen

WARNING: Disconnect primary power prior to servicing.

3.8.3 RF Upconverter

The RF Upconverter is used on FM Exciters ONLY, thus this screen is only needed in FM Exciters and the Home screen does not show the RF Upconverter button on AM Exciters. This screen shows faults and metering for the RF Upconverter in FM Exciters.

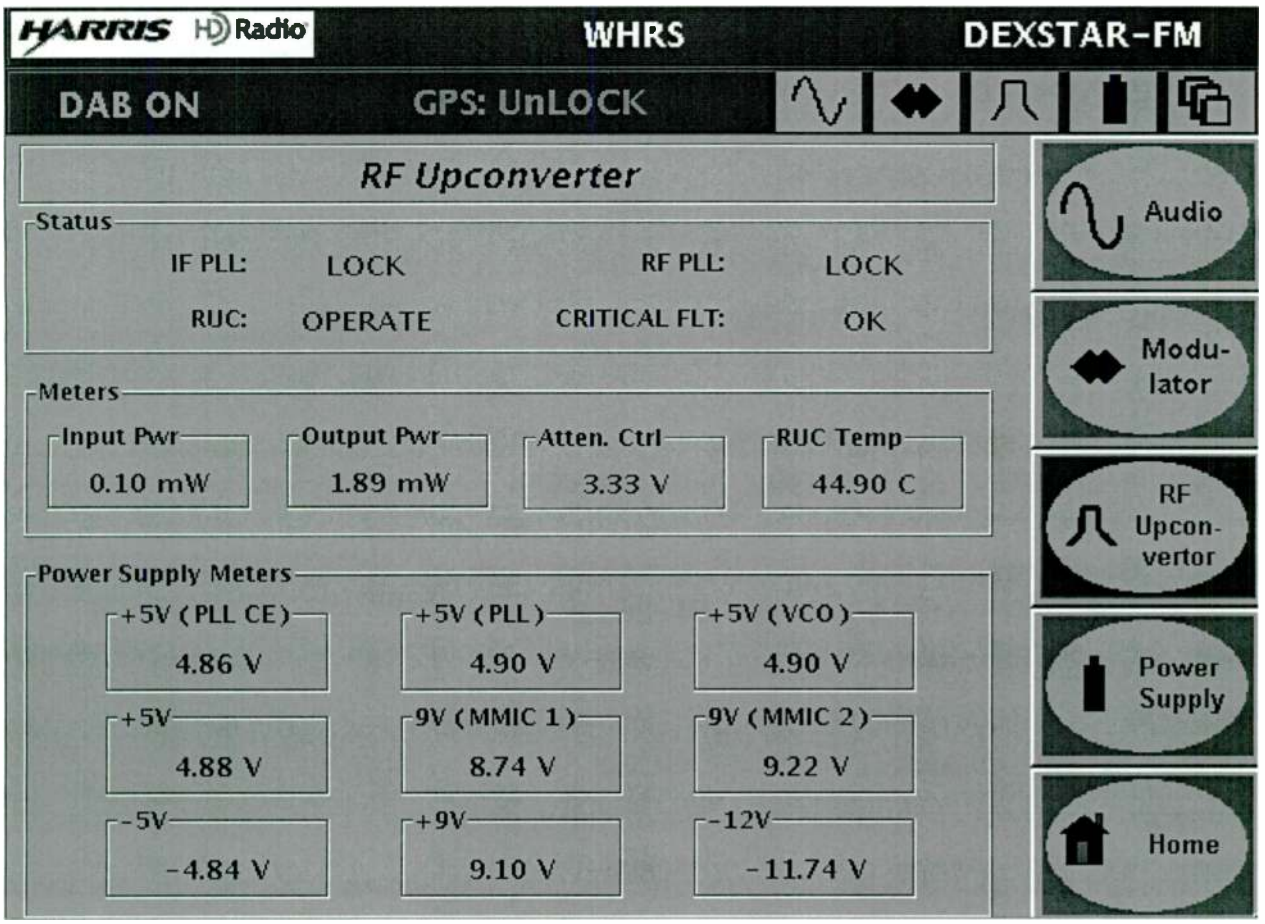


Figure 3-9 RF Upconverter

The fault status includes IF and RF phase locked loop, RUC (RF Up converter) Mute from within the Up converter board and any critical faults. The rest of this screen contains metering. Analog control is the external power control voltage applied to the Exciter to lower the power. The attenuator control voltage shows the active value for the attenuator in the ALC loop. A nominal value of about 2-3V either extreme can result in improper output power. The power supplies on the RF upconverter are monitored on the lower part of this page. The box will change to yellow when the voltage is 5% out of tolerance, and red when it's 10% out of tolerance.

3.8.4 Power Supply

The Power Supply screen illustrates the summary status only of the power supplies and metered voltages produced.

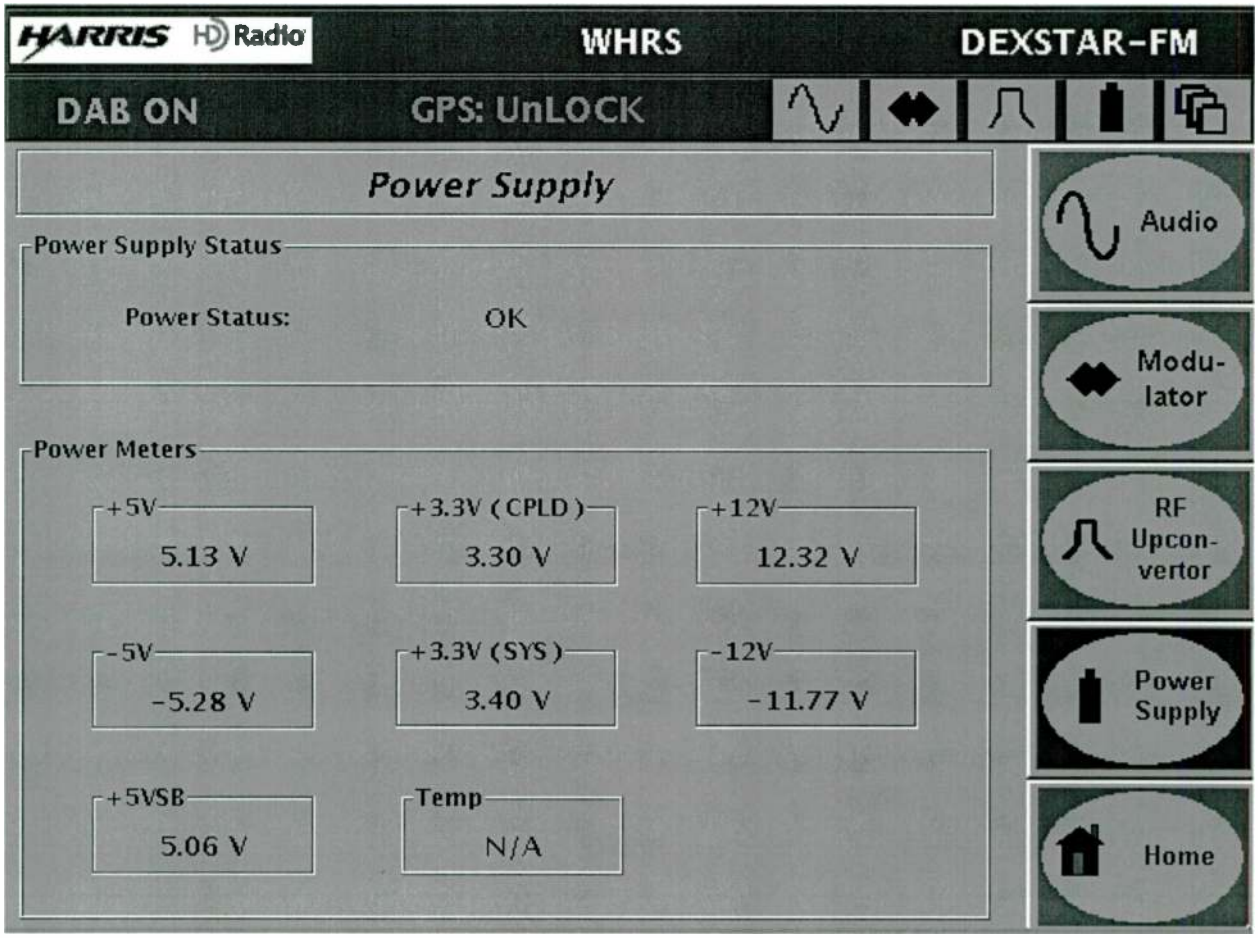


Figure 3-10 Power Supply screen

The power supplies are monitored on the lower part of this page. The box will change to yellow when the voltage is 5% out of tolerance, and red when it's 10% out of tolerance.

3.8.5 System

The top level System screen is a system status and shut down screen. Contained on this screen is the local time and access to the password protected System Setup screen, the System Configuration screen, the System fault Log and the System Service screen.

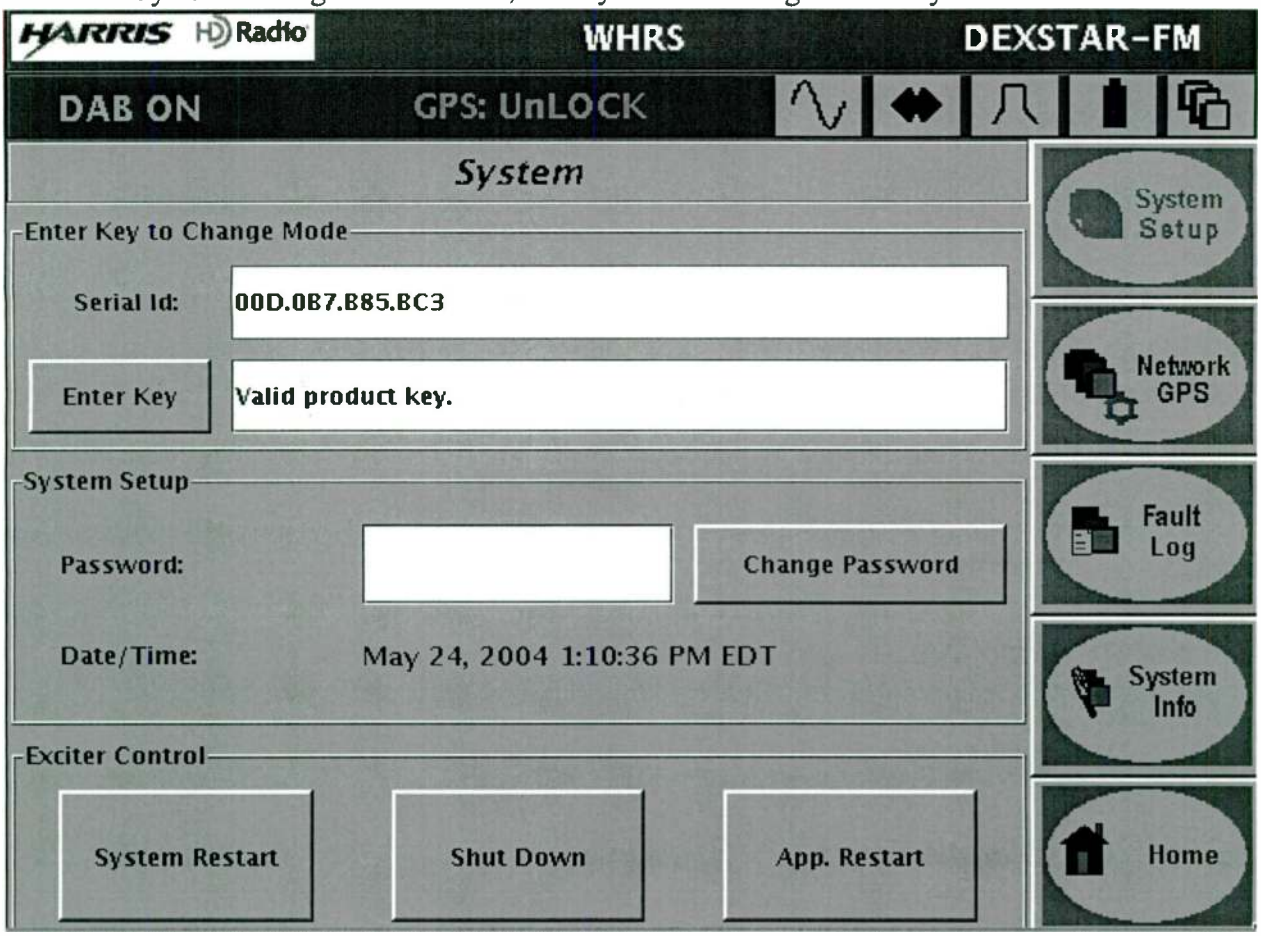


Figure 3-11 System screen

3.8.5.1 Levels of Shut down

As with a computer, there are three different levels of shutting down. From least to most, the shut down choices are as follows;

1. Application Restart. This is the least evasive and takes the least amount of time to recover from, about 1 minute. If the program appears to be locked up, pressing APP. RESTART is comparable to restarting the program on a computer. Use this method first when the program fails to respond. It will restart the application only.

2. System Restart. If the exciter program does not respond to the previous method, pressing SYSTEM RESTART will be the same as a warm boot on a computer, or similar to pressing Ctrl-Alt-Delete on a PC. The system will reload and reboot the entire operating system. This is only to be used if the application restart does not work and you want the computer to reload and return to opperational mode.
3. Normal, or proper shut down procedure would be through the button labeled SHUT DOWN. Shut down is similar to a regular shut down on a computer, it stops the operating system and prepares the computer to be turned of in a proper fashion. If there is a loss of power, the Exciter will auto shut-down with in 5 minutes if power is not restored.

3.8.5.2 System Setup

System Setup is password protected on the System Configuration screen. Touch the white box and the keypad will appear.

Enter the default password; 1234. After you do, you will get the confirmation message in the password box indicating that it will expire if inactive after a reasonable amount of time.

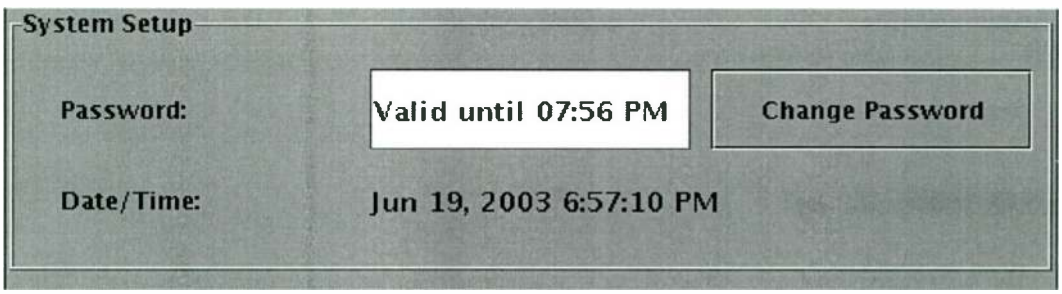


Figure 3-12 Password confirmation example

The System Setup screen shows the current configuration of the Exciter. This screen is also where the I/Q Scale factor is adjusted, Digital Carriers and the Remote Control enable can be turned ON/OFF with buttons on this screen. Additional screens are accessed from here for FM Setup, Station Setup and Troubleshooting.

Your Exciter will only operate in the mode which it was purchased for, AM or FM. Attempting to operate in any other mode will cause the Exciter's output to mute until the intended mode is again selected. Current Modes supported are; FM hybrid (MP1) and AM hybrid (MA1) Consult the program licensing agent for other modes of operation.

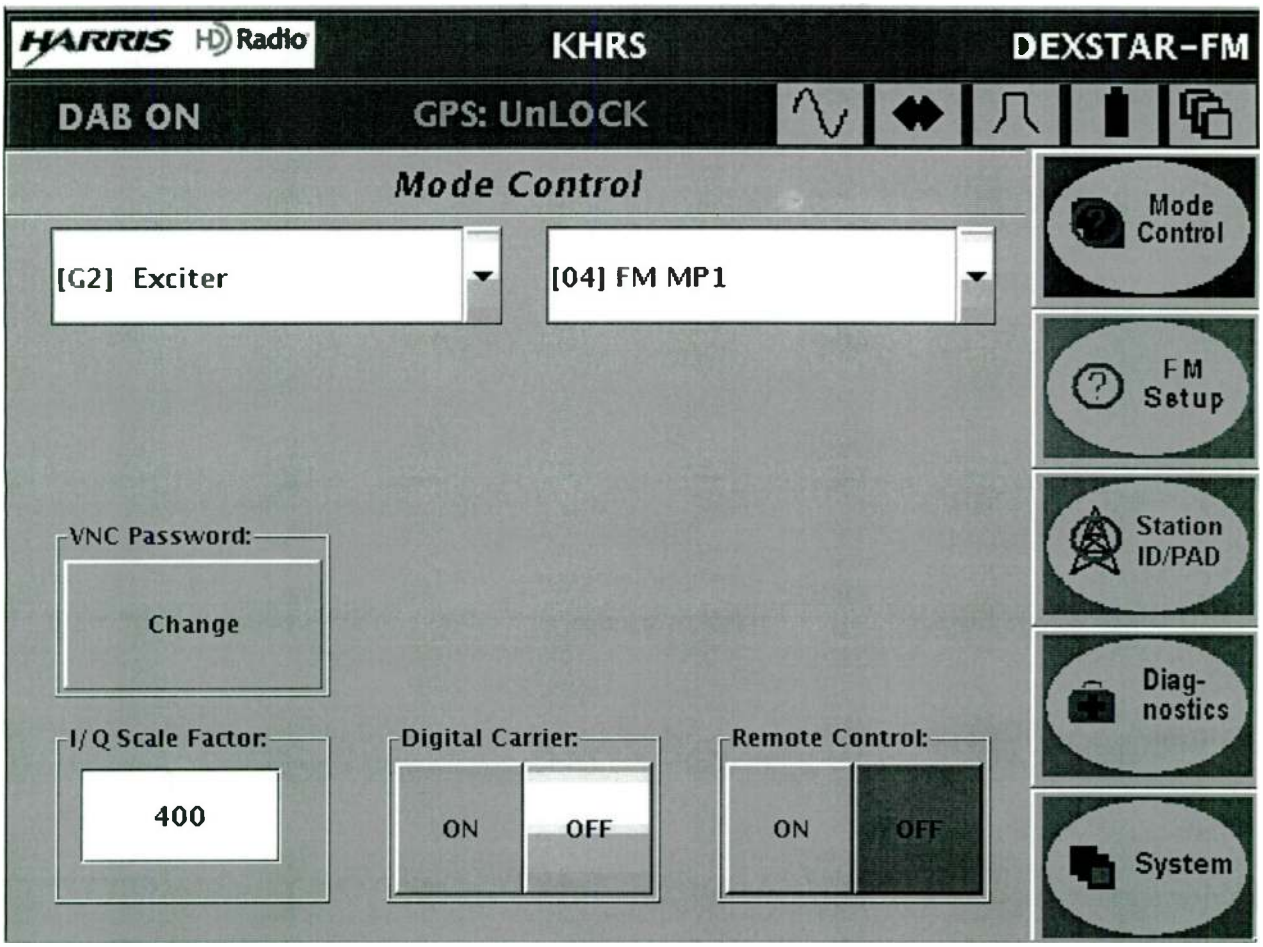


Figure 3-13 System Setup screen

I/Q Scale factor is used to set the level of the composite magnitude prior to the last D/A so you don't overflow the D/A converter. It is recommended to NOT adjust this value. This adjustment along with the Analog gain and Magnitude DC level settings can cause D/A overflow which would result in high distortion. The highest I/Q number with out distortion is desired. Normal values would be 300 for FM with PAR OFF, 400 for FM with PAR ON, and 12000 for AM.

