FLEXIVA ™
FAX 50W- 3.5kW FM

COMPACT TRANSMITTER SERIES
888-2739-001

Revision AB
Jan. 19 2021

Manual Revision History

888-2739-001

Flexiva FAX 50-3.5 kW Compact Transmitter Series

REV.	DATE	ECN	Pages Affected / Description
Preliminary	Feb 2011		Preliminary - in process
A	28Sep2012	P53517	Updated Sections 4, 5, and 6
E	10Oct2012	P53833	Revised Complete Manual
F	05Mar2013	P54684	Update Title Page, MRH-1 and Section-1
H	05Apr2013	P54840	Replace ECM Date Sheets Pages 1-10 thru 1-17
J	03Jun2013	N/A	Various updates (rev never was released)
K	28Oct2013	P55668	Complete updates for new software added new power calibration procedures.
L	26Feb2014	P56382	Updates for GPS Option, recal when changing modulator/ps inf,added html event/fault log,added data extraction to spreadsheet,A44 software release.
M	21May2014	P56873	Rebranded GatesAir
N	10/22/14	64106	Updated Procedures
P	3/31/15	64453	General Updates
Q	5/13/15	64534	Updated information about timing distribution jumper settings
R	3/11/2016	65233	General Update
S	6/29/2016	65507	General Update
T	1/2/2018	66614	General Updates SDoCs, , 1 PPS clarification
U	8/15/2018	67163	Imported new parts drawings.
V	8/23/2018	67178	Updated ECM for 3.5K
W	1/23/2019	67585	Updated ECM for 500.
X	8/23/2019	67697	Update table 5-2 and figure 7-1 parts exploded view
Y	10/16/2019	68230	Cover page, MRH, FCC Doc, table 2-2
Z	Feb. 17, 2020	68507	Cover page, MRH, CE DoC
AA	April 14, 2020	68671	Updated Table 2-2, Section 3 images and table 3-24, added Table 6.2 Fan Speed, Section 7, removed ECM Data
AB	Jan. 19, 2021	69214	Cover page, MRH, Updated Chapter 3.

WARNING: Disconnect primary power prior to servicing.

Publication Information

This publication is designed to assist in the use of the product as it exists on the date of publication of this manual, and may not reflect the product at the current time or an unknown time in the future. This publication does not in any way warrant description accuracy or guarantee the use for the product to which it refers.

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NOTE: For all service and parts correspondence, please provide the sales order number, as well as the serial number for the transmitter or part in question. Record those numbers here:

_____/_____

Please provide these numbers for any written request, or have these numbers ready in the event you choose to call regarding any service or parts requests. All warranty claims require a serial number to be provided. For out of warranty products, this will help us identify what hardware shipped.

Replaceable Parts Service

The service parts department is available from 8:00AM to 5:00 PM CST Monday - Friday, and 8:00AM to 12:00PM CST on Saturday.

Telephone *+1-217-221-7500* or email service*partsreq@gatesair.com*.

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Unpacking

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

Returns And Exchanges

No equipment can be returned unless written approval and a return authorization is received from GatesAir. 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 GatesAir, specify the GatesAir order number or invoice number.

Safety

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 be 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 to personnel and equipment, and must be performed only by qualified personnel exercising due care. GatesAir 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/electrical codes and fire protection standards must be observed.

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

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.

WARNING:

DO NOT REMOVE, SHORT-CIRCUIT OR TAMPER WITH INTERLOCK SWITCHES ON ACCESS COVERS, DOORS, ENCLOSURES, GATES, PANELS OR SHIELDS. KEEP AWAY FROM LIVE CIRCUITS, KNOW YOUR EQUIPMENT AND DON'T TAKE CHANCES.

WARNING:

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

First Aid for Electrical Shock

Faulty switches, frayed flexes and defective appliances can all be causes of electrical shock. Even a shock from a domestic current - the type used in the home or the workplace - can cause serious injury or even result in a fatality.

Water is a very efficient conductor of electricity and presents an additional risk. Handling otherwise safe electrical equipment with wet hands, or when standing on a wet floor, greatly increases the risk of electrical shock.

Treatment for Electrical Shock

Before doing anything else, remember that the first priority is personal safety. Do not touch a victim if they are still in contact with the appliance that has caused the shock. If they are still in contact with the electrical source, they will be 'live' and you risk electrocution to yourself.

Turn off the source of the electricity, if possible, to break contact between the victim and the electrical supply. Switch off the supply at the mains or meter point if possible, otherwise remove the plug or wrench the cable free.

Alternatively, you can move the source of the shock away from you and the victim. Stand on some dry, insulating material such as a wooden box, plastic mat or telephone directory. Using a wooden pole or broom, push the casualty's limb away from the electrical source or push the source away from them.

If it is not possible to break the contact using a wooden pole or broom, loop a length of rope around the casualty's ankles or under their arms. Take great care not to touch them while you are doing this. Once you have looped the rope around them, use this to pull them away from the source of the electrical current.

Once you have broken the contact between the victim and the source of the shock, conduct the primary survey - response, airway, circulation, breathing - and treat any urgent condition found. Call immediately for emergency services.

Post as much information as possible at the transmitter site. Posters such as Figure 0-1 on the next page should be prominently displayed near the transmitter. Emergency contact phone numbers and directions to the transmitter site with landmarks in the area should be posted near the transmitter and telephone.

References

It is very important to have a safety plan in place and available personnel that are trained and certified in first aid and CPR. Please refer to the following web sites for more information:

American Red Cross - www.redcross.org

Occupational Safety and Health Administration (OSHA) - www.osha.gov

For countries other than USA, contact health and safety agencies in your area for more information.

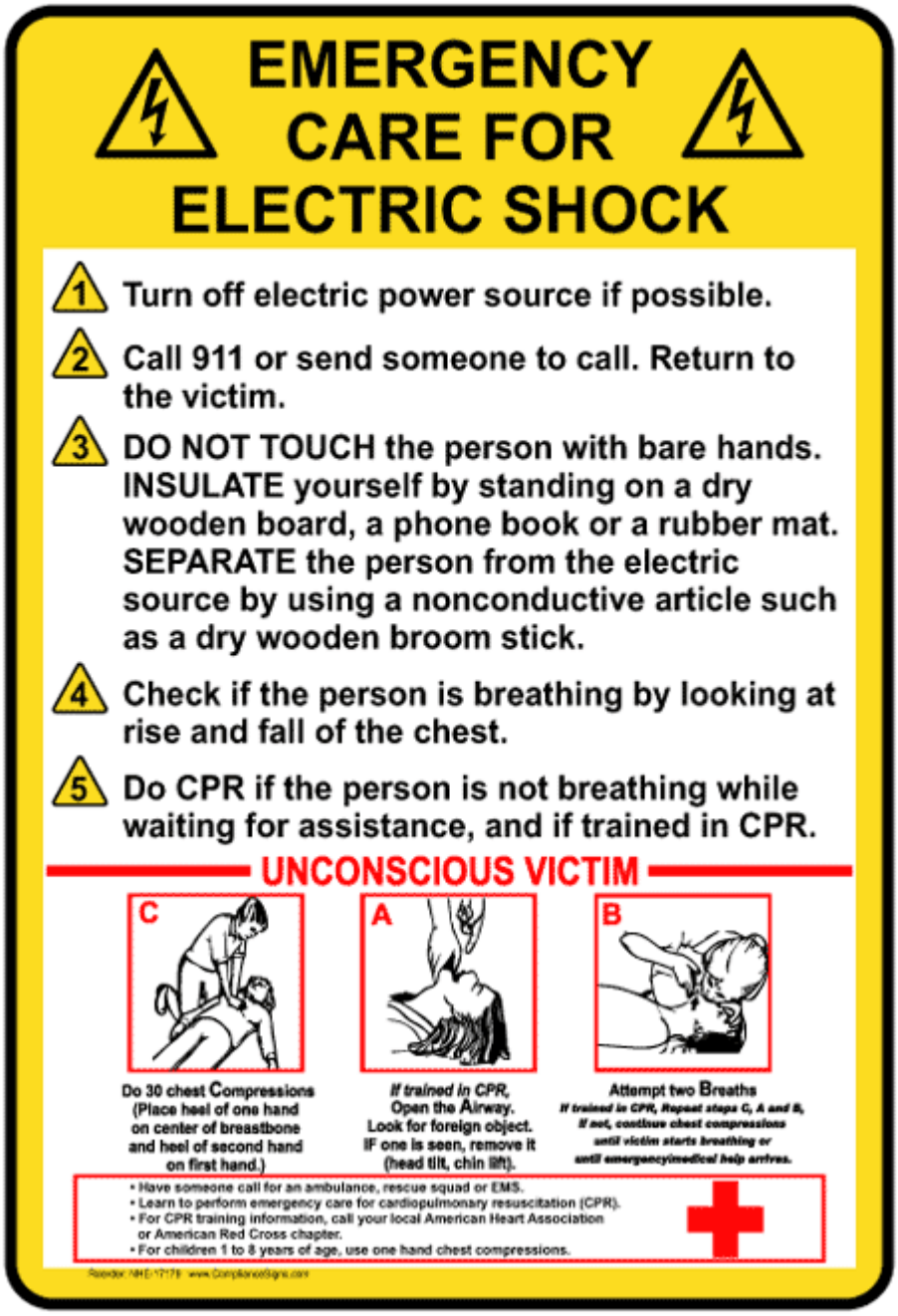

Figure 0-1 Electrical Shock First Aid Poster (Example)

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Glossary

ADC - Analog to Digital Converter

AES-EBU - is a standard for the exchange of digital audio signals between professional audio devices. AES3 was jointly developed by the Audio Engineering Society (AES) and the European Broadcasting Union (EBU).

AES192 - This term is an indication of the audio content and its intended use. This type of connection uses the standard AES-EBU interface. It is a quantized rendition of Composite audio, often referred to as MPX (term for: multiplex). Typically sourced from an FM audio broadcast processor. The sample rate is 192 kHz. Often only the L or R audio stream carries the audio.

AMSL - Above Mean Sea Level

APC - Automatic Power Control refers to the ability of a transmitter to maintain a constant power output in a dynamic environment.

ASI - Asynchronous Serial Interface, A streaming format used to carry the MPEG transport stream from the network origination point to the transmitter for modulation onto the RF carrier(s).

AUX - Shortened from the word Auxiliary. Typically refers to a backup or a redundant option.

BER - Bit Error Rate.

BPF - Band Pass Filter. May also be called a mask filter or critical mask filer. A high power filter centered about the desired channel bandwidth and located at the transmitter output port to eliminate out-of-band intermodulation products arising from the power amplification process.

CCIR - Consultatitve Committee on International Radio

COFDM - Coded Orthogonal Frequency Division Multiplex. A transmission technique in which the information content of a complete ensemble (multiplex) is divided and modulated onto a multitude of closely neighboring RF carriers within a channel bandwidth (frequency block). The division of the information payload among a large number of RF carriers ensures that each individual RF carrier has a very low data rate (symbol rate). The long symbol period of the individual RF carriers allows the receiver to wait until all delayed signal reflections have arrived and been added to the direct signal (...during a guard interval to be discarded). This permits recovery a stable signal in difficult reception conditions, especially during mobile reception.

Content Stream - A continuous flow of data that represents the program material being broadcast by the transmitter. An exciter converts content stream to modulated RF for amplification in the transmitter.

CPLD - Complex programmable logic device.

CRC - Cyclic Redundancy Checksum is a procedure for error detection in digital signals. Before distribution to the transmitter, a CRC is computed for the transport stream signal. This CRC is sent in the transport stream. Upon reception at the transmitter site, another CRC is computed from the received transport stream and compared to the transmitted value. If the CRCs are identical, no error has occurred during the distribution to the transmitter site.

DAC - Digital Analog Converter refers to a circuit that converts digital values inside the processing stages of the LPU modulator into analog RF waveforms for amplification and transmission by the transmitter.

dBm - Decibels above a milliwatt refers to a logarithmic signal power measurement scale referenced to 1 mW. 0 dBm is equivalent to 1 mW. 10dBm = 10mW, 20dBm = 100mW, 30dBm = 1000mW.

DHCP - Dynamic Host Configuration Protocol (DHCP) is a client/server protocol that automatically provides an Internet Protocol (IP) host with its IP address and other related configuration information such as the subnet mask and default gateway.

DMB - Digital Multimedia Broadcasting is a modification of the basic DAB system according to ETSI standard (TS 102 427 and TS 102 428) using MPEG-4 (H.264) and BSAC/HE-AAC V2 compression to permit sending of multimedia information (radio, TV, and data casting) to mobile devices such as mobile phones. Originally developed in South Korea.

DNS - The Domain Name System (DNS) is a naming system for computers connected to the Internet or a network. It translates user domain names to the assigned numerical IP addresses.

DSB-SC - Double-Sideband Suppressed-Carrier.

Dynamic Delay - Refers to a processing function provided in the modulator section to compensate for different delays of the program data stream in the data distribution network between the network origination point and various transmitter sites. A time-stamp contained in the transport stream serves as a reference. The present time is delivered by a GPS receiver at the transmitter (1pps signal, rising slope). Comparing these two sources, the dynamic delay function is able to synchronize the program input to all transmitters over a one-second correction range.

ECM - Electrical, Cooling, Mechanical.

Ethernet - Physical interface by which a device may be connected to a LAN and/or the Internet to provide web-based supervision. It generally employs an RJ45 connector.

E2X - Exporter to Exciter see Content Stream.

FAX - Flexiva Air-Cooled Transmitter.

FEC - Forward Error Correction.

FFT- Fast Fourier Transform.

FPGA - Field Programmable Gate Array, is an integrated circuit designed to be configured by the customer or designer after manufacturing. FPGAs perform many of the intensive digital processing steps used to synthesize the transmitted RF signal in the LPU modulator section.

FSK - Frequency Shift Keying is a frequency modulation scheme in which digital information is transmitted through discrete frequency changes of a carrier signal.

GPS - Global Positioning System is satellite-based navigation system commonly used for determining position and navigating. In a single frequency network context, it delivers an extremely precise time reference (UTC... universal time coordinated) that is used to synchronize all transmitters.

GUI - Graphical User Interface is a type of user interface that allows users to interact with electronic devices via images rather than text commands. In this application, the user interface provided by a touch screen in dual drive systems or the web-based remote interface served over the Ethernet interface.

Hot-pluggable - Term to denote that the device in question can be removed and replaced while transmitter is operating without suffering damage or causing damage to other devices.

HTML - HyperText Markup Language is the predominant markup language for web pages. HTML is the basic building block of web pages.

I2E - Importer to Exporter see Content Stream.

IEC- 215 - International Electronics Commission regulation 215 refers to safety standard requirements for radio transmitting equipment.

IP - Internet Protocol.

IP Address - Internet Protocol Address is a numerical label assigned to each device (e.g., computer, printer) participating in a computer network that uses the Internet Protocol (IP) for communication. An IP address serves two principal functions: host or network interface identification and location addressing.

ISP - In-System Programming refers to a GatesAir utility used to update transmitter software.

LAN -Local Area Network. Typically, a LAN encompasses computers and peripherals connected to a server within a distinct geographic area such as an office or a commercial establishment.

LCD - Liquid Crystal Display is a thin, flat electronic visual display that uses the light modulating properties of liquid crystals to display text and images. Often used to refer to the blue display screen on the front panel of LPU (low power unit).

LED - Light-Emitting Diode is a two-lead semiconductor light source. It is a p–n junction diode, which emits light when activated

LP - Low Power

LPFM - Lowe Power Frequency Modulation. In the FAX transmitter family this refers to any transmitter model under 3.5kW.

LPF - Low Pass Filter. Typically installed withing the transmitter or close to the transmitter output port. It is used to attenuate out of band emissions at the signal harmonic frequencies arising from the high power amplification process. It may also be referred to as a harmonic filter.

MAC - Media Access Control. Typically usage is “MAC address”. This is a 12 digit hexadecimal number that is meant to be both permanent and unique. It is used in networking to keep track of what IP address a piece of equipment has. This is typically done automatically inside Ethernet switches, routers and computers. Example: 00:01:29:02:E1:43. There are networking situations where the MAC address is used as part of a configuration to facilitate a path for special network traffic.

MER - Modulation Error Ratio is a measure used to quantify the quality of the digital being transmitted. A signal sent by an ideal transmitter would have all constellation points precisely at the ideal locations. However various imperfections in the signal path cause the actual constellation points to deviate from the ideal locations by finite error vectors. The modulation error ratio quantifies the ratio of the desired signal to the undesired error vectors. MER is typically associated with COFDM modulation formats such as HD Radio, DRM, DVB or DAB.

MIB - Management Information Base is a database used for managing the entities in a communication network. Most often associated with the Simple Network Management Protocol

MOV - Metal Oxide Varistor, an electrical component that varies resistance depending on the voltage applied.

MPX - Multiplex, referring to composite audio which incorporates several signals such as; L + R audio, 19 kHz pilot, L - R 38 kHz DSB (double sideband) Suppressed Carrier, RDS, SCA.

NIST - The National Institute of Standards and Technology is a measurement standards laboratory, and a non-regulatory agency of the United States Department of Commerce. Calibration of test equipment is linked to the standards defined and maintained by NIST.

NIT - Network Information Table.

NTP - Network Time Protocol is a networking protocol for clock synchronization between computer systems over packet-switched, variable-latency data networks. In operation since before 1985, NTP is one of the oldest Internet protocols in current use.

PA - Power Amplifier is an electronic circuit that accepts a low level RF signal and outputs an amplified output. FAX amplifiers work in either class C or class AB amplification modes depending on the mode of operation.

PAI - Power Amplifier Current.

PAV - Power Amplifier Voltage.

PAB - Power Amplifier Block refers to a high power amplifier stage. May refer to the LPU power amplifier section or one or more high power amplification stages external to the LPU. PABs are typically numbered from 1…n with PAB 1 being the highest in the rack.

PAPR - Peak-to-Average Power Ratio.

PC - Personal Computer.

PCB - Printed Circuit Board in the transmitter. Synonymous with PWA.

PFRU - Precise Frequency Reference Unit is a circuit sub-assembly inside the LPU modulator section responsible for supplying the various high-stability oscillator signals required to synthesize the RF waveform that will be transmitted.

PLL - Phase Locked Loop.

PPS - Pulse(s) Per Second.

PS - Power Supply is a device that supplies DC electrical energy to one or more electric loads, typically via the rectification of an AC mains electrical input.

PSU - Power Supply Unit.

PWA - Printed Wiring Assembly.

PWB - Printed Wiring Board. Typically refers to the circuit card without components installed.

RBDS - Radio Broadcast Data System is the US version of RDS (see below). The primary difference between RBDS and RDS is a different list of program format names for Program Type (PTY) code number.

RBW - Resolution Bandwidth. A term for a setting in a spectrum analyzer referring to the fineness of the measurement of the signals under test. The unit is in Hertz. The smaller the value the more detailed the results. However, if the SPAN divided by the RBW is greater than the number of sweep points in a digital analyzer display you risk missing key details. Also, noise like signals often need a calculated correction value to determine the total level (power) when the RBW is narrower than the signal of interest.

RDS - Radio Data System is a communications protocol standard for embedding small amounts of digital information in conventional FM radio broadcasts. This relatively low data rate traffic is carried on a 57 kHz subcarrier with a data rate of approximately 300 bps. Peak control of the total FM modulation can be improved when the RDS subcarrier is synchronized with the FM pilot.

RF - Radio Frequency refers to an electrical oscillation at the frequency of radio waves in the range of 3 kHz to 300 GHz. In this application, typically a signal in the 168 MHz to 242 MHz frequency range of the VAX transmitter.

RoHS - also known as Lead-Free, stands for Restriction of Hazardous Substances. RoHS, also known as Directive 2002/95/EC, originated in the European Union and restricts the use of six hazardous materials found in electrical and electronic products.

RS-485 - TIA/EIA standard for serial multipoint communications lines, also known as EIA-485 and TIA/EIA-485, is a standard defining the electrical characteristics of drivers and receivers for use in balanced digital multipoint systems. The standard is published by the Telecommunications Industry Association/Electronic Industries Alliance (TIA/EIA).

RTAC^{TM} - Real Time Adaptive Correction is a signal processing technique applied in the modulator signal generation stage which seeks to correct distortions produced in the high power amplification and filtering stages by means of pre-distortion.

RU - Is an abbreviation for rack unit. One rack unit equals 1.75" (44.45mm). The rack unit is used to describe the height of components that will be placed in racks.

SCA - Subsidiary Communications Authorization is an auxiliary multiplexed channel or channels in a broadcast FM signal, located higher in frequency that the stereo sub-channel.

SFN - Single Frequency Network is a type of transmission network in which all transmitters are synchronized in frequency and phase (symbol). This transmission technique offers high frequency economy, as a single frequency can be used in a large geographic area.

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

SMT - Surface Mount Technology.

SNMP - Simple Network Management Protocol is a popular protocol for network management. It is used for collecting information from various devices on a network.

Span - A spectrum analyzer setting for the display width of the plotted measurement. The unit is in Hz.

SSB-SC - Single-Sideband Suppressed-Carrier.

Static Delay - A delay function provided by the exciter over a manually settable range of 0 to 1000 ms to compensate for differences in signal processing delays or local propagation conditions for individual transmitters in a single frequency network.

TPO - Transmitter Power Output refers to the transmitter forward output power level.

UPS - Uninterruptable Power Supply is a battery-based system designed to provide power during an AC mains failure event.

VGA - Video Graphics Array is a video display standard used by the personal computer industry based on a 640 x 480 pixel resolution. The standard used by the TCU touchscreen in dual drive systems.

VSWR - Voltage Standing Wave Ratio is a measurement term used to express the reflected power in reference to the transmitted power.

WAN - Wide Area Network. A wide area network is a telecommunications network or computer network that extends over a large geographical distance.

WEB - A system of Internet servers that support HTML formatted documents. A device or interface that uses HTML formatted documents transmitted according to the IP protocol, typically over LAN/WAN/Internet servers, but also locally via 1:1 communications.

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SUPPLIER DECLARATION of CONFORMITY

Manufacturer:
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Quincy, IL 62305, USA

Applicant:
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Mason, OH 45040

Equipment declared compliant by this Declaration:

Product Series:	Flexiva FAX Air Cooled FM Transmitters
Models:	FAX40K, FAX30K, FAX20K, FAX15K, FAX10K, FAX10KXP, FAX7.5K, FAX5K, FAX3.5K, FAX3K, FAX2K, FAX1K, FAX500, FAX300, FAX150, FAX50
Standards:	FCC 47 CFR parts 2 and 73
Test Report:	BD-REG-12-002, BD-REG-13-007, BD-REG-12-013

We hereby certify that the above product has been tested by GatesAir and complied with the FCC official limits. These products are to be marketed in the US acccrdance to FCC Rules based on the standard 47 CFR Part 2 and 73. The tests were performed in accordance to the procedures from ANSI C63.4-2014. The tests and data results are issued on test reports BD-REG-12-002, BD-REG-13-007, BD-REG-12-013, GA-REG-18-010.

John Harmon

John Harmon – Compliance Engineer
14 OCT 2019

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EU DECLARATION OF CONFORMITY

This declaration of conformity is issued under the sole responsibility of GatesAir, Inc. at 5300 Kings Island Dr. Ste. 101 Mason, OH USA, for the equipment:

Flexiva FAX

FAX20K, FAX10K, FAX5K, FAX3.5K, FAX3K, FAX2K, FAX1K, FAX500, FAX300, FAX150, FAX50

That all the essential requirements set out in article 3 of Directive 2014/53/EU on radio equipment has been demonstrated.

That the equipment is in conformity with the following relevant Union harmonisation legislation:

Directive 2014/53/EU on radio equipement.
Directive 2014/30/EU relating to Electromagnetic Compatibility.
Directive 2014/35/EU relating to electrical equipment designed for used within certain voltage limits.
Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS).

That the equipment is in conformity with the following harmonised standards:

EN 6100 4-2 thru 4-6 4,11	ESD, Immunity, Harmonics, Susceptibility
EN 301 489-1 v2.1.1, 11	EMC Standard Common technical requirements meeting article 3.1(b) of Directive 2014/53/EU and article 6 of Directive 2014/30/EU
ETSI EN 302 018 v2.1.1 :2017-04	Electromagnetic compatibility and Radio spectrum Matters (ERM); Transmitting equipment for the FM sound broadcasting service covering article 3.2 of Directive 2014/53/EU
IEC 60215 ed 4.0 2016-04	Safety Requirements for radio transmitting equipment

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

John Harmon

John Harmon – Compliance Engineer
Mason, OH 17 Jun 2017

WARNING: Disconnect primary power prior to servicing.

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1 Section-1 Introduction

1.1 Purpose of This Manual

This manual provides important information for the proper installation, operation and maintenance of the Flexiva FAX(**F**M, **A**ir Cooled, **X**mtr) Compact Series of transmitters. Included are the 50 W, 150 W,300 W, 500 W, 1 kW, 2 kW, 3 kW, and 3.5 kW transmitters. These high performance transmitters are compact and easily mount into standard 19" rack mount cabinets. They occupy a minimum of 2 RU's (FAX 50 W) and up to a maximum of 4 RU's (FAX 3.5 kW). The following information in this section highlights key features, important physical characteristics, and operational parameters. It is highly recommended to read this section, plus sections 2 and 3, thoroughly before beginning the installation.

1.2 FAX Compact Key Features

The key features of the FAX Compact series are similar for all FAX Compact models.

Each Flexiva Transmitter features:

- Integrated Direct to Channel Digital FM modulator includes Stereo Encoder Auto-switching analog L/R (2), AES-EBU audio (2) and composite (2) inputs, Two (2) SCA baseband inputs, Ext. 10MHZ and 1 PPS inputs
- Composite/MPX inputs over AES 192
- Internal harmonic filter
- Internal auto switching for external RF Source
- Built-in MOV transient voltage suppression on incoming AC mains lines
- Proportional VSWR fold-back for safe operation at reduced power into marginal loads (icy antenna, etc)
- RF ramp-up to minimize turn-on transients
- Air filter serviceable while transmitter is in operation
- Meets or exceeds all applicable FCC, Industry Canada, CCIR and IEC215 standards, RoHS compliant
- Front panel control and metering.
- Built-in parallel interface for remote control, status and metering; RFI and transient protected.
- RF directional couplers for system protection and RF sample ports for customer use.
- Automatic restart after AC mains interruption; returns to previous operational mode.
- Web GUI for use in remote diagnostics using customer's PC.
- SNMP for basic network control and monitoring

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1.3 FAX Options and Spare Parts

Spares shown are kits only. Please contact the GatesAir Parts Department or Customer Service for detailed list of what items are included in the kits.

Optional boards are available for all models unless noted.

1.3.1 50/150 Spares

Spare Parts Kit - 990-1201-009 (HARFAXEXSPK)
Spare Modules Kit - 990-1201-011 (HARFAXEXSMK)
Spare Modulator and Control Kit - 990-1201-014 (HARFAXEXSMODCTRLK)

1.3.2 300 - 3.5 kW Spares

Spare Parts Kit - 990-1201-008 (HARFAXLPSPK)
Spare Modules Kit - 990-1201-012 (HARFAXLPSMK)
Spare Modulator and Control Kit - 990-1201-013 (HARFAXLPSMODCTRLK)

1.3.3 Options (All models)

Orban 550 Audio Processor Kit (Internal Card) - 981-0090-568
GPS Kit (Cable and Antenna) - 981-0090-567

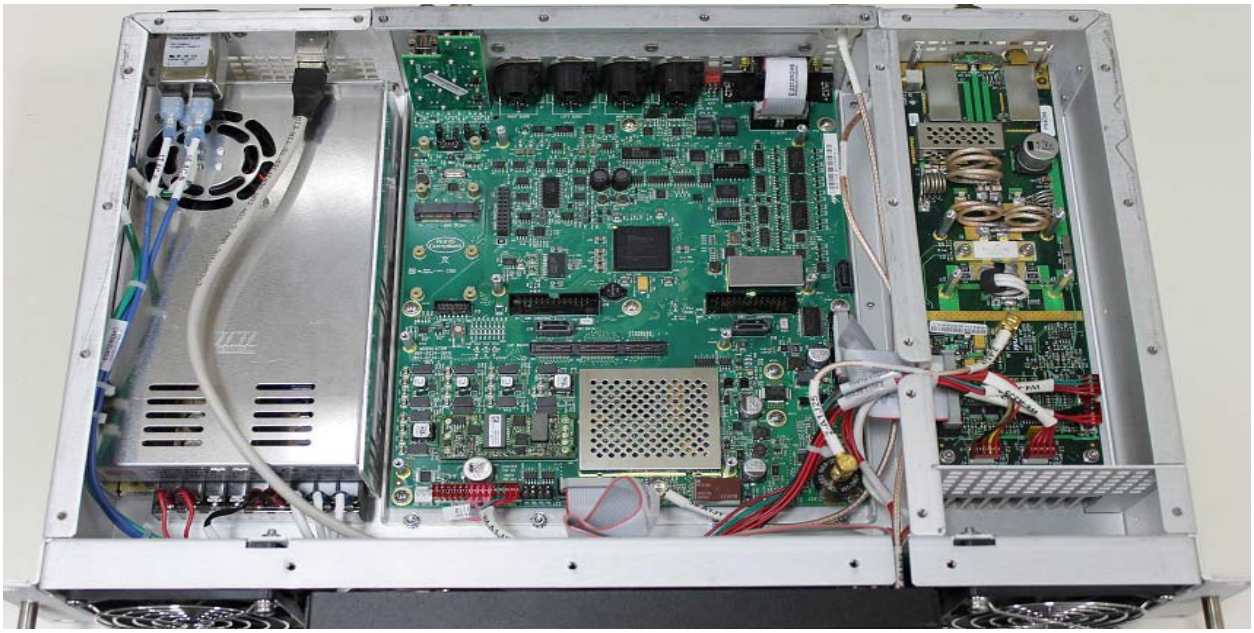
1.4 FAX Compact Model Summary

The FAX Compact transmitter uses a common front panel and modulator for all models. The Modulator card is a direct to channel FM Modulator with built-in stereo encoder that provides unsurpassed high quality FM broadcasting. The optional Exgine card is available for digital operation. The front panel contains the same Control and Display card for all models of FAX including the High power. The rear panel I/O, with the exception of the RF Output connector and the AC Input connector, is the same for all models.

1.4.1 FAX50/150 Models

The 50 W and 150 W models occupy 2 RU in a standard rack. These units use a single PA Pallet and a single internal (non-pluggable) power supply module. The RF output is a type N connector. The air filters are accessible by removing from panel.

Figure 1-1 FAX 50 W and 150 W Transmitters



1.4.2 FAX300W/500W/1K Models

The FAX 300 W, 500 W, and 1,000 W (1K) models occupy a 3 RU cabinet. The Power Supply Module is easily accessible by removing the front panel using the 4 black thumbscrews.

Figure 1-2 FAX 300, 500, and 1K Transmitters

Prior to August 2016, all FAX300/500/1K models utilize an IPA, splitter, and two high efficiency PA pallets that are combined together internally to produce up to 1000W of RF output power. These FAX300 and FAX500 models can be upgraded to a FAX1000with a software feature key.

FAX300/500 model transmitters manufactured after August 2016 have no IPA or splitter, and only have one PA. With only one PA no combiner is needed within the transmitter. These FAX300 models could be upgraded to a FAX500 with a feature key, but would lack the hardware to be upgraded to a FAX1000.

WARNING: Disconnect primary power prior to servicing.

Removing the top cover allows access to the key RF assemblies. The following picture shows the 1kW model with the top cover removed.