Digital Carrier ON/OFF is used to mute the digital carrier only, with out affecting the analog signal. ON is for analog and digital, OFF is for analog output only in hybrid Exciters.

The Remote Inputs at A12J3 can be turned on or off. Remote On enables these inputs on the rear of the Exciter, Remote Off disables them.

To enable the (optional) NeuStar communications enter the NeuStar serial number found on the back of the NeuStar. Touch the textfield box and use the pop-up keypad.

3.8.5.2.1 FM System Setup

This screen will only be visible or functionable for FM Exciters only. On this screen the number of Exciters used inthe system (single or dual), Peak to Average Reduction (PAR) is selected and the P3 interleaver length is selected.

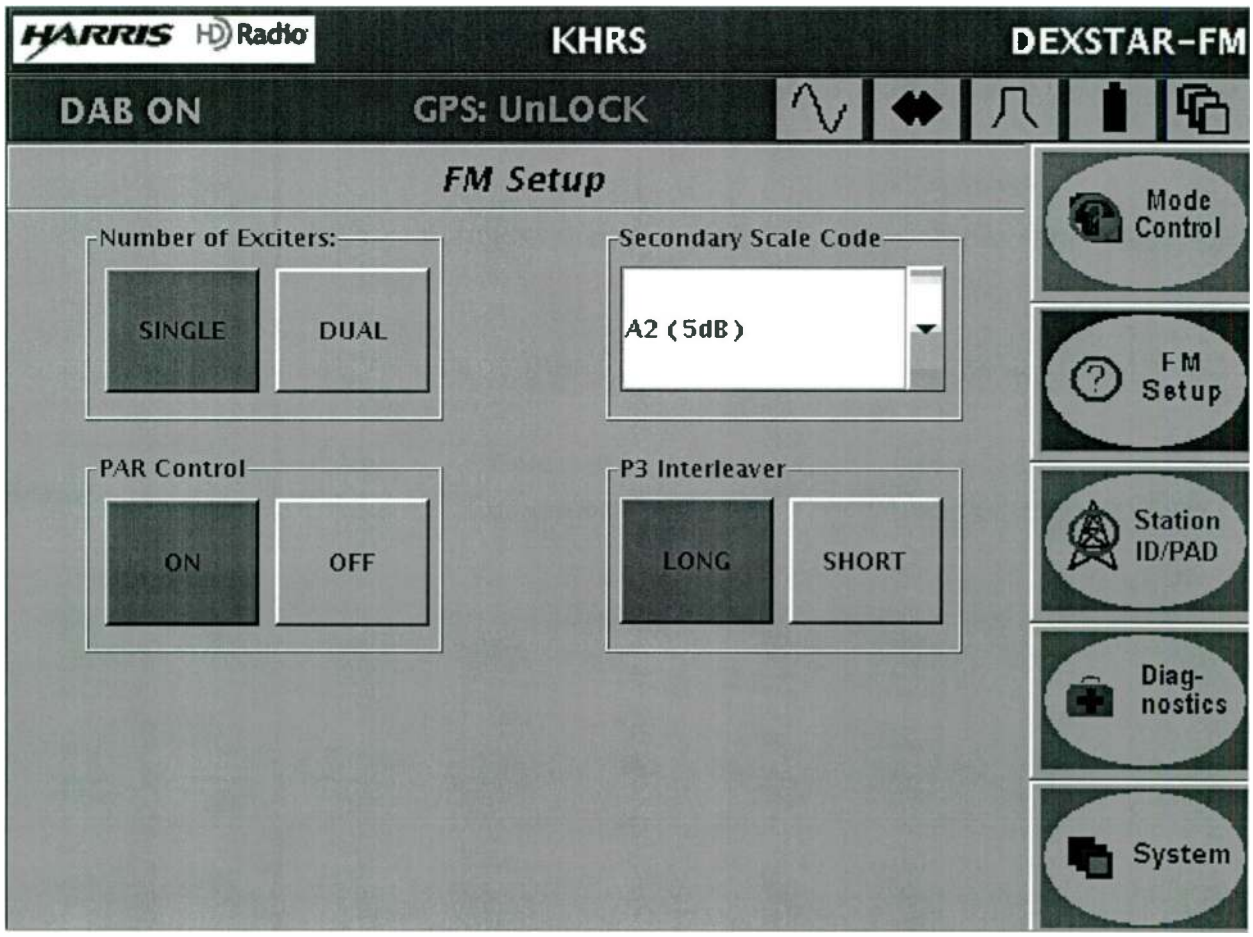


Figure 3-14 FM System setup

In a Single Exciter system, the Exciter will initiate a transmitter OFF command with in 3 seconds of an Exciter fault. This is quicker than in a dual Exciter system. In dual Exciter systems, it is important to select dual mode which allows the second Exciter time to come into the circuit instead of faulting off the transitter. In the dual Exciter systems the transmitter OFF command takes 12 seconds to inititate.

The PAR reduces the peak to average of the signal when it's turned on. Use caution when turning the PAR control OFF because the peak to average along with the I/Q scale factor and the particular waveform being transmitted can cause D/A overflow. Adjust the I/Q scale factor numbers on the Setup screen before turning the PAR control OFF.

The P3 interleaver selects a long or short interleaver length for the channel. Changing this on-air will momentarily cause errors in all channels of a receiver tuned to that frequency. This adjustment is used along with the Audio Diversity delay adjustment. A short interleaver will not require as long of a delay as a long interleaver. A long interleaver will make the data stream more robust, however it will require a longer Audio Diversity delay to reconstruct the complete digital word that has been spread out over the longer time frame.

3.8.5.2.1 AM Set-up

This screen will only be visible and functional for AM Exciters. Adjustment of the delay for both phase and magnitude is done here. Different presets for day/night and winter/summer is selected. Different settings will be needed due to different directional patterns.

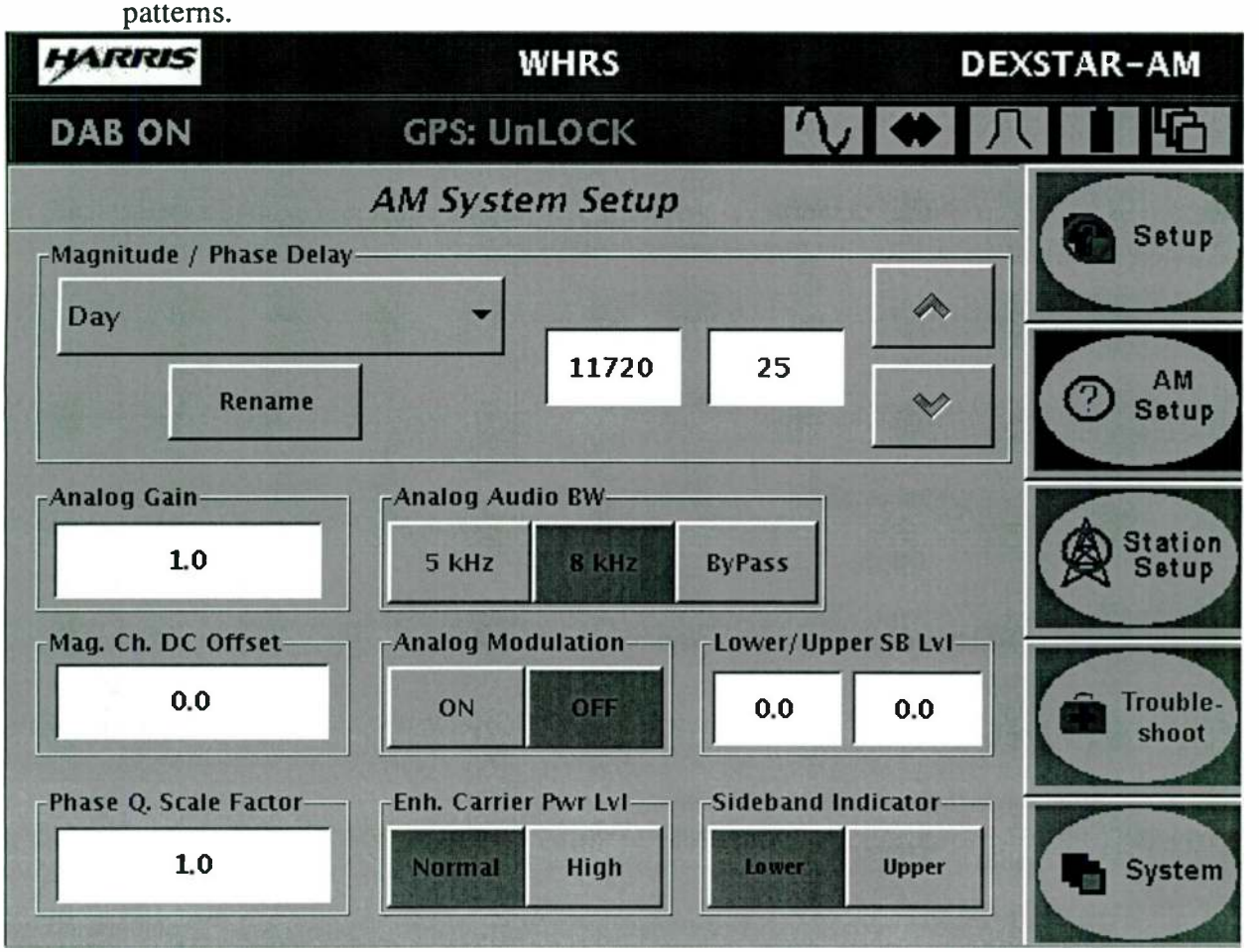


Figure 3-15 AM Set up screen

The Magnitude/Phase Delay is adjusted using the up/down buttons. The result appears in the center of the screen in the numeric window. The amount each button push

increments/decrements depends on the value entered in to the number box to the left of the up/down buttons. These can be memorized into the preset pull-down selection. Preferably use the first two for your primary day/night settings since these first two are selectible from the back panel at the Remote I/O connector.

Analog gain scaling factor scales the analog signal relative to the digital signal. Caution must be used when adjusting these values.

Magnitude channel DC offset is used in conjunction with the Analog gain to maintain ground reference of the analog signal.

Phase Q (quantization) Scale factor should NOT be adjusted, leave set to factory default of 1.

The analog bandwidth limiting can be selected at 5kHz, 8kHz bandwidth or bypass with no filtering where you would need to filter in the audio chain before the Exciter.

The analog modulation can be turned ON or OFF with buttons in the middle of the screen.

Enhanced Carrier power level pertains to the digital carriers. Normal is 0dBm and HIGH is +6dBm. This raises the levels of the digital carriers relative to the analog carrier.

Sideband indicator is no longer valid in any mode. Primary sideband level adjustment allows the primary digital sidebands (upper and lower) to be adjusted independently of the analog signal.

3.8.5.2.1 Station System Set up

The Station set up screen is where the carrier frequency is selected and the Titling at top of the screens.

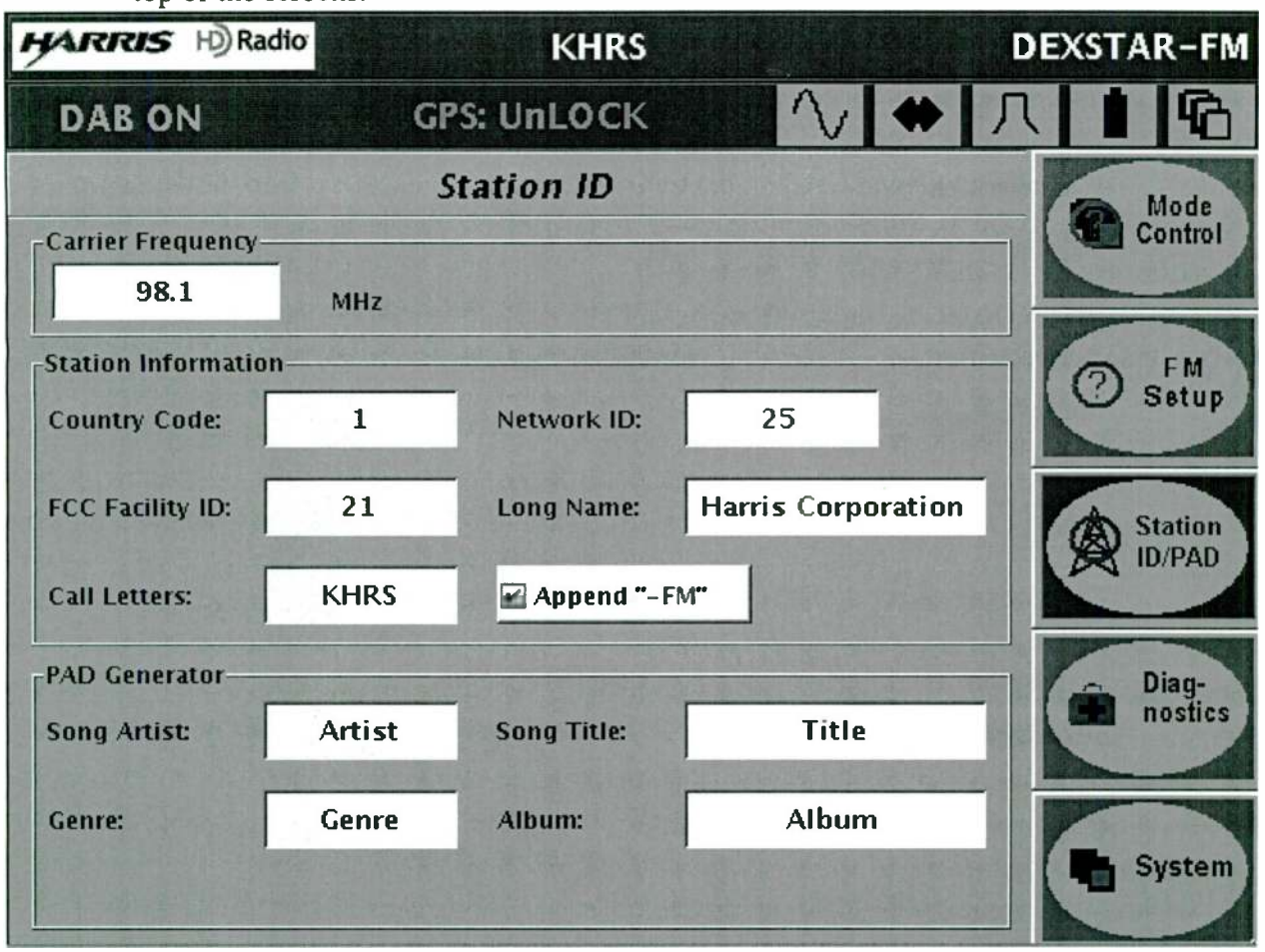


Figure 3-16 Station System Set up screen

Clicking in the white boxes will make a pop-up keypad appear for you to enter in the data desired. AM Exciters will require an application restart when changing to anohter AM frequency. FM Exciters can be put onto any FM frequency with out needing to reboot the system.

Consult the licensing agent for Network ID and FCC Facility ID. For country Code, US broadcasters enter in number 1, all others refer to ITU Operational Bulletin 763-1.V.2002.

Station Call sign contains up to 4 characters and will appear at the top of all screens. The long name can contain up to 56 characters.

3.8.5.2.1 Troubleshooting

There are two screens for troubleshooting the Exciter; Exciter Diagnostics and Exciter test.

Bit Error Rate mode ON/OFF is used for trouble shooting, by sending a test bit pattern that the reference (test) receiver will decode. The BER mode equal to 0 (when OFF) is the normal operational mode of the Exciter. When set to Bit Error Rate mode is turned ON, there will be no DAB signal transmitted and only the bit pattern test signal for the test receiver (no digital audio signal)..

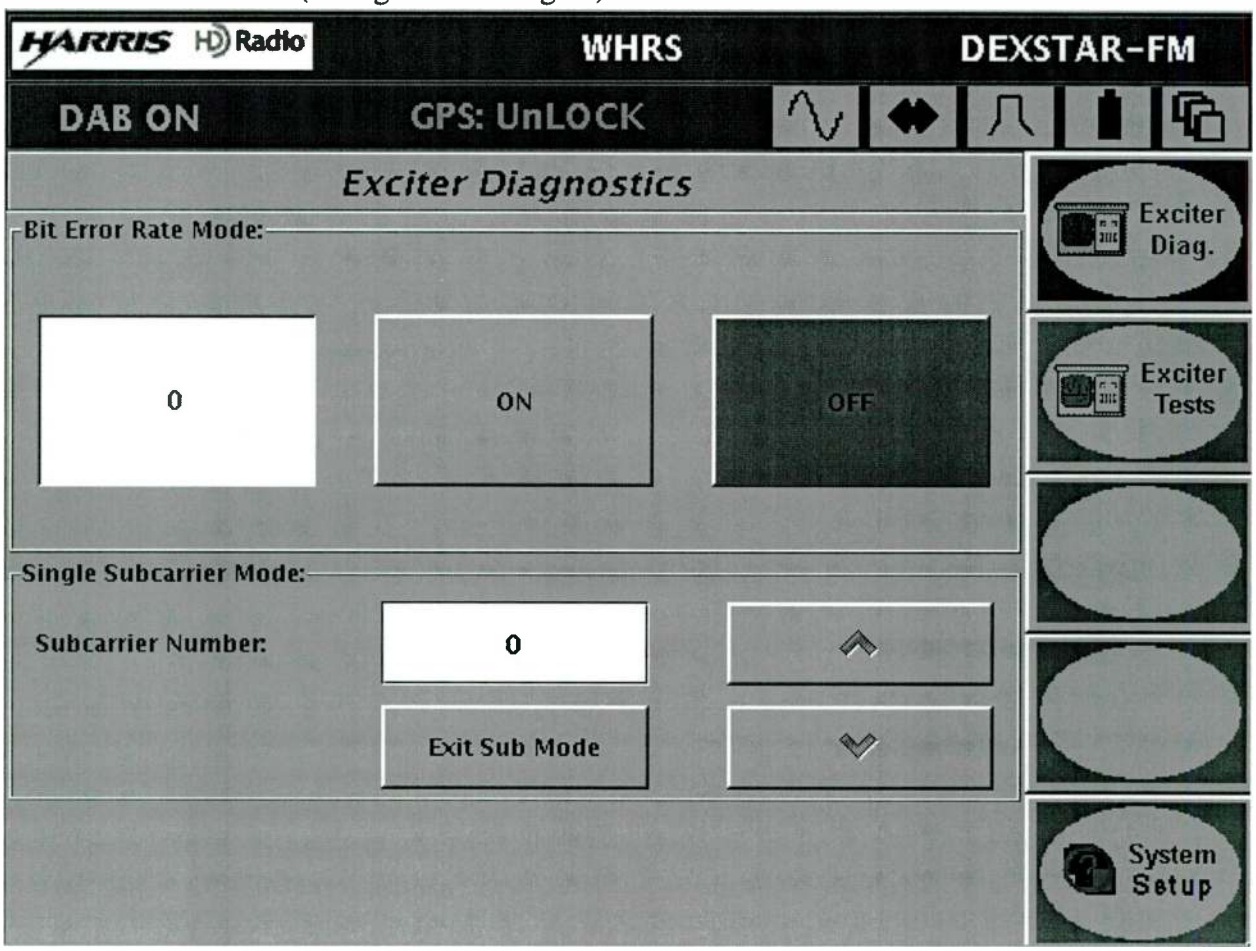


Figure 3-17 Troubleshooting screen

Subcarrier number is also used for troubleshooting. This provides a means to enable one digital subcarrier at a time for testing purposes, observing each subcarriers EVM. It indicates the single subcarrier that will be transmitted; 0 being the lowest subcarrier. Then the single subcarrier being used can be changed, up or down with the arrow keys, incrementing or decrimenting the subcarrier number. When finished testing the single subcarriers, use the Exit Sub Mode button to return to normal operation