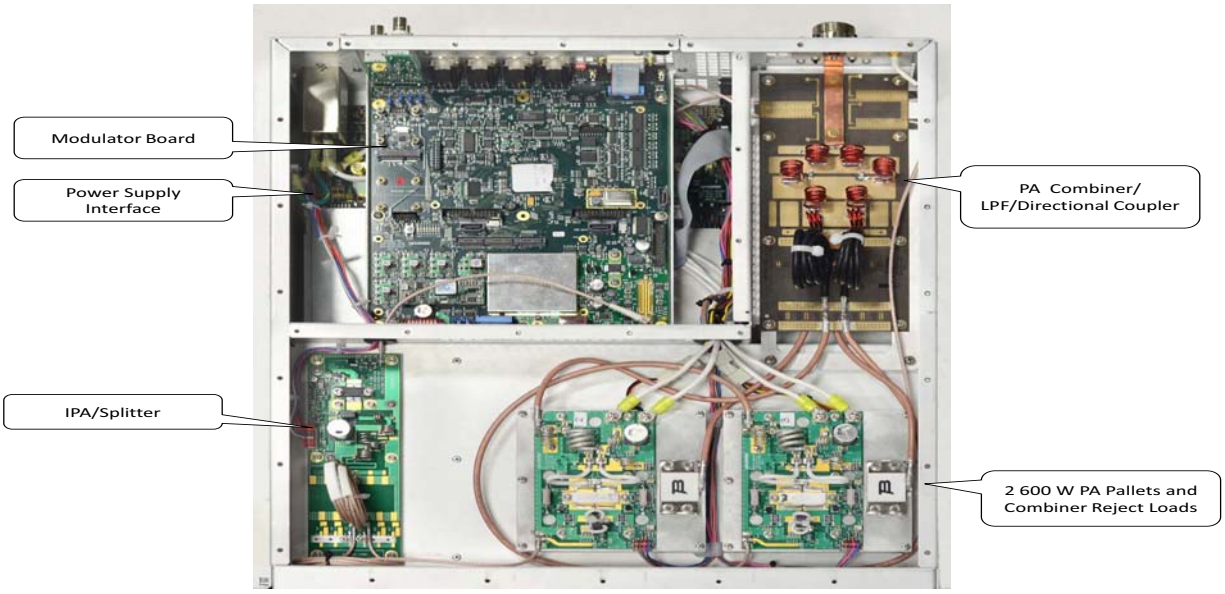


Figure 1-3 FAX 300/500 single PA (top), 1 kW (bottom) Top Cover Removed

Figure 1-4 FAX 1 kW Front Panel Removed

1.4.3 FAX 2/3/3.5 kW Models

The FAX 2 kW, 3 kW and 3.5 kW models occupy a 4 RU cabinet. The 2 kW model utilizes 4 high efficiency PA Pallets and 2 hot pluggable Power Supply modules. The Power Supply Module is easily accessible by removing the front panel using the 2 black thumbscrews. The 3 kW and 3.5kW models use 3 hot pluggable Power Supply Modules and 6 high efficiency PA Pallets in which the RF outputs are combined together internally to produce up to 3.85 kW of RF output power. The 2 kW and 3 kW models have a 7-16 DIN RF connector and the 3.5 kW model has a 7/8 EIA unflanged connector.

Figure 1-5 FAX 2 kW, 3 kW, and 3.5 kW Transmitters

WARNING: Disconnect primary power prior to servicing.

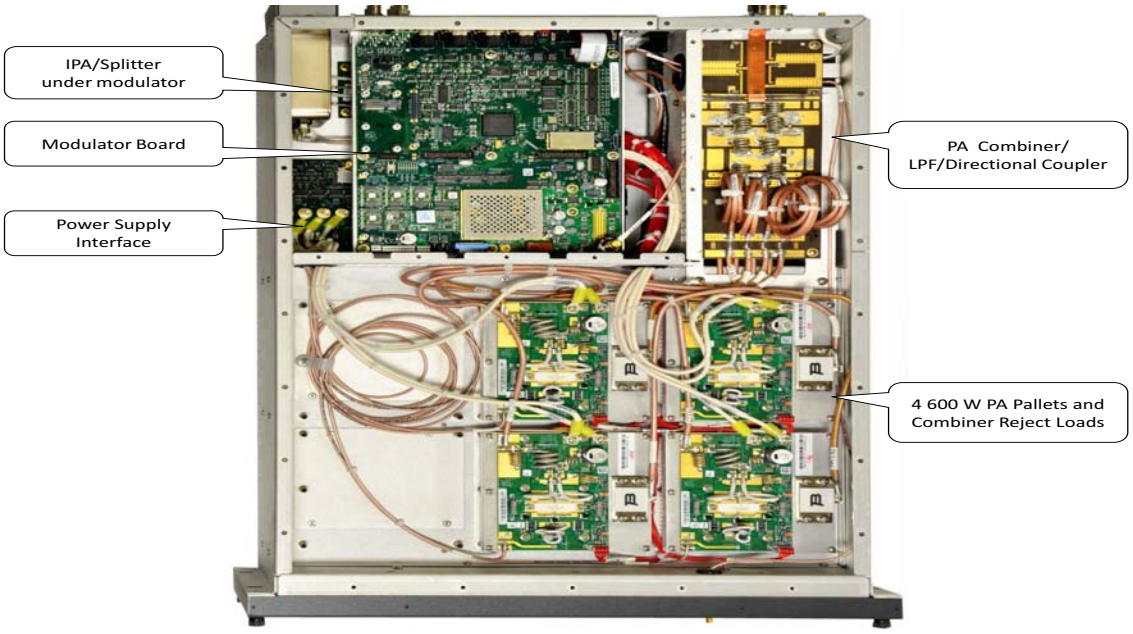


Figure 1-6 FAX 2 kW To Cover Removed

Figure 1-7 FAX3.5 kW Front Panel off

1.5 FAX Compact Rear Panel Connections and I/O Description

See the ECM Sheets in Section 1.6 for details on AC Mains requirements for each model.

Figure 1-8 FAX Back Panel

- AC input - See ECM sheets for each model and section 2.5 for Installation
- RF Sample - Sample of the RF output, can be used for modulation monitor (approx -42 dBc)
- RF Output - Each FAX model has a standard connector
  - FAX 50/150: Type N Female
  - 500 W/1 kW/2 kW/3 kW: Type 7-16 DIN
  - FAX 3.5 kW: Type 7/8 EIA male unflanged connector
- Ethernet - used for LAN, can be static or DHCP; provides Web GUI and SNMP control

Figure 1-9 Modulator Connections

- User Remote - Parallel I/O Status, Commands and Analog Voltages
- Transmitter Interface - Used when FAX is an Exciter connected to a GatesAir or other high power transmitter
- AUX AES - Second AES Audio Input
- Main AES - Main AES Audio Input
- Left Audio - Mono Left input or Stereo Left Audio Input
- Right Audio - Stereo Audio Right Input
- Main Comp - Main Composite Audio Input
- AUX Comp - Second Composite Audio Input
- SCA1/2 - SCA audio Inputs
- 19 kHz Out - Stereo pilot for external generator

WARNING: Disconnect primary power prior to servicing.

- 1 pps - 1 PPS reference input or output from internally generated signal 50 Ohms or 10 k Ohms jumper selectable
- 10 MHz - 10 MHz reference input or output from internally generated signal -10 dBm to +10 dBm; 50 Ohms
- GPS Antenna - When Optional GPS receiver is installed. Jumper setting available for voltage to antenna (+5 or +3.3 VDC)
- Switch - Left section resets transmitter back to Factory Pretest defaults, Right section indicates Exciter ID A or B

Warning

DO NOT SWITCH THE LEFT SECTION OF REAR PANEL SW1 UNLESS INSTRUCTED TO DO SO BY CUSTOMER SERVICE. THIS SWITCH WILL RESET THE UNIT TO A FACTORY DEFAULT IMAGE IF AC POWER IS CYCLED WHILE IT IS IN THE "UP" POSITION. IF THIS OCCURS A NEW UPLOAD OF SOFTWARE WILL BE REQUIRED.

1.6 Electrical/Cooling/Mechanical Data

FAX ECM(Electrical/Cooling/Mechanical) data sheets, subject to change are available on the GatesAir Customer portal www.GatesAir.com. For outline drawings for each model, please see 843-5614-471 in the drawing package for details and important Installation information.

1.7 Specifications

Specifications are subject to change without notice.

All FAX Compact series transmitter models are comply with the following International Standards.

Standards:
RoHS 2002/95/EC
R&TTE 1999/5/EC
ETSI EN 60215 (Safety)
ETSI EN 302 018 (ERM)
ETSI EN 300 384 (Radio)
FCC Part 73 (LPFM Type Acceptance)
Industry Canada (IC)
Russia GOST
Brazil ANATEL
CE Mark

Table 1-1 Transmitter Specifications (Subject to Change)

Parameter	Specification
Power Stability	≤±0.25 dB to VSWR <=1.3:1
Power Factor	0.99 Typical
Asynchronous AM S/N Ratio	60 dB minimum below equivalent 100% amplitude modulation by 400 Hz using 75 µS de-emphasis
Synchronous AM S/N Ratio	50 dB minimum below equivalent 100% amplitude modulation with 75 µS de-emphasis and 400 Hz high-pass filter (FM deviation ±75 kHz by a 1 kHz sine wave). Measured at wideband input
RF Harmonic and Spurious Suppression	Internal harmonic filter meets or exceeds all FCC and ETSI requirements
VSWR	Operates in to infinite VSWR with proportional foldback above 1.5:1 (Foldback range 1.3 to 1.5:1 user selectable); Protected against open or short circuit, all phase angles. Includes user selectable 3:1 VSWR limit.
Altitude	15,000 ft (4,573 M) elevation above sea level
Ambient Temperature Range	Inlet air temperature must not exceed 45° centigrade at sea level. 32° to 113° F (0 to 45° C), derated 3.66° F (Δ2° C) per 1000 feet (300m) elevation
Humidity	95%, non-condensing
Remote Control	Parallel DB25-female;Web Interface Front and rear RJ-45 connectors Ethernet/IP provided allows full control and monitoring of all parameters via Web browser SNMP, SNMP compliant with IRT TC-MIB
Frequency Stability	±150 Hz, <10e-6 per year, using high-accuracy internal TCXO 10 MHz input for synchronization to external (GPS) reference Automatic switching to internal oscillator if external reference fails
External 10 MHz Clock I/O	BNC female, unbalanced input (or output user selectable with internal GPS option), 50 ohms -10 dBm to +10 dBm
External 1 PPS Clock I/O	BNC female, unbalanced input (or output user selectable with internal GPS option), 50 ohms or 10K jumper selectable, TTL level
Modulation Type	FM digitally synthesized direct to channel in 10 kHz increments
FM Modulation Capability	Adjustable up to ±150 kHz(200 %); 75 KHz default; 320 kHz deviation maximum

Table 1-1 Transmitter Specifications (Subject to Change)

Parameter	Specification
AES Inputs	AES 3: 2 auto-switching AES3 inputs. Female XLR, 110 ohms balanced;-2.8 dBfs nominal; GUI adjustable level from 0 dBfs to -15 dBfs in 0.1 dB steps for ±75 kHz deviation; input sample rate 44.1 to 96 kHz
	AES 192: Digital MPX/Composite input over AES192 interface with fail-over switching. Female XLR, 110 ohms
Analog L/R Inputs	Female XLR, >10 K or 600 ohms (selectable), balanced, resistive; default level is +10 dBu for ±75 kHz deviation Level GUI adjustable from 0 dBu to +15 dBu
Analog Composite Inputs	2 BNC inputs (unbal); 10 K ohms; +4 dBu (3.5 V pk-pk) for ±75 kHz deviation; adjustable -6 to +18 dBu (2 to 5 V pk-pk). The input audio level range was extended on rev G.2 and higher modulators to -6 to +18 dBu, which equates to 1.1 to 17.4 v pk-pk.
External SCA Inputs	Inputs 2 BNC female, unbalanced; >10 K ohms; -3.3 dBu (1.5 V pk-pk) nominal for ±7.5 kHz (10%) deviation of main carrier; adjustable from -6.8 dBu (1 to 4 V pk-pk)
19 kHz Pilot Sync Output	BNC female, unbalanced, 50 ohms resistive, sinewave, phase adjustable, AC coupled, 4.5 V pk-pk nominal, unterminated
Wideband Analog Input Performance	
FM Signal-to-Noise Ratio	>90 dB below ±75 kHz deviation at 400 Hz; measured in a 10 Hz to 100 kHz bandwidth with µS de-emphasis; DIN "A" weighting
Amplitude Response	<±0.04 dB 20 Hz to 53 kHz; ±0.02 dB, 53 kHz to 100 kHz
Total Harmonic Distortion	<.02 % THD over stereo sub band (10 Hz to 53 kHz) with 75 µS de-emphasis
Intermodulation Distortion	CCIF: <0.02 % (14/15kHz, Ratio 1:1) SMPTE: <0.02 % (60/7000Hz, Ratio 1:1)
Transient Intermodulation Distortion (DIM)	<0.02 % (2.96 kHz square wave/14 kHz sinewave modulation).
Slew Rate	11.8 V/us - symmetrical
Phase Response Variation	±0.1° from linear phase, 10 Hz to 100 kHz
Group Delay Variation	±5 ns, 10 Hz to 53 kHz, ±30 ns, 53 to 100 kHz
Stereo Generator Performance (AES3 or Analog Inputs)	
	Modes Stereo, Mono L+R, Mono L, and Mono R; remote controllable
Pre-emphasis	Selectable 0, 25, 50, or 75 µS
Audio Low Pass Filter	Selectable, 15 kHz, 17 kHz, or BYPASS
Stereo Pilot Tone	19 kHz ±0.03 Hz; injection adjustable 0% to 12% in 0.05% steps; Nominal: 9%
Suppression	38 kHz, 57 kHz, 76 kHz, 95 kHz >70 dB below ±75 kHz deviation
Stereo Separation	>70 dB, 10 Hz to 15 kHz
Dynamic Stereo Separation	>70 dB, 10 Hz to 15 kHz
Stereo Amplitude Response	±0.05 dB, 10 Hz to 15 kHz referenced to selected pre-emphasis curve
Stereo Signal to Noise Ratio	(L or R) >83 dB below 100% modulation at 400 Hz; measured in a 10 to 22 kHz bandwidth with µS de-emphasis and DIN "A" weighting
Stereo Total Harmonic Distortion	<0.05 %, 10 Hz to 15 kHz, in bandwidth 10 to 22 kHz; without de-emphasis
Stereo Intermodulation Distortion	(L or R) <0.05 % (14/15 kHz 1:1), SMPTE: 0.02% (60 and 7000 Hz 1:1)
Transient Intermodulation Distortion (DIM)	<0.05 %; (2.96 kHz square wave/14 kHz sinewave modulation)

Table 1-1 Transmitter Specifications (Subject to Change)

Parameter	Specification
Linear Crosstalk	>70 dB below 100% modulation reference (AES3 input); L+R to L-R or L-R to L+R due to amplitude and phase matching of L&R channels (10 Hz to 15 kHz)
Nonlinear Crosstalk	>70 dB below 100% modulation reference; L+R to L-R or L-R to L+R due to distortion products
Audio Overshoot	Less than 0.16 dB
Mono Performance (AES3 or analog input)	
Pre-emphasis	Selectable 0, 25, 50 or 75 microseconds
FM Mono Signal-to-Noise Ratio	>90 dB below 100% modulation at 400 Hz; measured in a 10 Hz to 22 kHz bandwidth with 75 µS de-emphasis and DIN "A" weighting
Amplitude Response	±0.01 dB, referenced to selected pre-emphasis curve (no low-pass filter)
Mono Total Harmonic Distortion	>0.02 % THD, 10 Hz to 22 kHz bandwidth
Mono Intermodulation Distortion	CCIF: 0.02 % (14/15 kHz 1:1); SMPTE: 0.01% (60/7000Hz 1:1)
Mono Transient Intermodulation Distortion (DIM)	0.02 % (2.96 kHz square wave/14 kHz sine wave).
External SCA, RBDS Performance	
SCA Format	Externally generated, analog FM subcarriers in the range 53-99 kHz
SCA Sub-band Amplitude Response	±0.5dB, 40 to 100 kHz; high-pass filtered
SCA Channel FM Signal-to-Noise Ratio	80 dB below ±6 kHz subcarrier deviation at 400 Hz with 150 uS de-emphasis
Harmonic Distortion	<0.2 % in audio passband of SCA generator
Intermodulation Distortion	SMPTE (60 and 7000 Hz, 1:1): <0.2 %, no pre/de -emphasis, SCA generator low-pass filter bypassed
Crosstalk, SCA to Stereo	80 dB below 100% modulation, L or R channel with 75 µS de-emphasis
Crosstalk, Stereo to SCA	80 dB below 100% modulation referenced to ±6 kHz deviation and 150 uS de-emphasis
Crosstalk, SCA to SCA	80 dB below 100% modulation referenced to ±6 kHz deviation and 150 uS de-emphasis per channel

1.8 Ground Requirements

Two separate ground connections are required for the Flexiva FAX Compact series transmitter: an *AC safety ground* and an *RF earth ground*.

*The **AC safety ground*** prevents an electrocution hazard should a dangerous potential from inside the unit accidentally contact an exposed metal surface. This is done by ensuring all metal surfaces have an uninterrupted connection back to the physical earth (PE) terminal at the AC mains service entrance. A physical earth (PE) connection is typically tied to the return current terminal either indoors at the main distribution panel or outside “at the pole” (as dictated by local codes), thus allowing any fault current to safely return to the power source.

The AC safety ground connection is made automatically for the FAX Compact and other GatesAir auxiliary equipment via the green/yellow wire on the third prong of the AC input cord. When the exciter and any auxiliary equipment are connected directly to a user-supplied outlet box or distribution panel, the green-yellow wire from the AC input cord(s) must terminate at the PE terminal at the AC mains source.

When present, a rack buss-bar will also connect to the PE terminal. Individual panels making up the rack cabinet without a solid, permanent connection back to the PE terminal that might be exposed to unsafe voltages (e.g. doors on hinges) will connect to the PE terminal via a wire jumper connection to the buss-bar.

*The **RF earth ground*** prevents damage to the equipment during lightning-induced transients and reduces RF interference to low level circuits in general. An RF ground strap/wire attachment point is located at the rear of the FAX Compact transmitter and exciter chassis. This connection is suitable for use in a single point grounding system, with the ground strap attached to the equipment rack and the rack, in turn, to a common grounding plate.

Note

Observe this important distinction: The AC safety ground ensures that energy originating at the AC mains source is always safely returned to the AC mains source (i.e. prevents electrocution), whereas the RF earth ground ensures that energy "originating in the earth," such as lightning, safely returns to the earth. Confusion may arise in some cases because the AC safety and RF earth ground circuits may share the same conductor or connection point(s) in some situations. To prevent confusion, some sources refer to the AC safety ground as "bonding" and the RF earth ground as "earthing."

1.8.1 RF Safety Ground

The FAX Compact transmitter is equipped with a RF/Safety ground lug connection on the rear panel located near the AC mains input. This safety ground must be connected to the site ground system, a flat copper ground strap is recommended.

When the FAX Compact transmitters are placed in a rack mount cabinet, the transmitter(s) will have special grounding cables or copper ground straps connected to the copper ground buss bar that runs down the left side of the cabinet (when viewing from cabinet rear). The rack mount cabinet Buss Bar must be grounded to the site ground system. A minimum 2" wide copper ground strap is recommended attach the site ground system to the bottom of the cabinet copper ground buss bar.

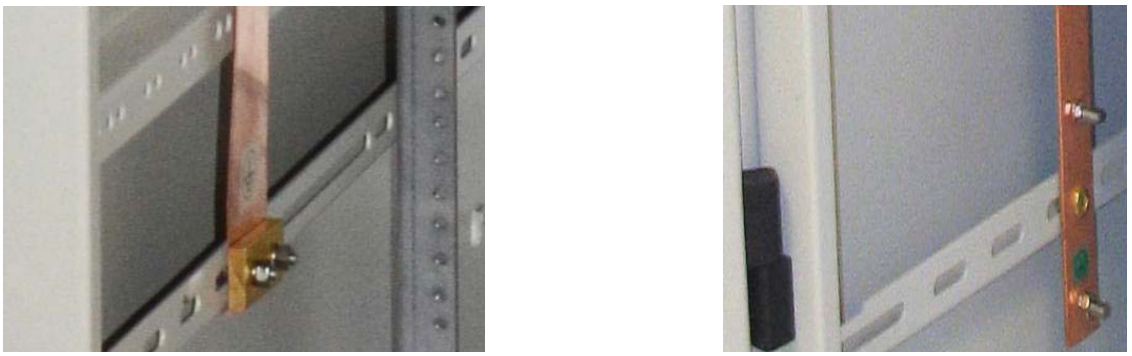


Figure 1-10 Cabinet Ground Buss Bar Connections

Caution

WHEN INSTALLING ANY ADDITIONAL EQUIPMENT IN THE TRANSMITTER RACK, BE SURE TO CONNECT A SEPARATE GROUND WIRE FROM EACH COMPONENT TO THE BUSS BAR. NEVER RUN "DAISY CHAIN" GROUND WIRES ACROSS MULTIPLE COMPONENTS AND THEN GROUND TO BUSS BAR. THIS CAN CREATE A POSSIBLE GROUND LOOP.

1.8.2 Overview of RF Grounding Practices

The importance of a good RF grounding system and lightning protection cannot be overemphasized for reasons of personnel safety, protection of the equipment, and equipment performance. The following is only a brief overview.

Lightning and transient energy via the power line or tower connections can impose serious threats to personnel safety, as well as damage the equipment. For these reasons, a good protective grounding system to divert these forms of energy to earth ground is imperative. The energy in a lightning strike has a very fast rise time and can have

frequency components up to the megahertz range. For this reason, it is always preferred to use straight, direct runs of large, flat conductors so as to minimize inductance and allow the free passage of transient energy to earth. Note that the small cross-section and non-direct path to ground of the green/yellow wire of the AC safety ground make it an unsuitable means for safely diverting the transient energy present during a lightning strike.

A good grounding system should include substantial grounding at the tower base using copper ground rods and/or a buried copper ground screen, with copper strap used to connect the tower base to earth ground. Coaxial cable shield(s) should be electrically connected to and exit the tower as near to the bottom as practical to minimize the lightning voltage potential carried by the cable back to the transmitter building.

Ideally, a common grounding plate (bulkhead panel) with a low impedance connection to building earth ground should be the entry point to the transmitter building for all signal lines, including AC mains. It should serve as a single-point ground for all coaxial and mains surge protection devices. Wide copper straps should be used for making the connection from the common grounding plate to earth ground.

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

A ground system that has been in place for a long period of time can deteriorate and should be inspected periodically. This is especially true at the point where the ground strap enters or exits the building. All ground connections should be bolted and brazed together.

Good grounding and shielding practices will also help keep stray RF current to a minimum. RF interference usually shows up as intermittent problems with digital/control circuits, spurious radiated emissions, or audio/video noise if analog signals are present. Even a small amount of non-shielded wire makes a very efficient antenna for RF and transient energy. Wire and cable shields should be connected at both ends to the equipment chassis.

1.9 AC Power Regulation and Surge Suppression

1.9.1 Surge Suppression Devices

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

1.9.2 Voltage Regulation

If voltage variations in excess of the rated voltage for the transmitter are anticipated, the transmitter AC input must be equipped with automatic voltage regulators (optional equipment) capable of correcting the mains voltage. Contact manufacturers of these devices for proper unit and sizing.

1.10 Cooling System Requirements

Flexiva series transmitters use forced air cooling provided by multiple internal fans to remove the heat generated by the signal generation and amplification processes.

To avoid operational problems due to excessive temperature, the blower openings must not be blocked. The transmitter *Outline Drawing 843-5614-471* in drawing package provides an indication of the relative location of the transmitter blowers and the necessary clearances to respect.

Air input is from the transmitter front with hot air exhaust at the rear of the cabinet. When factory rack integration has been provided, the exhaust air exits through a vent at the top of the rack.

When the transmitter is mounted in a rack, care should be taken not to overheat the other pieces of equipment installed in the rack. The exhaust from the Flexiva amplifier chassis will typically be 10^{o}C to 20^{o}C hotter than the ambient air. In some cases, this may necessitate use of a vented rear rack door or removal of rear rack door

altogether. Additionally, sufficient rear clearance must be left behind the Flexiva cabinet exhaust ports, typically 15cm (6 in.) or greater.

In general, transmitter cooling systems fall into two categories:

An ***open system*** in which the heated transmitter exhaust passes through a dedicated duct to the outside of the transmitter building. The transmitter may receive fresh outside air directly through a separate intake duct or may receive ambient air from the transmitter hall, with the transmitter hall being supplied make-up air from outside via a filtered inlet vent. With an open system, it is imperative to correctly balance the input and output air flow volumes, paying particular attention to the pressure drops in external ducts and providing external blowers to overcome these losses and ensure correct air flow. The Flexiva transmitter internal air system is designed to supply sufficient air at the required static pressure to cool the transmitter only and all external duct losses must be compensated for by external blowers (this includes the optional intake plenum). Outside air containing salt or pollution must have those items removed by an adequate filtration system, and any pressure drops caused by filtration must also be considered.

A ***closed system*** in which the transmitter exhausts and inputs air directly to and from the transmitter room. The transmitter room is closed to outside air and makes use of air conditioning units to remove any heat buildup. This type of system is the most common setup with FAX Compact and is highly recommended in geographic areas with especially salty, sulfuric, or otherwise polluted air.

Figures for both the transmitter heat load and air flow volume are provided in the transmitter *Outline Drawing*. If necessary, consult a professional heating and ventilation expert in your area for help in designing the building cooling system.

2 Section-2 Installation

2.1 Introduction

This section details the procedures for installation and the steps required for the initial turn-on of the FAX Compact series transmitters. All steps should be followed in order to ensure the installation and turn on process are completed properly.

2.2 Unpacking

When the transmitter is delivered to the site, the shipment should be inspected and inventoried before installation is begun. Each transmitter shipment will be accompanied by a packing check-list identifying which items are packed in the various crates or boxes. Be sure to locate and save this document when the shipment arrives.

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

2.3 Returns and Exchanges

Damaged or undamaged equipment should not be returned unless written approval and a Return Authorization is received from GatesAir. 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 must be sent freight prepaid and properly packed and insured by the customer. When communicating with GatesAir, specify the GatesAir order number or invoice number and serial number.

2.4 Transmitter Documentation

Prior to installation, this technical manual, the factory test data, and the accompanying drawing package should be studied carefully to obtain a thorough understanding of the principles of operation, circuits, and nomenclature used in the Flexiva FAX series transmitter. This will facilitate proper installation and commissioning. Store the documentation, including the factory test data, in a secure location for future reference.

Note

The information contained in the drawing package should be considered the most accurate in the case of a discrepancy. Document any changes and all external connections, sign and date them, and keep this info with the doc package.

2.4.1 Installation and Outline Drawings

In Section 1 of the accompanying documentation package there are several drawings that will aid in the installation and initial turn-on of the transmitter. It is always a good practice to locate and review all documentation prior to continuing.

In the case that both generic and custom drawings are provided, the generic drawings are superseded by site/model-specific drawings.

Before continuing please be sure that the site AC mains and cooling are adequate for the installation of your transmitter. Pre-Installation information and data for each FAX model can be found in Section 1 of this manual.

WARNING: Disconnect primary power prior to servicing.

2.5 Personnel and Equipment Protection

All electrical equipment can pose a safety hazard if not operated properly or if proper safety precautions are not taken. Every care should be taken during the site planning process to maximize personnel protection on site, both during the installation and once the transmitter has been placed into operation. Below is a collection of recommendations to follow to enhance personnel safety on site.

- Post first aid procedures in a visible location.
- Maintain a well-stocked first aid kit in a visible location.
- Post emergency phone numbers next to all site telephones.
- Install fire extinguishers appropriate for extinguishing electrical fires.
- Maintain a file of Material Safety Data Sheets (MSDS) for any hazardous chemicals on premises.
- Restrict site access to unauthorized personnel and post applicable high voltage and non-ionizing radiation hazard warnings.
- Secure all equipment racks to prevent tip over hazards, especially at sites prone to seismic activity.
- When mounting Flexiva transmitting equipment in a pre-existing rack, be sure to mount equipment low enough in relation to rack center of gravity to prevent a tip over hazard. It is a good practice to bolt rack to the floor.
- Install mains safety disconnects (pull box or emergency off button) in sight of transmitter so as to permit visual verification of mains status at all times while performing maintenance.
- Provide a means to lock out AC mains while performing maintenance to prevent inadvertent electrocution by a second party.

2.5.1 Safety Circuits

The Flexiva FAX series transmitter has provisions for the following safety connections, see Section 2.8 for further details of circuit operation:


Note

The safety circuits are enabled regardless of the Remote Enable/Disable state

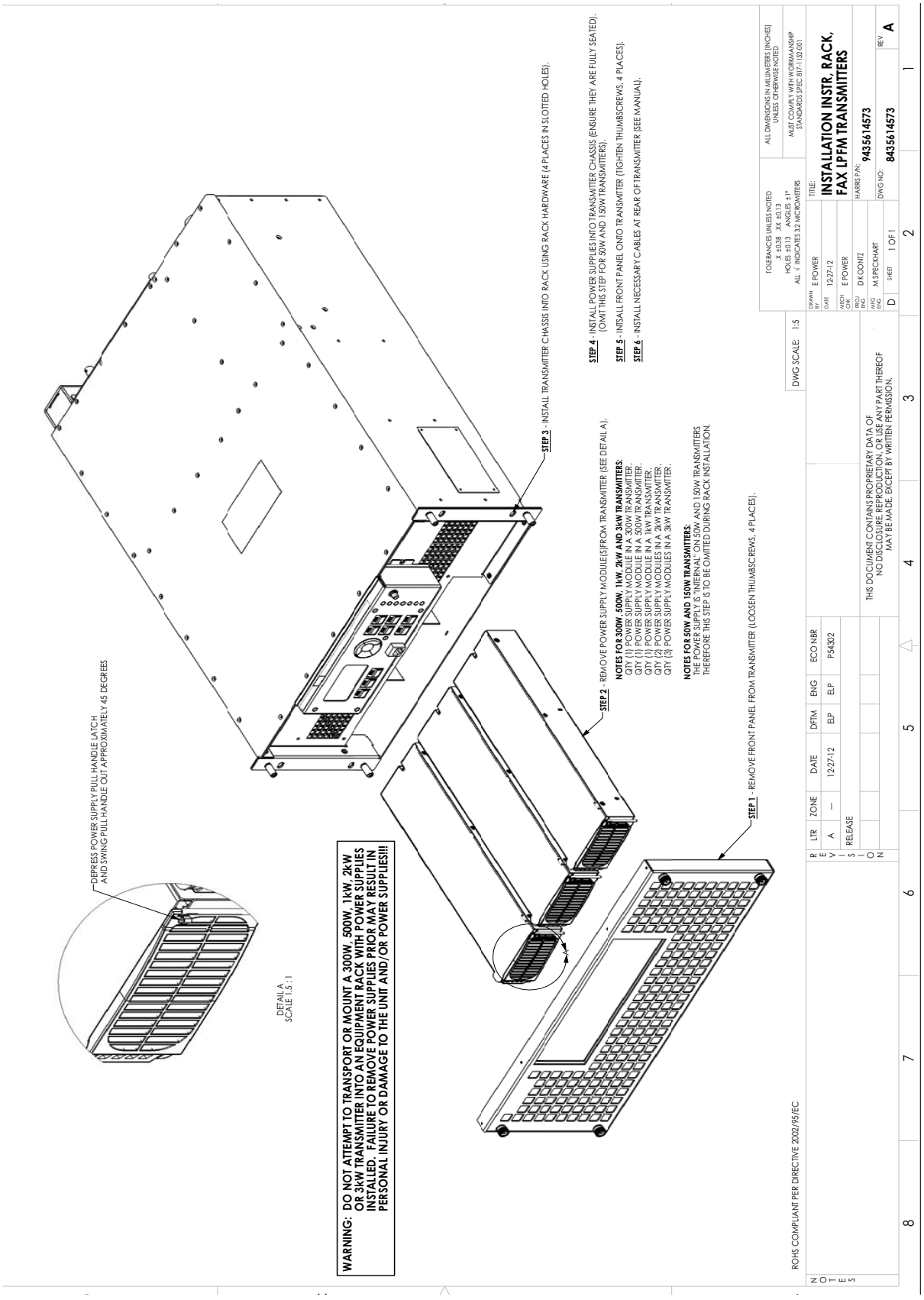
> ***External mute:***
The RF MUTE signal line is available on pin 7 of J10 USER REMOTE connector at the rear of the transmitter. The input is active low input. If the RF MUTE input goes to a logic high, the power control circuits within the amplifier chassis force its RF output to zero, but the 50V DC circuits and cooling fans continue to operate.

> ***External Interlock:***
The EXTERNAL INTERLOCK signal is available on pin 25 of J10 USER REMOTE connector at the rear of the transmitter. The interlock pin must have a continuous connection between pin 25 and Ground (Pin 24) to allow the transmitter to turn ON. The transmitter is shipped with a “dummy” D-sub 25 connector (952-9266-071) with a jumper between pins 24 and 25 to defeat this circuit for initial turn on. If disconnected, this interlock requires a manual or remote "TX ON" command for the transmitter to restart.

> ***Equipment Interlock:***
The EQUIPMENT INTERLOCK signal is available on pins 9 of J10 USER REMOTE connector at the rear of the transmitter. The interlock polarity is configurable to be continuous Active High(Open) (default state from factory) or continuous Active Low (ground). When the interlock is not satisfied, or active, the transmitter turns OFF. When the interlock is satisfied, or non-active, the transmitter returns to its previous operational state ON or OFF. No user interaction is required for the transmitter to turn back to the ON state.

2.5.2 Rack Mounting

If the FAX Compact is to be racked in a customer supplied rack, drawing 843-5614-573 on the next page outlines the steps for installation. Consult the mechanical specifications in Section 1 of this manual to ensure your rack has adequate space, cooling and electrical service to accommodate the FAX.



WARNING: Disconnect primary power prior to servicing.

2.5.3 Transmitter Cooling

If outside air is brought into the building it should be well filtered to keep dirt out of the building and the transmitter. The transmitter should be placed where it will have adequate ventilation and access to the front and rear panels.