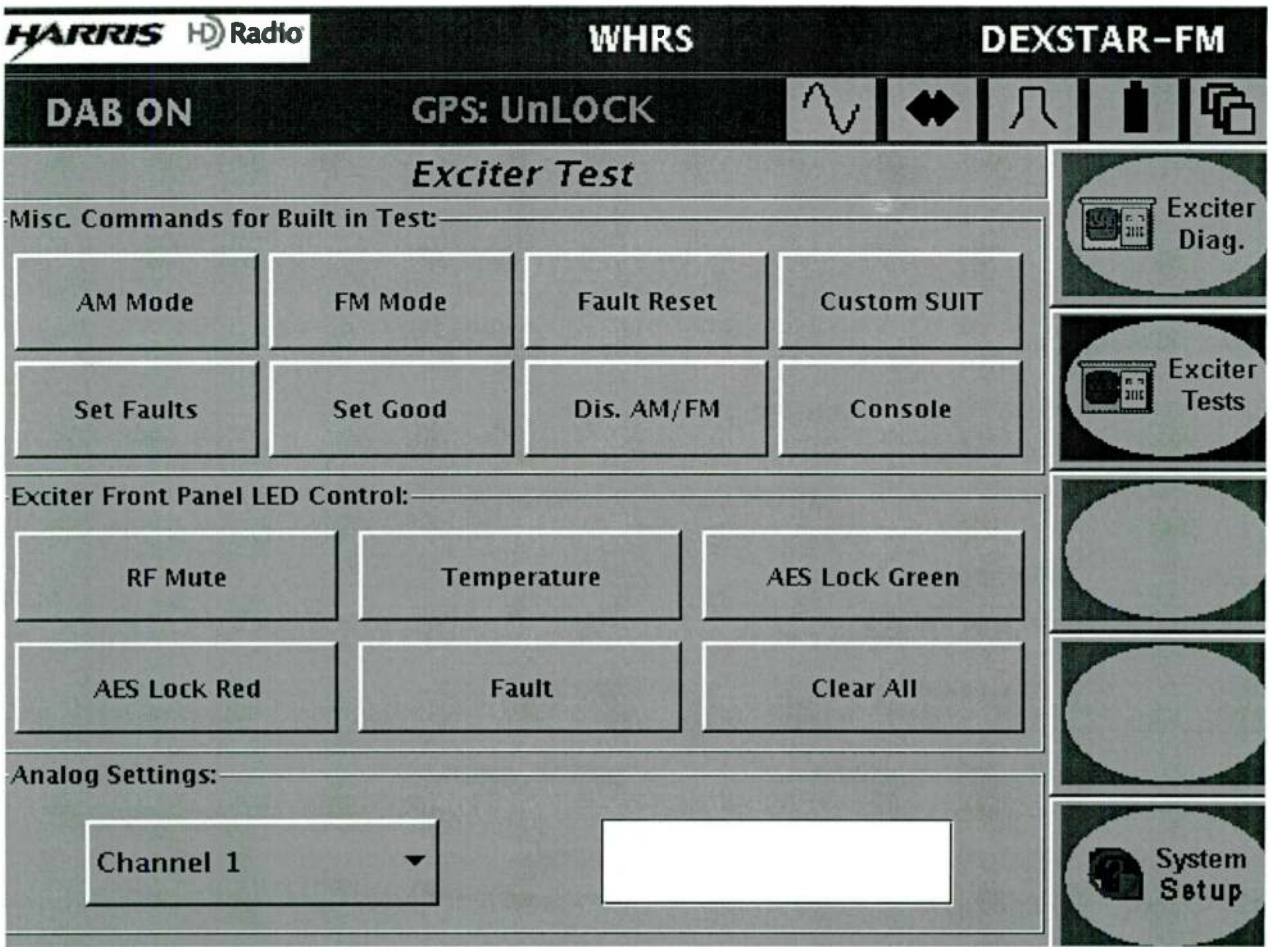


Figure 3-18 Exciter Test

The miscellaneous Commands for built in test are for testing purposes only. Consult field service before using these.

The buttons under Exciter Front Panel LED control are used to illuminate the front panel LEDs. These will remain latched on until another LED test button is pushed. To return the LEDs to the normal active condition, exit the screen. Clear All will extinguish all LEDs, including any that are illuminated because of normal Exciter functions.

The Analog settings allows the operator to check the D/A converters on the station interface board. First select the channel on the drop-down menu, then enter a number with the keypad that will appear when you touch the number box. Enter any number from 0 to 1023. Measure the voltage at the back panel station interface output.

3.8.5.3 System Configuration

The System Configuration group of screens starts with the Network Configuration screen, the GPS Configuration screen and SIS screens.

On the Network Configuration screen, touching on the white box will popup a keypad to allow you to enter in the information for the host name, domain, IP address, net mask and default gateway, and to change the network configurations for static IP addresses. When DHCP is pressed, the Exciter queries the host server to get these values.

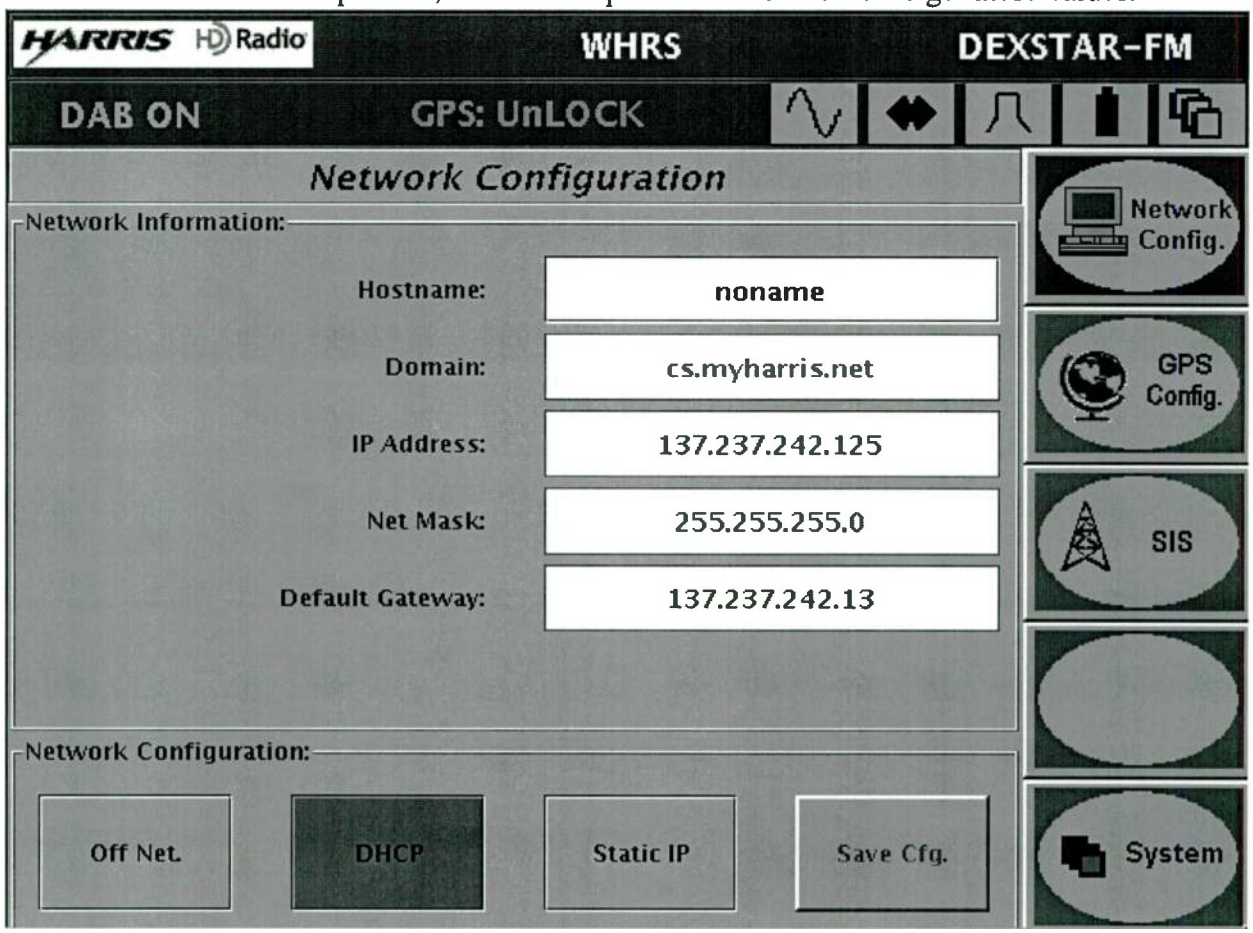


Figure 3-19 Network Configuration screen

When OFF NET is chosen, it points to a default IP address. Anytime a value is changed, the Save Configuration button becomes enabled.

3.8.5.4 GPS Configuration

The GPS screen shows the UTC time (not local time), the status of the receiver and the location of the antenna.

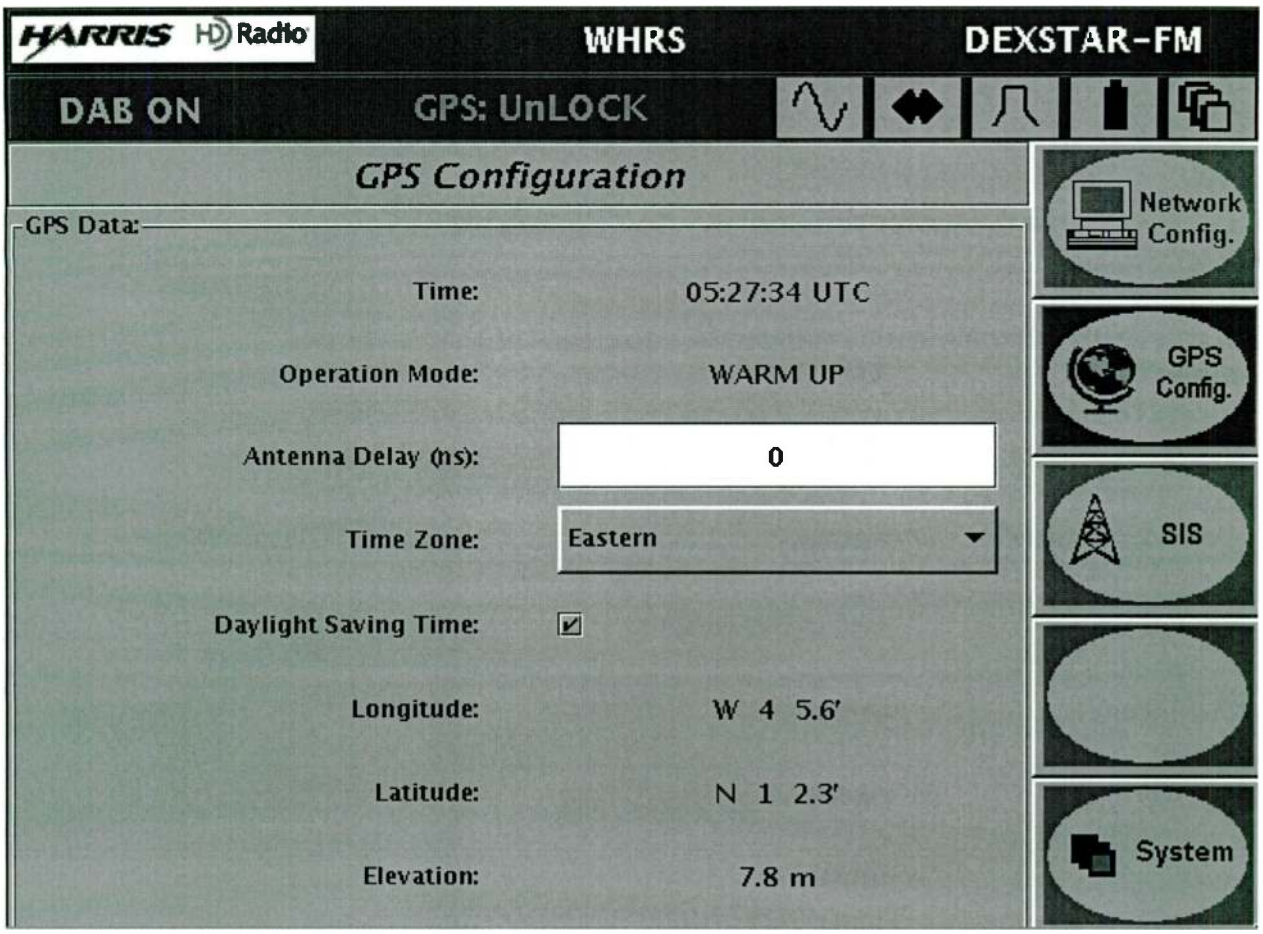


Figure 3-20 GPS Configuration screen

Using the chart in Section 2 of this manual, enter in the amount of delay that is induced through the GPS antenna and cabling to the Exciter.

3.8.5.5 SIS/Station Information Scheduler

The Station Scheduler is for future receiver utilization. It will allow the station to configure the data payloads to the receiver in Program Independent Data Service (PIDs). The Exciter will download Payload 1 and Payload 2. AM Exciters have one page of downloads, FM has two. If the long station name is chosen, then no other data

for that payload can be chosen. To configure, touch the box and the buttons below will become active for the allowable selections. Press the SAVE button to the right after configuarion is complete, before exiting the screens.

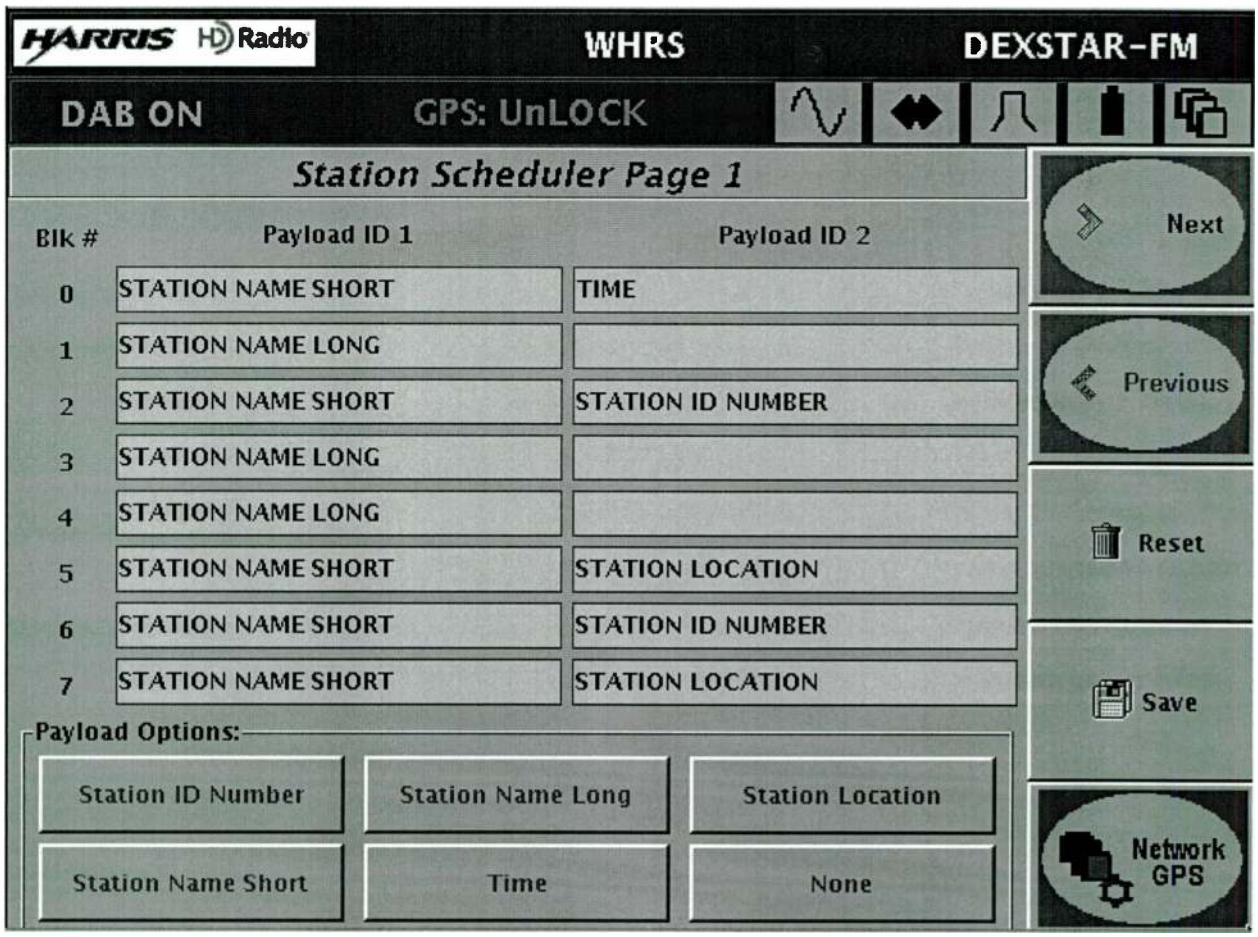


Figure 3-21 SIS Station Scheduler screen

WARNING: Disconnect primary power prior to servicing.

3.8.5.6 System Log

Under the System Log screen specifics of the faults are listed with date and time, most recent last. Only 100 entries fit in this log.After 100 have filled the log, the new entries will over-write the oldest ones.

Figure 3-22 System Log screen

WARNING: Disconnect primary power prior to servicing.

3.8.5.7 System Service

The System Service button takes you to a group of screens starting with the Exciter monitor screen. The Exciter monitor screen is a tally for the operation of the system.

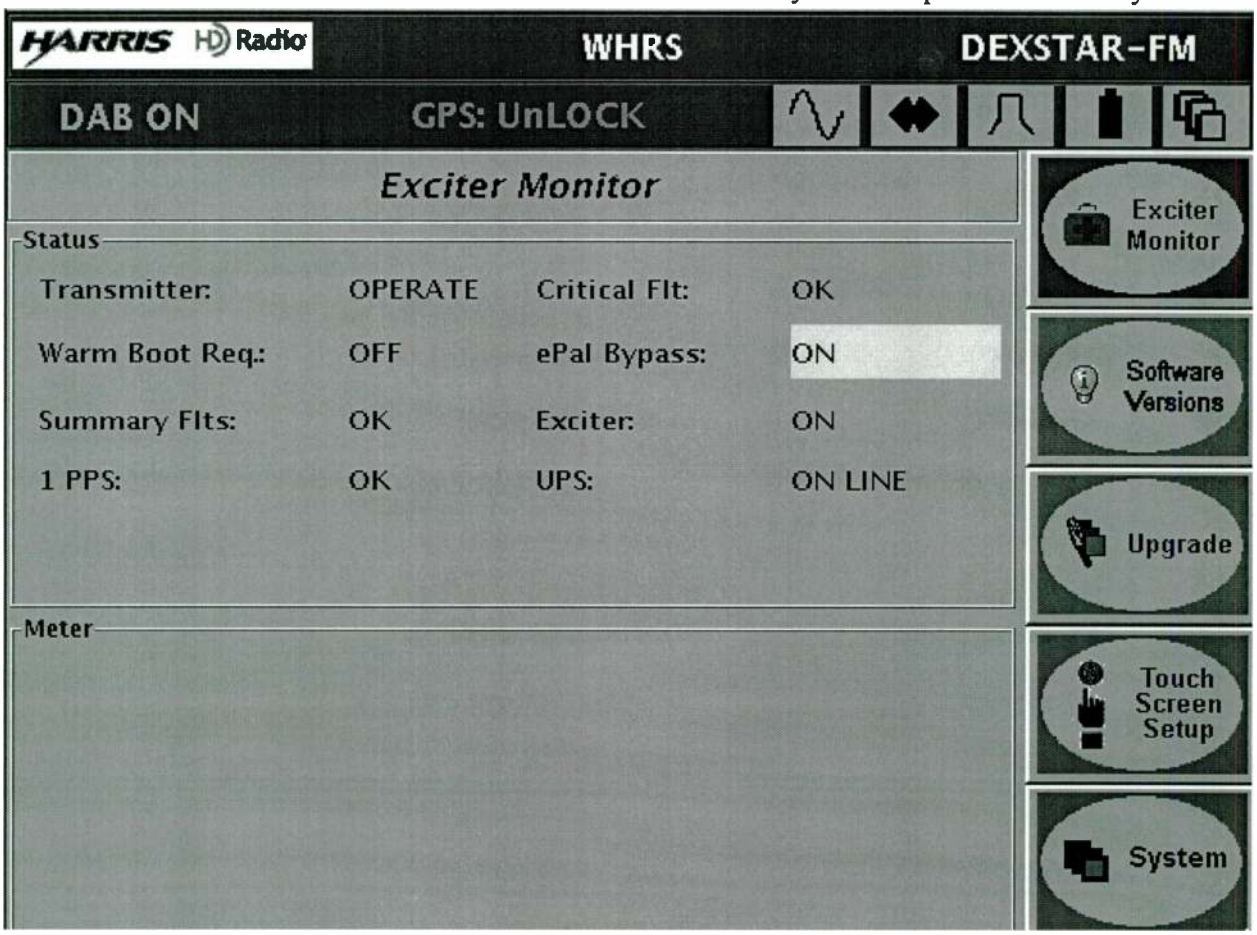


Figure 3-23 Exciter Monitor

Status includes Transmitter in operate or bypass mode. Warm boot enabled allows a remote input from the customer Interfce to initiate a warm boot. 1 PPS is the status of the GPS receiver. UPS on line or on battery. Summary faults and critical faults are either OK or Fault.

3.8.5.7.1 Software revision

This screen tracks the software revisions in the Exciter. When a newer revision of software is loaded, this screen will automatically update.

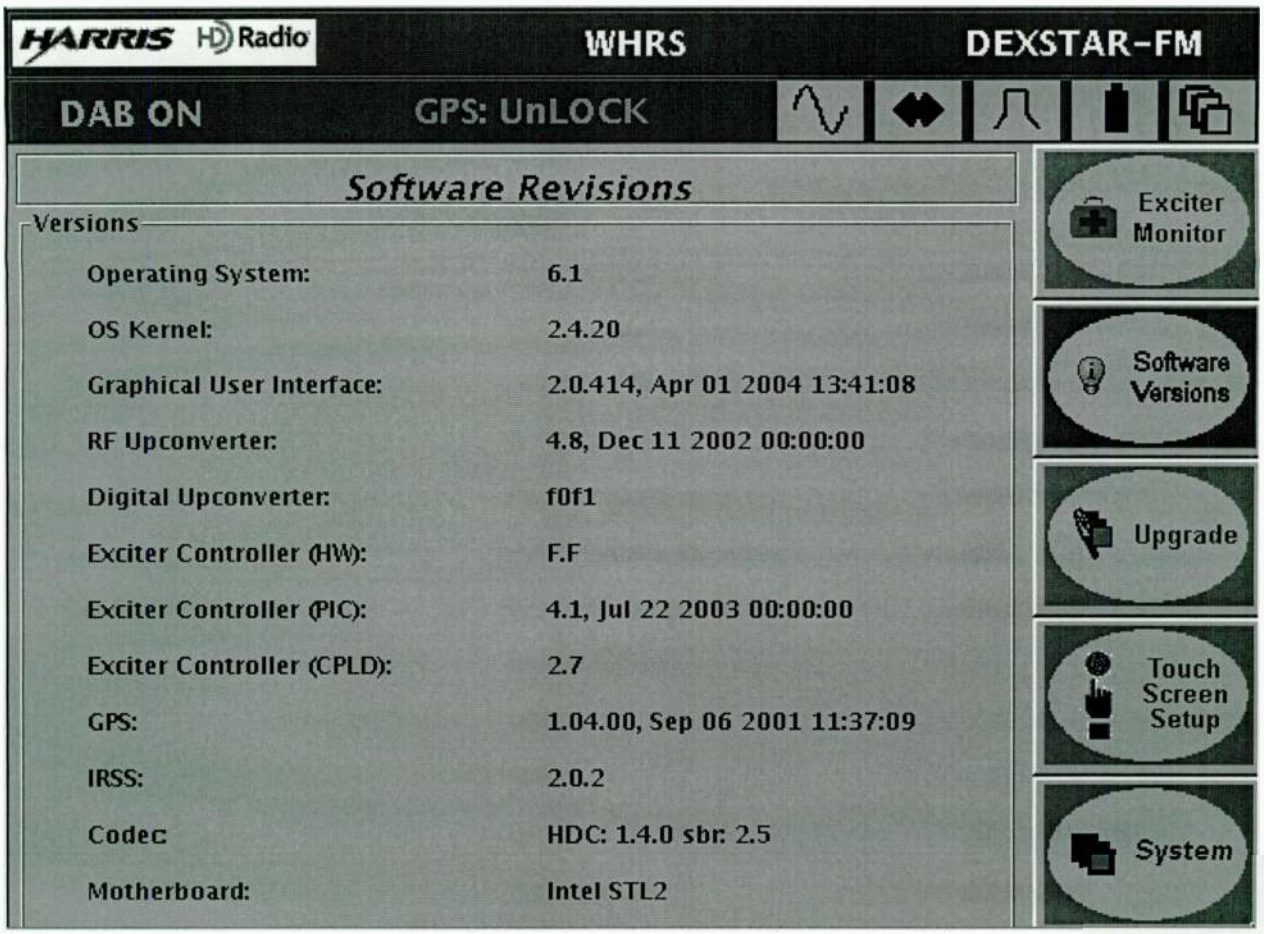


Figure 3-24 Software revision

3.8.5.7.1 Upgrade

When upgrading the software to a newer version, use this screen. There are two pull down menus which show the source and destination of the files you will be loading. The flash disk device must be a USB 1.1 compatible device and will connect to the rear panel USB port.

IRSS Upgrade can be done from a CD or from a file via the InterNet using file transfer protocol (.ftp). Save configuration will save the selected files from the above pull-down

menus (left to the right, or source to the destination). Restore Configuration moves files from the right to the left of the pull-down menus.

To SAVE or RESTORE will require a warm boot of the Exciter to load the new configuration.

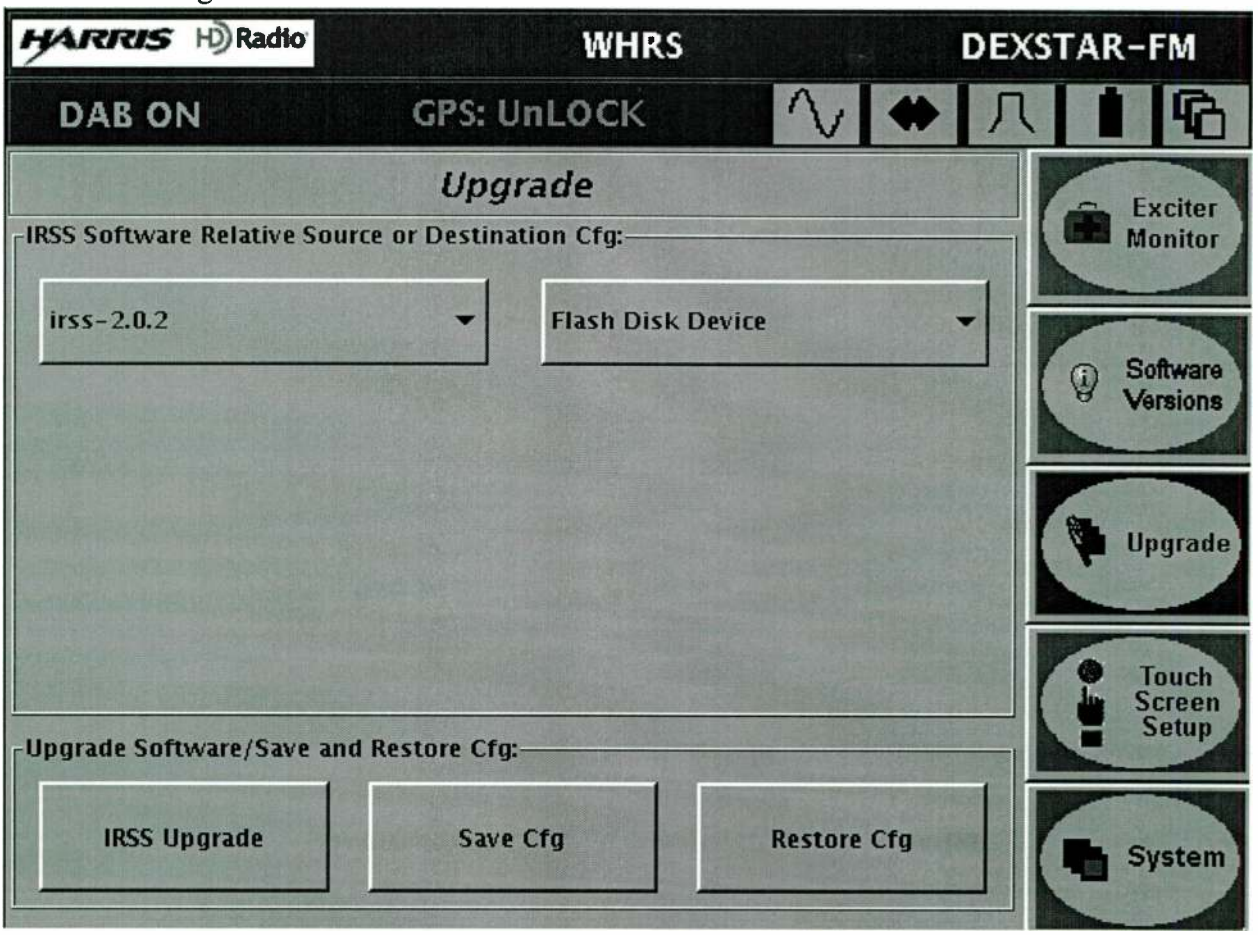


Figure 3-25 Upgrade screen

WARNING: Disconnect primary power prior to servicing.

3.8.5.7.1 Touch Screen Configuration

The pointer is calibrated by touching each target with a stylus or pencil tip. The new coordinates of the area you touched will be displayed as X and Y coordinates. Press SAVE to keep this calibration, this will require the Exciter application to restart.

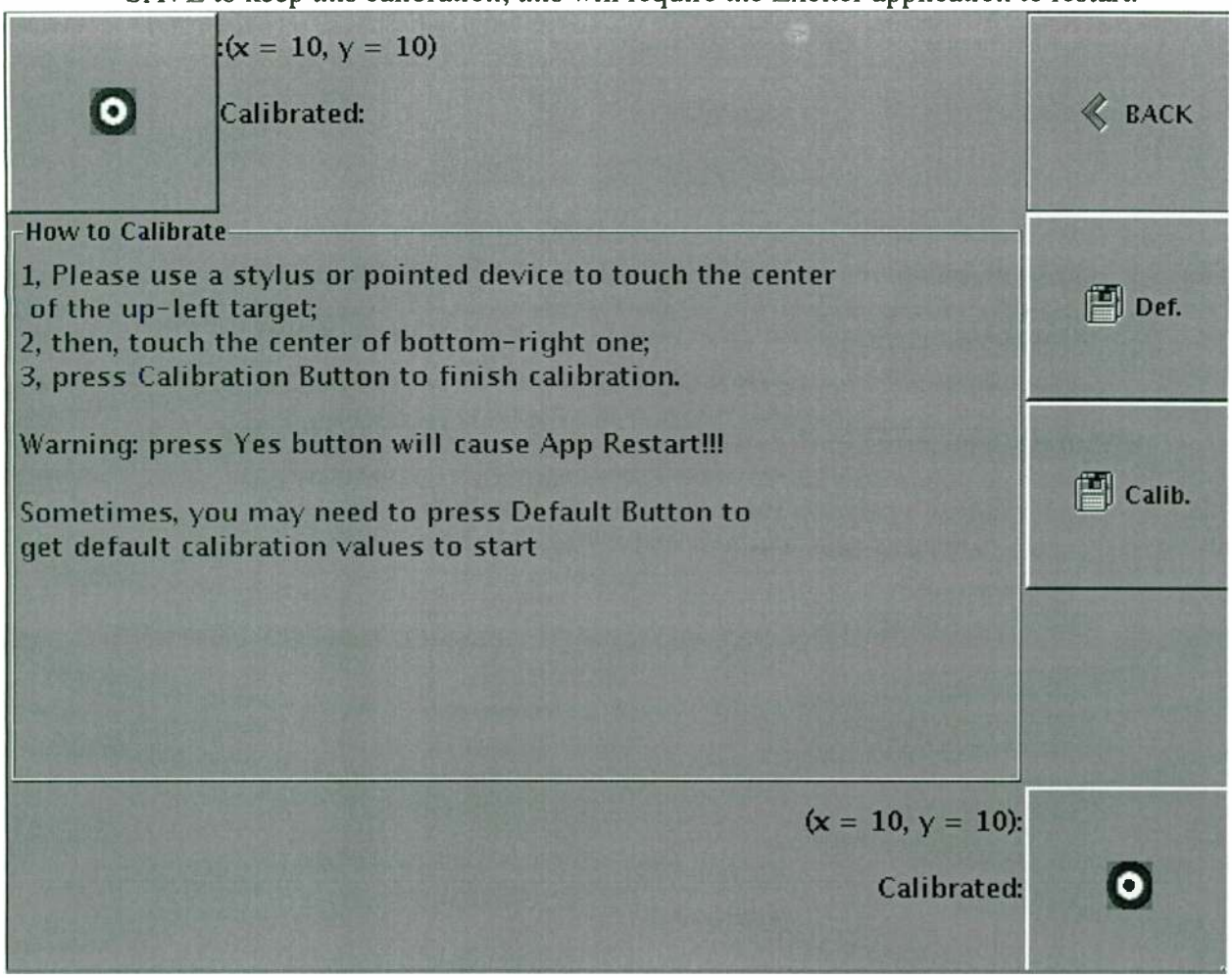


Figure 3-26 Touch Screen Set up screen

WARNING: Disconnect primary power prior to servicing.

Section 4 Theory of Operation

4

4.1 Introduction

The DEXSTAR™ Exciter and ePAL™ switch unit are configurable units used for AM and FM, and single or dual exciters. All subassemblies are used for both AM or FM operation with the exception of the RF Upconverter, which is only used in FM systems. The specific application will determine which jumpers and outputs are utilized.

The Harris IBOC Exciter normally consists of two components; the DEXSTAR™ and the optional Program Audio link ePAL™. In this section, the DEXSTAR™ and the ePAL™ will be discussed individually at the block level.

4.1.1 IBOC Digital modulation techniques

IBOC digital audio broadcasting uses one or more of the following modulation methods on multiple subcarriers along with forward error correction and interleaving. AM and FM uses different numbers of subcarriers and different combinations of modulation schemes.

The IBOC exciters use common digital modulation methods including

a. BPSK- Binary phase shift keying

b. QAM- Quadrature amplitude modulation

c. OFDM- Orthogonal frequency division multiplexing

These digital methods use phase and amplitude variations (or I and Q) to transmit digital data by creating vectors. BPSK and QAM are modulation methods. OFDM

allows multiple carriers, each one can be modulated with the above methods. OFDM allows for many individual carriers in a narrow bandwidth.

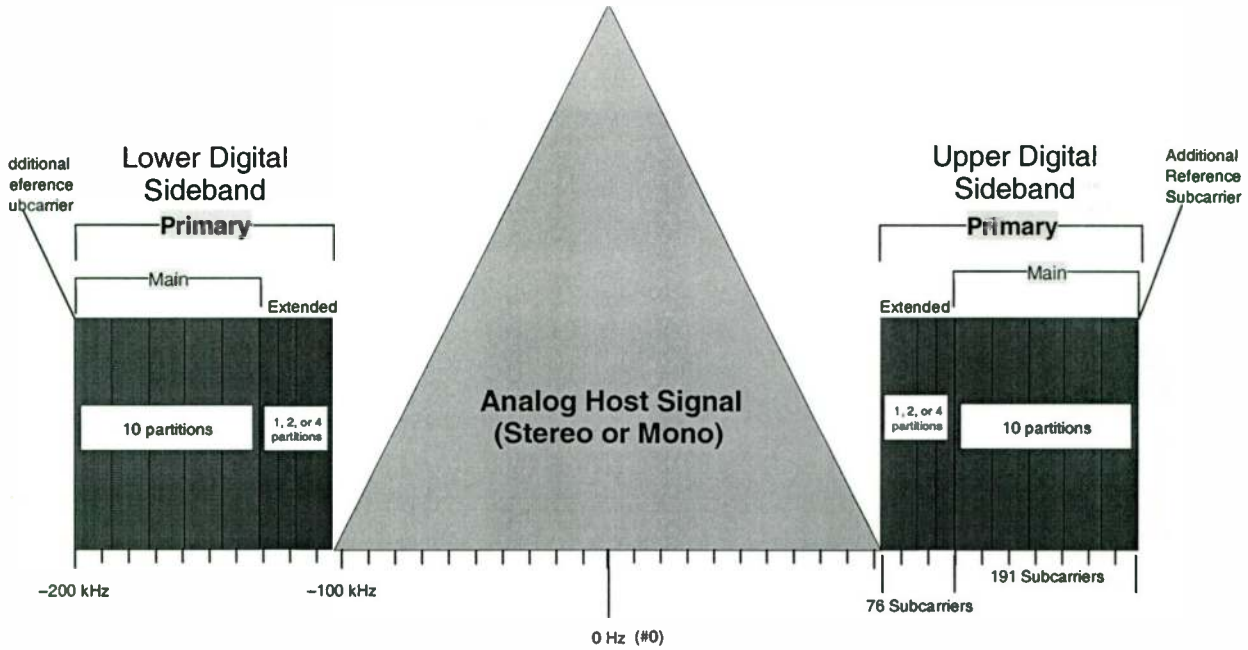


Figure 4-1 FM hybrid waveform.