Ambient temperature and relative humidity should always range between the following limits at the installation location:

Ambient temperature: 0 to +45^{o}C; derated 2^{o}C per 300 m (1000 feet) AMSL

Relative humidity: max 95% non-condensing

Transmitter cooling is accomplished by the fan(s) built into the transmitter cabinet. In all models of FAX Compact transmitters the cool air is brought in the front panel and hot air is exhausted out the rear. It is important that nothing obstructs this air flow in the front or the rear. Be sure the top of the rack is vented, the fan(s) should be able to blow air freely into the room.

Warning

DO NOT OPERATE THE TRANSMITTER WITH THE LID OFF, THE INTERNAL MODULES WILL NOT GET PROPER COOLING.

Often peripheral equipment such as exciters, processors, controllers, etc., may take in air through their sides or back panels. Do not allow the flow of the transmitter exhaust air to flow into their intake vents. This may cause over heating of the peripheral units. Added peripheral equipment may require a cover or partition to protect it.

If the FAX Transmitter is shipped in a GatesAir equipment rack, the top will be vented. When necessary, peripheral equipment mounts will be covered to prevent exposure to the transmitter exhaust air. Note: If adding any additional components in the same rack, take steps to minimize exposure to the transmitter exhaust air.

2.5.4 Connecting AC Power

Refer to Section 1.6 ECM Data Sheets for detailed information on voltage range, power consumption, and AC wire a circuit breaker sizes for each model. If the FAX Compact transmitter is supplied in a GatesAir cabinet with a AC distribution panel there will be only one AC feed from the wall breaker/fuse panel required. This connection will be made directly to the distribution panel terminal block or breaker. In the case where multiple FAX Compact transmitters are installed in a rack with a single AC distribution panel ensure the AC breaker and wire are sized for the number of transmitters in the rack.

Warning

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

Warning

CHECK THE AC POWER FEEDING THE FAX. IT MUST BE WITHIN THE VOLTAGE RANGES SPECIFIED ON THE MAINS INTERCONNECT WIRING DIAGRAM. ANY VOLTAGE OUTSIDE THIS RANGE WILL CAUSE DAMAGE TO THE EQUIPMENT. THE

VOLTAGE SHOULD BE MEASURED LINE TO LINE, AND IF A NEUTRAL IS USED, LINE TO NEUTRAL.

Warning

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

The following pictures show the AC input connections for each FAX Compact model.

Figure 2-1 FAX AC Power Input

The FAX2/3/3.5 model transmitters are single phase input but can be connected to 3-Phase source. When connecting to a 4-wire WYE power source, be sure to connect between phase and NEUTRAL. When connecting to a 3-wire Closed Delta power source, connect phase to phase and no NEUTRAL is required.

2.5.5 Grounding the FAX and Cabinet

Referring to Figure 2-1 above, notice that each unit has a ground connection near the AC mains input. This should be connect to either the ground bar within the rack or to the station ground. If installing in a rack the rack should be grounded to the station ground by 2" copper ground strap.

2.5.6 RF Output and Sample Connections

The RF output connection is located on the rear panel of the FAX. When making connection to the FAX ensure that the RF coaxial cable does not put undo stress on the RF connector. Ensure that the connection is tightened correctly for the connector style in use. The connection must be made to a good 50 ohm load, either an antenna or dummy load.

Two RF Sample ports are provided for customer convenience. One is located on the front panel and the second port is located on the rear panel. Output levels are approximately -40dBc. These may be used for a modulation monitor or spectrum analysis. Ensure the level from the FAX sample does not overdrive the equipment it is connected to.

2.5.7 Audio Inputs

The audio can be connected to the FAX transmitter at any time during the installation process. Refer to Section 1 for input locations. Refer to Section 3 of this manual for the input level range for the type of audio used and proper setup.

2.5.8 RDS and SCA Inputs

The FAX Compact Modulator board has a built-in Static RBDS Generator. It is setup by connecting a pc to the front panel Ethernet port and accessing the RBDS GUI screen. See Section 3 for further details after the installation has been completed.

If an external Static or Dynamic RBDS Generating system is utilized, refer to that product's Owners Manual for detailed connection and operating information.

The FAX also has two SCA inputs that can be used. See Section 1 of this manual for input location and details of level and frequency capabilities of these inputs and Section 3 for proper setup.

2.6 Initial Turn-on "Transmitter Mode" all models

This procedure provides the steps required to turn on the FAX Compact series as a standalone transmitter for the first time. It is recommended that installation personnel read this entire guide before starting. Refer to the general description in Section 1 of this technical manual, plus the Controls and Operation material in Section 3 to become familiar on how to navigate the LCD menus.

Warning

WHEN THE FAX IS SHIPPED AS A STANDALONE TRANSMITTER, THE OUTPUT POWER WILL COME UP AT 0 WATTS.

STEP 1 Ensure these basic requirements have been met before proceeding:

- Transmitting antenna or terminal resistance (dummy load) of 50 ohms, rated for at least the maximum power of your model, is connected to RF output.
- All rack-mounted units have continual AC mains safety ground connection via green/yellow conductor (third prong) back to main safety ground at AC service entrance.
- Suitable AC mains service connected to transmitter with overload protection (properly sized breakers) and surge protection devices installed.
- Transmitter rack and all rack-mounted units have protective RF earth grounding.
- Fan exhaust and air inlet openings are not blocked, and all necessary duct work is in place where applicable.
- Original factory test data sheet shipped with transmitter is on-hand and ready for consultation.
- Verify the GatesAir supplied connector that defeats the External Interlock is installed on J1 USER REMOTE connector on the rear panel of the FAX. If the connection between J1-24 and J1-25 is not closed the transmitter will not operate.

STEP 2 Switch on AC mains power. The FAX should power up with the OFF button illuminated. In the FAX50/150 the power supply fan will start running. In the higher power models the power supply fans will operate at slow speed. The transmitter cooling fans in these models will run when the ON button is pressed or at elevated internal temperatures.

STEP 3 Verify the lower most AC Input LED on each power supply module is illuminated Green, (requires the front panel to be removed). (No PS Led's on the 50/150W models.) The Green DC Output LED above the AC Input LED will be off until the transmitter is turned on.

STEP 4 Verify the transmitter frequency by using the “Setup Menu”. Goto SETUP>>TX CONFIGURE>> FREQ. If necessary set the frequency.

Note

If the transmitter has been calibrated at a single frequency (tilt has not been setup) changing frequencies will cause the forward and reflected power calibrations to be invalid. See Section 5.6 for calibration procedures.

STEP 5 Before turning the transmitter on, verify the RF power is configured to come up to the power required for your system. This step will ensure that your antenna and load will not be overdriven. Goto SETUP>>TX CONFIGURE>> TPO. Set the TPO to the transmitter operating power, ie the power that is required to properly drive the antenna. The TPO setting sets where the transmitter power will be limited, which is 10% above this setting. This setting also sets the reference level for RF power warning and fault detection.

STEP 6 Goto SETUP>>TX CONFIGURE>> PWR SET. This is set to 0 Watts before leaving the factory. This setting is the actual power out of the transmitter. It can be set in the range of 0 Watts to 10% above the TPO setting. The power can be brought up slowly in increments using this setting. Set the PWR SET to desired power level.

STEP 7 Turn ON transmitter via front panel ON button. Verify following actions take place:

- The light above the ON button illuminates Green.
- Front panel STATUS LEDs remain Green (if PWR SET is less than the configured TPO, the output light could be Out or Red).
- Amplifier ramps up from zero to the power set in Step 6 above, as indicated on the front panel LCD display.
- All LEDs illuminate Green on the Power Supplies and front panel.

STEP 8 Replace front panel and allow transmitter to operate for thirty minutes to warm up.

STEP 9 Inspect output transmission line to antenna for signs of localized heating.

STEP 10 If infrared inspection equipment is available, check AC mains connections, disconnect switches, circuit breakers for signs of excessive heat rise.

STEP 11 If the PWR SET was not set to full power, set it up to the TPO and repeat Steps 9-11.

STEP 12 Verify the APC voltage is 3.0 VDC ± 0.25 VDC. The APC voltage is easier to monitor with a computer connected to the Web GUI of the FAX, See Section 3.8. If the voltage is outside this range, adjust the Internal APC Gain (%) field until it is in range.

STEP 13 If transmitter is operating at the same power level as tested in the factory, verify all meter readings closely match those recorded on factory test data report.

STEP 14 Take complete set of as-installed readings and save for future reference.

STEP 15 Retain packing materials in a safe, dry location. These could be useful should it become necessary to return the equipment to GatesAir or ship equipment to another site at a future date.

STEP 16 Go to section 3 of this manual for a detailed tutorial on how to navigate the front panel LCD screens and access the GUI screens.

STEP 17 If not already completed, the audio can now be setup and connected to the transmitter.

STEP 18 If using an external parallel remote control unit, go to Section 2.8 for connection and circuit description information. The transmitter will have to be put in ENABLE on front panel for the interface to respond to commands.

STEP 19 Now is a good time to download and save the Configuration file from the transmitter. This file is useful in the event of a failure of the Modulator card. It will save the time of having to manually re-enter all the setup in the transmitter. See Section 3 and Section 5 for detailed procedure and connection information.

Note

The configuration file only contains the setup of the transmitter and does not contain calibration factors. If replacing the modulator card calibration will be required.

STEP 20 This completes the initial startup procedure as a standalone transmitter.

2.7 Initial Turn-on "Exciter Mode" (FAX50/150 Only)

This procedure provides the steps required to turn on the FAX Compact series as an Exciter for the first time. This procedure is for operation in the FM Only mode, not for any type of HD operation. It is recommended that installation personnel read this entire guide before starting. Refer to the general description in Section 1 of this technical manual, plus the Controls and Operation material in Section 3 to get familiar on how to navigate the LCD menus.

Before proceeding ensure that these basic requirements have been met:

- All rack-mounted units have continual AC mains safety ground connection via green/yellow conductor (third prong) back to main safety ground at AC service entrance.
- Suitable AC mains service connected to exciter with overload protection (breakers) and surge protection devices installed.
- Fan exhaust and air inlet openings to exciter are not blocked

2.7.1 Transmitter Interface Cable and RF Connection

In applications where the FAX Compact is used as an Exciter for FAX High Power or other GatesAir manufactured transmitters an interface cable is required for the purpose of logic control. This cable will be a 15 pin d-sub straight through and pin for pin compatible.

If using the FAX as an exciter in another manufacturers product, Table 2-1 below gives details of the transmitter interface connections. It will be up to the customer to make a compatible cable for this type of installation.

The RF output from the FAX exciter is a Type "N". A 50 ohm coax cable will be required to connect to the transmitter.

Table 2-1 TRANSMITTER INTERFACE (D-sub 15, amplifier rear)

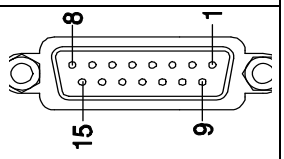
Designation	Remarks	Pin	
GND	Signal ground	1	
FORWARD POWER SAMPLE	Exciter Forward Power analog voltage (0-4 VDC linear scale); Scaling available via Remote GUI	2	Output
RS485	RS485 + (to communicate to FAX HP transmitter)	3	Input/Output
FM_ON_STATUS	Exciter grounds pin to indicate FM Only mode (continuous closure).	4	Output

Table 2-1 TRANSMITTER INTERFACE (D-sub 15, amplifier rear)

Designation	Remarks	Pin	
HD_ON_STATUS	Exciter grounds pin to indicate HD carriers are on (continuous closure).	5	Output
EXC_SUM_FAULT	User selectable polarity Active Hi or Active Lo via Remote GUI	6	Output
Spare		7	
PA_APC	Analog Power Control voltage input to control RF Output power. 0-5 VDC	8	Input
MUTE	User selectable polarity Active Hi or Active Lo via Remote GUI	9	Input
REFLECTED POWER SAMPLE	Exciter Reflected Power analog voltage (0-4 VDC linear scale); Scaling available via Remote GUI	10	Output
RS485	RS485 - (to communicate to FAX HP transmitter)	11	Input/Output
N/C	No connection	12	n/a
EXCITER ACTIVE	Used by main/alt exciter switcher exciter is selected. Low=Exciter B;High=Exciter A Set by rear panel switch to determine if unit is Exc A or Exc B	13	Input
FAST MUTE	User selectable polarity Active Hi or Active Lo via Remote GUI	14	Input
EXCITER_READY	User selectable polarity Active Hi or Active Lo via Remote GUI	15	Output

2.7.2 FAX150 Setup as Exciter in FAX5/10/20/30/40 FM Only Mode

Before continuing with this procedure it is best that the user go through Section 3 of this manual to become familiar with the LCD menus and connecting to the remote GUI. This will be essential to completing the setup of the FAX as an exciter. This procedure utilizes the External APC input on the Transmitter Interface to control the power output of the exciter and ultimately the transmitter.

Note

To disable the exciter On/Off buttons so the exciter is On at all times, switch SW15-2 to ON on the Control&Display board in the FAX150. Select ON and set Remote to Enable.

STEP 1 Switch on mains power. The FAX Compact should power up with the OFF button illuminated. In the FAX50/150 the power supply fan will start running. The transmitter cooling fans only run when the ON button is pressed.

STEP 2 On the rear of the FAX150 Exciter set dipswitch SW1 (Right Switch **ONLY**) OFF (Down) if Exciter A and ON (UP) if this is exciter B.

Warning

ENSURE LEFT RESET SWITCH SW1 ON REAR PANEL DOES NOT GET SET ON (UP). IF SWITCH IS UP AND AC POWER IS CYCLED, THIS WILL WIPE OUT CONFIGURATION AND SET THE FAX150 BACK TO INITIAL DEFAULTS AND TRANSMITTER WILL NOT OPERATE.

STEP 3 Verify the exciter is in correct mode by using the exciter Setup Menu. Goto SETUP>>TX CONFIGURE and verify the following:

- Freq - Set to the correct FM carrier frequency if necessary
- INT RF MODE - Set to FM

- APC MODE - Set to EXT APC

STEP 4 It is now necessary to log into the web GUI. If not already familiar with how to do this, goto Section 3 of this manual, completely read this section for help in connecting a computer to the transmitter.

STEP 5 After logging into the GUI, at the home page click on the EXCITER>>Internal Exciter>>I/O icons. For the Mute Input verify the following:

- Fast Mute Input - Enabled
- Fast Mute Setup - Pull Up
- Fast Mute Polarity - Active Low

STEP 6 Click NEXT and verify the Exciter Summary Fault and Ready Status per the following:

- Sum Fault - Enabled
- Sum Fault Setup - Pull Up
- Sum Fault Polarity - Active Low
- Rdy Status - Enabled
- Rdy Status Setup - Pull Up
- Rdy Status Polarity - Active Low

STEP 7 Click NEXT and set the RF Gain field to 0. This will limit the maximum power out of the exciter to approximately 16 Watts. This should not need to be changed for use as an exciter in FAX high power transmitters.

STEP 8 On exciter LCD goto SETUP>>TX CONTROL menu and set the following:

- EXT APC LMT - Set to 4095
- EXT APC GAIN - Set to 0% (0 Watts out for starting point)

STEP 9 On the Transmitter (Pwr Blk) LCD go to SETUP>>EXCITER SETUP. Set EXC SELECTED to A or B whichever the FAX150 exciter is connected to. Set EXC TYPE to FAX.

STEP 10 The Transmitter (Pwr Blk) has dipswitches on the System Interface/Multi-Unit Interface that require setting for the exciter model in use. There are 2 switches, S5 for Exciter A and S6 for Exciter B, per the table below set the dipswitch that corresponds to the which port the exciter is connected to (x= 5 or 6):

- Sx-1=ON;Sx-2=ON;Sx-3=ON;Sx-4=ON;Sx-5=ON;Sx-6=OFF;Sx-7=ON;Sx-8=OFF

STEP 11 This procedure assumes the FAX5/10/20/30/40 power output has previously been calibrated. On the FAX Transmitter (Pwr Blk) LCD set the following:

- Set EXC ON AIR A or B whichever the FAX150 is connected to
- If dual exciters, set the EXC SW MODE to MAN. This will inhibit the auto switching function in the transmitter since the power out of exciter will start at 0 watts.
- On the LCD menu go to SETUP>>TX CONTROL and set APC to OFF. This will keep APC voltage constant so the exciter power can be set to transmitter TPO that is was originally calibrated at.

STEP 12 Verify the FAX150 is communicating with the Power Block. On the Transmitter (Pwr Blk) LCD go to STATUS>>EXCITER>>MODULATOR1>>EXCITER STATUS, the FREQ should match what is programmed in the FAX150. If this field is 00 MHz, there is likely a communication problem between the exciter and the power block. As long as the transmitter is in the FM only mode this procedure can be completed. The communications issue can be resolved after.

STEP 13 Turn the Transmitter ON, it should startup but the power out should be 0 Watts. Turn the Exciter ON, verify that the FAX150 is unmuted with 0 Watts output. The exciter should now be left ON at all times, the transmitter will mute and unmute the exciter when it needs to.

STEP 14 On the Exciter go to SETUP>>TX CONTROL>>EXT APC GAIN. Slowly increase this value until the transmitter reaches its calibrated TPO. The RF power will not start to increase on the meter until the exciter APC Gain is in the 20 to 30% range (approximate value). This value increases in 0.4% steps, set it to a value closest to the TPO as possible. It does not have to be exact, when the APC is turned on the transmitter will raise/lower the power to the TPO.

STEP 15 Let the transmitter run for approximately 30 minutes, this will allow the temperature in the PA modules to stabilize. As the temperature stabilizes over time the gain will need to be adjusted to get the transmitter back to TPO by adjusting the EXT APC GAIN setting.

- Once the power output of the transmitter has stabilized, turn the transmitter APC back on, the transmitter should now run at the TPO it was calibrated at.

STEP 16 In the FAX high power transmitter LCD go to SETUP>>EXCITER SETUP>>EXC POWER CAL menu. The EXC PWR filed should show a DC voltage, this needs to be set to approximately 2 VDC with the transmitter running at TPO. The next step will set this voltage from the exciter.

STEP 17 On the exciter GUI click on Exciter>>Internal Exciter>>I/O>>Next>>Scaling. Set this page per the following.

- Forward Power - set this field until the DC voltage in the FAX HP transmitter EXC PWR is 2 VDC as in Step 16.
- Reflected Power - Set to 1, sets scaling of reflected power so 4 VDC= 1 watts
- Current - Set to 2, sets scaling of power supply current so 4 VDC= 2 Amps.

STEP 18 If the transmitter has dual exciters the exciter threshold can now be set. See the FAX high power transmitter manual for detailed setup procedure.

STEP 19 On the exciter goto the SETUP>>TX CONFIGURE menu, set the TPO PWR to match the exciter power out. This sets the 100% point of the bargraph on the GUI Home screen.

STEP 20 Now is a good time to download and save the Configuration file from the transmitter. This file is useful in the event of a failure of the Modulator card. It will save the time of having to manually re-enter all the setup. See Section 3 and Section 5 for detailed information.

Note

The configuration file only contains the setup of the transmitter and does not contain calibration factors. If replacing the modulator card calibration will be required.

STEP 21 End of setup

2.7.3 Setup External RF Input

This setup is for using the External RF Input with an external exciter connected to it. The external RF Input accepts a RF signal in the range of 0 to +10 dBm, exceeding +10 dBm will damage the input to the FAX transmitter.

Warning

DO NOT EXCEED +10 DBM (10 MW) ON THE EXTERNAL RF INPUT TO THE FAX OR DAMAGE TO THE INTERNAL COMPONENTS WILL OCCUR.

Warning

THE FAX COMPACT SHOULD HAVE BEEN SETUP AND CALIBRATED AT THE PROPER FREQUENCY, POWER LEVEL AND OPERATING MODE PRIOR TO ATTEMPTING TO USE THE EXTERNAL RF INPUT AS A SOURCE.

Note

The External RF Input is not setup for use as dual exciters. If the External Source is setup as primary and it fails, the auto switching function will put the internal modulator on the air. However, if the internal modulator is the primary RF source and it fails there is no provision to switch to the External RF input as a backup.

STEP 1 Turn the FAX ON using the internal RF source and verify the transmitter is set to the correct power and the UC Attenuation voltage is at 3 VDC. Turn the transmitter OFF.

STEP 2 Setup the external RF source so the level at the input to the FAX EXT RF Input is +5 dBm (3.1 mW). It may require the RF source to run at a higher power and then be attenuated to achieve +5 dBm. For example set the RF source to 3.25 W (+35 dBm) add a 30 dB pad with a 20 W dissipation level to achieve the correct level at the FAX input.

The following is an example using a GatesAir Flexstar.

- Set the Flexstar to 3.25 W (+35 dBm) out
- Set the Flexstar limit so the power cannot increase above 6.5 W (38.1 dBm) to keep it below the +10 dBm Max input level
- Set the Flexstar to Internal APC
- Connect the Flexstar RF out to a 30 dB 20 Watt attenuator
- Connect the output of the attenuator to the External RF Input of the FAX

STEP 3 Connect a computer to the Ethernet port and log into the FAX. See Section 3 for connection details.

STEP 4 Go to the Drive Chain menu on the GUI and set the following parameters:

- Set EXT RF SOURCE to ENABLE
- Set Set RF SW MODE to Manual
- Set PRI RF SOURCE to External
- Set EXT RF MODE to match the external exciter mode, FM, FM+HD or HD

STEP 5 On the GUI System>>SETUP screen ensure the APC Mode is set to Internal

STEP 6 On the GUI Drive Chain screen verify the Ext RF Detector is approximately +5 dBm (3.1 mW), if not adjust the exciter power until it is +5 dBm.

STEP 7 Turn the FAX ON, the output should go to the SET PWR level

STEP 8 On the GUI Exciter>>Internal Exciter>I/O>>Scaling (Click Next 2 times), verify UC Attenuation is 3.0 VDC +/-0.1. If not adjust the external RF source for 3.0 VDC

STEP 9 Verify the EXT RF Detector is +5 dBm +/-2 dB.

STEP 10 FAX power should remain at the Set Power Value.

STEP 11 If the Internal source is to be used as a backup in the event the external source fails, on the GUI Drive Chain screen set RF SW MODE to Auto

STEP 12 End of procedure.

2.8 User Remote Control Connection

The 25 pin female connector labeled J10 “User Remote” is located on the rear panel of the transmitter. It can be used for remote control and monitoring on all FAX transmitter systems. The Table 2-2 provides the pinout for control, status, and metering functions.

The provided connector that was used to defeat the interlock for the initial turn on of the transmitter can be replaced with the new cable. However, "EXTERNAL INTERLOCK" must have a continuous ground to satisfy the interlock, J1-24 to J1-25, so the transmitter will operate.

There is an optional Remote Control Breakout board that converts the connections from the dB-25 to a terminal block with screw-down connections. GatesAir Part Number 901-0218-201G.

Figure 2-2 shows input and output circuits with maximum voltage and current for the Status Outputs. Status Outputs are open collector outputs and require an external pull up. All Status Outputs are active low unless otherwise stated in Table 2-2.

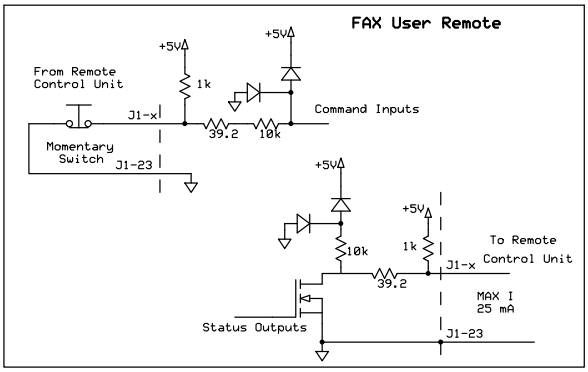
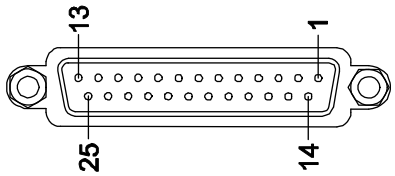


Figure 2-2 Remote I/O Circuits

Table 2-2 USER REMOTE (D-sub 25, amplifier rear)



Designation	Remarks	Pin	Type
TX ON COMMAND	Momentary. Ground pin to turn transmitter on.	1	Input
TX OFF COMMAND	Momentary. Ground pin to turn transmitter off.	2	Input
POWER RAISE COMMAND	Momentary Ground pin to raise output power	3	Input
POWER LOWER COMMAND	Momentary Ground pin to lower output power.	4	Input
Command Input	User Programmable via GUI See Section 3.	5	Input
Command Input	User Programmable via GUI See Section 3.	6	Input
EXTERNAL MUTE	Active Low - Continuous Ground Mutes the transmitter; Open - transmitter RF un-Mutes	7	Input
LOW POWER	Active Low - Continuous Ground sets transmitter into Low Power Mode, power user settable from 0 - 100% TPO; Open returns to Normal Power Mode	8	Input
**EQUIPMENT INTERLOCK	Active High/Low (active state set in GUI) - Continuous High/Ground turns transmitter OFF; Open returns automatically to previous state(No user ON command required)	9	Input

WARNING: Disconnect primary power prior to servicing.

Table 2-2 USER REMOTE (D-sub 25, amplifier rear)

TX ON Status	Active Low - Transmitter ON;Hi - Transmitter OFF	10	Output
REMOTE RESET	Momentary Low causes a Modulator Reset	11	Input
Not Connected		12	N/A
Command Input	User Programmable via GUI See Section 3.	13	Input
Command Input	User Programmable via GUI See Section 3.	14	Input
Status Output	User Programmable via GUI See Section 3.	15	Output
Status Output	User Programmable via GUI See Section 3.	16	Output
Status Output	User Programmable via GUI See Section 3.	17	Output
Status Output	User Programmable via GUI See Section 3.	18	Output
FORWARD POWER	4.00VDC = Forward Power Scaling Value GUI: Home>System>TX Setup>User Remote>Scaling	19	External Metering Output
REFLECTED POWER	3.5VDC = 1.5:1 VSWR; 3.0VDC= 1.3:1 VSWR	20	External Metering Output
PA VOLTAGE	4.095VDC = 50VDC	21	External Metering Output
PA CURRENT	4.095VDC = 50A for 2kW FAX 4.095VDC = 25A for 1kW FAX	22	External Metering Output
GROUND	Ground	23	GND
Interlock GROUND Note 1	**Ground	24	GND
**SAFETY INTERLOCK	External Interlock Input. Default is Active Low and continuous ground required for transmitter to operate. Open circuit causes transmitter to stay in OFF state. Requires return of low state and manual ON command for transmitter to operate.	25	Input

NOTE 1 - On Modulator boards prior to Revision G, Pin 24 was Interlock 5 VDC Output. To match legacy GatesAir products this was changed to a Ground Interlock System on Rev G boards and newer.

**** These inputs operate regardless of Remote Enable/Disable state. All others require Remote Enable**

Note

See Section 3.8.11 and 3.8.13 for available settings for Programmable Status Output and Programmable Command Input functionality.

3 Section-3 Operation

3.1 Introduction

This section contains normal day-to-day operational procedures and information pertaining to the function of the Flexiva FAX Compact Transmitters. See Section 2 of this manual for installation and initial turn on steps. It is important that the operator be aware of normal transmitter operation and performance and note any changes or fault indications. Changes in operation may indicate a need for maintenance or corrective action before a more serious problem develops. Refer to the factory test data which includes meter readings, measured performance data, information and data measured with external equipment, and adjustments specifically for each transmitter's operating frequency and power level.

The screens and menus shown in this manual were taken from the FAX150 unit and may vary slightly in the higher power models. All information in the manual pertains to all models and differences between models should be noted.

3.2 Controls and Indicators

The following section identifies the location and function of all front transmitter controls and indicators required for operation of the FAX Transmitters.

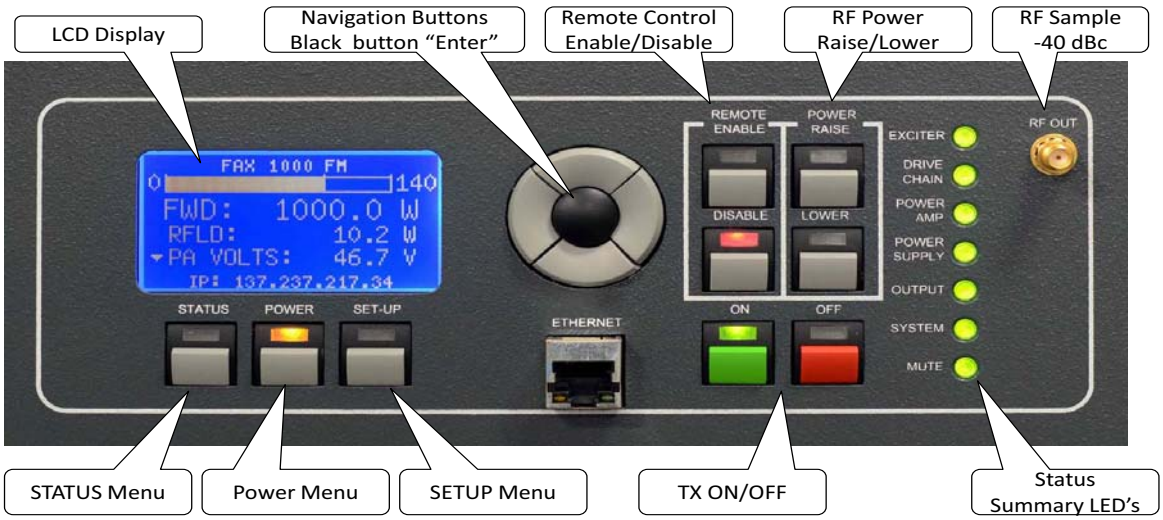


Figure 3-1 Front Panel Controls

Referring to Figure 3-1, the information displayed in the LCD are as follows:

- Top Line - Displays FAX + Model and operating mode; 1000 is the power level of the transmitter (FAX1k); FM is the modulation mode (FM,FM+HD or HD)
- Bargraph - Modulation%, vertical bar is 100%, maximum deviation is 140%
- IP: - IP address of **rear** Ethernet port.

WARNING: Disconnect primary power prior to servicing.

Note

Front Ethernet port address is 192.168.117.88 and is a DHCP Server. This is a local service port only. Do not plug LAN into this port!

Table 3-1 Front Panel Control Buttons

Field	Explanation
STATUS	Displays the Status Menu.This includes event log, meter readings, etc
POWER	Displays model number, forward/reflected power levels
SETUP	Displays the set-up menus on the LCD to configure and calibrate the transmitter.
UP/DOWN/LEFT/RIGHT	Used for LCD menu navigation. The up and down buttons are used to move the arrow cursor, which indicates the menu line that will be activated by pressing the black enter button. The left button is primarily used as a back button to return to a previous menu selection.
ENTER	This is the black button in the center of the UP/DOWN/LEFT/RIGHT buttons. Used to select or expand LCD menu items.
REMOTE ENABLE	Allows remote control of the FAX. Includes parallel, IP, SNMP. See Note
REMOTE DISABLE	Disables remote control of the FAX. Includes parallel, IP, SNMP. See Note
POWER RAISE	Pressing POWER RAISE will adjust the RF power output
POWER LOWER	Pressing POWER LOWER will adjust the RF power output

Note

Transmitters shipped starting August 2013, Remote must be enabled to control transmitter via rear Ethernet port and remote must be disabled to control transmitter via front Ethernet port.

3.2.1 Summary Status LEDs

- Exciter: Monitors the status of the built-in Exciter on the Modulator Board
- Drive Train: Status of IPA (or Pre-Driver)
- Power Amp: Indicates summary status of all PA’s
- Power Supply: Indicates summary status of all Power Supply Modules
- Output: Monitors RF output status including VSWR, foldback conditions and Forward Power Limit
- System: Summary status control, cooling and interlocks
- Mute: Indicates status when the RF output is muted for any reason

Table 3-2 Summary Status LEDs

Status LEDs	States	Explanation
EXCITER	Green = OK Amber/Yellow = Warning Red = Fault	Represents the status of the Exciter.
DRIVE CHAIN	Green = OK Amber/Yellow = Warning Red = Fault	Represents a summary status of the Predriver/IPA
POWER AMP	Green = OK Amber/Yellow = Warning Red = Fault Off = N/A	Represents a summary status of the FAX PA Modules.
POWER SUPPLY	Green = OK Red = Fault	Represents a summary status of the internal power supplies
OUTPUT	Green = OK Amber/Yellow = Warning Red = Fault	Represents the status of the RF output for the system. When the transmitter is switched off, the OUTPUT LED is off **Green:** The transmitter is switched on, and the RF output level is greater than the FWD POWER THRESH (also called FWD LOW PWR WARNING) setting. **Yellow:** The transmitter is switched on, but the RF output level is below the FWD PWR WRN THRESH setting, the forward power limit has been reached or the transmitter is in Foldback **Red:** The transmitter is switched on, but the RF output is below the FWD PWR FLT Threshold setting or the VSWR has exceeded 1.5:1.
SYSTEM	Green = OK Amber/Yellow = Warning Red = Fault	Represents a summary status of the transmitter system. Yellow means transmitter is operating but the system is not in a completely normal mode. Event log should be looked at for further details
MUTE	Green = OK Red = MUTED	Indicates the transmitter is switched on, but the RF output is presently muted.