WARNING: Disconnect primary power prior to servicing.

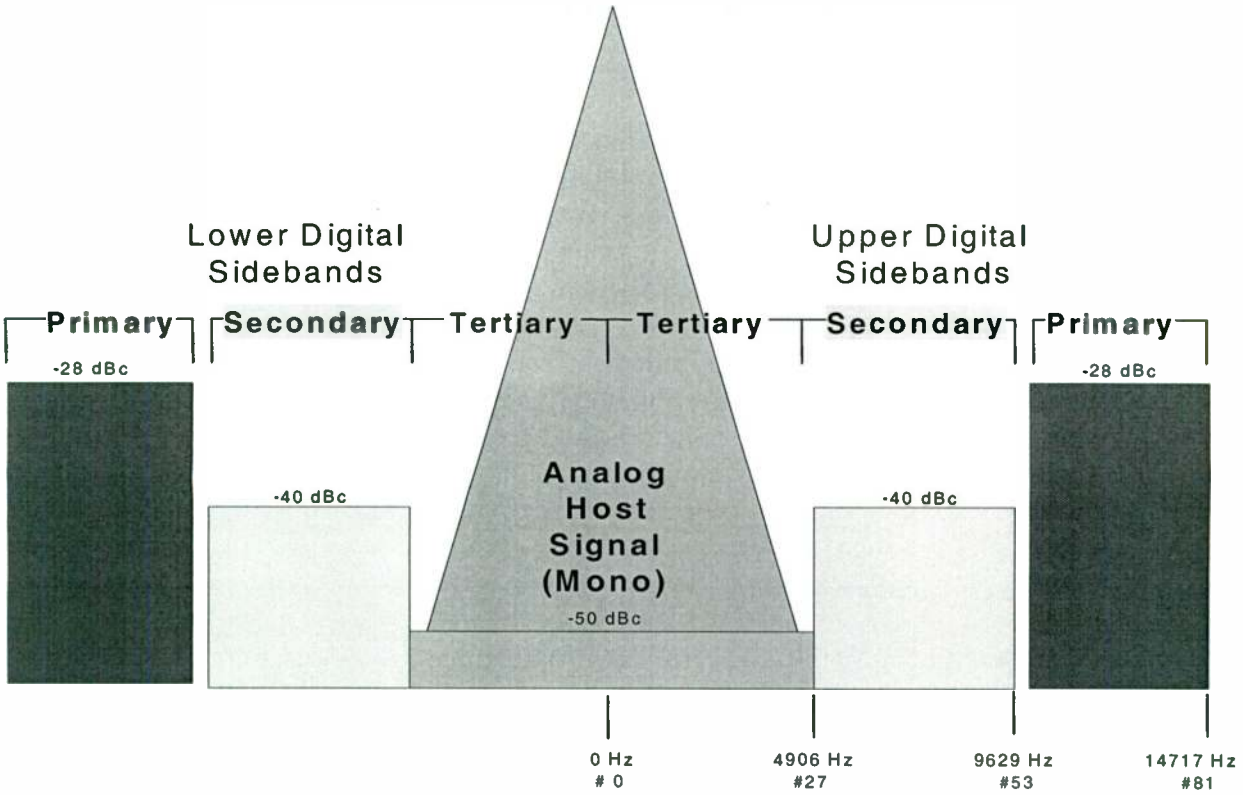


Figure 4-2 AM hybrid waveform.

4.1.2 Diversity

Other techniques used to make the digital data stream more robust include

a. FEC- Forward error correction

b. Interleaving

c. Time and frequency diversity

d. Digital data compression

Forward error correction is used to help correct errors associated with mulitpath. Redundant bits are encoded in the bit stream and substituted for corrupt bits.

Interleaving is another method of error correction where the data is dispersed before it's transmitted (i.e. bit two does not follow bit one, they are mixed up in the stream). The receiver will de-interleave the data stream and put the bits back in the correct order. When an impulse error occurs, consecutive bits are not damaged because they are

dispersed in the stream. Instead, the corruption, after de-interleaving is spread out to an occasional random bit instead of consecutive bits. This dispersed corruption in bits can be corrected by the receiver's forward error correction.

Time and frequency diversity are used to help prevent signal drop out. Time diversity is achieved by adding delay to a back-up signal (the analog signal). The analog back up signal is synchronized with the digital signal so the receiver can replace any corrupt digital data with the unimpaired analog signal. Frequency diversity is the use of OFDM, multiple carrier sidebands.

Digital data compression, in the form of perceptual audio coding is a form of digital source compression to reduce the bit rate. This perceptual audio coding (PAC) is based on pyschoacoustics, the study of hearing and how the ear and brain perceives sound which eliminates unnecessary information the human ear won't hear.

4.1.3 Band width

AM IBOC bandwidth is +/- 15kHz or 30kHz total with audio response up to 15kHz stereo. FM IBOC bandwidth is +/- 200 kHz or 400 kHz total with audio response up to 20kHz stereo.

4.2 Data

The HD Radio system has been designed to support thre broad catagories of data services,

1. Satation Information Services (SIS)
2. Main Program Service - Program Associated Data (MPS - PAD)
3. Advanced Application Services (AAS)

4.2.1 Station Information Services - SIS

The SIS Data consists of the broadcast station information and control information. The Broadcast station information provided by SIS includes the Station ID number, Station Name, Station location and the absolute time.

4.2.1.1 Station ID

The station ID Number is uniquely assigned to each broadcast facility. It consists of;

Table 4-1 Station ID number

Field	Description
Country Code	Binary representation of ITU country code. Refer to ITU Operational Bulletin 763-1.V.2002
Network ID	Unique number assigned by iBiquity Digital Corp. for networking applicaitons.
FCC Facility ID (US only)	Unique facility ID assigned by the FCC.

4.2.1.2 Station Name

The station name has both a short and a long format. Four-character station names may be broadcast with the short format. Only upper case characters are defined and a limited number of special characters. The space character may be used to terminate a three character call sign.

The long format permits the station name to consist of text strings. Each message contains seven characters encoded using the 7-bit Unicode (UTF-7) format. Letters, numbers and most punctuation follow the same character mapping as US-ASCII. Additional characters may be defined through the use of the shift key.

4.2.1.3 Absolute Time

The Absolute L1 Frame number (ALFN) is used to provide the absolute time and position correlated to a GPS to be sent over the air to HD Radio receivers.

4.2.1.4 Station Location

The station location field indicates the absolute three-dimensional location of the feedpoint of the broadcast antenna. Such location information may be used by the receiver for position determination.

4.2.2 Main Program Services/Program Associated Data - MPS-PAD

The Main Program Service allows Program Associated Data (MPS-PAD_) to be transmitted along with the program audio. MPS-PAD is intended to describe or compliment the audio program heard by the radio listener.

This section describes the basic uses of MPS-PAD.

4.2.2.1 Basic MPS-PAD Content

MPS-PAD consists of a general set of categories that describe the various programming content, such as song title, talk show, advertisement or announcement. For example, the title field can be used to describe the name of a song, topic of a talk show, advertisement or announcement.

The MPS-fields include

- Title
- Artist
- Album
- Genre
- Comment
- Commercial
- Reference Identifiers

4.2.2.2 Broadcast MPS-PAD Processing

MPS-PAD can originate from a studio automation system or any other computing resource where the program audio originates. Regardless of the source, the processing and interface to facilitate broadcastof MPS-PAD is consistent. MPS-PAD providers input the desired content (like artist, title, etc.) and transfer the resulting message to the service interface for the ancillary bit stream MPS-PAD.

While designed to support music metadata, ID3 can deliver meaningful information for a variety of programming.

Table 4-2 IDS information

ID3 Field	For Music	For Talk	For Announcements
Title	Song Title	Topic	Title
Artist	Atrists	Host	Author/Sponsor
Album	Album Name	Show Name	Sponsor Name
Genre	Jazz, Rock, etc.	Speech	Speech
Comment	Contact Info.	Call-in #	Info.
Commercial	Product Sale Info.	Product Sale Info.	Product Sale Info.

Some key considerations for MPS-PAD are;

- Program audio and associated data must be transmitted synchronously, so receivers can acquire correlated audio and data at the same time.
- MPS-PAD messages are continuously transmitted with the most recent message transmitted repeatedly.
- MPS-PAD messages connot exceed 1024 bytres, (8 bits to a byte).

4.2.2.3 Format of MPS-PAD Messages

MPS-PAD is formatted using a subset of the standard called ID3v2. Historically, ID3 has been used to allow text information, like artist, title and genre information to co-exist within MPEG-3 (MP3) audio files. The HD Radio main Program Service uses ID3 to deliver program associated data along with real-time broadcast audio.

MPS implements a specific subset of the ID3v2 parameters. The ID3v2 general structure;

- The complete ID3 message is called an ID3 tag.
- ID3 tags contain one or more content types referred to as frames. Frames contain individual pieces of information (song artist, title, etc.). Each frame has a four-character identifier. For example, the comercial frame is identified as COMR.
- Within frames, sub-elements called fields can exist. Fields further categorize the information within a frame. For example, the commercial frame has a field to specify sale price.

- MPS-PAD utilizes only the identified subset of the defined ID3v2 standard. Broadcasters providing MPS-PAD must, at a minimum, transmit the Title and Artist information. For a detailed description of ID3v2 message encoding used for MPS-PAD, visit www.id3.org.

4.2.2.4 Advanced Application Services (AAS)

This section provides an overview of AAS. Requirements and implementation procedures for AAS are in Development.

With the digital capabilities of the HD Radio system, the broadcaster will have the opportunity to deliver additional, new digital information services.

These advanced data services collectively are described as Advanced Application Services and include such services as;

- Delivery of Supplemental Audio Services
- Time-shifting audio programming
- Traffic information updates
- Multimedia presentation of stocks, news, weather and entertainment programming
- Mobile commerce (e.g. with integrated cell phones)
- Targeted advertising (e.g. incentives to purchase the new CD)
- Reading services for the visually impaired

The HD Radio system has been designed to support AAS through the use of common, open interfaces and data protocols. Third party service provides will be provided a "Services API" that will enable them to connect to a broadcast facility and seamlessly deliver their services data via an HD Radio broadcast. Much of that content will be formatted using HD BML, HD Radio Broadcast Mulitmedia Integration, a common protocol based on the widely accepted SMIL (Synchronized Mulitmedia Integration Language). Next generation HD Radio receivers will be deployed with applications capable of rendering this emerging set of Advanced Application Services. For more information regarding AAS, the Service API and HD BML, please visit http:// www.ibiquity.com/technology/data.htm.

4.3 Block Diagram Descriptions

4.3.1 ePAL™

The ePAL™ is configurable to work with up to 2 DEXSTAR™ and 2 Digit CD Exciters (for example). These Exciters will be bank-switched by the transmitter, meaning that DEXSTAR™ A and Digit A or DEXSTAR™ B and Digit B will be driving the transmitter. Switching of the sync signals to the rate converter normally occurs automatically. It also synchronizes the audio feeds, distributes the audio and has a rate converter which synchronizes the AES audio to a 44.1kHz clock based off the global positioning service (GPS) clock.The ePAL™ contains audio bypass switches and an AES rate converter.

In the ePAL™, the Main board provides the primary interface between the ePAL™ audio input/output, the ePAL™ front panel, rate converter and the outside world. To the ePAL™, the outside world is the DEXSTAR Exciter A and DEXSTAR Exciter B, the Exciter switcher and the transmitter. The complex programmable logic device (CPLD) on the Main board performs two functions; logic decisions and acts as a buffer. It receives and sends signals from the front panel, the Audio I/O and the outside world and makes decisions based on the data it received.

On the ePAL™ Main board is a rate converter which receives the studio feed (32kHz to 96kHz sample rate), a 44.1 kHz GPS synthesizer pulse and sends the AES3 audio product to the Audio I/O board. The Audio I/O board provides the primary interface between the ePAL™ and the outside world.

4.3.2 DEXSTAR™ Exciter

The Exciter contains these major sub assemblies; an Exciter controller and VGA display, Digital Upconverter, an RF upconverter, Audio and RF I/O, CD ROM, hard drive, Audio cards and GPS receiver.

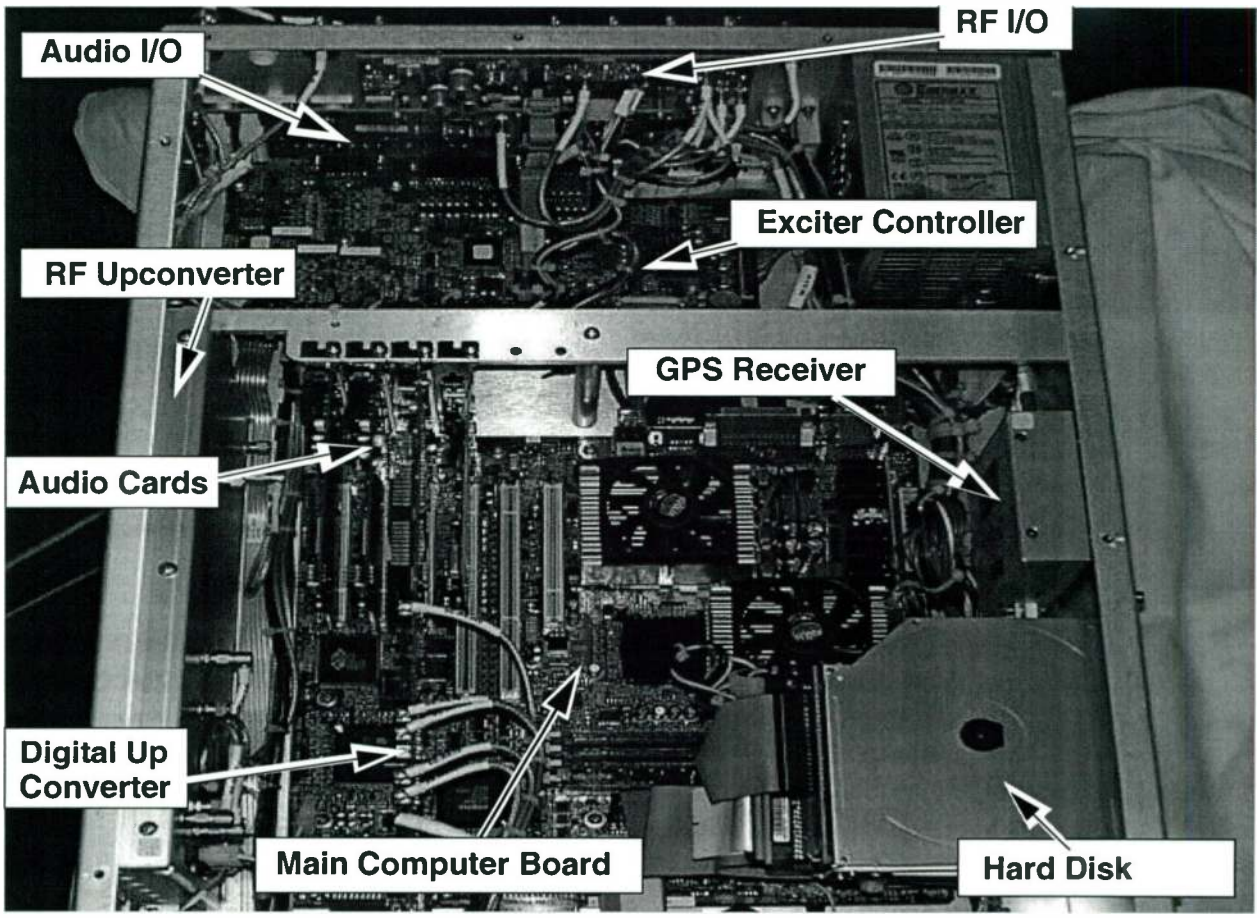


Figure 4-3 Exciter component layout

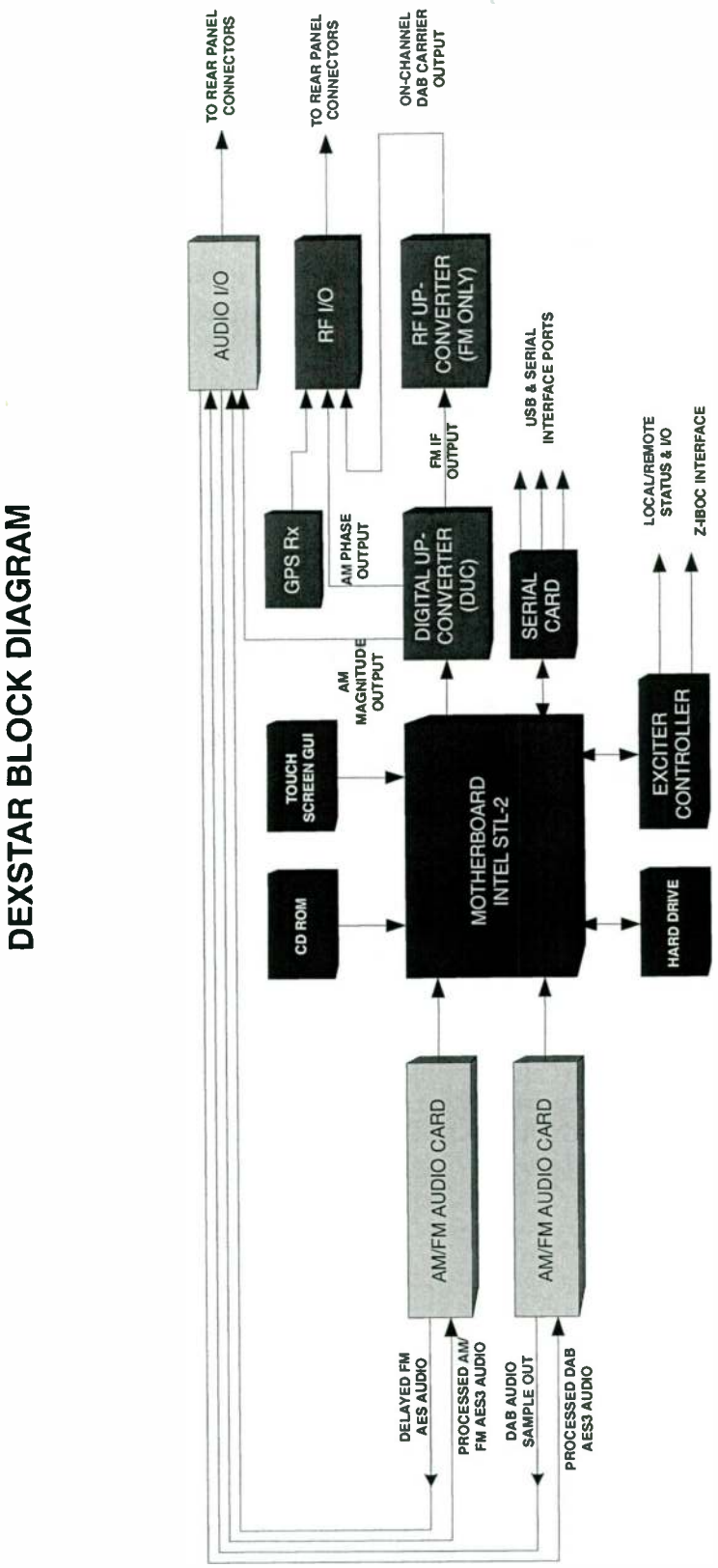


Figure 4-4 Exciter Block Diagram

WARNING: Disconnect primary power prior to servicing.

4.3.2.1 Audio Cards

There are two Audio Cards in the Exciter and they interface with the PCI bus on the Motherboard. The AES audio for these cards are brought out to the rear panel of the Exciter XLR connectors via the Audio I/O board.

One Audio Card receives processed AES DAB audio and the other receives processed AM or FM AES audio. These cards are syncornized to the 44.1kHz clock from the Digital Up-Converter board.

The DAB audio goes through the DAB AES card, then to the Motehrboard for processing and modulation. The FM AES goes through the AES card, then delay circuits before going out the rear panel for modulation by the FM exciter. For AM systems, the AES audio goes to this same card as FM, is delayed, and goes out the rear panel as the AM Magnitude signal.

4.3.2.2 Digital Upconverter

The Digital Upconverter takes the encoded audio base band data (complex I and Q data) and baseband magnitude data from the Modulator. The I and Q is converted to magnitude and phase components for AM use.

The phase component is upconverted to the AM carrier frequency. The on-channel signal is filtered and sent to the RF I/O for buffering and amplification before going out the rear panel of the Exciter. It is used as an external RF input to the AM transmitter. The magnitude signal goes through the Audio I/O for use as the AM transmitter analog audio input.

For FM the complex I and Q data is modulated and upconverted to the IF frequency of 10.7Mhz, filtered and sent to the RF Upconverter to be converted to the FM carrier frequency.

4.3.2.3 RF Up-Converter

The RF Up-Converter board is only used for FM IBOC systems. The primary purpose of the RF Up-Converter is to take a digital IBOC Intermediate Frequency (IF) at 10.7 MHz and up convert that to the correct FM carrier frequency. The board utilizes two Phase Lock Loop (PLL) circuits and a micro chip microcontroller to communicate over RS232 up to the system. Voltages and faults are communicated to the system and channel information is communicated to it from the system.

4.3.2.3.1 Block flow description

The 10.7MHz IF signal from the Digital Upconverter (DUC) enters the RF Upconverter and is low-pass filtered to suppress any high frequency components that may be present. This filtered signal is split and has two paths.

The first output from the splitter is low-pass filtered to provide 30dB attenuation to the LO frequency and only 0.5dB at the IF frequency. This is to prevent the LO signal from giving erroneous IF present indications because the LO signal is much stronger than the IF in the event of loss of IF. This low-pass filter prevents false IF present indications. Ports are for monitoring purposes and amplified through a wide-bandwidth op-amp and sent to a diode detector. The resultant signal, IF_DET, is multiplexed on to the ADC line to be read by the micro controller.

The second output from the splitter is the main signal path. This main signal is applied to a mixer where the sum and difference signals are taken at the RF port. A 70Mhz bandpass filter passes the desired 70Mhz IF signal to a mixer with a variable local oscillator of 158-178 Mhz to produce the on-channel FM RF of 88-108 Mhz. This RF is buffered and filtered and attenuated by a PIN diode which is controlled by the APC circuitry to maintain a constant RF output from the upconverter. Low-pass then high-pass filters follow to removed any residual mixing products.

4.3.2.4 RF I/O

The RF I/O assembly is used to interface the RF signals to the rear panel BNC connectors. The AM Phase output on this board is adjustable from 3 to 10V peak. A sample of the AM Phase signal goes to the Exciter Controller for frequency verification. If the AM carrier frequency deviates more than +/-7% from the selected value, the Exciter Controller will mute the RF I/O phase output to prevent damage to the transmitter due to incorrect frequency.

The RF I/O takes the 10MHz clock and the 1PPS signal from the GPS receiver and distributes then where needed in the Exciter. The 10 MHz clock from the GPS becomes the reference lock for the rest of the system. This clock pulse is buffered and fed to the RF Up-converter, Digital up-converter and rear panel. The 1PPS signal goes through clock driver, one output goes to the Digital Up-converter so the OFDM waveform and the digital framing are in sync. Another output goes to the Exciter Controller for long time duration delays and to the rear panel.

The AM carrier enters the RF I/O from the Digital Upconverter the goes through a high speed power driver. The carrier detector circuit goes to the Main Controller where it is monitored for duty cycle and frequency. If the carrier is out of tolerance, the Exciter

controller will disable the high speed driver. The AM carrier level is detected on the RF I/O board and sends a DC voltage to the controller.

4.3.2.5 Exciter Controller

The Exciter Controller communicates with the transmitter Master Controller to receive signals and send status back over dedicated lines. It monitors the status on the processor, supply voltage levels, RF levels to the RF Upconverter, fault monitoring for alarms and LED indication.

The CPLD on the Exciter controller implements custom logic functions like routing the digital inputs and outputs for the micro controller, logic required for system functionality and AM digital carrier verification/protection.

The AM digital carrier frequency tolerance is +/-5%. If the frequency is outside this range, the CPLD will disable the AM carrier output from the digital upconverter. The AM duty cycle tolerance is between 60/40 and 40/60 (or centered around a 50/50 duty cycle square wave). If the duty cycle is outside of this range, again the CPLD will disable the AM carrier output from the digital upconverter. The CPLD will enable the output at any time the frequency or duty cycle has returned to within tolerance.

Section 5 Maintenance and Alignments

5

5.1 Introduction

Normally if the operating system fails to function as intended, simply restarting the system, as with a personal computer, often times fixes the problem by reloading the programs. ALWAYS shut down operating system before removing primary power.

5.1.1 Exciter Software Upgrades

GUI updates are factory authorized improvements to the Exciter functions.

5.1.1.1 Maintenance Release software upgrade.

NOTE:
READ THESE INSTRUCTIONS ALL THE WAY THROUGH FIRST BEFORE ATTEMPTING TO PERFORM THE UPGRADE.

Future Harris Dexstar software maintenance release will be applied over the current Maintenance release currently on your Exciter.This can be verified by going to the System / System Services / Software version screen. The irss version will be written here as X.X.X whereas you will need to use the current numeric version in the specific file names.

NOTE:
Write down the current versions of software now located on the screen following this path; System / System Services / Software versions.

You will need the software upgrade in the form of a CD ROM and a simple set of instructions on how to implement it properly. The procedure is mostly automated with the exception of saving the station configuration data. This can be done in one of two ways: The preferred method is to purchase a relatively inexpensive 16 Megabyte or

larger USB flashdisk. The other method is to write down all the station specific information on the provided sheets at the end of this chapter and obtain the "key" from Harris field service by email (fieldservice@harris.com) or by faxing your serial number, station call letters and the serial ID number found on the System page of the GUI (see the attached form). It is recommended that everyone records their station specific information on the provided form before beginning the upgrade process as a backup in case the automated process fails for some reason.

NOTE:
AM users check the values for Mag/Phase delay by switching from day to night and then back to day to verify the correct value is displayed.

To back up your data using the USB flashdisk device you will need a PS/2 compatible keyboard (one with the small connector). Connect the keyboard to the keyboard connector J8 on the back of the Exciter (this can be done while the GUI is running). While holding the "ctrl" and "alt" keys down, press "F2" (<ctrl><alt><F2>) this will bring up a login prompt. (The alternate method is to put the ePAL into manual mode and then into bypass mode taking the Dexstar off the air. Then selecting shutdown on the system menu, when prompted enter the letter "c" and <cr> (carriage return) to go to the console). Type the following when prompted:

login: **cust<cr>**

Password: **password<cr>**

The Exciter should respond with the prompt; *[cust@<Exciter name> cust]$*

where <Exciter name> is the Dexstar's device name.

At the prompt type the following commands:

[cust@<exciter name>cust]$ cp - vf /usr/local/bin/save2fldd/usr/dab/irss-X.X.X/ bin/tx<cr>

Recall that your irss-X.X.X version is located on the software version screen that you recorded earlier. The Exciter should respond with the following:

/usr/local/bin/save2fldd -> /usr/dab/irss-X.X.X/bin/tx/save2fldd

[cust@<exciter name> cust]$exit

The screen should now return to the Dexstar GUI. Now connect the USB flashdisk device to the rear of the Dexstar Exciter on one of the USB ports. If you have not done so yet, place the ePAL in the Manual mode and then in Bypass mode (this takes the

Dexstar off the air). Go to the GUI System / System setup / Station System Setup page and press the "Save Cfg" button.

NOTE:
The Dexstar Exciter will need to reboot after this process is complete).

Press "yes" to continue this process.

If you elect not to use the USB Flash device, record all the station specific information on the sheets before continuing.

Put the Dexstar upgrade CD into the CD-ROM drive on the right side of the Dexstar Exciter. If the do this before the Exciter reboots and the warning message comes up then continue with the upgrade, otherwise go to Home / System page and press "System Restart." The CD-ROM will automatically start and come to a prompt. Press ENTER <CR> to start the installation of the Operating System and install all the IRSS software in one process that takes about 10 minutes.

When the software is loaded, the Dexstar Exciter will eject the CD and will reboot. At the opening screen the Dexstar Exciter will warn the user that you have a bad key. Press "yes" to continue. To restore the Station specific data from the USB flashdisk, go to the "System / System Services / Upgrade" page with the left drop down box showing irss-X.X.X version desired and the right drop down showing the Flash Disc Device press the Restore Cfg button. The GUI will prompt you that you are going to restore the configuration which requires the Dexstar to reboot when finished, press "YES" to continue. Connect the USB flashdisk device to the rear of the Dexstar Exciter on one of the USB ports and press "OK." The Dexstar Exciter will reboot when this process is finished.If for some reason the process fails, try the "retry" entry.

If you are doing the upgrade without a USB Flash Disk you will need to enter the key into the Exciter on the System page first. Then continue to enter all the other station specific information on the GUI.

When the Dexstar Exciter is back in operational mode put the ePAL in OPERATE mode and in AUTO mode which will put the Dexstar Exciter back on the air and finish the upgrade process.

5.1.1.2 Operating System

The Operating System can be upgraded in the field by inserting a CD into the ROM drive on the side of the Exciter. The upgrade launches itself after the CD is in the drive and the computer is restarted.

Before upgrades, it is recommended that he user specified data be saved to a USB Flash Disk device so it can be restored when the operating system upgrade is complete. Using the System Set-up screen, press save data to the USB Device.

5.1.2 System Setup

The system set up screen is where important operating parameters can be changed. This screen is protected on the top level System screen, by a password; 1234. After this password is keyed in, access to the system setup screen is available.

5.1.3 ePAL™ indications

If you suspect the ePAL™ has not switched to the intended path, verification can be made by observing the internal LED's in the ePAL™. On the ePAL™ Main board, DS3 / Switch A indicates Exciter A is in bypass mode. When OFF the exciter is in operate mode. Likewise, DS4 when ON indicates Exciter B is in bypass mode.

5.1.4 Hardware maintenance

If it is necessary to service the hardware of the Exciter or ePAL™ perform a proper shut down first. Disconnect primary power and disconnect the Exciter form the UPS.

⚠ **WARNING:**
THE EXCITER IS NORMALLY POWERED THROUGH AN UNINTERUPTALBE POWER SUPPLY (UPS). AC POWER WILL STILL BE PRESENT AT THE EXCITER AFTER THE INPUT VOLTAGE HAS BEEN SHUT OFF. ELECTRICAL SHOCK IS POSSIBLE.

5.1.5 Diversity Delay

Audio diversity delay is the alignment of the digital stream to the analog stream so they are aligned in time at the receiver. This will allow a smooth transition at the receiver from analog to digital feeds. The total delay is adjusted on the Audio Setup screen. Two methods of adjusting the amount of delay depending on test equipment available.

Using a reference receiver, set the receiver to "dual" mode where you can hear both analog and the digital feeds at the same time. Set the delay increments to 1 second

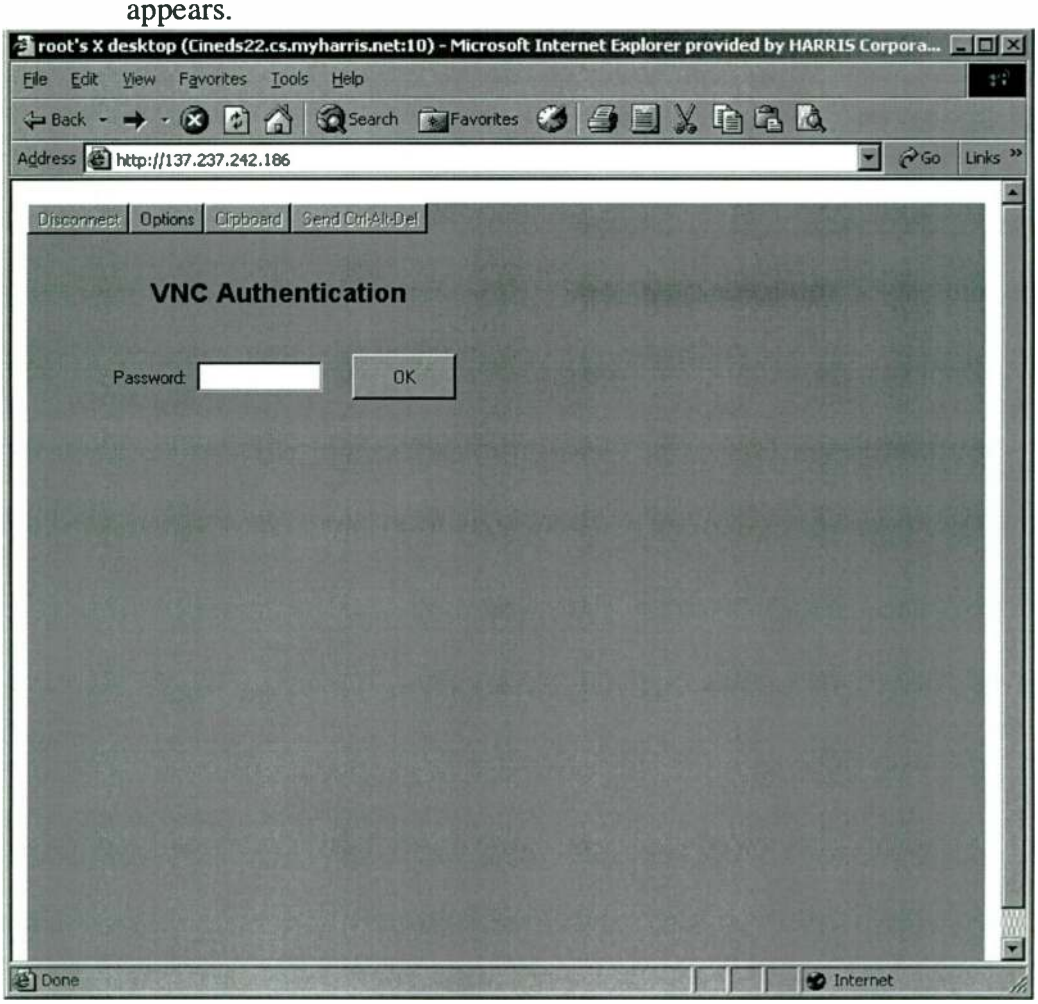
increments and adjust manually raise/lower until the two feeds are as close as possible. Then reduce the increment level to a smaller value and again adjust for closer alignment. Reduce the increment until alignment is audible.

As a preferred method, using a dual trace scope, digital and analog receiver and a tone source like an Audio Precision to align the two samples. Monitor an analog demodulated signal and a digital demodulated signal with each trace of the scope. Send a burst tone from the source, through the transmission system and align the leading edge of the burst using the same increment, raise/lower procedure mentioned earlier.

5.2 Download fault logs

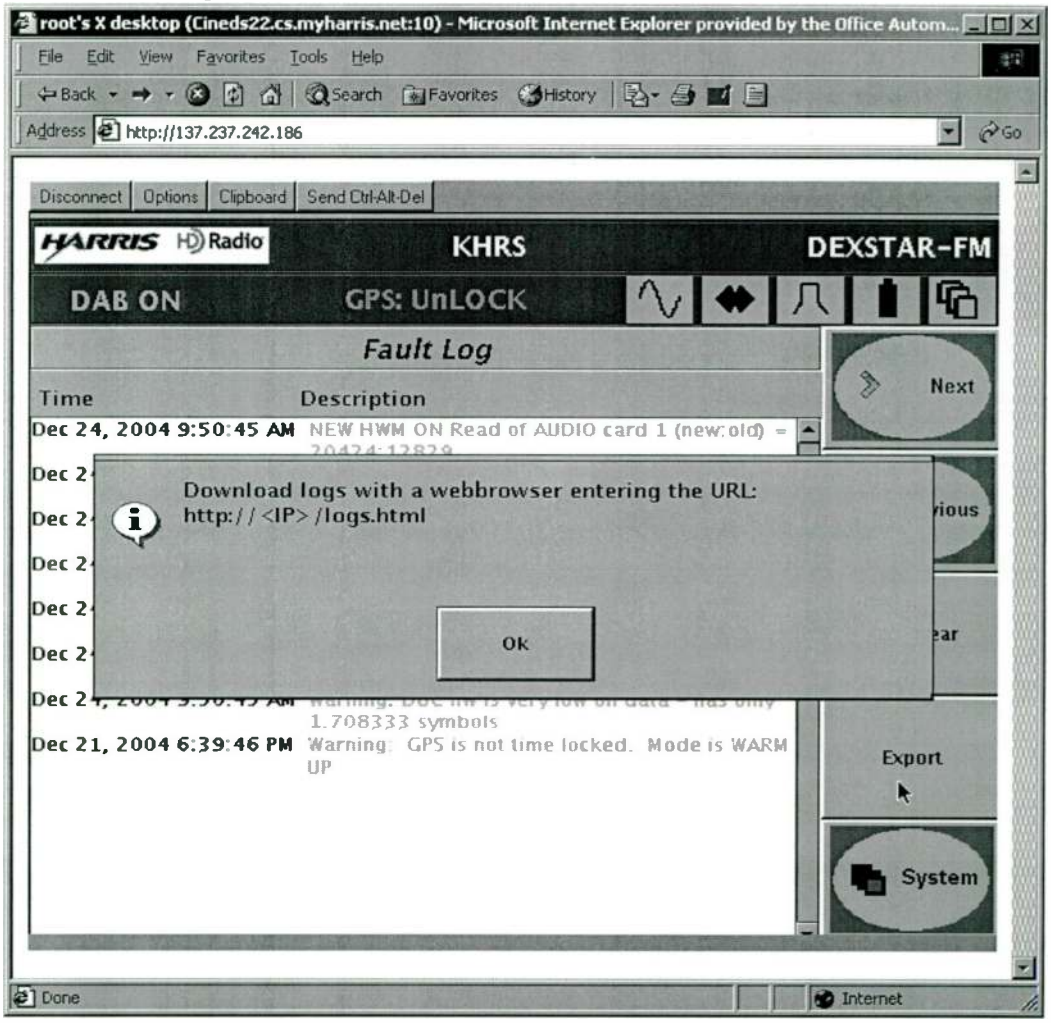
You can download the fault logs to another PC using the DEXSTAR's VNC capability with an InterNet web browser. This procedure describes how to download the fault log files.