3.3 Front Panel Operation

The following information is a tutorial for the first time user on how to navigate through the screens to observe operation data, perform setup and calibration procedures via the front panel LCD.

3.3.1 ON/OFF Operation

To turn the transmitter ON from the front panel press the Green ON button. The following should occur:

- Green ON button LED should illuminate
- Power supply internal fans turn on
- Fans should turn on
- RF should ramp up from 0 watts to PWR SET

To turn the transmitter OFF from the front panel press the Red OFF button. The following should occur:

- Red OFF button LED should illuminate
- Power supply fans turn off
- Fans should turn off
- RF should ramp down from PWR SET to 0 watts

Note

The Front panel Forward Power meter reading is slow to react. The actual forward power ramps up to full power very quickly.

3.3.2 Power Raise/Lower Procedure

To raise or lower power, press and hold the RAISE or LOWER button until the desired power level is reached. When the FAX is used as an exciter, these buttons are disabled.

Note

Small time delay: When pressing the RAISE or LOWER buttons, a small delay occurs before the transmitter power actually changes. The same is true when releasing the RAISE or LOWER button. The output power will continue to change momentarily upon release. This is normal. The control circuits are scanning all of the critical functions and parameters of the transmitter to protect it from an overload. This creates the slight delay. When setting the power out to a very specific level, release the buttons before the desired power level is reached. Then give short momentary presses to nudge the power to the exact level desired.

3.3.3 Remote Enable/Disable Buttons

Pressing the Remote Enable button allows the transmitter to be controlled by a customer provided remote control system. When connected to the rear Ethernet port and using the remote GUI or SNMP, no changes can be made unless the Remote is ENABLED. When connected to the front Ethernet port and using the remote GUI, no changes can be made unless the Remote is DISABLED.

Caution

WHENEVER WORK IS BEING PERFORMED ON THE TRANSMITTER SYSTEM, ALWAYS DISABLE THE REMOTE CONTROL SYSTEM BY PRESSING THE DISABLE

BUTTON. THIS WILL PREVENT ANOTHER OPERATOR FROM TURNING THE TRANSMITTER ON WHILE WORK IS BEING PERFORMED ON IT.

Caution

ALWAYS CHECK TO VERIFY THE REMOTE ENABLED LED IS ILLUMINATED BEFORE LEAVING THE TRANSMITTER SITE. A REMOTE CONTROL SYSTEM CANNOT GAIN CONTROL OF THE TRANSMITTER IF THE DISABLED LIGHT IS ILLUMINATED. THIS IS AN IMPORTANT SAFETY FEATURE. IF NO REMOTE CONTROL SYSTEM IS UTILIZED, THEN LEAVE THE TRANSMITTER IN THE "REMOTE DISABLE" MODE.

3.4 LCD Navigation Tutorial

The navigation button is comprised of 5 separate buttons. Left, Right, Up, Down, and the center black ENTER button. These buttons allow you to navigate through the POWER,STATUS and SETUP menu screens by scrolling up or down, and left and right to select different pages. The left button sometimes works as a "Back" button to go back one screen.

Looking at Figure 3-2 left screen, there is an arrow on the left side by TX CONTROL. The arrow indicates the that there is a more menus or information that can be viewed under TX CONTROL by pressing the ENTER button.

In the case of a triangle shape on the left side of the screen, as in Figure 3-2 right screen, this indicates that there is more information that can be viewed by using the UP/DOWN button.

Caution

THERE IS A DIPSWITCH SETTING ON THE CONTROL/DISPLAY BOARD THAT LOCKS THE FRONT PANEL OUT WHEN REMOTE IS ENABLED. IF THE SWITCH IS SET TO FRONT PANEL DISABLE, NO CHANGES TO SETUP CAN BE MADE UNTIL THE REMOTE IS DISABLED. SEE SECTION 5 DIPSWITCH SETTINGS FOR DETAILS.

Figure 3-2 LCD Screen Navigation

In the SETUP menu there are several selections that can be made to configure, control and calibrate the transmitter. When navigating the SETUP menu, the following steps can be used as an example on how to make changes. In this example the Date will be changed. After pressing the SETUP button, scroll down to SYSTEM SETUP, press ENTER and the display should be as shown in Figure 3-3 left screen.

Figure 3-3 Date Setup

The DATE screen will display the current date (month/day/year) information. If you press the ENTER button when the arrow is next to the selection you wish to change, the selection will be highlighted like DAY in Figure 3-3 right screen. To change an entry such as DAY, highlight it, then use the up or down buttons to change the number. When the number is correct, press the ENTER button and the highlight will go away and the entry will stay. To actually store the date, highlight "APPLY DATE" by pressing the ENTER button. With the selection highlighted, press the ENTER button again, once the highlight clears the date is saved. This procedure is common to most items in the menu. The best way to get familiar with the menus and the operation is to spend time going through all sections of the LCD menu system.

3.5 Power Button Menu

The Power Button light illuminates automatically whenever the transmitter AC Mains is turned ON. This is the default home screen. It provides the operator a Modulation bargraph, Forward power, Reflected power, PA Voltage and Current information immediately without having to access it. To view this screen whenever another screen is being displayed, simply press the POWER button.

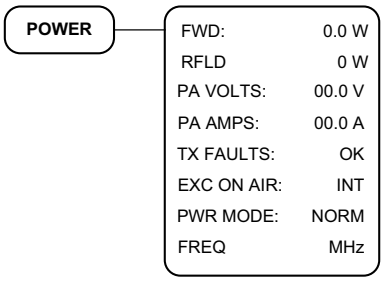


Figure 3-4 POWER Menu

3.6 Status Button Menus

Pressing the Status button allows the user access to specific status information including the transmitter FAULT LOG, EXCITER status, POWER AMP, OUTPUT status and meters, etc. Status menus are strictly read only, all setup of the transmitter is done under the SETUP menu.

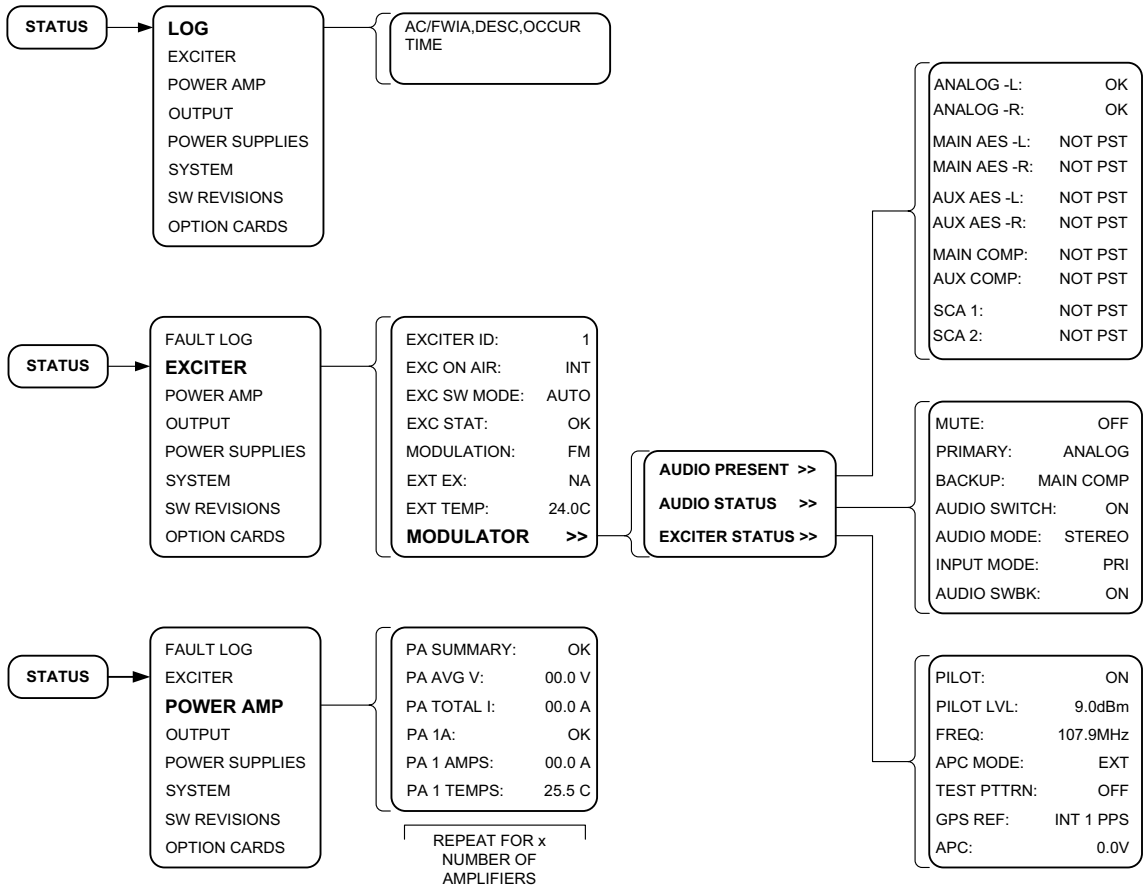


Figure 3-5 STATUS Menu

WARNING: Disconnect primary power prior to servicing.

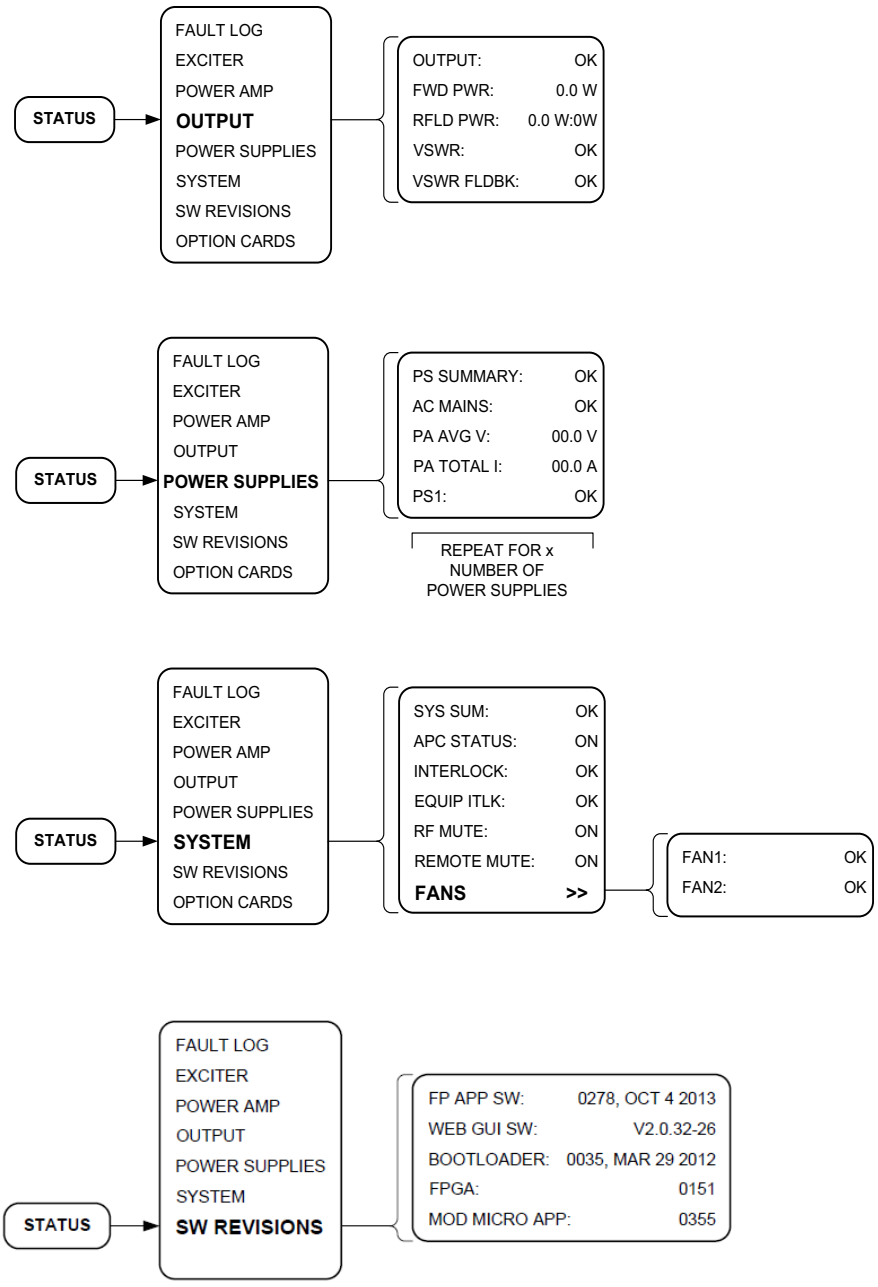


Figure 3-6 STATUS Menu Continued

3.6.1 LOG Fault/Event

The Log displays information about events and faults that have occurred in the transmitter. The faults can be both active and cleared faults. On the LCD the active faults will be highlighted, pressing the ON button on the front panel will attempt to reset any faults that are no longer active but may show up highlighted in the log. If the fault returns after pressing the ON button they are still active faults. If the fault is cleared by pressing the ON button it will show as cleared in the log. Once the log is full, the oldest entries will drop out as new ones are entered.

There are four possible entries in the LOG:

F = Fault; W = Warning; I=Information; A = Action(or Event)

The following is an example of a Fault:

F Sys Fwd Pwr 9/28 13:10

System Forward Power Level Fault

9/28 13:10 = Time and date fault occurred or cleared

The following is an example of a Action:

A TX OFF CMD 9/28 13:10

The transmitter was issued an OFF command at 13:10 on 9-28

3.6.2 STATUS>>EXCITER Menu

Displays information about the status of the internal exciter.

Table 3-3 STATUS>>EXCITER Menu

Menu	Description
EXCITER ID:1	1=Exciter A; 2=Exciter B; set by Switch on rear panel right section ONLY
EXC ON AIR: INT	INT is the internal Modulator card; EXT is an external exciter. An external RF source cannot exceed +10 dBm (Range 0 to +10 dBm)
EXC SW MODE: AUTO	Switching to backup RF Source, can be AUTO or Manual. EXT Source must be enabled.
EXC STAT: OK	OK or Fault;
MODULATION: FM	FM;FM+HD;HD
EXC EX: NA	External Exciter (Optional)
EXT TEMP: 24.0C	Temperature measured on the Control and Display board
MODULATOR>>	Expands to AUDIO PRESENT,AUDIO STATUS and EXCITER STATUS

3.6.3 STATUS>>EXCITER>>MODULATOR Menu

Table 3-4 STATUS>>EXCITER>>MODULATOR>>AUDIO PRESENT

Menu	Description
ANALOG-L: OK	OK- Audio is present and within range; NOT PRES - No audio is detected
ANALOG-R: OK	OK- Audio is present and within range; NOT PRES - No audio is detected
MAIN AES-L: NOT PRES	OK- Audio is present and within range; NOT PRES - No audio is detected
MAIN AES-R: NOT PRES	OK- Audio is present and within range; NOT PRES - No audio is detected
AUX AES-L: NOT PRES	OK- Audio is present and within range; NOT PRES - No audio is detected
AUX AES-R: NOT PRES	OK- Audio is present and within range; NOT PRES - No audio is detected
MAIN COMP: NOT PRES	OK- Audio is present and within range; NOT PRES - No audio is detected
AUX COMP: NOT PRES	OK- Audio is present and within range; NOT PRES - No audio is detected
SCA 1: NOT PRESPRES	OK- Audio is present and within range; NOT PRES - No audio is detected
SCA 2: NOT PRES	OK- Audio is present and within range; NOT PRES - No audio is detected

Table 3-5 STATUS>>EXCITER>>MODULATOR>>AUDIO STATUS

Menu	Description
MUTE: OFF	RF Mute ON=muted; OFF=unmuted
PRIMARY: ANALOG	Primary source of audio; Analog, Main/AuxAES or Main/AuxComp
BACKUP: MAIN COMP	Backup source of audio; Analog, Main/AuxAES or Main/AuxComp
AUTO SWITCH: ON	Auto switching to backup audio source is enabled or disabled; Switching parameters are set in the SETUP>>EXCITER SETUP>>AUDIO SETUP Menu
AUDIO MODE: STEREO	Stereo or Mono mode
INPUT MODE: PRI	Primary or Backup audio source that is currently on-air
AUDIO SWBK: ON	ON allows for automatic switchback of audio source once the audio has returned. Switchback is based on the parameters set in SETUP>>EXCITER SETUP>>AUDIO SETUP Menu

Table 3-6 STATUS>>EXCITER>>MODULATOR>>EXCITER STATUS

Menu	Description
PILOT: ON	Internal 19 kHz Pilot is ON or OFF
PILOT LVEL: 9.0%	Internal 19 kHz Pilot level, 0 - 12%
FREQ: 98.1MHz	Frequency that the Transmitter/Exciter is set to operate at; 87.5 - 108 MHz in 10 kHz steps
APC MODE: EXT	INT=Internal APC or EXT=set to external to accept an APC voltage from a transmitter in the range of 0 to +5 VDC. (0 VDC= 0 watts out)
TEST PTTRN: OFF	Test pattern can be set to ON or OFF
GPS REF: INT 1PPS	AUTO - based on available signals;EXT 10MHz;EXT 1PPS;INT 1PPS; or manual which uses internal frequency standard
APC: 0.0V	APC voltage of external APC input at TX INTERFACE Connector pin 15 on rear Panel, only active if APC MODE above is set to EXT

3.6.4 STATUS>>POWER AMP Menu

The POWER AMP Menu table explains each menu item for one amplifier, if the FAX has multiple amplifiers this set will be repeated for each amp.

Table 3-7 STATUS>>POWER AMP Menu

Menu	Description
PA SUMMARY: OK	Fault Summary status of the Power amplifier(s) in the transmitter. OK or FAULT
PA AVG V: 00.0V	Average power supply voltage from the power supplies 44 - 52 VDC (Except FAX50-150 48 VDC)
PA TOTAL I: 00.0A	Total Current of all the amplifiers summed together
PA 1: OK	Fault Summary status of the PA 1 in the transmitter. OK or FAULT
PA 1 Amps: 00.0A	Current draw by PA 1
PA 1 TEMP: 00.0C	Temperature of PA 1 heatsink

3.6.5 STATUS>>OUTPUT Menu

Table 3-8 STATUS>>OUTPUT Menu

Menu	Description
OUTPUT: OK	Status of transmitter RF Output OK, LOW or FAULT
FWD PWR: 00.0W	Transmitter forward power reading
RFLD PWR: 00.0W	Transmitter reflected power reading
VSWR: OK	VSWR Fault indication OK or FAULT
VSWR FLDBK: OK	VSWR Foldback indication OK or FLDBK

3.6.6 STATUS>>POWER SUPPLIES Menu

The POWER SUPPLIES Menu table explains each menu item for one supply, if the FAX has multiple supplies this set will be repeated for each one.

Table 3-9 STATUS>>POWER SUPPLIES Menu

Menu	Description
PS SUMMARY: OK	Status of all Power Supplies in the transmitter OK or FAULT
AC MAINS: OK	Status of AC Mains Voltage OK or FAULT
PA AVG V: 00.0V	PA Average Voltage
PA TOTAL I: 00.0A	Total Current draw from all the power supplies summed together
PS1: OK	Fault Summary status of the PS 1 in the transmitter. OK or FAULT

3.6.7 STATUS>>SYSTEM Menu

Table 3-10 STATUS>>SYSTEM Menu

Menu	Description
SYS SUM: OK	Summary of the System Summary Fault Line OK or FAULT
APC STATUS: ON	Status of APC (Automatic Power Control) ON or OFF
INTERLOCK: OK	Status of External Interlock USER REMOTE J10-24 Rear Panel
EQUIP ITLK: OK	Status of Equipment Interlock USER REMOTE J10-9 Rear Panel
RF MUTE: ON	Status of RF Mute by Micro
REMOTE MUTE: ON	Status of External Mute input USER REMOTE J10-7 rear panel
FANS>>	FANS Menu

Table 3-11 STATUS>>SYSTEM>>FANS Submenu

Menu	Description
FAN1: OK	Status of Fan1 tach in the transmitter
FAN2: OK	Status of Fan 2 tach in the transmitter

3.6.8 STATUS>>SW REVISIONS Menu

Table 3-12 STATUS>>SW REVISIONS Menu

Menu	Description
FP APP SW: 0278, OCT 4 2013	Control Application code Rev and date
WEB GUI SW: V2.0.32-26	GUI code Rev and Date
BOOTLOADER: 0035,MAR29 2012	Micromodule Bootloader code Rev and Date
FPGA: 0151	Modulator FPGA code Rev and Date
MOD MICRO APP: 0355	Modulator Application code Rev and Date

3.6.9 STATUS>>OPTION CARDS

Orban 5500 Audio Processor card (Kit part # - 981-0090-568) - September 2013. There is a separate manual for this card that ships with each unit that has processor installed. Manual part number 888-2776-001.

Required Software Version - A42 or later

3.7 SETUP Button Menu

The Setup button accesses the menus in the transmitter to configure and calibrate the system.

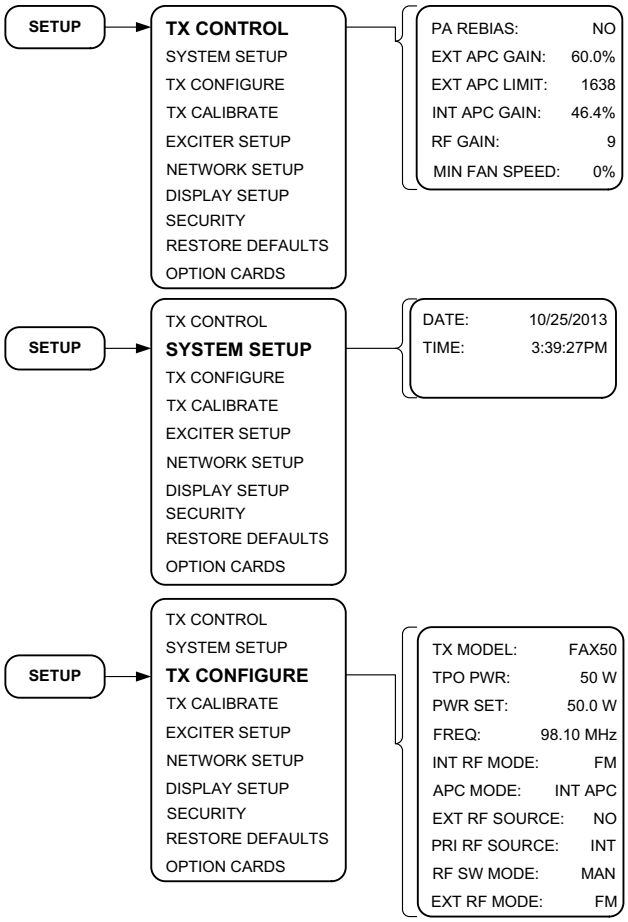


Figure 3-7 SETUP Menu

WARNING: Disconnect primary power prior to servicing.

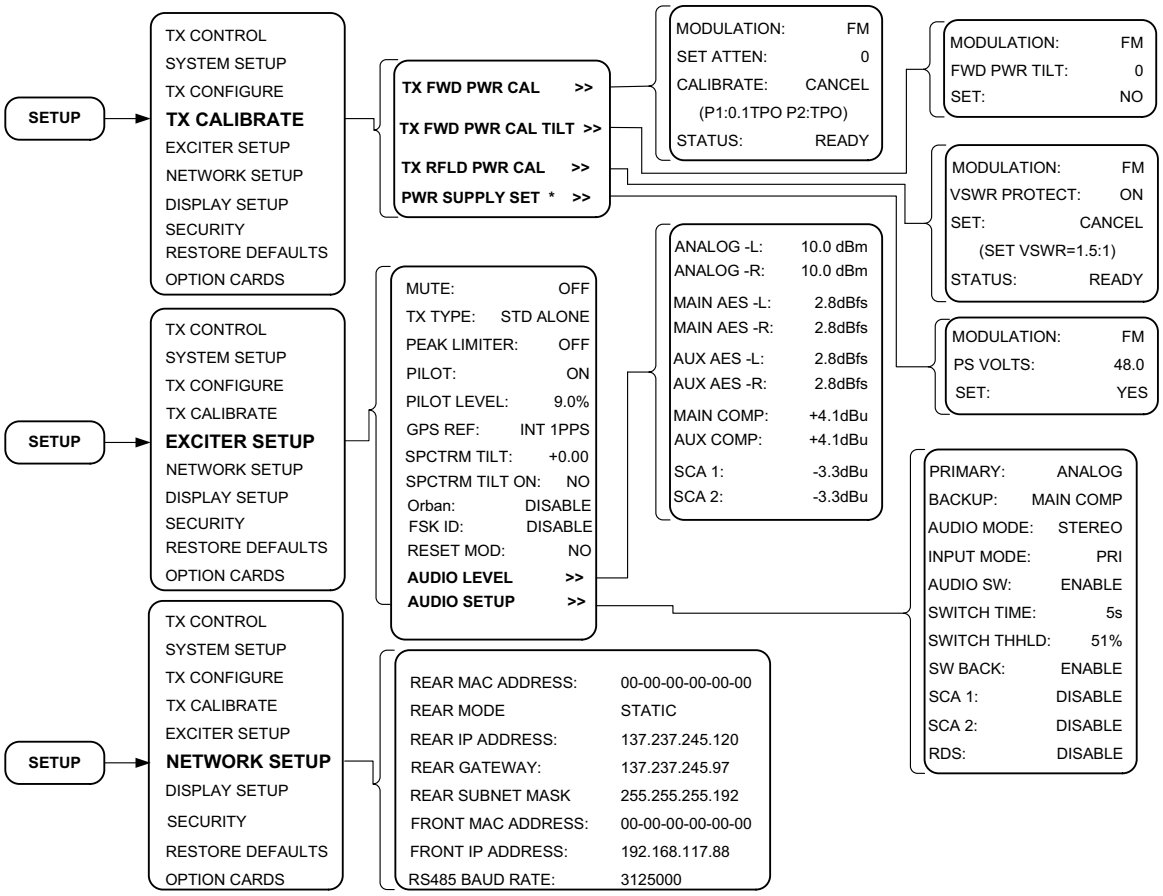


Figure 3-8 SETUP Menu Continued

Note

** TX CALIBRATE>>PWR SUPPLY SET menu is only available on FAX300 - 3.5*

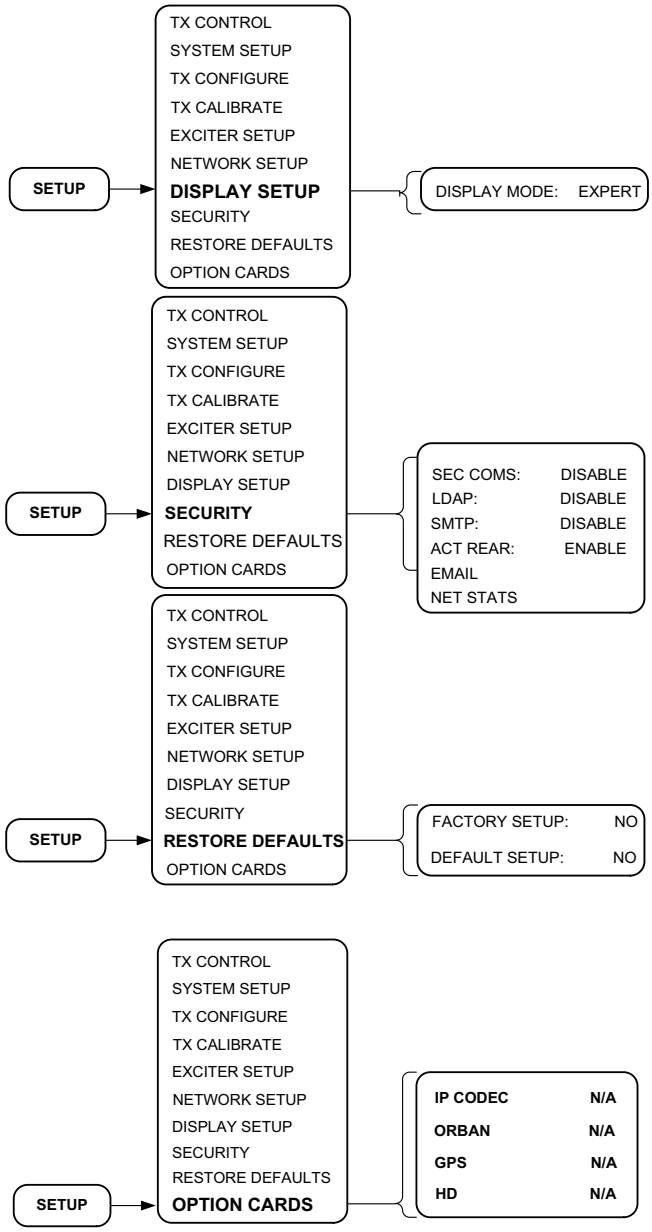


Figure 3-9 SETUP Menu Continued

WARNING: Disconnect primary power prior to servicing.

3.7.1 SETUP>>TX CONTROL Menu

Table 3-13 SETUP>>TX CONTROL Menu

Menu	Description
PA REBIAS: NO	Yes=Rebias Modulator final power amplifier only in FAX300 and higher power models. On the FAX50/150 rebias will include both the final amp on the modulator as well as the output (150 W) amplifier. This should only be performed when installing a new modulator board or when Customer Service instructs this to be done
EXT APC GAIN: 00.0%	External APC must be enabled; 0-100% sets RF output level, limited by EXT APC LIMIT and RF GAIN settings. This is setup in FAX high power during calibration of system power.
EXT APC LIMIT: 4095	External APC Mode Only; 0-4095 Limits the RF power out up to the RF Gain setting; When used as an exciter in FAX5/10/20/30/40 set to max (4095)
INT APC GAIN: 50%	0-100 % Used to set the UC Attenuation voltage in the range of 3.0 +/-0.1 VDC at TPO during calibration
RF GAIN: 15	Sets Step Attenuator value on the Modulator board which limits maximum RF power output; 0-15. See Table 3-14. Set during calibration. See Note
MIN FAN SPEED: 50%	Sets minimum fan speed when transmitter is ON, range is 0 - 100 %

Note

RF Gain sets the step attenuator on the modulator board that controls maximum power out of the unit. The lower the RF Gain number the lower the maximum power out. During calibration this is used to set the UC Attenuation voltage in the correct range. RF Gain is also used when the unit is setup as an exciter to limit power out. Table 3-14 below illustrates power out vs RF gain setting for FAX150.

See the calibration procedures in Section 5 for complete setup details.

Table 3-14 RF GAIN Setting and Maximum Power Out FAX150

RF GAIN	Max Power Out FM Only
0	16
1	25
2	35
3	50
4	70
5	105
6	135
7	155
8	160
9	170*
10	180*
11	183*
12	184*

Table 3-14 RF GAIN Setting and Maximum Power Out FAX150

RF GAIN	Max Power Out FM Only
13	186*
14	186*
15	187*

* : Max transmitter power is 165watts. Overhead power levels are for Power Calibration Only.

3.7.2 SETUP>>SYSTEM SETUP Menu

Table 3-15 SETUP>>SYSTEM SETUP Menu

Menu	Description
ID: TRAINING	Transmitter ID, must be set in remote GUI; maximum 20 characters
DATE: 06/05/2012	Current Date; If using NTP date and time will be disabled
TIME: 3:39:27AM	Current Time; Entered as 24 hour clock but displayed as 12 hour clock. 24 hour clock used in the Event log

3.7.3 SETUP>>TX CONFIGURE Menu

Table 3-16 SETUP>>TX CONFIGURE Menu

Menu	Description
TX MODEL: FAX150	Model of transmitter, set at factory
TPO PWR: 50W	Customer setting, Sets the 100 % power level of the transmitter and limits the transmitter to 10 % over this setting. When in Exciter mode (External APC enabled) this sets the GUI forward bargraph 100 % line
PWR SET: 50.0W	Customer setting, sets the actual power out of the unit when in Transmitter mode. Has no effect when in Exciter mode (External APC enabled)
FREQ: 98.10MHZ	Current operating frequency of transmitter; 87.5 - 108 MHz in 10 kHz steps
INT RF MODE: FM	RF Mode that Modulator board is currently FM,FM+HD,HD
APC MODE: INT	INT=Internal APC; EXT=External APC voltage from TX INTERFACE connector rear panel pin 8
EXT RF SOURCE: NO	YES or NO; Used when a RF Source of +10 dBm (Range 0 to +10 dBm) or less is connected to rear panel EXTERNAL RF IN BNC
PRI RF SOURCE	Internal or External.
RE SW MODE	Auto/Manual; Auto switching is only available from External RF source back to internal RF source. If the internal is set to primary and fails auto switching will not occur to the external. If set to auto and primary source is external, if ext RF source drops below 0 dBm switch occurs to internal.
EXT RF MODE	FM,FM+HD, HD Must be set to match external source so RF detectors internal to the FAX read properly.