1. Start with a remote connection to a DEXSTAR. Refer to section 2 for network configuration. After entering the address, a password window appears.



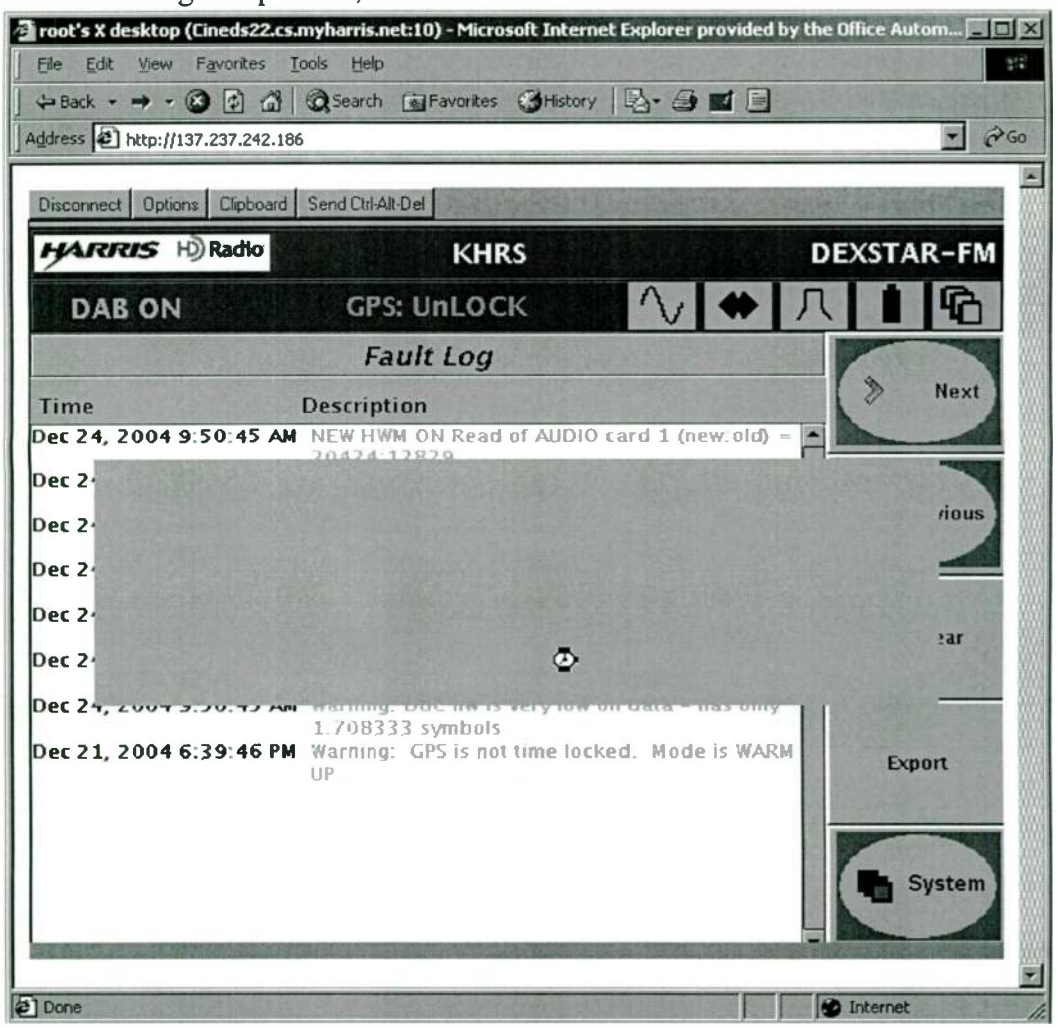
WARNING: Disconnect primary power prior to servicing.

2. Navigate through the System screen to the Fault Log screen and press "Export."



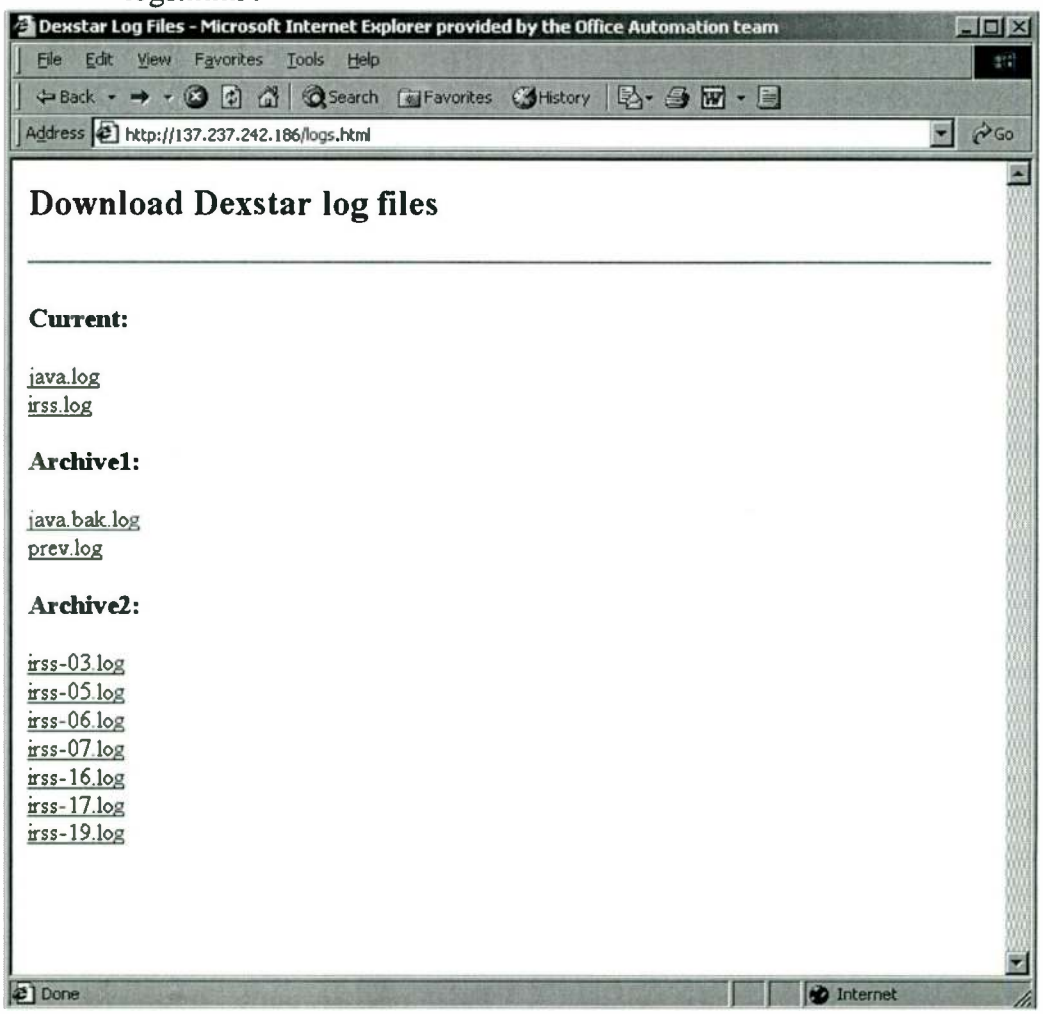
WARNING: Disconnect primary power prior to servicing.

3. Press the "OK" button, the block will appear empty while the files are being compressed, this could take several minutes.



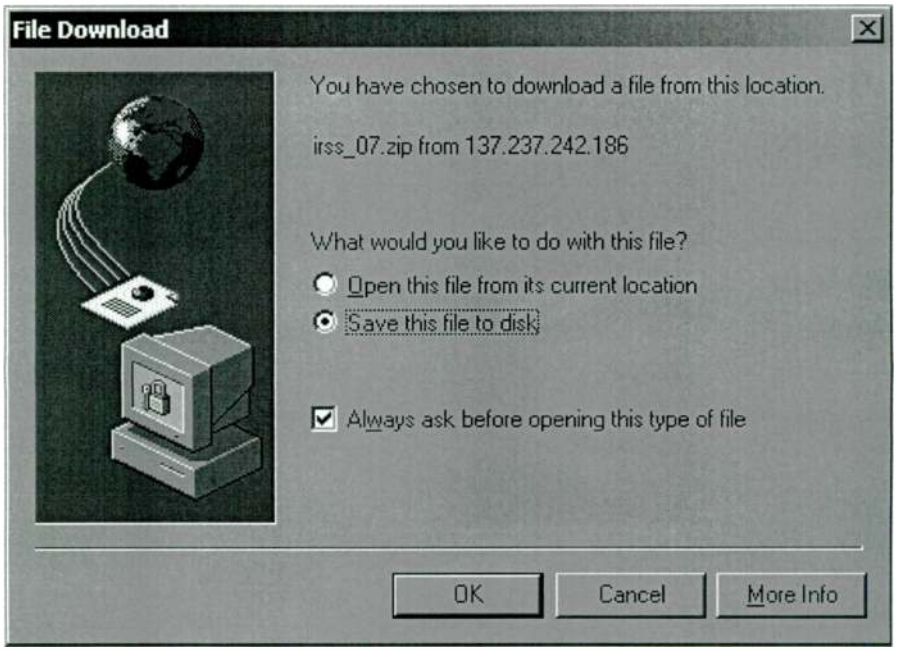
WARNING: Disconnect primary power prior to servicing.

4. Navigate the web browser to where the logs are by appending the end of the DEXSTAR URL in the address box with " /logs.html " So for this example with this DEXSTAR the logs would be at http://137.237.242.186/logs.html .

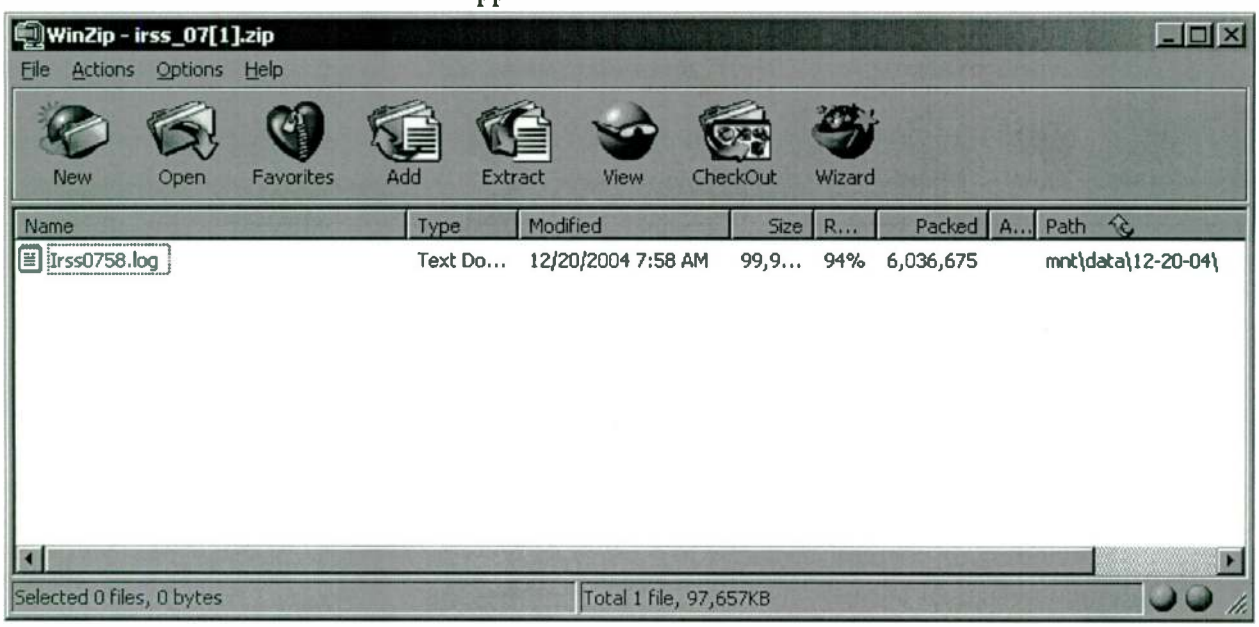


WARNING: Disconnect primary power prior to servicing.

5. Select which log file you wish to download to your PC by clicking on it. The archive name depicts the hour of the save made by DEXSTAR. The complete time and day of the log can be found by opening the file you downloaded.



6. Save the file to disk. Then press "OK." After the file has transferred a zip window will appear.



7. Double click on the file to unzip it. Note that if Notepad lauches, the text will run-on with out formatting or carriage returns. To overcome that select a different text program, or simply copy and paste it into another program.

User Specific information that should be save before upgrading

Note: Default values are shown underlined

Serial Number (Left rear of Unit) _____

System

- Serial ID _____._____._____._____
- Key (available from Harris field service)

_____

Audio

- Audio Diversity Delay setting _____ Seconds
- Delay Increment _____ Seconds
- Rate _____

System Setup

- I/Q Scale Factor _____
- Bit Error Rate Mode OFF ON

FM Setup

- PAR Control On Off
- Interleaver Long Short

AM Setup

- Magnitude / Phase Delay

• 11	Value	Increment
• 2 Day	_____	_____
• 3 Night	_____	_____
• 4 Custom1	_____	_____
• 5 Custom2	_____	_____
• 6 Custom3	_____	_____
• 1 Custom4	_____	_____
• 2 Custom5	_____	_____
• 3 Custom6	_____	_____

- Analog Gain _____
- Magnitude Channel DC offset _____ Volts
- Phase Quantization Scale Factor _____
- Lower Primary Sideband power level _____ dB
- Upper Primary Sideband power level _____ dB
- Enhanced Carrier power level Normal High
- Analog audio Bandwidth 5 kHz 8 kHz Bypass
- Sideband indicator Lower Upper

WARNING: Disconnect primary power prior to servicing.

Station Setup

- RF Frequency _____ MHz
- Country Code _____
- Network ID _____
- FCC Facility ID _____
- Station Callsign _____
- Append FM Yes No
- Long Station Name _____

GPS Configuration

- Antenna Delay _____ mS
- UTC Time Offset _____ Hours

Network Configutation

- Mode of Operation off Network DHCP Static IP
- Device Name _____
- Domain Name _____
- IP Address _____._____._____._____
- Net Mask _____._____._____._____
- Default Gateway _____._____._____._____
- DHCP Server _____._____._____._____

WARNING: Disconnect primary power prior to servicing.

WARNING: Disconnect primary power prior to servicing.

Section 6 Diagnostics

6

6.1 Introduction

6.1.1 Loss of communications

Communications loss can be categorized an internal or external. Internal is considered a loss of communications between two subassemblies with in a box. External communications is a signal that is to be applied to the box, typically through a back panel connection.

6.1.1.1 Internal communications loss

When there is a loss of communications, any information from that particular micro will be reset to "0", an example is if the RF monitor losses communications. There will be a fault showing up on the GUI indicating the loss of communications for that board. This shows up on the control screen with the exception of the PA modules which will show up on the individual PA fault screen.

6.1.2 ePAL LED indications

The front panel LEDs indicate the condition of the unit. They will be illuminated green, red or flashing red. The rate of the flash indicates the condition of the error. They will flash at a 1 Hz rate or at one flash every 2 seconds, in other words they will flash fast or slow. When more than one fault is present, the LED's will flash at the faster of the two rates, as an example when a fault flasher is every 2 seconds and another fault is present with a 1 Hz rate, the 1 Hz will be indicated. When that fault is cleared, the one flash every 2 seconds will then be visible if that fault is still present.

6.1.2.1 AES lock

The AES lock LED is driven by the 44.1kHz rate converter. When AES lock is green, the AES audio is locked to the sync signal and the rate converter has a valid output signal.

If it is red and flashing fast (1 Hz) the rate converter does not have a valid input AES audio signal (at A2J15).

If it is blinking slow (once every 2 seconds) the rate converter is not receiving a valid 44.1 kHz sync pulse from the DEXSTAR Exciter (at A2J7/J8).

6.1.2.2 AES sync

Both Exciter 1 and Exciter 2 have this LED. When green, this indicates the rate converter is locked to that DEXSTAR 44.1 kHz sync pulse. As an example, when two DEXSTAR Exciters are connected, only one of these will be green, this indicates which DEXSTAR is supplying the sync pulse to the rate converter.

When the Exciter AES LED is blinking red, this indicates the signal is going to the rate converter but there are problems associated with the rate conversion. Refer to the "AES Lock" blinking rates above for the cause.

When the Exciter AES LED is solid red, this indicates that sync signal is not going to the rate converter.

6.1.2.3 Auto/Manual

The Auto/Manual LED provides a front panel indication of which unit, the DEXSTAR or ePAL, has control of FM Exciter diversity delay audio bypassing. In the Automatic mode, the LED is green and the DEXSTAR Exciter either automatically or manually controls audio routing.

When in Manual mode the LED is red and selection for operate or bypass is made from the front panel of the ePAL or it's remote control inputs.

Should the DEXSTAR fail it can automatically switch to the bypass mode of operation. Manual audio bypassing from the front panel GUI of the DEXSTAR is also possible, see section three in this manual.

6.1.2.4 Operate/bypass

The ePAL has an LED for both Exciter 1 and Exciter 2. Both indicate the same thing.

Green indicates it is in the Operate mode and the FM Exciter/AM transimtter is receiving a diversity delayed signal through the Dexstar Exciter. A2J19 (output to Digit FM Exciter or to the AM transmitter's analog input) is driven from A2J16 (delayed AES from DEXSTAR). A2J18 output is driven from A2J17 (delayed AES from DEXSTAR #2).

Red indicates the switch is in Bypass mode and no delay is added to the signal (bypassing the Dexstar). A2J19 and A2 J18 are driven from A2J5 non-delayed AES audio.

6.1.2.5 Remote switching operate/bypass

The remote I/O on the ePAL can be used for status and control of the ePAL. If the Dexstar Exciter were to fail to operate and not automatically switch the ePAL to bypass mode, follow these steps to manually switch to bypass operation. The 25 pin D connector on the rear of the ePAL has the control lines needed for this function; pin 11 for remote switch 2 for second Exciter input control, pin 12, remote switch 1 for the primary Exciter, pin 23 for automatic/manual selelction and pin 24 for remote present/ remote enable.

1. Start with all these input lines high, +5v on J9-11, 12 23 and 24.
2. Check the status of switch 1 and two by monitoring pins 7/8 for switch one and 17/18 for switch 2. This will verify if they are in operate or bypass mode already.
3. Check the automatic/manual status by observing pins 20/21.
4. Enable the remote inputs by pulling pin 24 low.
5. Ensure the ePAL is in manual mode by pulling line 23 low only if necessary. If it already is in manual mode DO NOT pull the line low again.