3.7.4 SETUP>>TX CALIBRATE Menu

Table 3-17 SETUP>>TX CALIBRATE (Forward Power) Menu

Menu	Description
TX FWD PWR CAL>>	This menu is for Forward Power Calibration only. Each mode of operation(FM, FM+HD,HD) must have a calibration completed.
MODULATION: FM	Modulation mode that the transmitter will be calibrated in
SET ATTEN: 0	Adjusts power out during calibration.0 - 4095
CALIBRATE: CANCEL	CANCEL to abort or YES to start calibration. See Section 5 for detailed forward power calibration procedure
STATUS: READY	READY- Wanting to begin calibration process; IN PROGRESS is shown after process is started

Table 3-18 SETUP>>TX CALIBRATE (FWD PWR TILT) Menu

Menu	Description
TX FWD PWR TILT>>	Used when performing a wideband calibration from 88 - 108 MHz. If doing a single frequency calibration tilt setup is not required.
Modulation: FM	Modulation mode that the transmitter will be calibrated in
FWD PWR TILT: 0	0 - 127; Set this to make the power reading flat across the FM band. See procedure in Section 5 of this manual.
SET: NO	Yes or No, Stores and Activates the setting

Table 3-19 SETUP>>TX CALIBRATE (Reflected Power) Menu

Menu	Description
TX RFLD PWR CAL>>	This menu is for Reflected Power Calibration only. Each mode of operation(FM, FM+HD,HD) must have a calibration completed.
MODULATION: FM	Modulation mode that the transmitter will be calibrated in; FM, FM+HD,HD
VSWR PROTECT: ON	Turns the VSWR Protection off. DO NOT USE unless instructed to by GatesAir Service
CALIBRATE: CANCEL	CANCEL to abort or YES to start calibration. See Section 5 for detailed forward power calibration procedure
STATUS: READY	READY- Wanting to begin calibration process; IN PROGRESS is shown after process is started

3.7.5 SETUP>>EXCITER SETUP Menu

Table 3-20 SETUP>>EXCITER SETUP Menu

Menu	Description
MUTE: OFF	ON=RF Muted; OFF= RF Un-muted
TX TYPE: STD ALONE	Selects the Model transmitter the exciter will be used in. STD ALONE should be used for all models except for a FAX50/150 being used as an exciter. Selecting a transmitter type presets many of the settings for you such as Mute and Exciter Ready polarity and APC type . The options to choose from are STD ALONE, BE TYPE 1, BE TYPE 2, HPX, ZX, ZCD, ZHD, FAX and CUSTOM.
PEAK LIMITER: OFF	Turns the audio peak limiter ON or OFF
PILOT: ON	Turns the internal 19 kHz Pilot ON or OFF
PILOT LEVEL: 9.0%	Sets the internal pilot level on air; 0-12 %
GPS REF: INT 1PPS	Sets the GPS Reference source; AUTO selecting; External 10 MHz; External 1PPS; Internal 1PPS
SPCTRM TILT: +0.00	Range -20.0 to +20.0; Set for minimum Synchronous AM Noise
SPCTRM TILT ON: ON	Turns tilt ON or OFF
RESET MOD: NO	Yes=Reboot transmitter, takes the transmitter off-air for a few seconds
AUDIO LEVEL>>	Selects the Audio Level Menu
AUDIO SETUP>>	Selects the Audio Setup Menu

Note

Spectrum Tilt adjustment should be made when replacing Modulator board or any board in the RF chain. See Section 5 for procedure.

Table 3-21 SETUP>>EXCITER SETUP>>AUDIO LEVEL Menu

Menu	Description
ANALOG-L: 10dBu	Level at the rear panel audio input that determines 100% modulation on-air. Range -10 to +10 dBu
ANALOG-R: 10dBu	Level at the rear panel audio input that determines 100% modulation on-air. Range -10 to +10 dBu
MAIN AES-L: 2.8dBfs	Level at the rear panel audio input that determines 100% modulation on-air. Range 0 to - 15 dBfs
MAIN AES-R: 2.8dBfs	Level at the rear panel audio input that determines 100% modulation on-air. Range 0 to - 15 dBfs
AUX AES-L: 2.8dBfs	Level at the rear panel audio input that determines 100% modulation on-air. Range 0 to - 15 dBfs
AUX AES-R: 2.8dBfs	Level at the rear panel audio input that determines 100% modulation on-air. Range 0 to - 15 dBfs
MAIN COMP: 5dBu	Level at the rear panel audio input that determines 100% modulation on-air. Range -6.8 dBu to +18 dBu
AUX COMP: 5dBu	Level at the rear panel audio input that determines 100% modulation on-air. Range -6.8 dBu to +18 dBu
SCA 1: 0dBu	Level at the rear panel audio input that determines 10% modulation of the subcarrier on-air. Range -20 dBu to +8 dBu
SCA 2: 0dBu	Level at the rear panel audio input that determines 10% modulation of the subcarrier on-air. Range -20 dBu to +8 dBu

Note

User configuration modulation reference setpoints, i.e. Nominal Deviation (kHz), is available for the audio, composite and SCA inputs via the web GUI. The default value for the audio and composite inputs is 75kHz for 100% modulation. The default value for SCA 1 and SCA 2 INPUTS IS 7.5 KhZ FOR 10% deviation.

Note

Rev G.1 and earlier versions of Modulator hardware Main and Aux Composite inputs had a range of -0.8 to +8.7 dBu

Table 3-22 SETUP>>EXCITER SETUP>>AUDIO SETUP Menu

Menu	Description
PRIMARY: ANALOG	Selects Primary audio type
BACKUP: MAIN COMP	Selects Backup audio type; Audio source will not switch to backup unless AUDIO SW is set to enable. Main AES,AUX AES,MAIN COMP, AUX COMP, Analog, or None
AUDIO MODE: STEREO	Stereo, Mono, Mono-L, or Mono-R
INPUT MODE: PRI	Manual selection of the Primary or Backup audio source
AUDIO SW: ENABLE	Enables automatic switching between primary and backup audio sources
SWITCH TIME: 5s	Auto switching criteria, on-air audio source must be below SWITCH TRHLD level for more than SWITCH TIME seconds before audio will switch to other source. 0-250 seconds
SWITCH TRHLD: 51%	Threshold that the on-air audio level must be below for more than SWITCH TIME seconds setting before audio will switch sources. 0-100 %
SW BACK: ENABLE	Enables audio switch back when it meets the SWITCH TRHLD and SWITCH TIME settings
SCA 1: DISABLE	Enables or Disables SCA1
SCA 2: DISABLE	Enables or Disables SCA2
RDS: DISABLE	Enables or Disables internal RDS Generator; Setup parameters are only available in remote GUI

3.7.6 SETUP>>NETWORK SETUP Menu

Table 3-23 SETUP>>NETWORK SETUP Menu

Menu	Description
REAR MAC ADDRESS: 00-00-00-00-00-00	MAC Address of rear Ethernet port. Assigned at factory
REAR MODE: STATIC	Rear Ethernet port mode, Static or DHCP. LAN/WAN connection should be made to this Ethernet port only
REAR IP ADDRESS: 10.10.10.10	User assigned in Static Mode, network assigned in DHCP Default IP address is 192.168.1.10
REAR SUBNET MASK: 255.255.255.0	User assigned in Static Mode, network assigned in DHCP Default subnet mask is 255.255.255.0

Table 3-23 SETUP>>NETWORK SETUP Menu

Menu	Description
REAR GATEWAY: 10.10.10.1	User assigned in Static Mode, network assigned in DHCP Default gateway is 192.168.1.1
FRONT MAC ADDRESS: 00-00-00-00-00-00	MAC Address of front Ethernet port. Assigned at factory
FRONT IP ADDRESS: 192.168.117.88	Front Ethernet port IP address, coded in software and not changeable; Front Ethernet port is DHCP server and should only be used for Test/Setup purposes, Remote must be Disabled
RS485 BAUDRATE: 3125000	Baud rate of the Internal RS485 Bus. Must match the FAX high power transmitter baud rate or a MOD COMMS Fault will occur

Warning

CHANGING THE REAR NETWORK PORT FROM STATIC TO DHCP WITHOUT A VALID DHCP NETWORK CAN CAUSE THE FRONT PANEL BOARD TO LOCKUP AND WILL REQUIRE A BOARD RESET.

3.7.7 SETUP>>DISPLAY MODE Menu

Display mode has two settings, EXPERT or NOVICE. Novice mode locks out the Setup menu from allowing any changes to be made, viewing is still allowed. EXPERT allows full access to the Setup menus.

3.7.8 SETUP>>SECURITY

Selecting Security from the Setup menu displays the Security menu. Selecting a menu option on the Security menu to enable or disable the corresponding feature.

Table 3-24 Setup>>Security Menu

Menu	Description
Sec Coms	Enable/Disable encrypted communication between the web client and the web server.
LDAP	Enable/discable user authentication using Lightweight Directory Access Protocol (LDAP).
ACT REAR	Enable/Disable access control table used to limit access to the transmitter to only trusted management stations identified by their IP address.
PROTOCOL FILTERS	Enable / Disable protocol filters can be used to block the corresponding protocol packets on the rear interface.
EMAIL	Configure email messages when a fault or warning occurs in the system.
NETWORK STATISTICS	Displays statistics from the different layers of the networking software.
ARP CACHE	Displays collection of dynamic entries that are created as the networking software resolves IP addresses into Ethernet MAC addresses.

3.7.9 SETUP>>RESTORE DEFAULTS Menu

FACTORY SETUP: NO; Setting this to YES resets all configurations back to the way the transmitter shipped from the factory. All settings may or may not be valid, including calibrations depending on what software, hardware and user configurations have changed since shipment.

DEFAULT SETUP: NO; Setting this to YES resets all configurations back to their pre-test values.

Note

It is always a good idea to download and store the configuration file from the FAX whenever a change is made, See Section 3.8.15 .

3.7.10 SETUP>>OPTION CARDS

Orban 5500 Audio Processor Card - See manual 888-2776-001 for setup and operation of audio processor card. In this LCD menu select Present (If Installed) or N/A (Not Installed).

GPS Card with Antenna - See GPS Installation Guide 888-2742-001. LCD Display should read Present (If Installed) or N/A (Not Installed)

3.8 Remote Graphical User Interface (GUI)

The remote GUI allows the user to monitor and control the FAX series transmitters and it requires only a computer and any web browser to function. Some functions are only available using the GUI, ie RDS setup and not available on the LCD menus. Also certain functions that are available on the LCD menus, ie calibrations that are not available on the GUI. The GUI has only a single level of password security which is Engineer and allows anyone with a valid login to make any changes to the system. When logged in when connected to the rear Ethernet port the Remote must be Enabled to allow for changes to be made. If logged in when connected to the front Ethernet port Remote must be Disabled to allow for changes to be made. If not logged in no changes can be made but all screens can be monitored.

Note

In older versions of software the front and rear Ethernet ports required Remote to be Enabled to allow any changes tot the system to be made.

3.8.1 Login Setup

The Remote GUI can be accessed from either the front or rear Ethernet ports on the FAX transmitter. It requires a Engineer login and password on both ports to make any changes to the transmitter setup. There is a Administrator login and password to allow editing of the Engineer account information. Connection to rear port requires remote to be enabled and connection to the front port requires remote to be disabled.

The Front Ethernet port is a DHCP Server, it should not be connected to the LAN/WAN or IP addressing problems will occur. The front Ethernet port IP address is 192.168.117.88 and is coded into the software so the user cannot change it. See Section 3.7.6 (LCD menu) or Section (GUI menu) for setting up the rear Ethernet port.

A simple web browser is used to access the GUI, Firefox is preferred but Chrome or Internet Explorer will work as well. Open the web browser and in the address bar enter the IP address of the port the computer is connected to, ie front port is 192.168.117.88 and the GUI Home screen will appear as in Figure 3-11

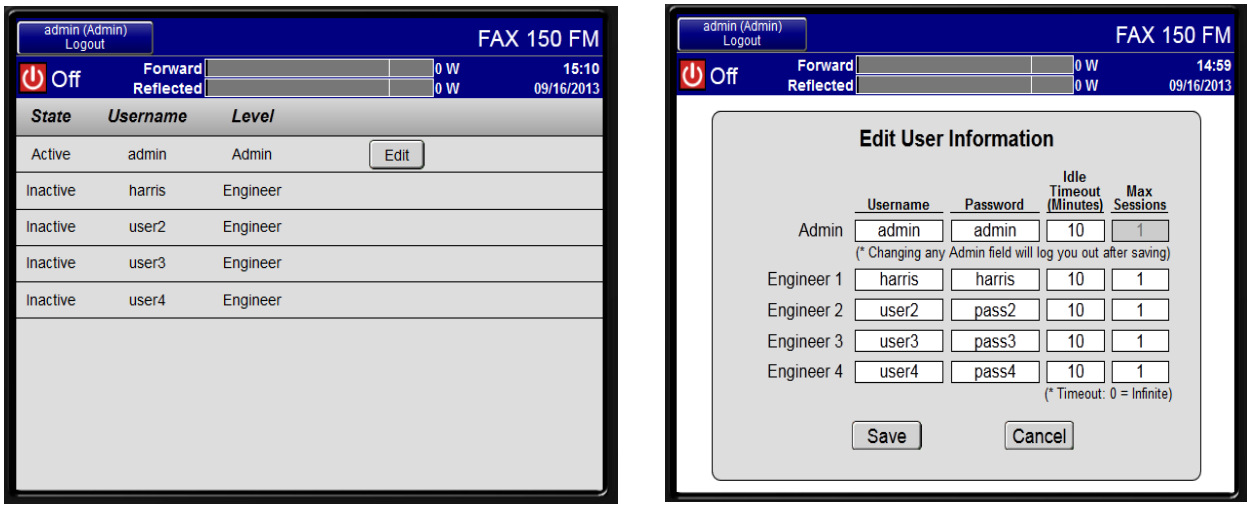


Figure 3-10 FAX Netadmin Screens

Units shipped after August 2013 will have the following default Login/Password setup:

From the Home screen there are five logins that are set at the factory. The passwords are case sensitive.

Engineer Login 1 - Username: gates; Password: gates

Engineer Login 2 - Username: user2; Password: pass2

Engineer Login 3 - Username: user3; Password: pass3

Engineer Login 4 - Username: user4; Password: pass4

Administration Login - Username: admin; Password: admin

The Engineer logins allow full control and monitoring of the transmitter. The Remote Enable/Disable button must be selected depending on which Ethernet port the computer is connected to for any changes to be made via the Remote GUI. If a user does not login screens can be viewed but all setup fields will be grayed out.

The Administration login, Figure 3-10, allows for the user to setup the passwords for the Engineer logins, set the password for the netadmin login, and the set the timeout for the GUI. The netadmin username is set in software and cannot be changed. The netadmin login password can be changed from this screen.

Units shipped prior to August 2013 will have the following default Login/Password setup:

Some versions of software had 2 logins and some versions had 4 logins. The passwords are case sensitive.

Engineer Login 1 - Username: admin; Password: admin

Engineer Login 2 - Username: user2; Password: pass2

Engineer Login 3 - Username: user3; Password: pass3

Engineer Login 4 - Username: user4; Password: pass4

Administration Login - Username:netadmin; Password: harris

The Engineer logins allow full control and monitoring of the transmitter. The Remote Enable/Disable button must be selected depending on which Ethernet port the computer is connected to for any changes to be made via the Remote GUI. If a user does not login screens can be viewed but all setup fields will be grayed out.

The Administration login, Figure 3-10, allows for the user to setup the passwords for the Engineer logins, set the password for the netadmin login, and the set the timeout for the GUI. The netadmin username is set in software and cannot be changed. The netadmin login password can be changed from this screen Event Log. Uploading newer software does not change the passwords entered.

3.8.2 GUI Home Screen

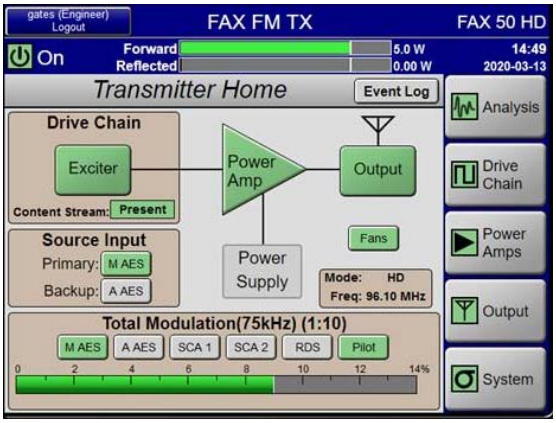


Figure 3-11 FAX Home Screen

The buttons on the right side of the home screen are for monitoring, setup and control. Each button will take the user to a submenu (s). The icons in the middle of the screen are analogous to the buttons on the right side of the display. If one or more of the icons are red, that icon can be clicked on and the user will be taken to the submenu to find a particular fault. The fault log can also be viewed by clicking the FAULT LOG button.

Station Name - The middle of the top bar shows the station name “KHAR-FM(Lab), this can be set in the SYSTEM>SERVICE> menu.

Transmitter Model - Top bar on the right side shows the model of FAX. Factory set.

Login - See Section 3.8.1 for details

FWD 100% Mark - The vertical bar in the power bargraph reflected power display is 100% power based on the “Nominal Power (w) in the OUTPUT>TPO Menu.

RFLD 100% Mark - The vertical bar in the power bargraph display for reflected power is 100% power based 1.5:1 VSWR.

Mode - shows the current operating mode of the transmitter, FM, FM+HD, or HD.

Frequency - Shows current operating frequency of the transmitter

Source Input - Shows Primary and Backup audio selections and which is currently on-air. Clicking on either icon will take the user to the Audio Input Mux Setup screen.

Total Modulation - Shows current on-air audio source, Vu response meter that is auto scaled. Icons that are green are enabled, gray they are disabled. Clicking on the audio source icons will take user to that audio type setup screen.

Home Icon - Clicking on the Home icon will always take the user back to the FAX Home Screen. This icon is displayed on all screens except the Home screen and the Event Log.

Fans - Displays Fan Tachometers, Internal temperature and allows for setup of minimum fan speed.

Setup - Sets the minimum fan speed when the transmitter is ON. If set to 100% fans will run at full speed continuously. This will lower efficiency of the transmitter.

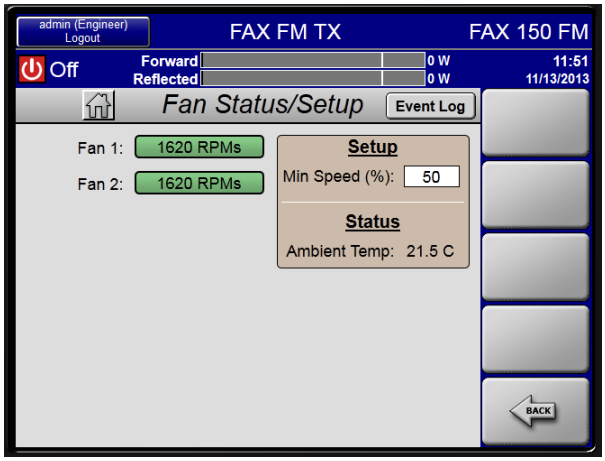


Figure 3-12 Fan Status and Setup Screen

Setup Min Speed % - Sets the minimum speed at which the fans will run. As the transmitter temperature rises the fans will speed up, however they will run at no less than this %.

3.8.3 Event Log

The Fault/Event log in software revisions prior to Application code 24 was strictly a Fault log. The log is shown in Figure 3-13. Faults are shown as active, in red, and cleared with date and time. To reset the log click on the Reset Log button, must be logged in and remote in correct mode depending on Ethernet port connection. To display only Active Faults click on the Active Faults button.

The first fault in Figure 3-13 shows that PA4 was out in power block 1 (PB1). The fault occurred at 15:41:41 on 10/02/12. It was cleared at 14:41:42 on 10/02/12.

The events can be filtered by clicking on any of the letters in the [AC / FWIA] or by using the Filter drop down menu button.

A = Active Faults
C = Cleared Faults

F = Faults
W = Warnings
I = Information
A = Action

WARNING: Disconnect primary power prior to servicing.

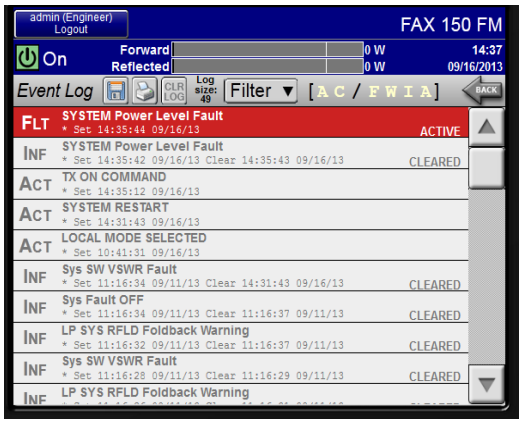


Figure 3-13 Event Log

Clicking the floppy disk icon will open a new tab in the web browser, this can then be saved as a text file, html file or copy and pasted into excel.

Clicking on the printer icon will allow the event log to be printed to an installed printer.

3.8.4 HTML Event/Fault Logs

The HTML logs are an advanced diagnostic tool for troubleshooting that GatesAir Customer Service may request be inspected and contain some advanced information that is not available in the LCD menu log or the GUI Event log. These can be obtained by typing the following (case sensitive):

IP Address/faultLog.html example: 192.168.117.88/faultLog.html - Fault log from front Ethernet port

These logs are cleared on AC power cycle or Clear Log button clears the logs.

The html navigation buttons on the left will be described below.

- HOME - This buttom will take you to the transmitter GUI Home Screen.
- ISP - This button will allow you to upload software files into the transmitter.

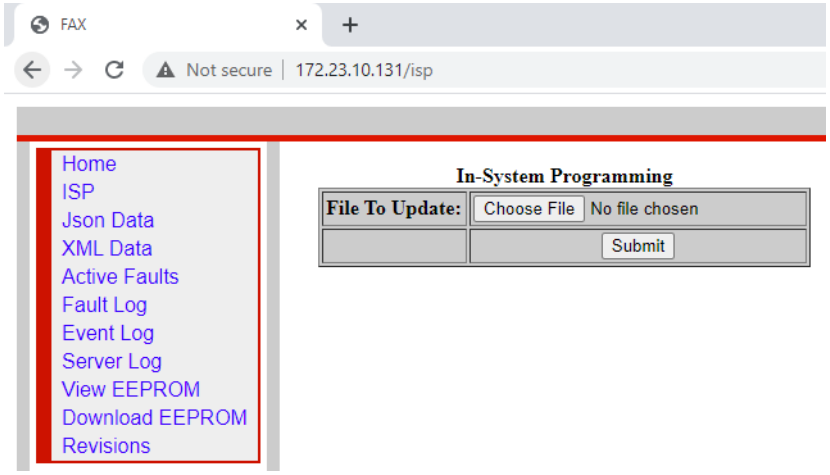


Figure 3-14 ISP html screen

- Json Data - This button will open a new browser window to show JavaScript Object Notation information used for advance diagnostics. Json represents data as key-value pairs, which can be easily converted to and from JavaScript objects.
- XML Data - This button will open a new browser window that displays all the datapoints from the transmitter at that moment.
- Active Faults - This takes you to the Active Faults screen.

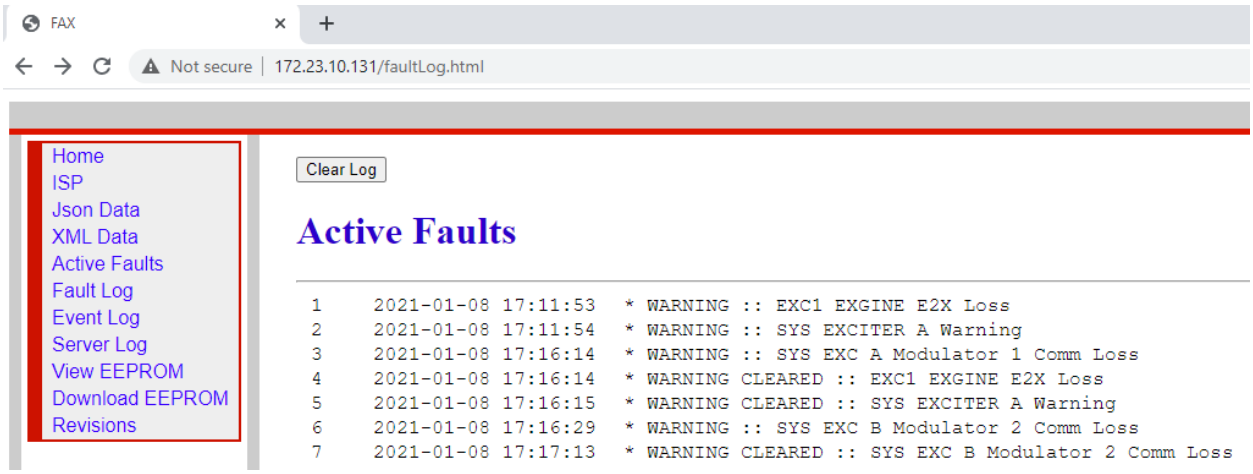
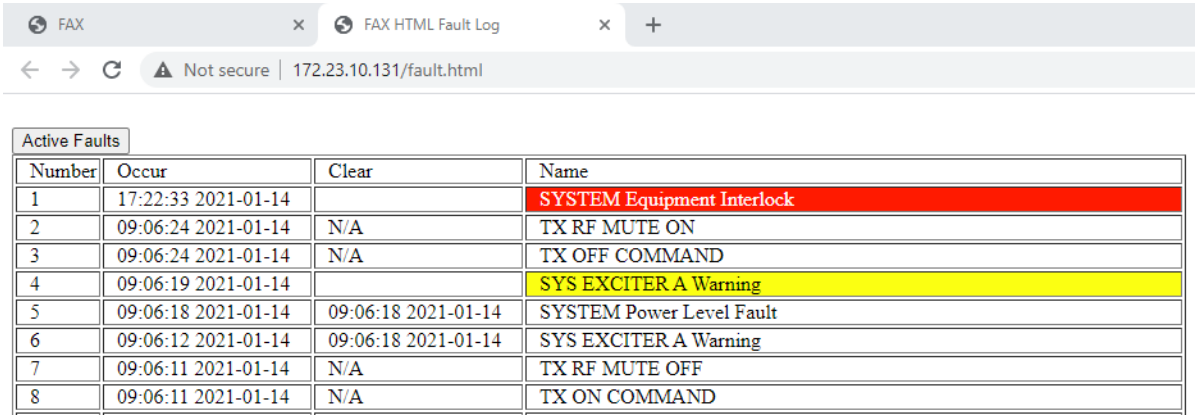


Figure 3-15 faultLog.html

- Fault Log - This button will open a new browser window and display an **EVENT LOG**. On this screen you can toggle between All and Active events.



Number	Occur	Clear	Name
1	17:22:33 2021-01-14		SYSTEM Equipment Interlock
2	09:06:24 2021-01-14	N/A	TX RF MUTE ON
3	09:06:24 2021-01-14	N/A	TX OFF COMMAND
4	09:06:19 2021-01-14		SYS EXCITER A Warning
5	09:06:18 2021-01-14	09:06:18 2021-01-14	SYSTEM Power Level Fault
6	09:06:12 2021-01-14	09:06:18 2021-01-14	SYS EXCITER A Warning
7	09:06:11 2021-01-14	N/A	TX RF MUTE OFF
8	09:06:11 2021-01-14	N/A	TX ON COMMAND

Figure 3-16 Event Log

- Event Log - This is an *advanced diagnostic* event log for GatesAir Service.

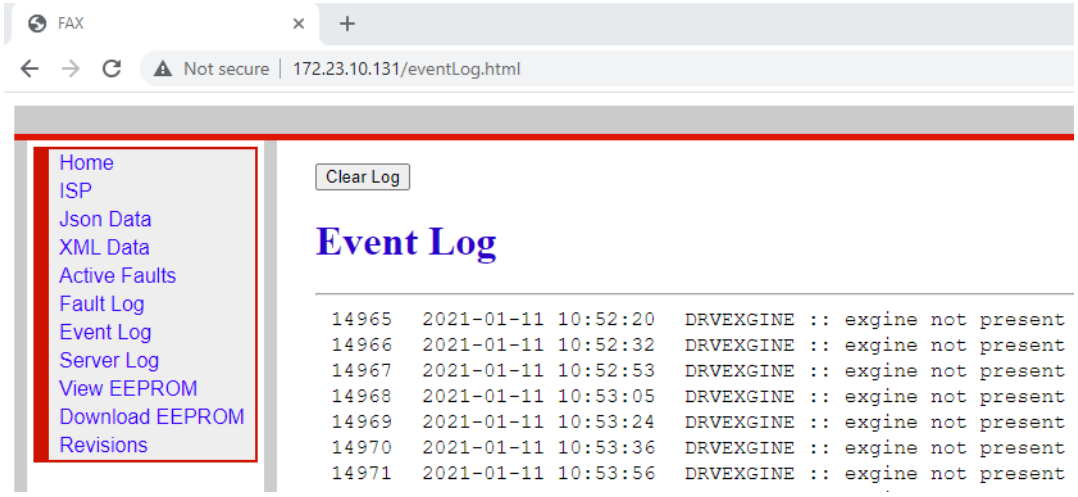


Figure 3-17 Advanced Diagnostic Event Log

- Server Log - This is an advanced diagnostic server log for GatesAir Service

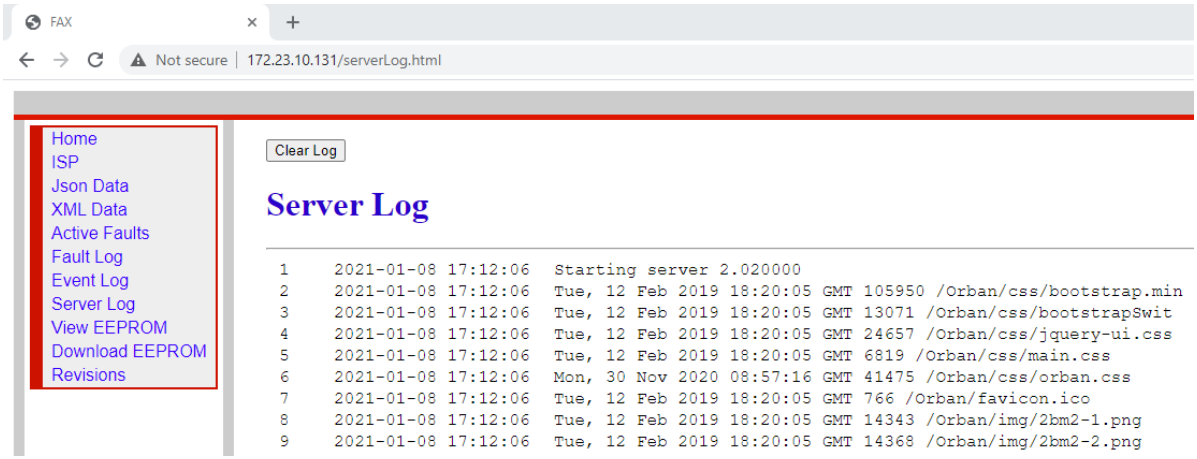


Figure 3-18 Advanced Diagnostic Server Log

- View EEPROM - This button opens a new browser window to display the EEPROM .s19 code.
- Download EEPROM - This button will download the EEPROM .s19 file
- Revisions - This buttom will open a new window to display the software revision.

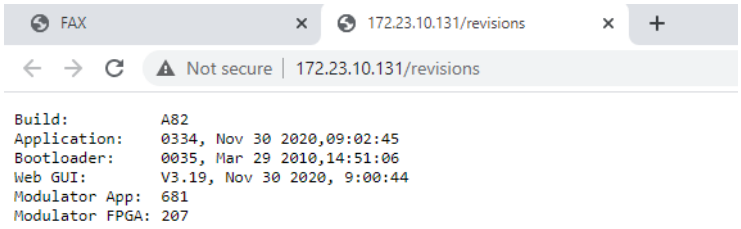


Figure 3-19 Revision html

3.8.5 Drive Chain Menu

The Drive Chain Menu allows for setting up the external RF input for use as a backup exciter input or to use the FAX as a boost amplifier.

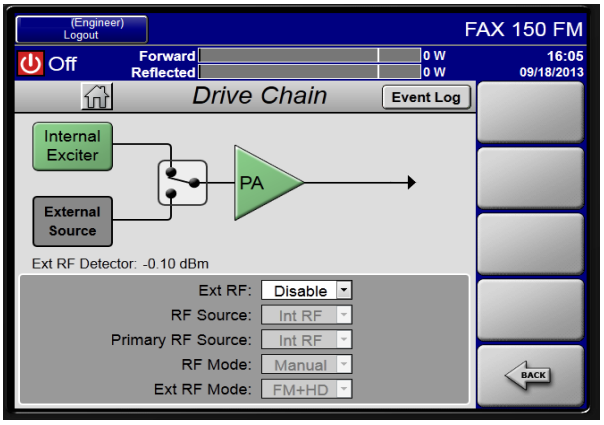


Figure 3-20 Drive Chain Screen

Ext RF Detector - Displays the level that is present at the RF Input to the FAX. Typically +5 dBm; Range 0 - +10 dBm(Max)

Ext RF: - Enables/Disables the External RF Input

RF Source: - Selects which RF source Internal or external is on-air

Primary RF Source: - Selects which RF source is Primary and the other will be backup

RF Mode: - Auto/Manual; Auto switching is only available from External RF source back to internal RF source. If the internal is set to primary and fails auto switching will not occur to the external. If set to Auto and primary external and the external RF source drops below 0 dBm switching to internal occurs.

Ext RF Mode: - Selects the operational mode of external RF source, FM, FM+HD or HD Only

3.8.6 Output Menu

The Output Menu allows for setting Power and other RF related parameters for each RF mode of operation; FM, FM+HD and HD.

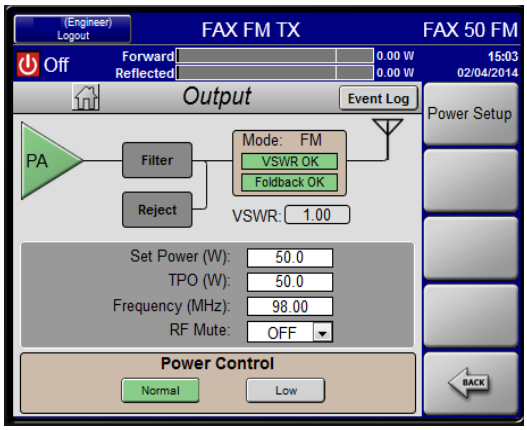


Figure 3-21 Output Screen

Set Power (W) - Sets the Actual power the transmitter will put out when the transmitter is turned ON. This can be set to a maximum of 110% of TPO (W), ie FAX1k can be set up to 1100 W

TPO (W) - Set the bargraph 100% point. This setting is used to calculate the Fwd Pwr Wrn and Flt thresholds

Note

There is a SET POWER and TPO value stored for each mode of operation, FM, FM+HD and HD Only.

Frequency (MHz): - Frequency of the internal exciter.

RF Mute: - ON = Transmitter Muted; OFF = Transmitter Un-muted

POWER CONTROL: - Normal = transmitter power will follow the “Set Power” value and “TPO” value for each mode (FM, FM+HD and HD); Low = Transmitter will go still use the “Set Power” and “TPO” values but will be the same for all modes. The max power when in Low is set in the Power Setup screen.

3.8.7 Power Setup Menu

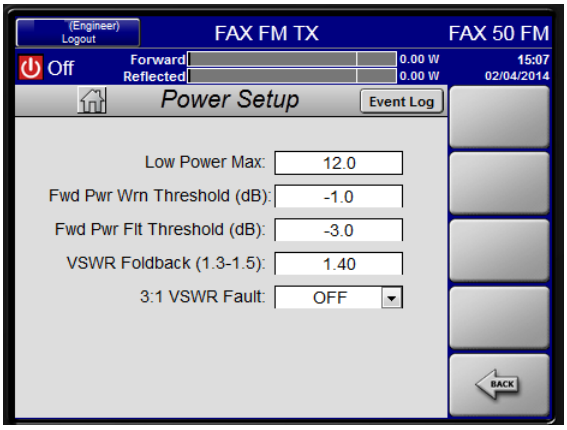


Figure 3-22 Power Setup Screen

Low Power Max: - Maximum power (Watts) the transmitter will operate when the Low Power mode is enter (previous screen). This setting can be lower than the “Set Power” filed and the transmitter will not exceed this power regardless.

Fwd Pwr Wrn Threshold (dB): - Sets the point at where a forward power warning event is activated. This will turn bargraph yellow and an warning in the event log. This is calculated from TPO setting. If TPO=150 and Warn=-1 dB the trip point is approximately 120 Watts.

Fwd Pwr Flt Threshold (dB): - Sets the point at where a forward power fault event is activated. This will turn bargraph red and an warning in the event log. This is calculated from TPO setting. If TPO=150 and Warn=-3 dB the trip point is 75 Watts.

VSWR Foldback (1.3-1.5): - Sets the point where the Forward power begins to foldback in the presence of excess reflected power. Range is 1.3:1 to 1.5:1.

3:1 VSWR Fault: - As VSWR increases above the foldback threshold the VSWR ratio continues to increase even though the reflected power remains constant. With this field set to ON, when the VSWR reaches 3:1 the transmitter will fault off and three-strike. On the fourth strike in 60 seconds or less the transmitter will stay OFF and will require a manual ON to return to operation once the VSWR is corrected.

3.8.8 System Menus

The System Configuration allows for setup of the transmitter system. Some of these menus are found under the TX SETUP button on the front panel of the transmitter. The calibration menu is not available in the GUI. SNMP and NTP Config are not available in the LCD menus. Only menus that are not available on the LCD menu will be covered in this section. Refer to Section 3.7 for Setup fields that are configurable in the LCD and the GUI.

Figure 3-23 System Config

3.8.9 System>Setup Menu

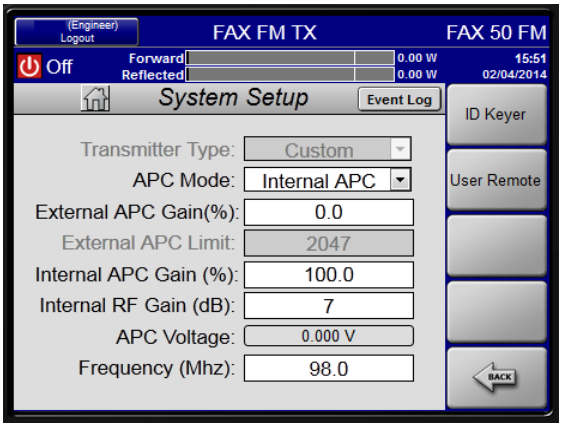


Figure 3-24 System Setup Menu

Transmitter Type: - Not Used

APC Mode: - Can be set to Internal or External. External APC (used when FAX is an exciter) allows for control of power output by an external voltage on J13-8 of the Transmitter Interface connector. This voltage must be in the range of 0-5 VDC, minimum power is 0 VDC and maximum power is 5 VDC. Internal APC is used when unit is a standalone transmitter or as an exciter in a transmitter that does not have a compatible APC voltage.

External APC Gain: - Used during the setup process to set power out for a specific external APC voltage.

External APC Limit: - Not used

Internal APC Gain: - 0 to 100%, Used in setting the UC Attenuation voltage in the range of 3.0 +/-0.1 VDC at TPO

Internal RF Gain: - Sets the Step attenuator to allow for maximum power limit. See Section 3.7.1 Table 3-14 for FAX50/150.

APC Voltage: - 0 to 5 VDC (Only if APC Mode is set to Internal); voltage to the variable attenuator on Modulator Amplifier set by Internal APC Gain. Set to 3.0 +/-0.1 VDC at TPO during factory test.

Note

APC Voltage is for Internal APC Mode only,. To view the APC voltage from a transmitter when in External APC Mode, on LCD go to STATUS>EXCITER>MODULATOR>EXCITER STATUS>APC:

Frequency: - Sets the transmitter carrier frequency, 87.5 to 108 MHz in 10 kHz steps.

3.8.10 FSK Station ID Menu

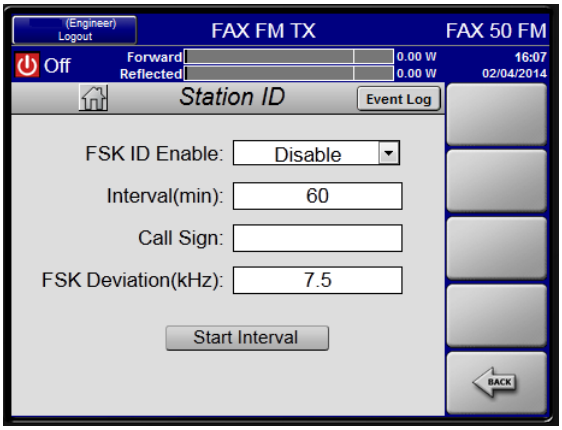


Figure 3-25 ID Keyer Setup Screen

Note

This screen used for translators ONLY.

FSK ID Enable: Enables/Disables FSK ID Broadcasting. Once enabled, the ID will be transmitted at the interval programmed.

Interval (min): Broadcasts ID every 60 minutes (as required by FCC regulations)

Call Sign: Enter translator call sign; FM translator call signs consist of W (if the transmitter location is east of the Mississippi River) or K (if the transmitter location is west of the Mississippi River), the FM channel number, and a two letter suffix (e.g., W285AD or K220AA).

FSK Deviation (kHz): Range -25 to +25 (excluding -5 to +5)

START Interval: Press button to transmit FSK ID immediately for testing purposes.

3.8.11 Remote Interface 1(Status Outputs) Menu

Figure 3-26 User Remote Setup Screen

Pin(#15-#18): Pin # on User Remote connector J10 rear of chassis. These are programmable status outputs by user, drop down box on GUI to choose the function required. Right screen shot shows available functions.

Eqpt Interlock Polarity: User Remote J10 Pin 9 user selectable for active high or low. A continuous logic high (or open, modulator has internal pull up resistor) or logic low (jumper to ground) is required to mute the transmitter. Transmitter will automatically return to previous state.

Table 3-25 Status Outputs

Status Outputs - Low equals 0.2 VDC @ 100 ma, +5 VDC pullup.

None	
PS SUM	Low equals Power Supply Summary Fault condition
SYS SUM	Low equals System Summary Fault condition
RF MUTE	Low equals RF Mute Condition
EXT INTLK	Low equals External/Safety Interlock Fault (Pin 25 is open to ground)
PWR LMT	Low equals the transmitter is at its power limit, cannot raise power with raise button. For example, the maximum allowable Set Power (W) value is 110% of the TPO.
VSWR FLT	Low equals Reflected Power Fault
VSWR FLDBK	Low equals transmitter in VSWR Foldback condition
FAN FLT	Low equals a Fan Fault
EQUIP INTLK	Low equals the Equipment Interlock (pin 9 input) not satisfied (high or low configurable)
FM ON	Low equals operating External RF Mode-FM
FMHD ON	Low equals operating External RF Mode-FM+HD Mode
HD ON	Low equals operating External RF Mode-HD Mode
LP MODE	Low equals transmitter operating in Low Power Mode
Audio Pri/Backup Status	Low equals Primary Audio Input Selected, +5 VDC equals Backup Input Selected
Stereo/Mono Status	Low equals Stereo Mode Selected, +5 VDC equals Mono Mode Selected
Int/Ext Exciter Status	Low equals Internal Exciter RF Source Selected, +5 VDC equals External Source Selected+
RBDS Enables/Disabled	Low equals RBDS Enabled, +5 VDC equals RBDS Disabled
Remote Enabled/Disabled	Low equals remote Enabled, +5 VDC equals Remote disabled

3.8.12 Scaling Menu

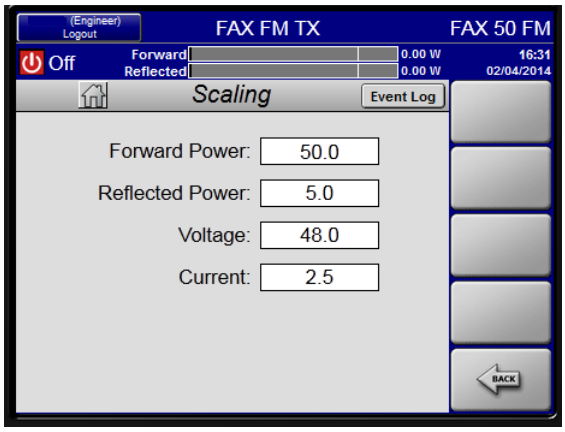


Figure 3-27 Scaling Screen

Forward Power: Sets the analog voltage vs. forward power to Transmitter and Remote Interfaces on rear panel of transmitter. 4 VDC = x Watts; x Watts is typically TPO

Reflected Power: Sets the analog voltage vs. reflected power to Transmitter and Remote Interfaces on rear panel of transmitter. 4 VDC = x Watts; x Watts typically = 1.5:1 VSWR

Voltage: Sets the analog voltage vs. average power supply voltage to Remote Interface on rear panel of transmitter. 4 VDC = x VDC

Current: Sets the analog voltage vs. total power supply current to Remote Interface on rear panel of transmitter. 4 VDC = x Amps

3.8.13 Remote Interface 2(Command Inputs) Menu

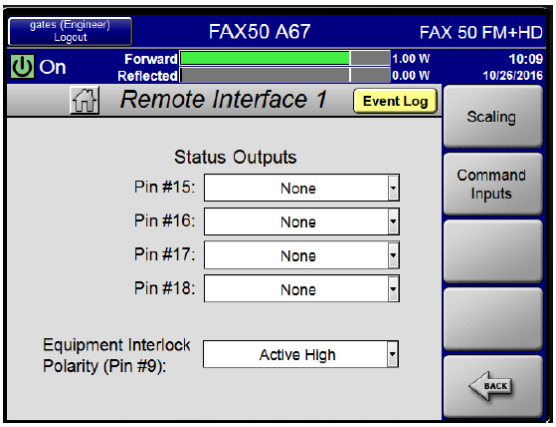


Figure 3-28 Command Inputs Screen

Pin(#5,6,13,14): Pin # on User Remote connector J10 rear of chassis. These are programmable command inputs by user, drop down box on GUI to choose the function required. Right screen shot shows available functions.

FM ON: Momentary low selects FM (only) External RF Mode, NOTE: Remote Enable/Disable must be Enabled, Ext RF Enable/Disable must be Enabled, RF Source Int/Ext must be set to Ext (external), Ext RF Detector must sense between 0-10dBm input on the External RF In (BNC) NOTE: Simultaneous connection of FM ON and HD ON command inputs will result in a mode switch to FM+HD mode.

HD ON: Momentary low selects HD (only) External RF Mode, NOTE: Remote Enable/Disable must be Enabled, Ext RF Enable/Disable must be Enabled, RF Source Int/Ext must be set to Ext (external), Ext RF Detector must sense between 0-10dBm input on the External RF In (BNC).

NOTE: Simultaneous connection of FM ON and HD ON command inputs will result in a mode switch to FM+HD mode.

HD ON/HD OFF: Momentary low toggles digital carriers ON/OFF. Only used with internal Exgine card option.

Audio Pri/Backup: Momentary low toggles audio Source Selection between Primary and Backup. NOTE: Remote Enable/Disable must be Enabled.

Stereo/Mono (Mono L+R): Momentary low toggles between Stereo or Mono modes. NOTE: Remote Enable/Disable must be Enabled.

Int/Ext Exciter: Momentary low toggles the RF Source between Int RF/Ext RF. NOTE: Remote Enable/Disable must be Enabled. NOTE: Remote Enable/Disable must be Enabled, Ext RF Enable/Disable must be Enabled, RF Source Int/Ext must be set to Ext (external), Ext RF Detector must sense between 0-10dBm input on the External RF In (BNC).

RBDS Enable/Disable: Momentary low toggles RDS Generator Mode between enable and disable. **NOTE:** Remote Enable/Disable must be Enabled.

Orban Enable/Disable: Momentary low toggles Orban between enable and disable. **Note:** Remote Enable/Disable must be Enabled, Only used with internal Orban card option.

Load Preset 1-8: Momentary low will switch to the preprogrammed operational configurations (for N+1 situations).

Adding individual TPO and Power Set values, along with the new available Status outputs and command inputs now allows interconnection between Flexiva and Flexstar products for “on the fly” RF mode switching.

3.8.14 System Service Menu

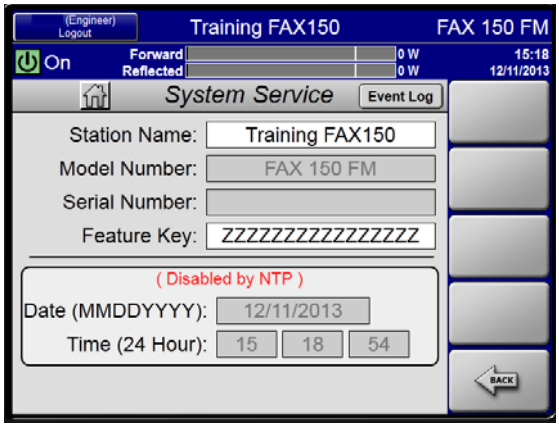


Figure 3-29 System Service Menu

Station Name - Sets the heading at the top of the GUI screen, up to 20 characters

Note

In software versions prior to A46 entering special characters (_,,&,etc) into the Station Name Filed will completely disable the GUI. Contact Factory Service if this occurs.*

Model Number/Serial Number - Set at the factory.

Feature Key - Set at the factory, call customer service if modulator board has been replaced in the field. The front Ethernet port MAC address will need to be provided.

3.8.15 System>ISP Menu

The ISP menu allows for uploading software when a new revision becomes available on the GatesAir website or from Customer Service. It is recommended that when acquiring a new software file that it be stored on the local hard disk drive before uploading it. See Section 5 for upload procedure. To exit this screen use the Back arrow in the upper right corner.

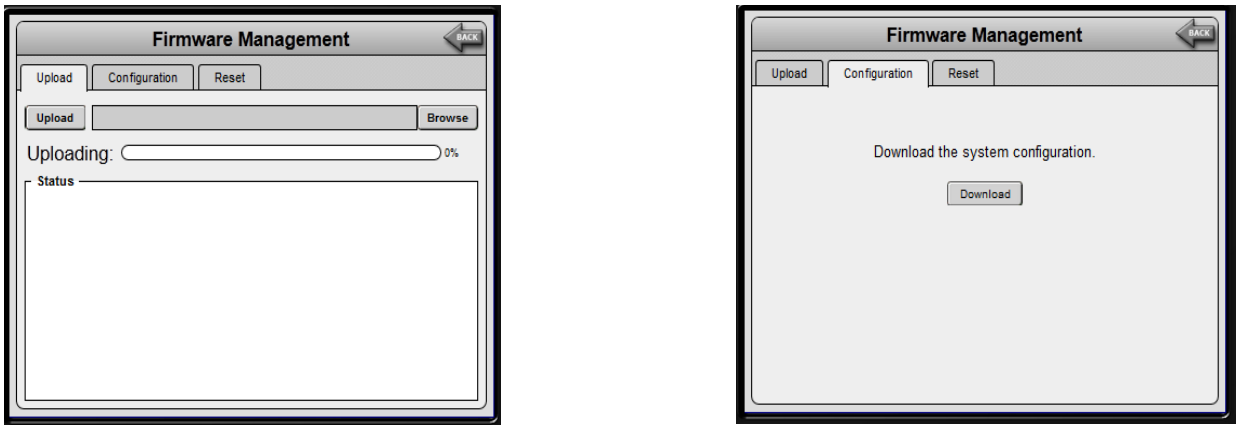


Figure 3-30 ISP Screen in GUI

To save a configuration file to the computer:

- Click on Configuration Tab
- Click Download button
- A dialog box will open and the file can be saved. Use a naming convention that will allow it to be easily identified if a need to upload it comes up. For example, “Installed9-16-2013.s19”.

An alternative method of uploading software to the FAX is via ISP outside the GUI. By typing the ip address with /isp added the isp screen can be accessed. Either method works in the same manner. For example if connected to the front Ethernet port, in the web browser address bar type, 192.168.117.88/isp. The following screen should appear:

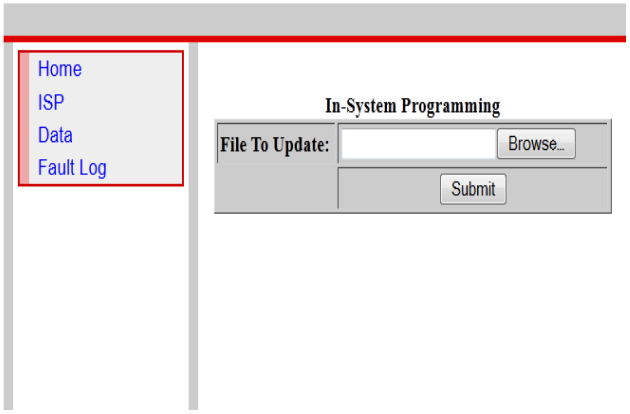


Figure 3-31 FAX isp

Browse to the file, open the file and click Submit. Once the file is loaded into the FAX a new screen will open, click Program and the file will be loaded into memory. Once the operation is complete the controller will automatically reboot and communications will be lost briefly. Login will now be required.

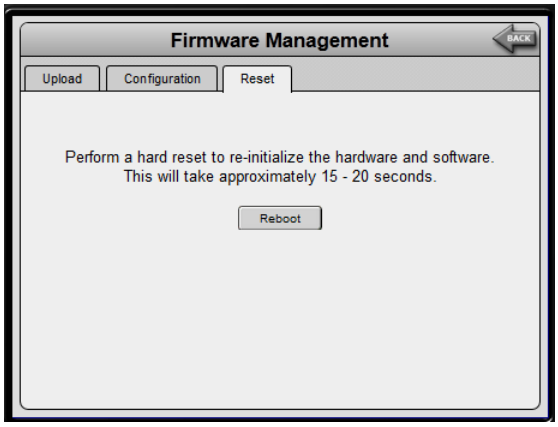


Figure 3-32 ISP Reset screen

Reset will reboot the transmitter hardware and software, transmitter will be off-air briefly.

3.8.16 System>Network Settings

From the Network Settings screen you can access IP Addressing, Ethernet Settings, SNMP, ACT ARP Cache, Configure email settings, look at Network Stats, LDAP and Secure Communications.

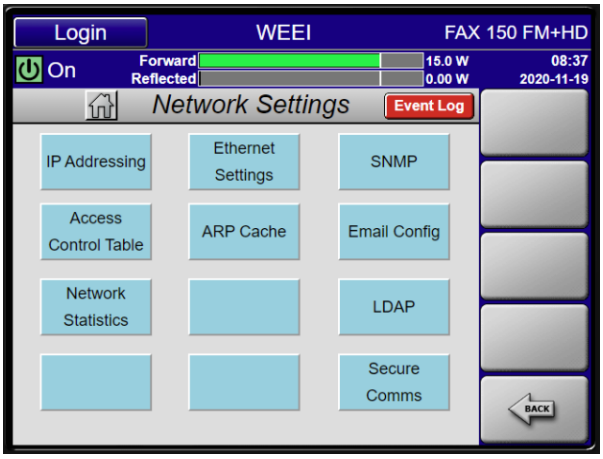


Figure 3-33 Network Settings

3•8•16•1 System>Network Settings>IP Addressing

The port settings can be changed in the System Network Settings page with firmware A69 or later.

Figure 3-34 IP Addressing

Rear Ethernet Port

Address Type - Select DHCP or Static to enter a status IP address below.

Address - IP address assigned by network in DHCP or by user in Static; ie - 10.10.10.10.

Subnet Mask - Subnet Mask assigned by network in DHCP or by user in Static; ie - 255.255.255.0.

Gateway - Default Gateway assigned by network in DHCP or by user in Static; ie - 10.10.10.1.

DNS Server - Address of desired DNS Server.

HTTP Port - Enter the open port to use.

Front Ethernet Port

MAC Address - MAC address of the Front Ethernet port, assigned at factory

Subnet Mask - 192.168.117.88 coded in software and cannot be changed

3•8•16•2 System>Ethernet Settings

If using the NTP setting for more accurate time and date, an IP address of a NTP time server must be entered. A list of time server IP addresses can be obtained from NIST. If the network that is the FAX is connected to does not have a NTP server then a connection to the Internet is required.

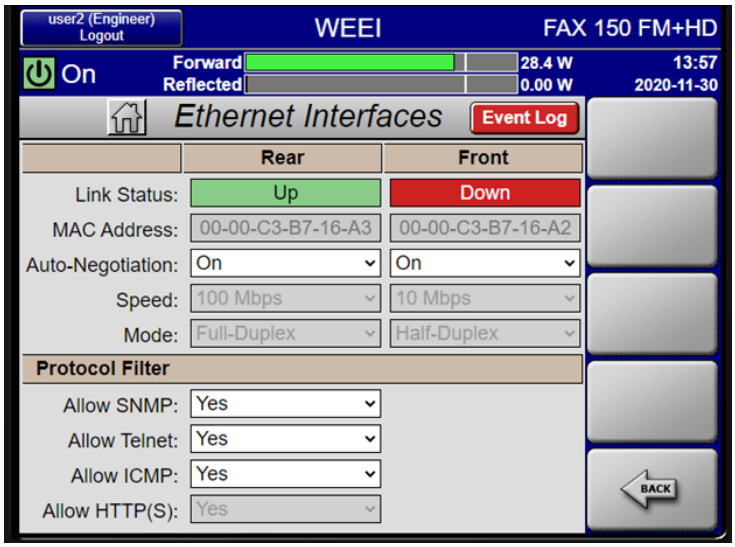


Figure 3-35 Ethernet Settings

Link Status - Link Status

MAC Address - MAC address of the Rear and Front Ethernet port

Auto Negotiation - Select ON or OFF

10/100 Mbps Speed - Select desired speed

Mode - Select Full or Half Duplex

3•8•16•2•1Protocol Filters

In addition to the access control filter, the protocol filters can be used to block the corresponding protocol packets on the rear interface. The protocols that can be filtered are SNMP, Telnet, ICMP, and HTTP or HTTPS. Disabling the HTTP and HTTPS protocols can only be done by connecting to the web interface through the front ethernet interface. The protocol filter controls are on the Ethernet Settings page.

3•8•16•3 System>Network Settings>SNMP Menu

The GatesAir transmitter family supports monitoring and alarming functionality via SNMP (Simple Network Management Protocol). SNMP versions V1 and V2c are implemented. MIB's are available on the GatesAir Customer Portal at **www.gatesair.com**.

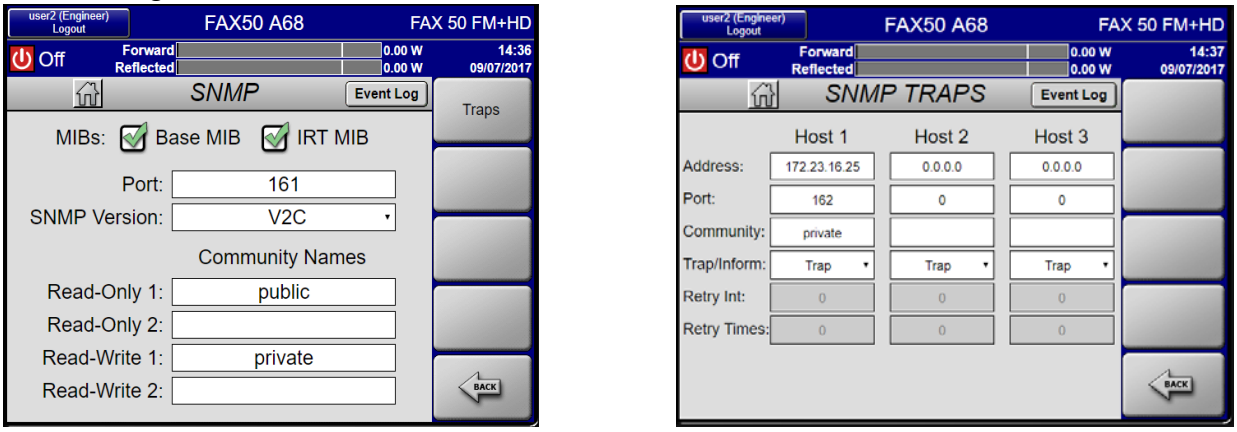


Figure 3-36 FAX SNMP Setup Screens

MIBs - GatesAir Base and IRT MIB's available for download at the GatesAir Website. Checking the box enables that MIB to work with third party SNMP boxes. Save must be clicked.

Port - Default is 161; Range is 161,162, 49152-65535 (**NOTE:** Changing the port assignments requires a reboot).

SNMP Version - FAX allows for version 1 or 2C only.

Read-Write Community - Private or Public; Default set to Private.

Save - Saves any changes made. Save and Cancel only show up when a change is made to a field.

Trap Address - IP address of SNMP trap receiver. Up to 3 available. Port 162 is default trap port, not changeable.

3.8.17 System>Network>Access Control Table

The access control table can be used to limit access to the transmitter to only trusted management stations identified by their IP address. The access control table only applies to packets received over the rear ethernet interface.

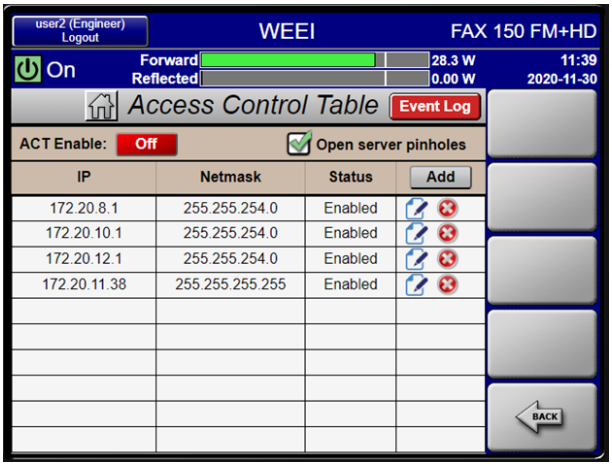


Figure 3-37 Access Control Table

When the table is empty, any computer or management station can access the transmitter. Adding entry to the table consists of specifying the IP address and subnet mask of the management station or stations that are allowed access. With the subnet mask, the entry can allow a single station (e.g. 255.255.255.255) or all stations on a specific subnet. For example, an entry with the IP address of 192.168.1.x and a subnet mask of 255.255.255.0, where x is any number, will allow entry to any management station whose IP address has the first three octets "192.168.1".

Entries in the table can be individually enabled and the whole table can be enabled. If the table is enabled and an entry in the table is disabled, the entry will have no effect. Similarly, if an entry is enabled but the table is disabled, the entry will have no effect. A user must be logged in to make changes to the access control table.

ACT Enable - Click on the Off or On button to change whether the table is enabled. The button color and text are indicators of the enable state of the table.

Add - Click on the Add button to add a new entry to the table. The dialog box is displayed where the IP address, subnet mask, and the enabled state of the entry are specified. Clicking on the "Ok" button adds the entry while clicking on "Cancel" aborts adding a table entry.

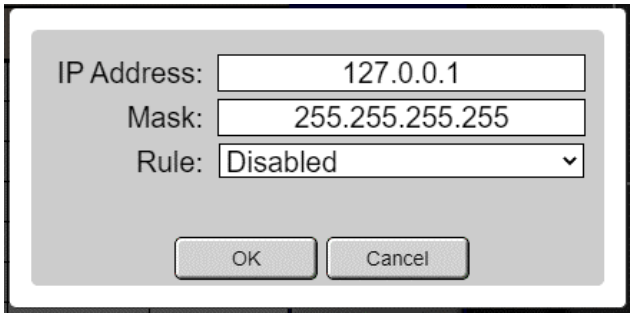


Figure 3-38 ACT Add Dialog Box

Edit an Entry - Click on the icon to change a table entry.

Delete an Entry - Click on the icon to remove an entry from the table.

Open Server Pinholes - Checking the **Open Server Pinholes** checkbox tells the access control table software to allow a response from the LDAP, NTP, DNS, and SMTP (email) servers through the access control table firewall even if there's no table entry matching the IP address of the server. Often, the address of one of these servers is a fully qualified domain name (pool.ntp.org for example) for which the server's IP address is unknown. In addition, the IP address that corresponds to the domain name can change without notice making it difficult to add an entry in the table for the server. When opening server pinholes is enabled, the software will add automatically add a temporary entry to the table after resolving a server's domain name to an IP address before sending a message to the server. Once it receives the server's response, or the conversation times out, the software removes the temporary entry from the table. Temporary entries are not displayed.

3.8.18 System>Network>ARP Chache

The address resolution protocol (ARP) cache is a collection of dynamic entries that are created as the networking software resolves IP addresses into Ethernet MAC addresses. ARP cache entries are deleted over time forcing the mapping between IP address and Ethernet MAC address to be learned again. This corrects for cases where the mapping may have changed. Viewing the ARP table can help solve intermittent communication issues caused by duplicate IP addresses or invalid entries. Clearing the ARP cache can sometimes correct these types of problems.

The entries in the address resolution protocol (ARP) cache can now be viewed on the ARP Cache page. The cache can be cleared by selecting the "Clear Cache" button.