NOTE:
The ePAL will be left in MANUAL mode for the duration of the bypass. When the ePAL is put back in the auto mode, it will give control back to the Dexstar Exciter

6. Operate Switch one (pin 12) or switch two (pin 11) by pulling the desired line low.
7. Lock-out any further remote input changes by returning pin 24 to the high state. Then return all the previously changed lines to the high state, these inputs will be ignored since they occur after the remote disable (pin24) change.

6.1.3 Signal tracing

The Exciter has an internal 1KHz tone generator for signal tracing. The tone is available at the A13J7 connector on the rear and can be jumpered, using an XLR jumper to the AES Audio IN connector J13J10. The AES Audio OUT J13J9 can be jumpered to the DAB AES IN at J13J8 to check both AES circuits.

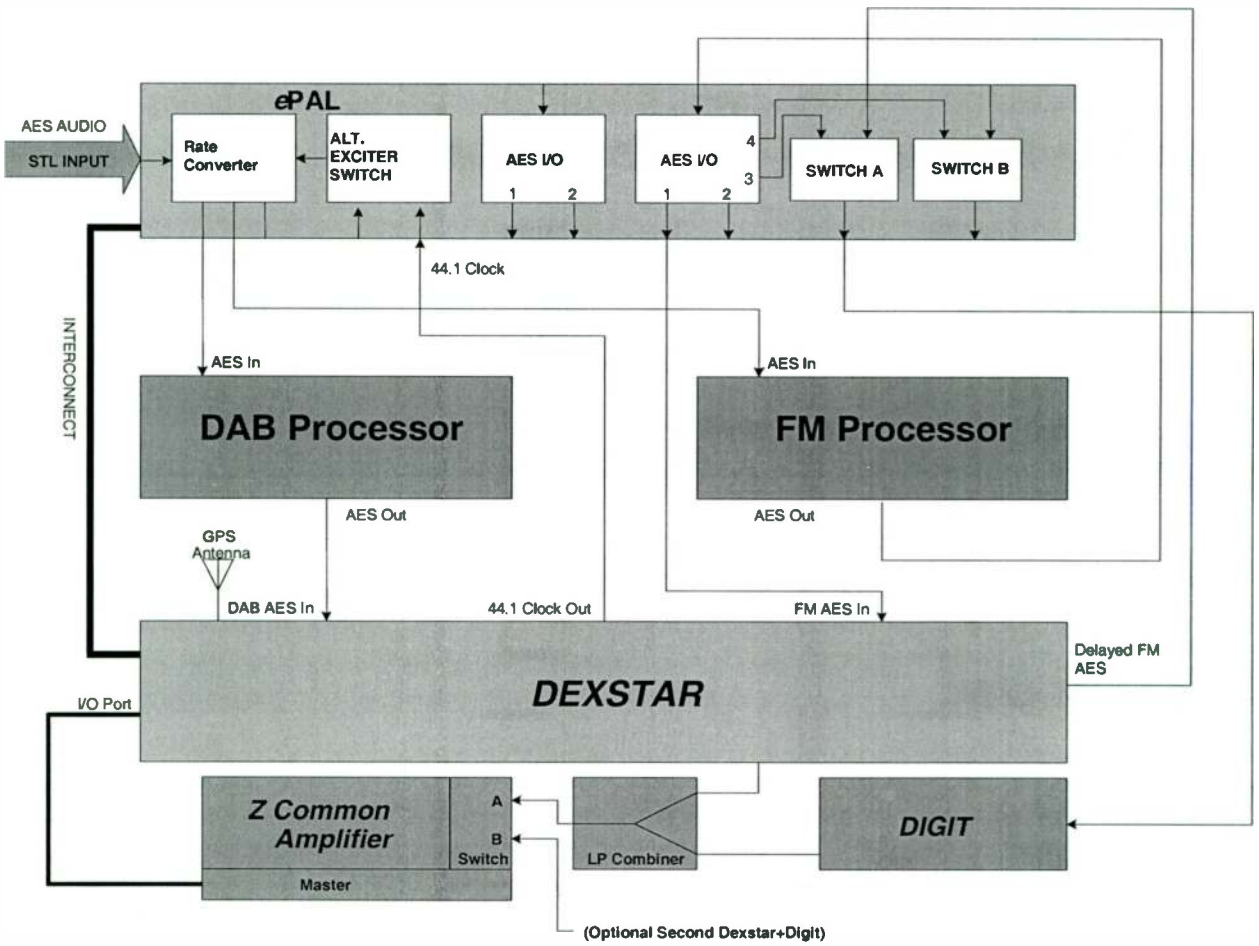


Figure 6-1 Simplified Audio flow, FM Common Amplification

WARNING: Disconnect primary power prior to servicing.

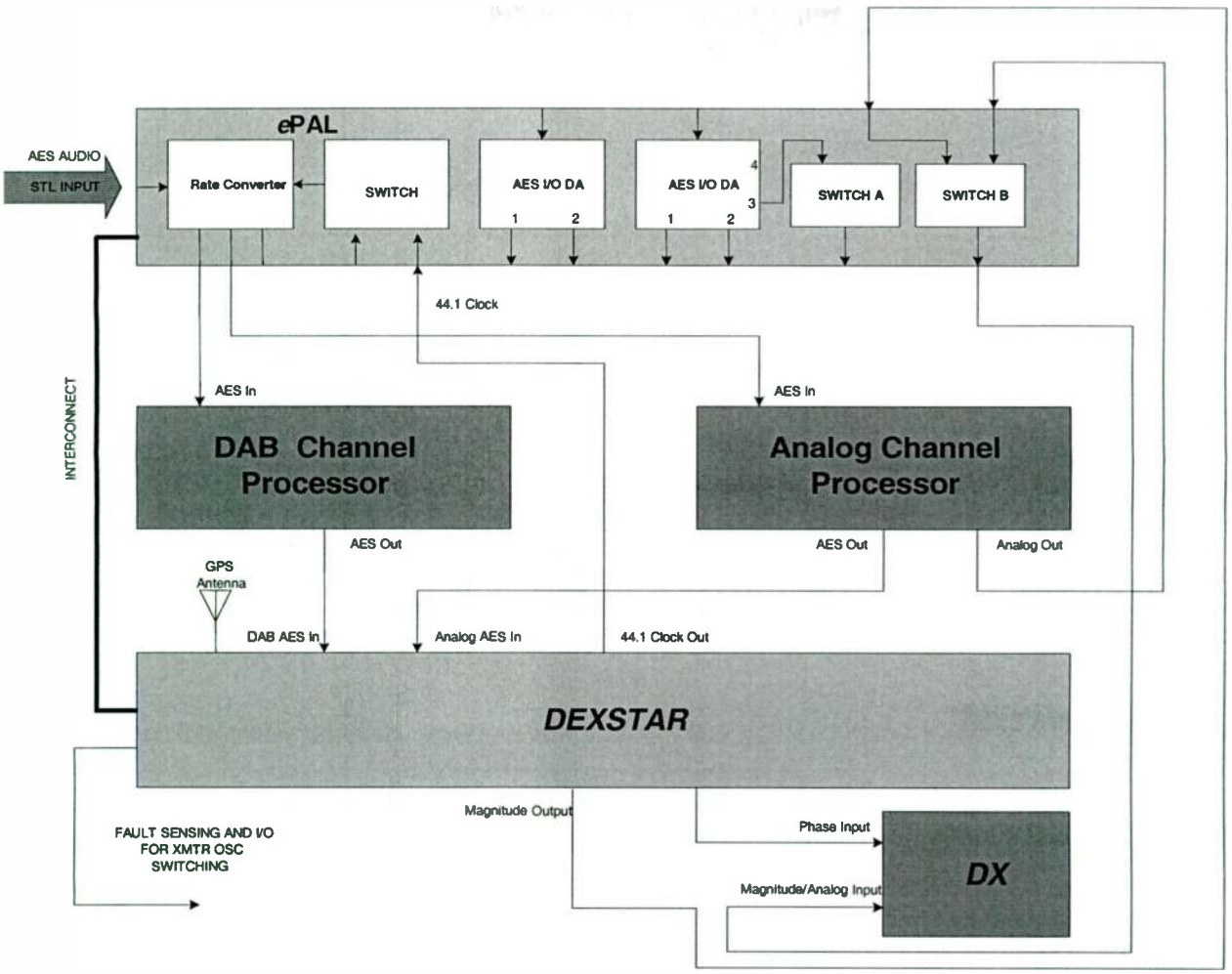


Figure 6-2 Simplified Audio flow, AM.

WARNING: Disconnect primary power prior to servicing.

WARNING: Disconnect primary power prior to servicing.

Section 7
Parts List

7

7.1 Parts List Index

Replaceable Parts List Index

WARNING: Disconnect primary power prior to servicing.

Table 7-1 EXCITER, IBOC994 9821 034

Harris PN	Description	Qty UM	Reference Designators (A)
843 5571 016	FAMILY TREE, EXCITER	0.0 EA	
988 2498 001	DP IBOC EXCITER	1.0 EA	
992 9993 001	EXCITER, BASIC, IBOC	1.0 EA	

Table 7-2 EXCITER, BASIC, IBOC992 9993 001

Harris PN	Description	Qty UM	Reference Designators (A)
302 0780 000	SCREW, PHMS, 6-32 X 3/8	0.0 EA	
358 3556 000	TENSION CARD GUIDE	1.0 EA	#A4
358 3579 000	SLIDES, DRAWER	1.0 PR	
358 3728 000	ACCESSORIES, SLIDE RACK MTG	1.0 EA	
382 1700 000	IC, INTEL P3 CPU, 1GHZ ESD	2.0 EA	A17 A18
408 0338 000	EMI GASKET 0.13 TALL X 0.19	2.0 EA	
448 1183 000	FILTER, FAN	2.0 EA	
646 1712 000	OVERLAY, IBOC EXCITER	1.0 EA	A7
710 0748 000	GPS ANTENNA KIT, INTEGRAL LNA	1.0 EA	#A9
731 1641 005	GPS RECEIVER, W/ OCXO	1.0 EA	A9
746 0264 000	MOTHERBOARD, STL2 ESD	1.0 EA	A1
746 0265 000	SDRAM MODULE, 128MB, PC133 ESD	1.0 EA	A16
746 0266 000	SERIAL CARD, 4-PORT, PCI ESD	1.0 EA	A5
746 0267 000	LCD DISPLAY, 6.4" VGA, COLOR	1.0 EA	A8
746 0268 000	AUDIO CARD, 24-BIT/96KHZ ESD	2.0 EA	A2 A3
746 0270 000	CD-ROM, 24X SPEED	1.0 EA	A14
746 0271 000	HARD DRIVE, 20GB, 7200RPM	1.0 EA	A10
917 2435 050	HANDLE, CTLR/DIGIT	2.0 EA	
917 2573 001	CABLE, EXCITER	1.0 EA	
917 2573 002	MODIFIED POWER SUPPLY	1.0 EA	A15
943 5571 007	CHASSIS, MAIN	1.0 EA	
943 5571 013	BOX, PWB MTG	1.0 EA	#A6
943 5571 014	PANEL, PWB MTG	1.0 EA	#A6
943 5571 015	BAR, PWB MTG	1.0 EA	
943 5571 017	BRACKET, MTG	1.0 EA	#A14
943 5571 020	BAR, SUPPORT	1.0 EA	
943 5571 021	BRKT, CARD GUIDE	1.0 EA	#A4
992 9993 003	EXCITER, KIT, FM	0.0 EA	OPTIONAL
992 9993 004	EXCITER, KIT, DUEL MODE	0.0 EA	OPTIONAL
992 9993 006	PWA, DUC, EXC, IBOC	1.0 EA	A4
992 9993 008	PWA, RF I/O, EXC	1.0 EA	A11
992 9993 009	PWA, AUDIO I/O, EXC, IBOC	1.0 EA	A13
992 9993 020	PWA, EXCITER CONTROLLER	1.0 EA	A12

Table 7-3 EXCITER, KIT, FM992 9993 003

Harris PN	Description	Qty UM	Reference Designators (A)
992 9993 005	PWA, RFU, EXCITER, IBOC	1.0 EA	A6

Table 7-4 PWA, RFU, EXCITER, IBOC992 9993 005

Harris PN	Description	Qty UM	Reference Designators (A)
610 0900 000	HEADER 3 CKT STRAIGHT	1.0 EA	JP1
610 0979 000	HDR 10C 2ROW VERTICAL	1.0 EA	J9
610 0991 000	HDR, STR, 6 PIN, 0.025 SQ	1.0 EA	J20
610 1045 000	HDR, STR, 4 PIN, SQ	1.0 EA	J21
610 1439 000	HDR, 4C 1ROW, VERTICAL, PCB MT	1.0 EA	J22

WARNING: Disconnect primary power prior to servicing.

612 1507 000	CONN SMA FEMALE BULKHEAD	8.0 EA	J1 J2 J3 J4 J5 J6 J7 J8
843 5570 051	SCH, RFU, EXC, IBOC	0.0 EA	
992 9993 018	PWA,RFU,EXCITER,IBOC SMT	1.0 EA	

Table 7-5 EXCITER, KIT, DUAL MODE992 9993 004

Harris PN	Description	Qty UM	Reference Designators (A)
992 9993 005	PWA, RFU, EXCITER, IBOC	1.0 EA	A6

Table 7-6 PWA, DUC, EXC, IBOC992 9993 006

Harris PN	Description	Qty UM	Reference Designators (B)
358 3828 000	BRACKET, COMPUTER I/O SLOT	1.0 EA	H1
610 0746 000	HDR, STR, 20 PIN, SQ	2.0 EA	J20 J26
610 0877 000	HDR, STR, 2 PIN, SQ	6.0 EA	J21 J22 J23 J25 J37 J42
610 0902 000	HDR 10 PIN STRAIGHT	2.0 EA	J13 J15
610 1402 020	HDR, FFC, 20C 2 ROW RT ANG	1.0 EA	J36
610 1446 000	HDR, 10C 2ROW RT ANG	1.0 EA	JP1
612 2208 000	JACK, RJ45 MODULAR, 8C, RT ANG	2.0 EA	J41 J43
620 3200 000	RECP, RT ANGLE, MCX	6.0 EA	J2 J4 J8 J38 J39 J40
843 5570 061	SCH, DUC, EXC, IBOC	0.0 EA	
992 9993 016	*PWA, DUC, EXC, IBOC SMT	1.0 EA	

Table 7-7 PWA, RF I/O, EXC992 9993 008

Harris PN	Description	Qty UM	Reference Designators (C)
055 0100 005	*THERMAL COMPOUND, 8OZ JAR	0.0 EA	U9
300 1485 000	SCR, 4-40 X 5/16	1.0 EA	1/U9
304 0087 000	NUT, HEX 4-40	1.0 EA	1/U9
310 0003 000	WASHER, FLAT NO. 4	1.0 EA	1/U9
312 0045 000	WASHER, SPLIT-LOCK 4	1.0 EA	1/U9
382 1703 000	IC, UC3705 ESD	1.0 EA	U9
550 0921 000	POT 100K OHM 1/2W	1.0 EA	R35
610 0979 000	HDR 10C 2ROW VERTICAL	1.0 EA	J10
610 1439 000	HDR, 4C 1ROW, VERTICAL, PCB MT	1.0 EA	J6
612 2195 000	RECP, BNC, THRU-PANEL, 50 OHM	5.0 EA	J1 J2 J3 J4 J5
620 2883 000	JACK, OSX, STRAIGHT, PCB MT	7.0 EA	J7 J8 J9 J11 J12 J13 J14
843 5570 130	SPEC, RF I/O, EXC	0.0 EA	
843 5570 131	SCH, RF I/O, EXC	0.0 EA	
992 9993 015	*PWA, RF I/O, EXC, SMT	1.0 EA	

Table 7-8 PWA, AUDIO I/O, EXC, IBOC992 9993 009

Harris PN	Description	Qty UM	Reference Designators (B)
610 0979 000	HDR 10C 2ROW VERTICAL	1.0 EA	J4
610 1045 000	HDR, STR, 4 PIN, SQ	1.0 EA	J6
610 1334 000	HDR, 3C 1ROW STRAIGHT	1.0 EA	J5
610 1423 008	HDR, 8C 1ROW VERTICAL	2.0 EA	J1 J2
610 1438 000	PLUG, 3C, STRAIGHT, PCB MT	6.0 EA	J7 J9 J11 J12 J13 J14
612 2185 000	RECP, 3C, STRAIGHT, PCB MT	2.0 EA	J8 J10
620 2883 000	JACK, OSX, STRAIGHT, PCB MT	1.0 EA	J3
843 5570 170	SPEC, AUDIO I/O	0.0 EA	
843 5570 171	SCH, AUDIO I/O	0.0 EA	
843 5570 173	PWB, AUDIO I/O	0.0 EA	
992 9993 014	PWA, AUDIO I/O, EXC, IBOC, SMT	1.0 EA	

WARNING: Disconnect primary power prior to servicing.

Table 7-9 PWA, EXCITER CONTROLLER992 9993 020

Harris PN	Description	Qty UM	Reference Designators (A)
358 1928 000	JUMPER 1/4 LG 1/8H	1.0 EA	JP1
382 1701 000	IC, ILQ621 ESD	3.0 EA	U3 U8 U17
382 1702 000	IC, AD4C111 ESD	4.0 EA	U10 U11 U12 U15
404 0673 000	SOCKET, DIP, 8 PIN (DL)	4.0 EA	XU10 XU11 XU12 XU15
404 0675 000	SOCKET, DIP, 16 PIN (DL)	3.0 EA	XU3 XU8 XU17
560 0121 001	POSISTOR 0.1 AMP 60VDC DISC	1.0 EA	R8
560 0121 016	POSISTOR 1.85 AMP 60VDC DISC	1.0 EA	R160
566 0037 000	CONVERTER, DC/DC 5V .75W ESD	2.0 EA	U6 U20
610 0787 000	HEADER, STRAIGHT 6 POS 1 ROW	1.0 EA	J5
610 0930 000	HDR, 6C 1 ROW RT ANG	1.0 EA	J13
610 0979 000	HDR 10C 2ROW VERTICAL	2.0 EA	J8 J10
610 1045 000	HDR, STR, 4 PIN, SQ	1.0 EA	J14
610 1069 000	HEADER 9 PIN SINGLE ROW	1.0 EA	J6
610 1334 000	HDR, 3C 1ROW STRAIGHT	1.0 EA	J15
610 1367 000	HDR, 16C 1ROW STRAIGHT	1.0 EA	J9
610 1434 002	*PLUG D RT ANG 15C MET SHELL	2.0 EA	J2 J3
610 1439 000	HDR, 4C 1ROW, VERTICAL, PCB MT	1.0 EA	J11
610 1444 000	HDR, 24C 2ROW, RT ANGLE	1.0 EA	J12
612 1499 003	D RECP 25C RT ANG METAL	1.0 EA	J4
612 2198 000	RECP, 4C 1ROW, RT ANG, FLANGE	1.0 EA	J1
620 2883 000	JACK, OSX, STRAIGHT, PCB MT	1.0 EA	J7
843 5570 071	SCH, EXCITER CONTROLLER	0.0 EA	
992 9993 019	*PWA, EXCITER CONTROLLER, SMT	1.0 EA	

WARNING: Disconnect primary power prior to servicing.