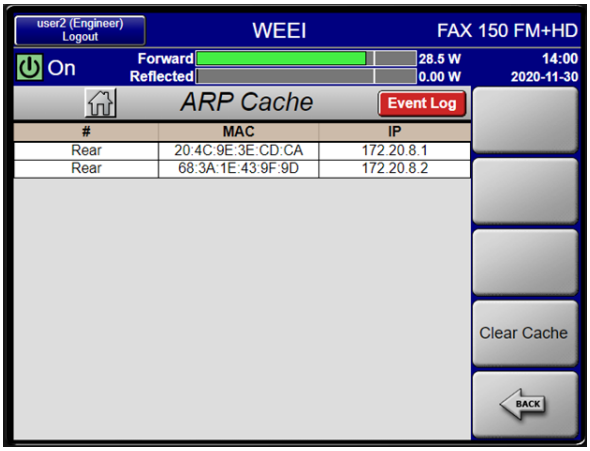


Figure 3-39 ARP Cache

3.8.19 System>Network>Email Config

The latest software now supports the generation of email messages when a fault or warning occurs in the system. When enabled, the transmitter will send an email when the event occurs and another message when the event clears.

Email Configuration - Email can be sent to up to five email addresses, and the email can be sent through secure email servers using transport layer security (TLS). The body of the email is formatted in HTML. Email configuration settings can be tested by clicking on the "Send Test Message" button.

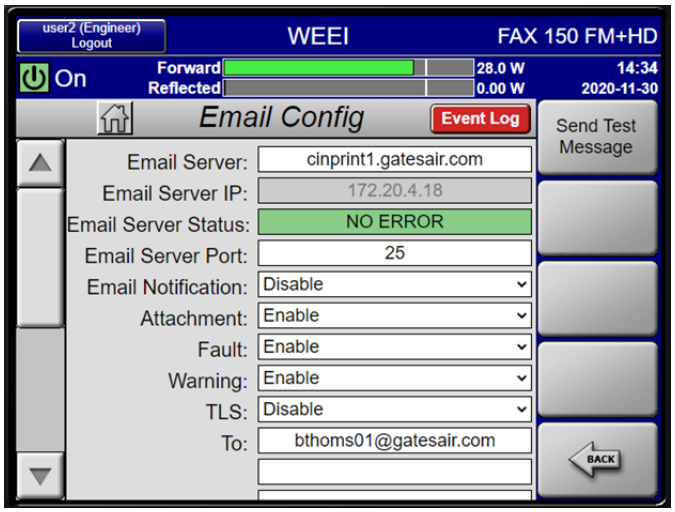


Figure 3-40 Email Configuration 1/2

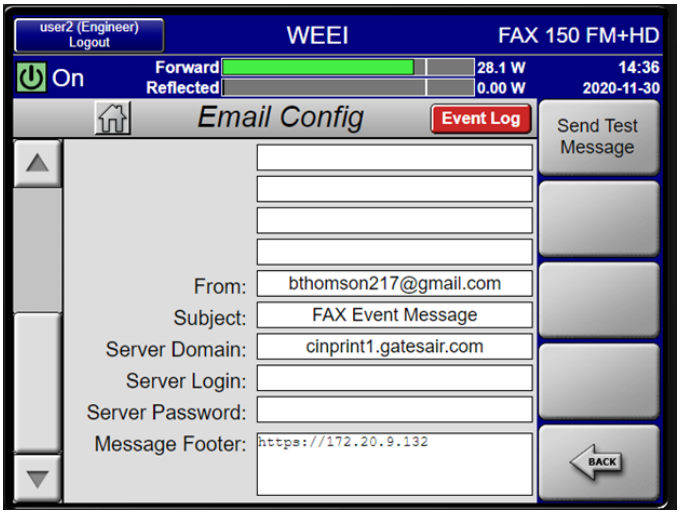


Figure 3-41 Email Configuration 2/2

Email Server - This field specifies the address of the email server. This can be either a fully qualified domain name such as smtp.gmail.com or an IP address.

Email Server IP - This read-only field shows the IP address of the email server. This is useful when the email server address is specified as a domain name.

Email Server Port - Specifies the port number that needs to be used to communicate to the email server. For non-secure servers, the port number is usually 25 while port 587 is usually used for secure servers.

Email Server Status - The server status shows the result of the last attempt to send email through the email server either by a test message or an email generated because of an event.

Email Notification - This allows email notification to be enabled or disabled.

Attachment - Selecting enable for this field causes the entire event log to be attached to the email as an attachment, not embedded in the email.

Fault - This controls if an email is generated on fault events.

Warning - This controls if an email is generated on warning events.

TLS - The TLS field controls whether the email server requires communications using transport layer security.

To - This is the receiving email address. Up to five receiving email addresses can be entered.

From - This is the email address put in the “From” field of the email.

Subject - This is the text used for the subject line of the email.

Server Domain - This is the domain of the email server, usually the same as what is put in the “Email Server” field.

Server Login - This is the login name for the email account on the server. This field should be left blank if the email server is non-secure.

Server Password - This is the password for the email account on the server. This filed should be left blank if the email server is non-secure.

Message Footer - This is text that will appear at the bottom of every email message. The body of the email is limited to 500 characters, and depending on the event description, the body of the email can consume over 400 characters. Any characters left after the body of the email has been created is available for the message footer. If the message footer string is longer than the number of available characters, it is truncated.

3.8.20 System>Network>Network Statistics

You can view statistics from the different layers of the networking software on the network statistics screen. Clicking on the different tabs displays the statistics kept for that part of the networking software.

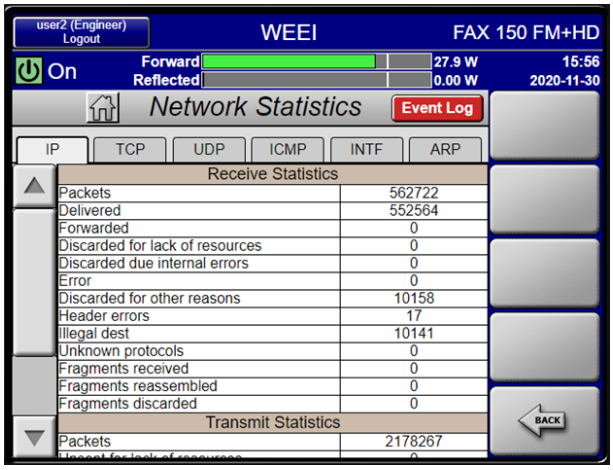


Figure 3-42 Network Statistics

3•8•20•1 IP Receive Statistics

Packet - the number of IP packets received

Delivered - the number of received IP packets sent up the protocol stack to a waiting software application

Forwarded - the number of IP packets received on the interface and then forwarded to another IP address.

Discarded for lack of resources - the number of received IP packets dropped because there was not enough memory to process them. This should normally be 0.

Discarded due to internal errors - the number of received IP packets dropped because of errors internal to the protocol stack. This should normally be 0.

Error - the number of received IP packets dropped because of an operating system error. This should normally be 0.

Discarded for other reasons - the number of received IP packets dropped for other reasons such as errors in the packet header, a bad destination address, the time-to-live (TTL) for the packet had expired, or the packet was blocked because of the access control table configuration.

Header errors - the number of received IP packets dropped because of an error in the packet header.

Illegal destination errors - the number of received IP packets dropped because of a bad destination address.

Unknown protocols - the number of received IP packets dropped because the packet had a protocol number not supported by the protocol stack.

Fragments receive - the number of IP packet fragments received.

Fragments reassembled - the number of IP packet fragments reassembled into a complete IP packet.

Fragments discarded - the number of IP packet fragments dropped because an error occurred trying to reassemble the fragment into a packet.

3•8•20•2 IP Transmit Statistics

Packets - the number of IP packets transmitted.

Unsent for lack of resources - the number of IP packets not transmitted because there was not enough memory to process it. This should normally be 0.

Unsent due to internal errors - the number of IP packets not transmitted because of errors internal to the protocol stack. This should normally be 0.

Error - the number of IP packets not transmitted because of an operating system error. This should normally be 0.

Destination found unreachable - the number of IP packets not transmitted because the destination IP address could not be reached.

Packets fragmented - the number of IP packets that had to be fragmented to be transmitted.

Fragments - the number of IP packet fragments created.

Fragmentation Failures - the number of errors that occurred while trying to fragment a transmit IP packet. This should normally be 0.

3•8•20•3 TCP Receive Statistics

Packets - the number of TCP packets received

Discarded for lack of resources - the number of received TCP packets dropped because there was not enough memory to process it. This should normally be 0.

Discarded due to internal errors - the number of received TCP packets dropped because of errors internal to the protocol stack. This should normally be 0.

Error - the number of received TCP packets dropped because of an operating system error. This should normally be 0.

Discarded for other reasons - the number of received TCP packets dropped for other reasons such as a bad destination address or the packet was dropped because of a protocol filter setting.

Header errors - the number of received TCP packets dropped because of an error in the header.

Acks of unsent data - the number of TCP acknowledgement packets received for data that was not sent. This should normally be 0.

With data outside window - the number of TCP packets received with a sequence number outside of the current window.

With data after close - the number of TCP packets received with data after the TCP connection has been closed.

Segments with data - the number of TCP packets received with data

Segments with duplicate data - the number of TCP packets received with data that was already acknowledged.

Segments with only an ACK - the number of TCP acknowledgement packets received that did not also contain data.

Segments with duplicate ACK - the number of TCP packets received that with an acknowledgement that has already been received.

Segments with RST - the number TCP packets received with the RST flag set.

Window probes - the number of times the sender requested the TCP stack to respond with its window size

Window updates - the number of times a TCP packet was received with an updated window size.

3•8•20•4 TCP Connection Statistics

Active opens - the number of TCP connections created by the TCP stack using the SYN message.

Passive opens - the number of TCP connections created by the TCP stack opening a TCP socket and listening for a connection request from a TCP client.

Currently established - the number of TCP connections that have been established since the transmitter was power cycled.

Gracefully closed - the number of TCP connections that closed cleanly with the FIN flag.

Aborted - the number of TCP connections that were closed with RST segment.

Failed connection attempts - the number of attempted TCP connections that were not successful.

3•8•20•5 UDP Receive Statistics

Packets - the number of received UDP packets

Discarded for lack of resources - the number of received UDP packets dropped because there was not enough memory to process it. This should normally be 0.

Discarded due to internal errors - the number of received UDP packets dropped because of errors internal to the protocol stack. This should normally be 0.

Error - the number of received UDP packets dropped because of an operating system error. This should normally be 0.

Discarded for other reasons - the number of received UDP packets dropped for other reasons such as a bad destination address or the packet was dropped because of a protocol filter setting.

Header errors - the number of received UDP packets dropped because of an error in the header.

With unknown ports - the number of received UDP packets dropped because there was no application listening to that port.

Blocked - the number of received UDP packets dropped because of a protocol filter setting.

3•8•20•6 UDP Transmit Statistics

Packets - the number of UDP packets transmitter.

Unsent for lack of resources - the number of UDP packets not transmitted because of errors internal to the protocol stack. This should normally be 0.

Unsent due to internal errors - the number of UDP packets not transmitted because of errors internal to the protocol stack. This should normally be 0.

Error - the number of UDP packets not transmitted because of an operating system error. This should normally be 0.

With illegal destination port - the number of UDP packets not transmitted because the destination port was 0. This should normally be 0.

3•8•20•7 ICMP Receive Statistics

Packets - the number of ICMP packets received.

Discarded for lack of resources - the number of received ICMP packets dropped because there was not enough memory to process it. This should normally be 0.

Discarded due to internal errors - the number of received ICMP packets dropped because of errors internal to the protocol stack. This should normally be 0.

Error - the number of received ICMP packets dropped because of an operating system error. This should normally be 0.

Discarded for other reasons - the number of received ICMP packets dropped for other reasons such as a bad destination address or the packet was dropped because of a protocol filter setting.

Header errors - the number of received ICMP packets dropped because of an error in the header such as a bad checksum.

Unrecognized codes - the number of received ICMP packets dropped because the ICMP code in the packet is not defined.

Redirects from non gateways - the number of received ICMP redirect packets that were sent from an entity that is not the default gateway.

Destination unreachables - the number of ICMP packets received with a “destination unreachable” type.

Time exceeded - the number of ICMP packets received with a “time exceeded” type.

Parameter problems - the number of ICMP packets received with a “parameter problem” type.

Source quenches - the number of ICMP packets received with a “source quench” type.

Redirects - the number of ICMP packets received with a “redirect” type.

Echo requests - the number of ICMP packets received with a “echo request” type, i.e. a “ping” packet.

Echo replies - the number of ICMP packets received with a “echo reply” type, i.e. a “ping response” packet.

Timestamp requests - the number of ICMP packets received with a “timestamp request” type. This should normally be 0.

Timestamp replies - the number of ICMP packets received with a “timestamp reply” type. This should normally be 0.

Info requests - the number of ICMP packets received with a “info request” type. This message type has been deprecated, so this number should normally be 0.

Info reply - the number of ICMP packets received with a “info reply” type. This message type has been deprecated, so this number should normally be 0.

Unknown - the number of ICMP packets received with an unknown message type.

Blocked - the number of ICMP packets because of a protocol filter.

3•8•20•8 ICMP Transmit Statistics

Packets - the number of ICMP packets transmitted.

Unsent for lack of resources - the number of ICMP packets not transmitted because of errors internal to the protocol stack. This should normally be 0.

Unsent due to internal errors - the number of ICMP packets not transmitted because of errors internal to the protocol stack. This should normally be 0.

Error - the number of ICMP packets not transmitted because of an operating system error. This should normally be 0.

With illegal type or code - the number of ICMP packets not transmitted because the packet had an undefined message type or code. This should normally be 0.

Echo requests - the number of ICMP packets transmitted with a “echo request” type, i.e. a “ping” packet.

Echo replies - the number of ICMP packets transmitted with a “echo reply” type, i.e. a “ping response” packet.

Timestamp requests - the number of ICMP packets transmitted with a “timestamp request” type. This should normally be 0.

Timestamp replies - the number of ICMP packets transmitted with a “timestamp reply” type. This should normally be 0.

Info requests - the number of ICMP packets transmitted with a “info request” type. This message type has been deprecated, so this number should normally be 0.

Info reply - the number of ICMP packets transmitted with a “info reply” type. This message type has been deprecated, so this number should normally be 0.

Unknown - the number of ICMP packets not transmitted because the packet had an unknown message type.

3•8•20•9 Interface (INTF) Receive Statistics

Packets - the number of ethernet frames received on the interface.

Discarded for lack of resources - the number of received ethernet frames dropped because there was not enough memory to process it. This should normally be 0.

Discarded for other reasons - the number of received ethernet frames dropped for other reasons such as a bad checksum.

Internal errors - the number of received ICMP packets dropped because of errors such as the frame size exceeded the maximum size allowed.

Error - the number of received ethernet frames dropped because of an operating system error. This should normally be 0.

Total bytes - the number of bytes transmitted out of the interface since the last power cycle.

Unicast packets - the number of frames received from a unicast ethernet address.

Multicast packets - the number of frames received from a multicast ethernet address.

Broadcast packets - the number of frames received from a broadcast ethernet address.

3•8•20•10 Interface (INTF) Transmit Statistics

Packets - the number of frames transmitted out of the interface.

Discarded for lack of resources - the number of ethernet frames not transmitted because there was not enough memory to process it. This should normally be 0.

Discarded for other reasons - the number of ethernet frames not transmitted for other reasons such as a bad checksum.

Internal errors - the number of frames not transmitted because of an error creating the ethernet frame. This should normally be 0.

Error - the number of frames not transmitted because of an operating system error. This should normally be 0.

Total bytes - the total number of bytes transmitted out of the interface since the last power cycle.

Unicast packets - the number of frames transmitted to a unicast ethernet address.

Multicast packets - the number of frames transmitted to a multicast ethernet address.

Broadcast packets - the number of frames transmitted to a broadcast ethernet address.

3•8•20•11 ARP Receiver Statistics

Packets - the number of ARP packets received.

Discarded for lack of resources - the number of ARP packets dropped because there was not enough memory to process it. This should normally be 0.

Discarded for other reasons - the number of ARP packets dropped for other reasons.

Internal errors - the number of ARP packets dropped because of an error internal to the protocol stack. This should normally be 0.

Error - the number of ARP packets dropped because of an operating system error. This should normally be 0.

Valid ARP requests received - the number of ARP requests received destined for this interface.

Valid ARP replies received - the number of ARP replies received for which a request was sent out this interface.

3•8•20•12 ARP Transmit Statistics

Packets - The number of ARP packets transmitted out this interface.

Discarded for lack of resources - the number of ARP packets not transmitted because there was not enough memory to process it. This should normally be 0.

Discarded for other reasons - the number of ARP packets not transmitted for other reasons.

Internal errors - the number of ARP packets not transmitted because of an error internal to the protocol stack. This should normally be 0.

Error - the number of ARP packets not transmitted because of an operating system error. This should normally be 0.

ARP request - the number of ARP requests transmitted out this interface.

APR replies - the number of ARP replies transmitted out this interface.

ARP alloc_returned NULL - the number of times an entry could not be added to the ARP cache

ARP cache hits - the number of times an IP address was found in the ARP cache.

ARP cache misses - the number of times an IP address was not found in the ARP cache.

Discarded due to missing entry - the number of times a packet was not transmitted because the ARP cache entry associated with the destination expired.

3.8.21 System>Network>LDAP

User authentication is available using Lightweight Directory Access Protocol (LDAP). When enabled, user login credentials are transmitted to an authentication server, such as X.500 or Active Directory, for authentication. If the server denies entry to those credentials, the software compares the credentials against the local user database. This prevents customers from being unable to access the transmitter if communication to the X.500 server is down. The configuration screen for LDAP is accessible from the Network Settings screen.

In LDAP, a globally unique user entry is represented by what is called a distinguished name or “DN”. The distinguished name is constructed by concatenating a sequence of relative distinguished name (RDN) attribute values such as their organization, common name, and country. Each RDN attribute consists of a label followed by the equal sign and then the attribute value. An example of the DN might be

cn=John Smith,ou=Engineering,company=GatesAir,c=USA

where “cn” is the common name, “ou” is the person’s organization, “company” is the company that the person works for, and “c” is the country where they are located.

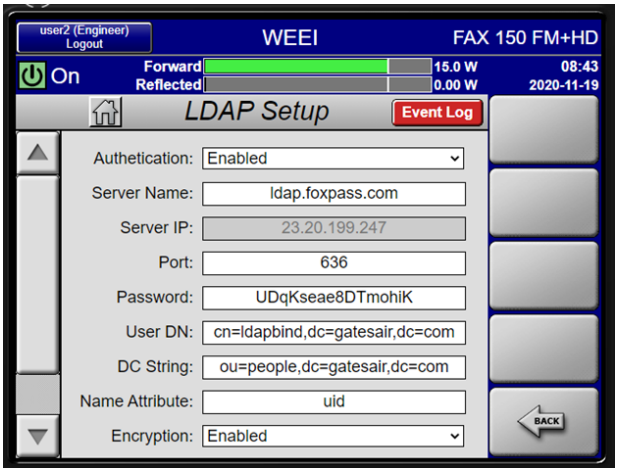


Figure 3-43 LDAP Setup 1/2

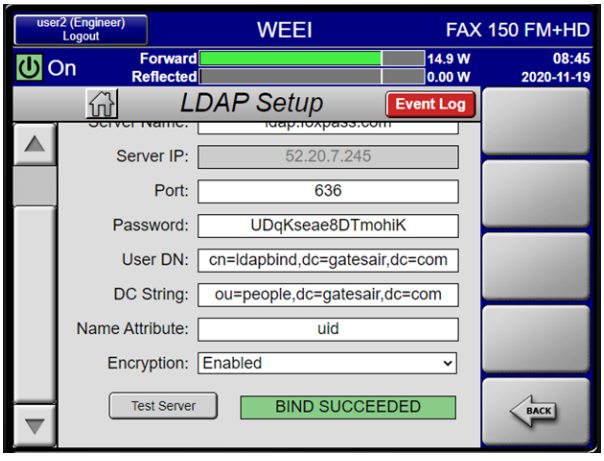


Figure 3-44 LDAP Setup 2/2

Authentication - This enables authentication using LDAP protocol to a X.500 server.

Server Name - The Server Name field configures the DNS name for the X.500 server. This can also be an IP address.

Server IP - The Server IP field displays the IP address of the X.500 server. This is useful when the server was specified using a DNS name as opposed to an IP address so that the customer can see the server's corresponding IP address. This field is read-only.

Port - This specifies the UDP port number on which the X.500 server is listening for LDAP communication. Secure communications normally use port 636 while port 389 is normally used for non-secure LDAP.

Password - This field specifies the password that needs to be provided when binding with the X.500 server during the LDAP procotol exchange. This is not the same thing as the password used in a user's authentication credentials.

User DN - The user distinguished name (DN) indicates the LDAP interchange format fields that need to be used during the authentication process. This string would be provided by the administrator for the X.500 server.

DC String - The domain component (DC) string specifies the path to the user domain object in the authentication server's directory. The "ou" field in the DC string specifies an organizational unit, and the "dc" fields specify components of DNS domain name. This string would be provided by the administrator for the X.500 server.

Name Attribute - This identifies the attribute to use to identify the user ID for the user's credentials. An "=" sign is automatically appended to this field. This string would be provided by the administrator for the X.500 server.

Encryption - The encryption field specifies if the LDAP protocol exchange should be encrypted using transport layer security (TLS).

Test Server - Pressing this button initiates a test where the LDAP client in the transmitter attempts to bind with the authentication server. This consists of initiating a conversation with the server where the LDAP version and server password are exchanged. No user DN is exchanged. The status of the bind attempted is displayed next to the test button.

3.8.22 System>Network>Secure Comms

Encrypted communication in the FAX is between the web client and the web server. For better performance, the encrypted communication uses a technology called "secure web sockets". In addition, only commands from the web client to the server and sensitive data sent back to the client are sent over the encrypted channel. The initial loading of web pages and files and other non-sensitive data such as meter data is done over a normal HTTP connection. Because there is a combination of secure and non-secure data exchanged between the web client and the server, the web browser will not show the connection as secure in the browser address bar.

The transmitter is configured for secure communications from the Secure Comms Setup page. Once secure communications mode is enabled, the web client will automatically reload the GUI.

Figure 3-45 Secure Comms Setup

FAX uses a certificate that is not signed by a certificate authority. When the home screen is first accessed from a browser window, the browser will display the warning screen. (This is the warning screen from the Chrome browser,

but all browser warning screens are similar.) Click on the “Advanced” button and then the “Proceed to x.x.x.x (unsafe)” link. The screen shown will be displayed while the web client loads the Flexiva certificate. After the certificate is loaded, the Flexiva home screen is loaded automatically. Once the certificate is loaded in a browser, the home screen will be directly accessible without having to go through the browser warning screens to load the certificate as long as the IP address is put in the address bar. Using https://172.20.9.132 will force the certificate to be reloaded.

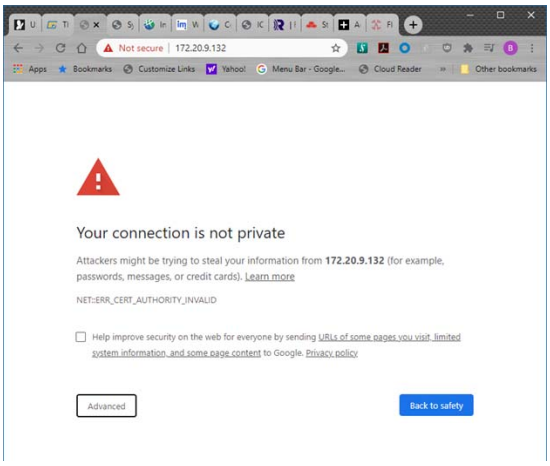


Figure 3-46 Unsecure Site Warning

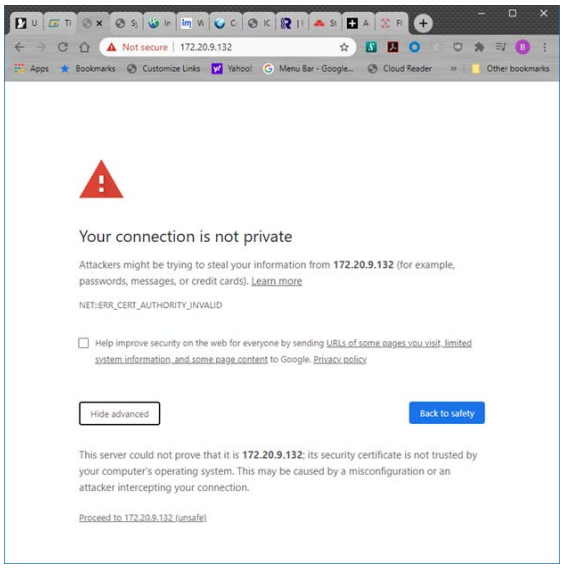


Figure 3-47 Unsecure Site Warning - Advanced Options

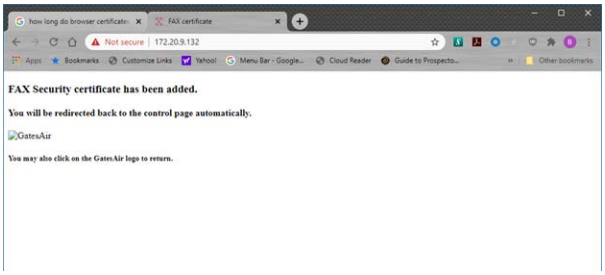


Figure 3-48 Security Loading

3.8.23 System>NTP Menu

If using the NTP setting for more accurate time and date, an IP address of a NTP time server must be entered. A list of time server IP addresses can be obtained from NIST. If the network that is the FAX is connected to does not have a NTP server then a connection to the Internet is required.

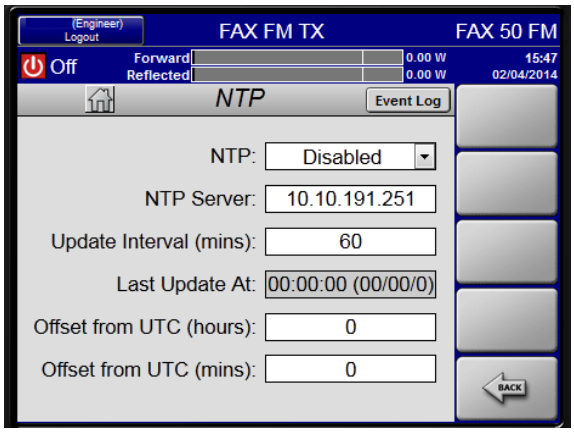


Figure 3-49 NTP Setup Screen

NTP Server - IP address of a NTP Time server either on the network or the internet. Cannot use the name of the server (ie time-a.nist.gov) See **website www.nist.gov** for IP addresses of time servers on the Internet.

Update Interval - Range is 2 - 1000 minutes

Last Update at - Shows the last time a successful update was obtained from server

Offset from UTC - Enter an offset in hours/minutes that your location is from Greenwich Mean Time. User must take into consideration daylight savings time if applicable.

Save - Button must be clicked for the NTP Server IP Address or Offset to be stored and activated

3.8.24 Exciter Icons Menus

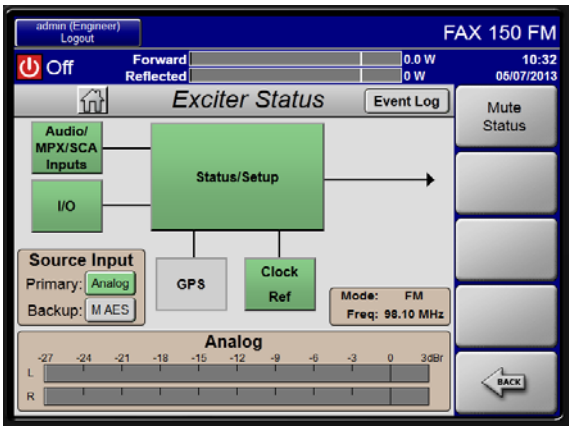


Figure 3-50 Exciter Menu

3.8.25 Exciter Status/Setup (Modulator Setup) Menu

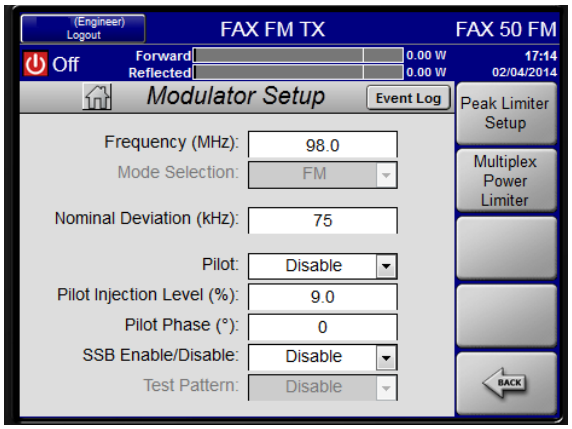


Figure 3-51 Modulator Setup Screen

Frequency (MHz)- Operating frequency of transmitter/exciter

Mode Selection - FM, FM+HD,HD Only, SLC, Boost Amp (Requires Exgine for HD Modes)

Nominal Deviation (kHz) - Amount of FM deviation that is on-air

Pilot: Enable or Disable - Internal 19 kHz Pilot

Pilot Injection Level (%) - 0 to 12%

Pilot Phase (˚) - Pilot phase offset; range is -5˚ to 5˚

SSB Enable/Disable - Enables/Disables Stereo Operation. Enable places the Stereo Encoder in SSB-SC mode. Disable places the Stereo Encoder in traditional DSB-SC mode.

Test Pattern - Enables/Disables 1 kHz - 100% modulated internal test tone.

WARNING: Disconnect primary power prior to servicing.

Warning

ENABLING THE TEST PATTERN FUNCTION WILL TAKE THE PROGRAM AUDIO OFF-AIR. THE 1 KHZ TONE WILL REMAIN ON-AIR UNTIL IT IS DISABLED.

3•8•25•1 Single Sideband Suppressed Carrier (SSB-SC)

The Flexiva FAX FM Exciter contains an implementation of SSB-SC stereo mode. To use SSB in Flexiva, access the Modulator Setup page and Enable SSB mode and Enable Peak Limiting.

Flexiva uses the Hilbert transform method, where a 90 degree broadband phase shift is used to cancel/eliminate the upper sideband of the 38kHz stereo subcarrier. The remaining lower sideband level is increased 6dB to support the correct L+R/L-R matrixing in the receiver.

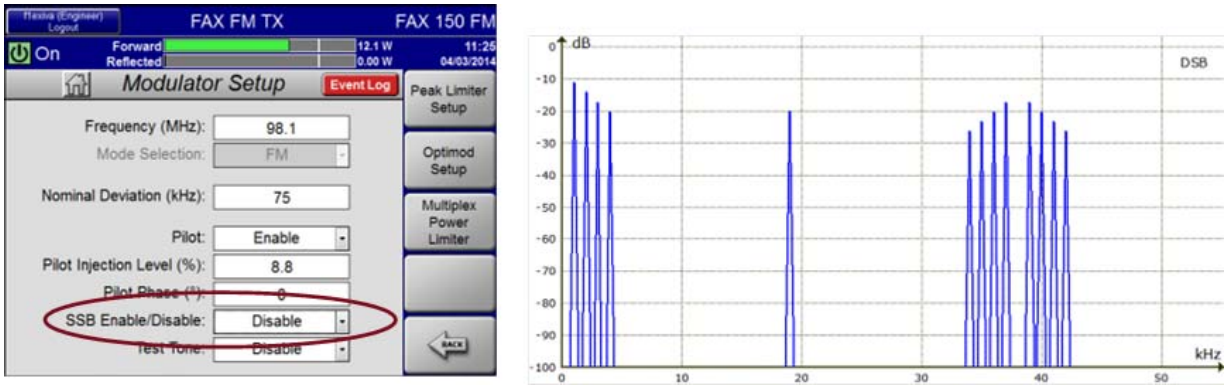


Figure 3-52 SSB Disabled

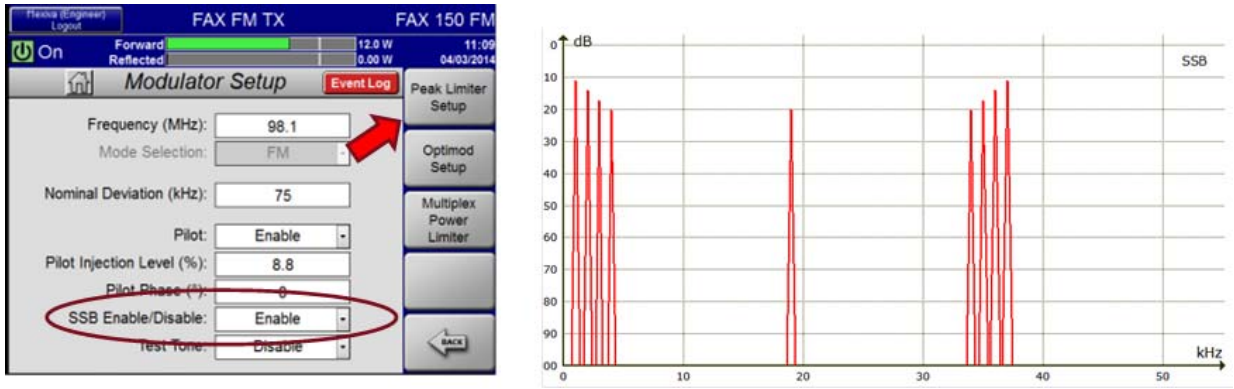


Figure 3-53 SSB Enabled

Without the benefit of interleaving in the SSB waveform as opposed to DSB, instantaneous phase differences between the L/R program channels can result in up to a 2.8 dB increase gain causing composite peak modulation overshoots. Peak limiting from the Flexiva's Composite Peak Limiter should be enabled and set to maintain desired modulation levels and equivalent loudness when using SSB mode. See section 3.8.26 for more information about setting up the modulator limiter.

Warning

SSB MODE IS CURRENTLY NOT AUTHORIZED BY THE FCC. § 73.322 FM STEREOPHONIC SOUND TRANSMISSION STANDARDS SPECIFICALLY REQUIRES THE DOUBLE SIDEBAND, SUPPRESSED-CARRIER SYSTEM. SSB MODE SHOULD NOT BE ENABLED WITHOUT SPECIFIC FCC EXPERIMENTAL AUTHORIZATION FOR SSB-SC.

Warning

USE OF THE SSB MODE CAN CAUSE PEAK MODULATION OVERSHOOTS. USE OF THE COMPOSITE PEAK LIMITER IS REQUIRED FOR SSB-SC OPERATION.

3.8.26 Limiter Setup Menu

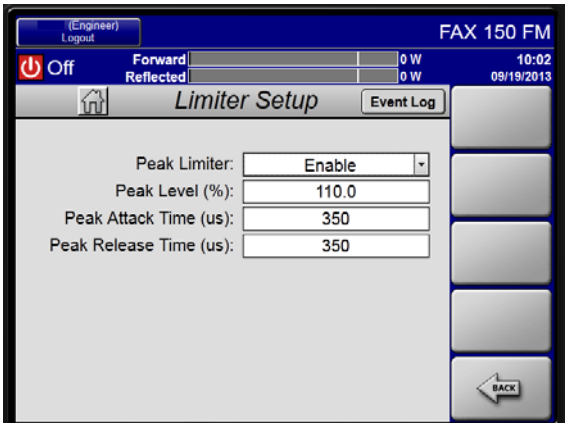


Figure 3-54 Limiter Setup Screen

Peak Level(%):- Audio peak level where the limiter takes effect

Peak Attack Time (us): - Time delay before the limiter starts acting on the composite signal once it has reached the Peak Level setting

Peak Release Time (us): - How soon the limiter starts to release the signal level back to normal after the level drops below the Peak Level setting

3.8.27 Multiplex Power Menu

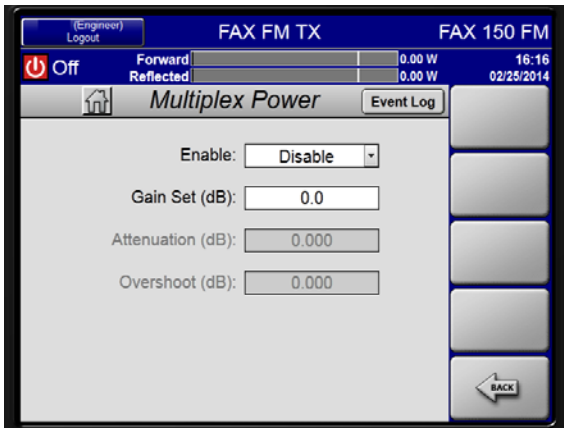


Figure 3-55 Multiplex Power Setup Screen (ITU-R 412)

Warning

THE MULTIPLEX POWER NEEDS TO BE DISABLED IN MOST CASES.

Enable: Enables or Disables the internal Multiplex Power Limiter; Set to DISABLE unless the country of installation requires this standard (ITU-R 412).

Gain Set: Range -30 to 60

Attenuation (dB): Displays current Attenuation applied in order to maintain 40 kHz 1 minute averaged MPX power.

Overshoot(dB): Displays the current 1 minute average MPX Power relative to the 40 kHz reference

3.8.28 Orban Option Menu

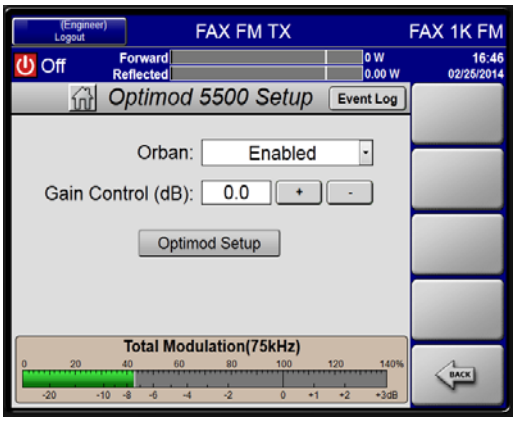


Figure 3-56 Modulator Setup with Orban Option

Optimod Setup - Takes the user to the Orban Setup menus. See 888-2776-001 Orban Manual for detailed installation, configuration and operation information.

Gain Control (dB): - Set to achieve 100% modulation, use test tone and adjust using bargraph at bottom of screen.

Note

*Orban card operates with Main or AUX AES and Analog L & R but does **NOT** operate when either Main Composite or Aux Composite audio is used.*

3.8.29 Clock Reference Option

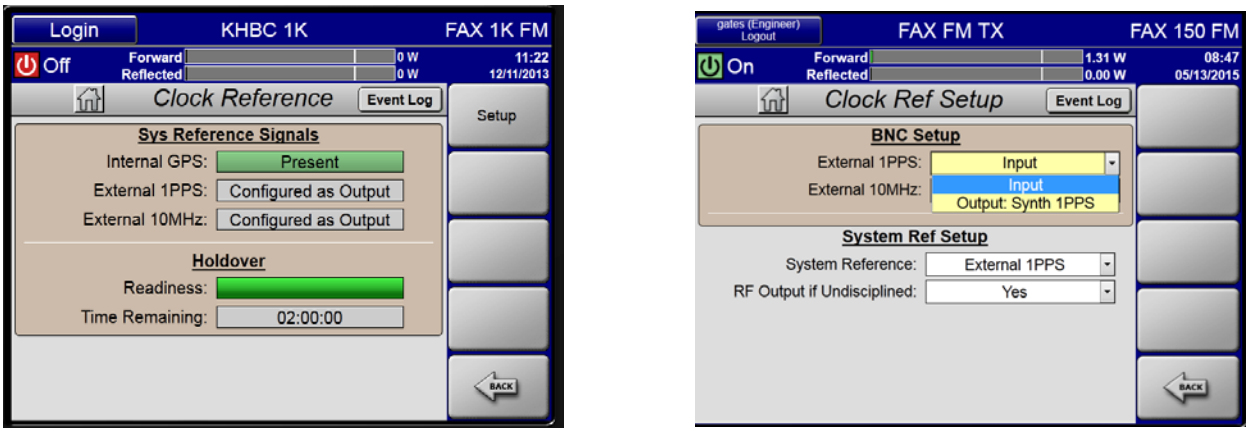


Figure 3-57 Clock Reference Setup

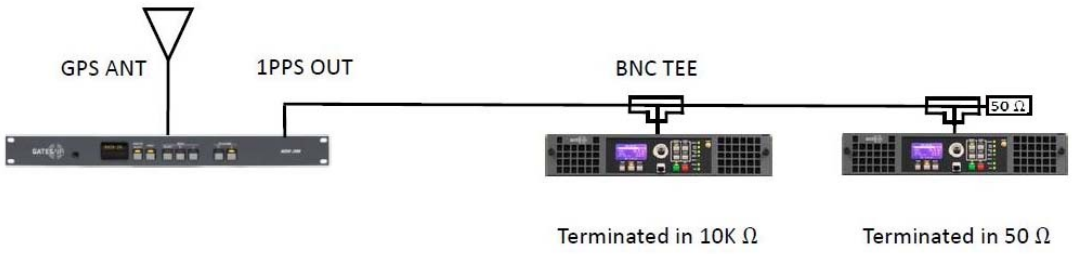
BNC Setup

External 10 MHz - Can be set to input (or output with internal GPS option). Output requires Internal GPS option to be installed. Level -10 dBm to +10 dBm

External 1 PPS - Can be set to Input (or output with internal GPS option). 50 Ohms or 10 k Ohms selectable

Note

Terminate in 10K ohms (JP1 2-3 see table in Section 5) if output is selected. If input is selected, terminate in 50 ohms (JP1 1-2) if a single unit or the last unit in a daisy chain configuration (with all other units unterminated).



HDE-200 1PPS output shown in "daisy chain" configuration for two exciters terminated in 50 ohms on end exciter.

Distance from HDE-200 to BNC TEE has been tested to 25' (RG-223/U Coleman 991079)

WARNING: Disconnect primary power prior to servicing.

System Ref Setup

System Reference: - Reference is which the clock and frequency of the transmitter will be locked to.

Manual - Running on internal oscillator

External 1 PPS - Requires a 1 PPS at rear panel and BNC Setup must have External 1 PPS set to Input

External 10 MHz - Requires a 10 MHz at rear panel and BNC Setup must have External 10 MHz set to Input

Internal GPS - Requires optional internal GPS receiver board, antenna kit and valid feature key to be installed in unit.

RF output of Undisciplined: - If this field is set to YES, RF will mute when on loss of lock to the selected System Reference. If internal GPS is selected, loss of lock will not occur until holdover has counted down to 0 seconds.

OCXO Clock Adjustment (%): - 0 to 100 %, Adjusts the internal 40 MHz OCXO frequency to set the final output frequency 88-108 MHz. Only when System Reference set to Manual

3.8.30 GPS (Requires GPS Option to be installed)

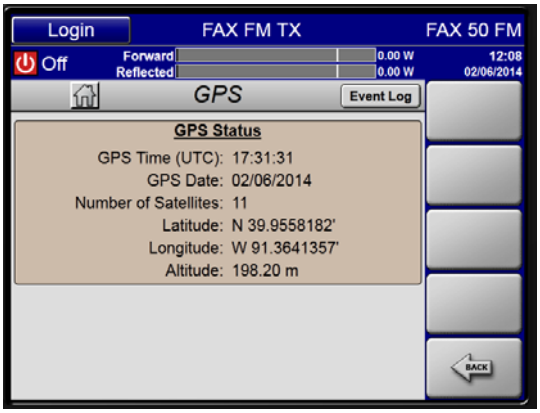


Figure 3-58 GPS Status Screen

Button will be grayed out if GPS option is not installed. Screen shows the status of the GPS RX.

There are two types of GPS option kits available for Flexiva transmitters

- 981 0090 584 High Gain Antenna Option is for units that have longer than 50ft of coax between the antenna head and transmitter and includes a 150ft (45.7m) cable.

- 981 0090 567 Standard Gain Antenna Option is for coax runs shorter than 50ft. This kit includes a 50ft (15.2m) cable.

3.8.31 Exciter I/O Menus

Exciter I/O lines are part of TX Interface DB15 connector on the rear panel of FAX.

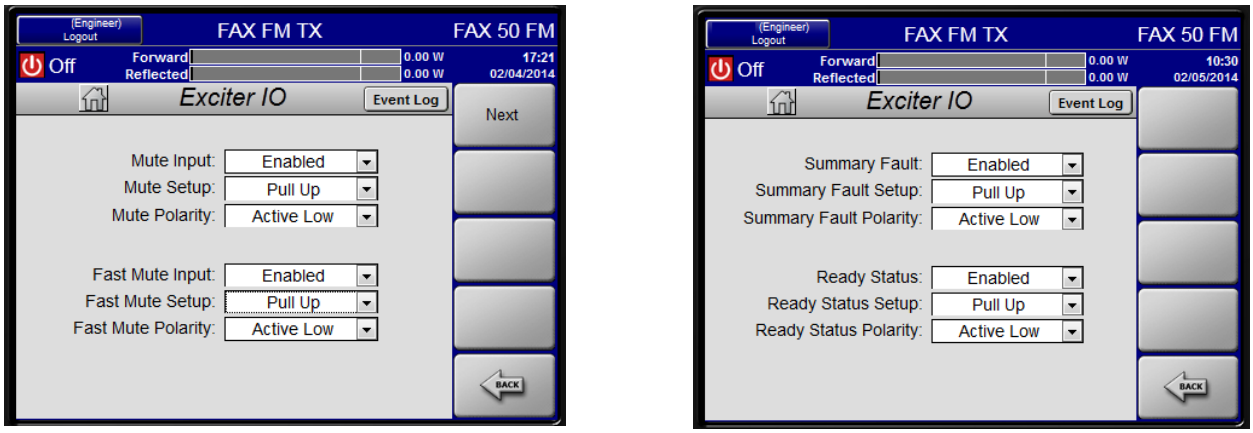


Figure 3-59 Exciter Scaling Menu

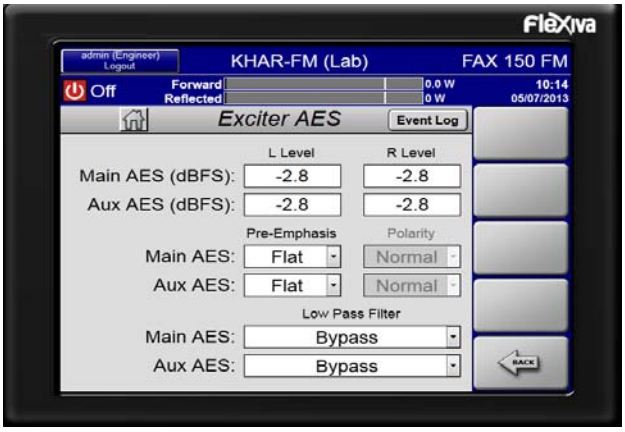
Mute Input - Selectable Active Hi or Low; Selectable Pull Up/Dn resistor(1 k ohm)

Fast Mute Input - Selectable Active Hi or Low; Selectable Pull Up/Dn resistor(1 k ohm); Provides faster ramp times than Mute

Summary Fault - Selectable Active Hi or Low; Selectable Pull Up/Dn resistor(1 k ohm)

Ready Status - Selectable Active Hi or Low; Selectable Pull Up/Dn resistor(1 k ohm)

3.8.32 AES Audio Setup



Main/Aux AES (dBfs) - Range -25.5 to 0 dBfs; Level that must be at the Main AES input on rear panel of transmitter for 100 % modulation

Main/Aux AES - Flat (0 uS) or 25, 50, 75 uS Pre-Emphasis

Main/Aux AES - Bypass, 15 kHz or 17 kHz Low Pass Filter

Note

When Orban option is installed, Pre-Emphasis and Low Pass Filter are fields are disabled and set to 0 uSec and Bypass respectively.

3.8.33 Analog Audio Setup

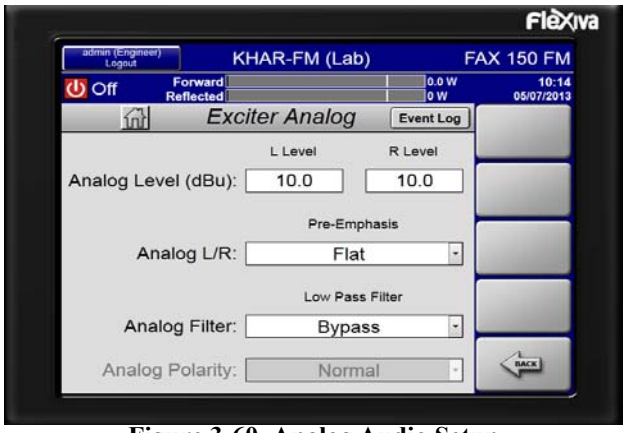


Figure 3-60 Analog Audio Setup

Analog Level (dBu) - Range 0 to +15 dBu; Level that must be at the Analog audio input(s) on rear panel of transmitter for 100 % modulation

Analog L/R - Flat (0 uS) or 25, 50, 75 uS Pre-Emphasis

Analog Filter - Bypass, 15 kHz or 17 kHz Low Pass Filter

Analog Polarity - Normal or Inverted

3.8.34 Composite Audio Setup

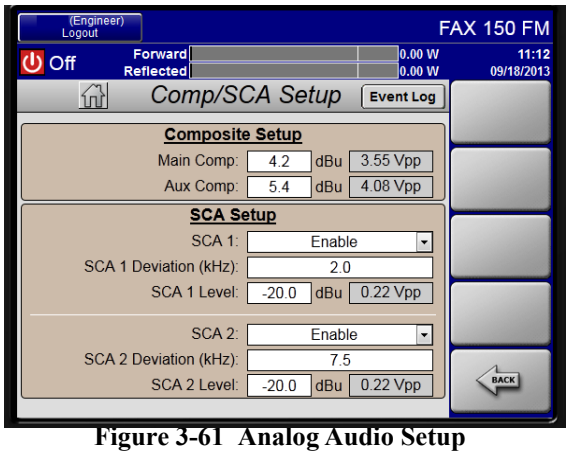


Figure 3-61 Analog Audio Setup

Main/Aux Level (dBu) - Range -0.8 to 8.7 dBu; Level that must be at the Analog audio input(s) on rear panel of transmitter for 100 % modulation

SCA1/2 Deviation - Deviation of Sub-Carrier 1 and 2; Range 0 - 15 kHz

SCA1/2 Level - Level required at the input to produce 100 % SCA deviation; Range -6.8 - 5.32 dBu

3.8.35 RBDS/RDS Setup Screen

The FAX Compact transmitters have a built-in RDS generator, it's setup is only accessible via an Ethernet connection. To get to the RDS Setup screen, click on the Exciter icon on the FAX Home Screen.

For more detailed descriptions of the RDS setups, refer to NRSC RDS Guidelines.

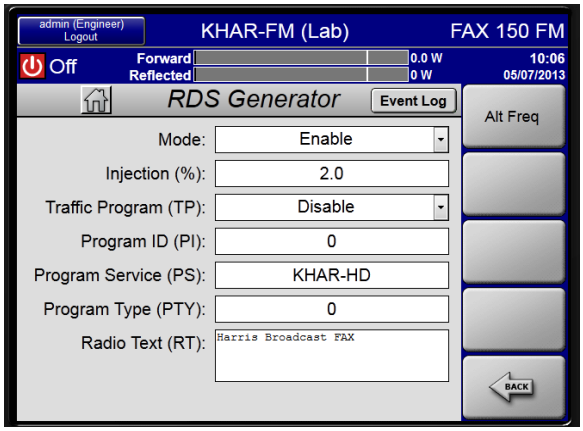


Figure 3-62

Mode - Enable or Disable; with this disabled all other parameters are ignored and no 57 kHz subcarrier is on air

Injection (%) - Injection level of 57 kHz subcarrier; 0 to 15%

Traffic Program (TP) - Enable or Disable; Used only if traffic reports are to be broadcast

Program ID (PI) - code that is mapped from station call letters, must be a Hex number. Generators are available on the Internet to calculate PI Code from call letters.

Program Service (PS) - Up to 8 characters long, Station call letters ie - KHAR-HD

Program Type (PTY) - Code for station format, ie - Jazz, Rock, classical, etc; Decimal value see table below.

Radio Text(RT) - Text filed can be entered; up to 64 characters

Alt Freq - Alternate Frequency (top button); opens screen for entry of up to 6 alternate frequencies. Allows receivers to find a simulcast station quickly.

Table 3-26 Program Type PTY Codes

RDS PTY Code	European Program Type	North American Program Type
0	No program definition type	No program definition type
1	News	News
2	Current affairs	Information
3	Information	Sport
4	Sport	Talk
5	Education	Rock
6	Drama	Classic Rock
7	Culture	Adult Hits
8	Science	Soft Rock
9	Variable	Top 40
10	Popular Music (Pop)	Country Music
11	Rock Music	Oldies Music
12	Easy Listening	Soft Music
13	Light Classical	Nostalgia
14	Serious Classical	Jazz
15	Other Music	Classical
16	Weather	Rhythm & Blues Music
17	Finance	Soft Rhythm & Blues Music
18	Children's Programs	Language
19	Social Affairs	Religious Music
20	Religion	Religious Talk
21	Phone-in Talk	Personality
22	Travel	Public
23	Leisure	College
24	Jazz Music	Not assigned
25	Country Music	Not assigned
26	National Music	Not assigned
27	Oldies Music	Not assigned
28	Folk Music	Not assigned
29	Documentary	Weather
30	Alarm Test	Emergency Test
31	Alarm	Emergency

3.8.36 Audio Monitoring Screen

The FAX Compact transmitters have a built-in input audio monitor. This monitor displays the audio at the input of the FAX. It will display all audio signals that are present regardless if they are on-air.

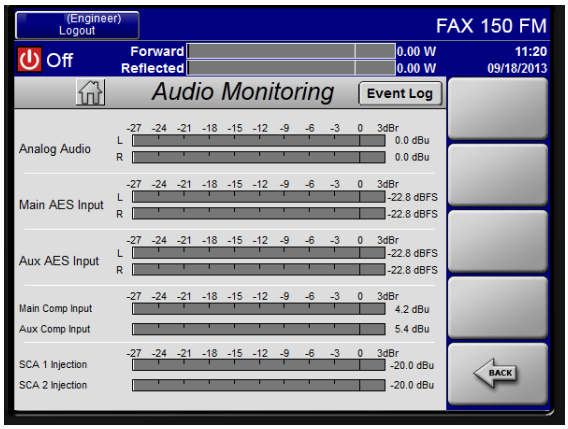


Figure 3-63

3.8.37 Input Mux Setup Screen

The FAX Input Mux Setup screen allows to select the Primary and Backup audio sources if more than one source is available.

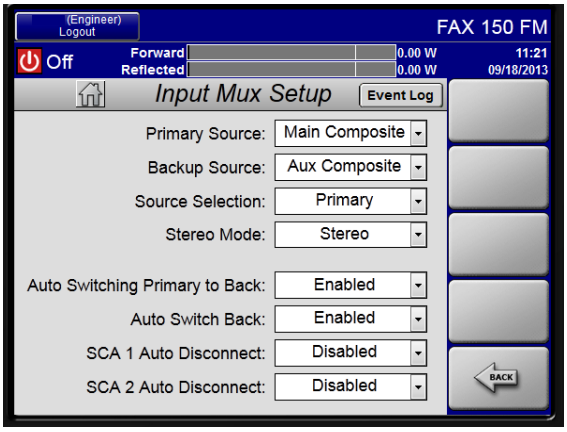


Figure 3-64

Primary/Backup Source - Selects the audio type for the Primary and Backup Source. Any available audio types may be selected from drop down box. Selecting Main or Aux, MPX L or MPX R, provides a direct, digital wideband composite baseband (multiplex or MPX) connection from MPX/AES192 equipped audio processor / Stereo generators into the exciter's AES/EBU inputs.

Source Selection - Indicates which source is currently on-air

Auto Switching Primary to Backup - Enable or Disable; Enables the auto switching. Should be Disabled if only one source is available

Auto Switch Back - Enables Auto Switch back feature which allows for switching back to the Primary source once the audio Level/Time parameters have been met

SCA1/2 Auto Disconnect - When enabled, anytime there is a switch from Primary to Backup audio source the External SCA input(s) are disconnected. This functionality affords prevention of discontinuity with an external RDS generator should the on-air audio source change and the RDS generator is not synchronized with the Backup source.

3.8.38 Input Thresholds Setup Screen

The FAX Input Thresholds screen allows to select the level and times for switching between the Primary and Backup audio sources.

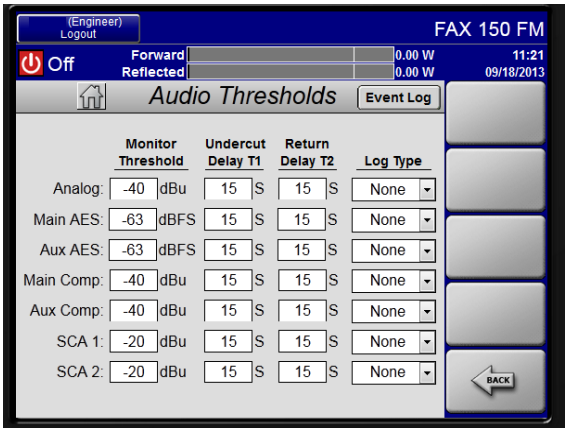


Figure 3-65

Monitor Threshold - Level where switch will occur

Undercut Delay T1 - Time that Primary source needs to remain below Monitor Threshold level to switch

Return Delay T2 - Time Primary source needs to remain above Monitor Threshold to switch back

Log Type - Type of event that is logged, None, Warning or Fault. The setting in this field will not effect the Primary/ Backup switching or transmitter operation. This will only generate an entry into the Event Log. If the Log type is set to Fault or Warning and no audio is present a continuous event, Fault or Warning, will be in the Event Log. Set the fields only for the audio types in use.

3.8.39 Exciter Presets

With the release of A67 firmware, the FAX/FLX series transmitter now supports exciter presets to allow on the fly switching between up to 8 loaded preset operational configurations. Following is a example of configuring, storing and loading a preset.

From the transmitter Home page select system button, then select TX Setup.

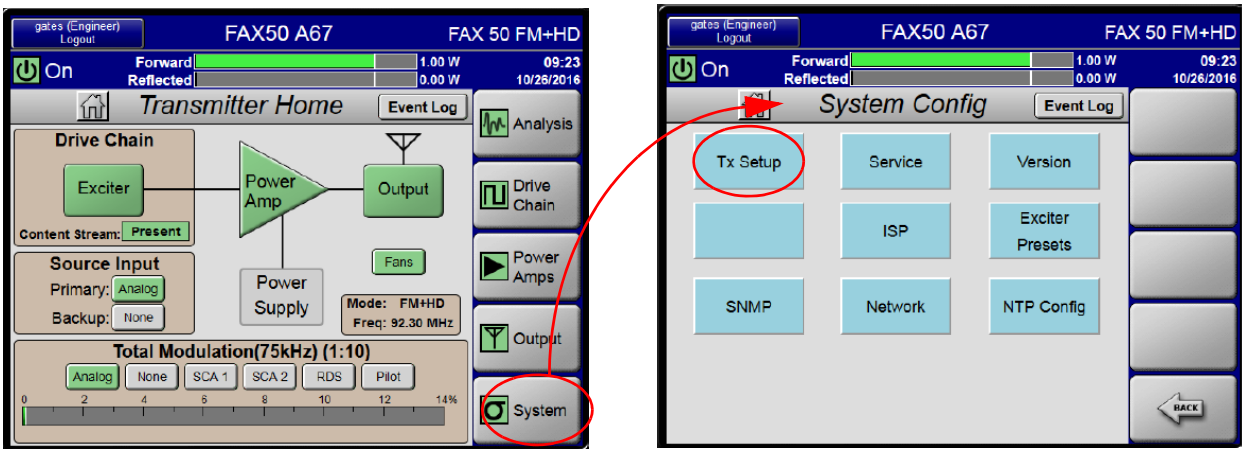


Figure 3-66 Exciter Preset Configurations

Configure the Exciter APC gains to allow operation at the first preset. Ensure you have completely configured all parameters for the preset; ie. Audio Input Source, Level, optional SCA or RBDS services.

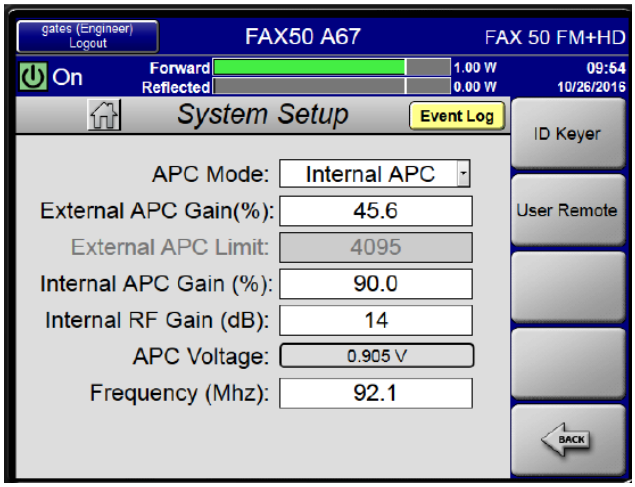


Figure 3-67 System Setup

Then: name or label the preset, select store, then confirm.

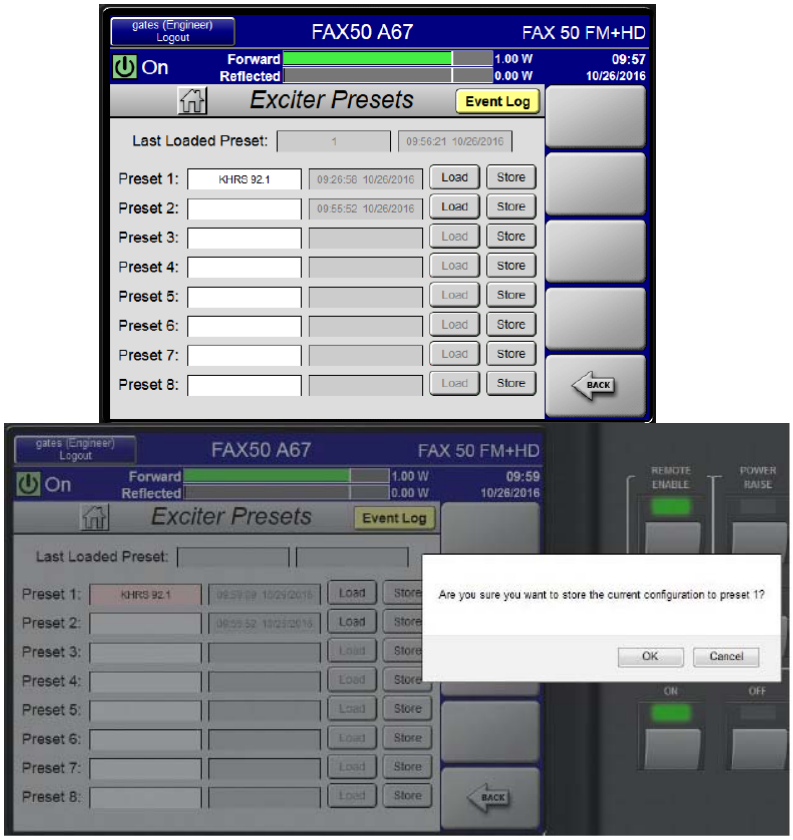


Figure 3-68 Confirmation

WARNING: Disconnect primary power prior to servicing.

To recall a specific preset from the GUI, simply select (Load) the preset for the desired frequency. To recall the preset through the parallel remote input, refer to the Command Inputs described earlier in this chapter.

3.8.40 HD SFN

The Flexiva exciter allows deterministic audio delays of the analog and HD transmit signals of the GatesAir FAX Exgine HD system so that multiple exciters will transmit their signals at the same time. The mechanism used to maintain deterministic delays involves creating the exact 1.48 second ALFN HD radio stream timing from internal GPS 1PPS timing signals. This allows all exciters in the system to know this exact ALFN timing so that the systems can start up in repeatable fashion, even when started at different times. All exciters must be FAX Exgine with internal GPS locked to a GPS satellite and must be running the same version of the Exgine software.

All components of system, including the Exporter, must be locked to GPS. Without GPS, the system will initially start in sync, but it will experience delay variation over time. In addition, the analog delay will not be deterministic from startup to startup. The FAX clock outputs can be used to drive external components such as IP Link/IP connect, but IP Links will usually have their own internal GPS option installed due to the need for additional link delay above 900ms (only possible using the internal IP Link GPS receiver).

Non-Exgine Booster exciters must have an additional delay added to the analog transport stream to match the delay of analog audio through the Exgine. The delay of the analog through the Exgine board is approximately 877.660 ms. Please allow 15 – 20 minutes after power on for the Exgine to stabilize to that amount of delay.

For FM+HD SFN operation, all the exciters must be in FM+HD mode. The IP Link needs to be configured to the desired link delay for the system as a first step in the installation process. Because the arrival time and jitter of the E2X data relative to the Exgine ALFN timing can cause the HD delay to vary between exciters, the “Clocking/SFN” page in the Exgine GUI must be used to determine if the system has startup up with E2X arrival times that could adversely affect system delays. Specifically, the exporter needs to be continually restarted until the following three conditions are true as seen in the “Clocking/SFN” GUI page.

The “E2X to ALFN (us)” field has a value between 50,000 us and 1,400,000 us. This value needs to be the same, within approximately 5 ms, between all FM+HD exciters.

The “ALFN to IQ Start” field has the same value between all FM+HD exciters.

The “E2X to 93ms Int (ms)” field has a value between 10ms and 85ms. This value should be the same, within approximately 5ms, between all FM+HD exciters.

It should not take many Exporter restarts to achieve the 3 criteria above. These criteria should be checked again after changing the IP Link delay, rebooting the Exgine, or rebooting the Exporter. HD to analog diversity delay will vary with every startup of the exporter, sometimes greatly, but all exciters will have the same diversity delay. This can be adjusted for at the Exporter.

Correct system operation assumes the transport mechanism delivers both the analog audio and E2X HD IP packets to each transmitter simultaneously. i.e. GatesAir IP Connect. Using Broadcast mode for E2X transmission provides the best delay consistency.

Changing modes from FM+HD to FM and then back to FM+HD will cause the Exgine to reboot so that the Exgine board can resynchronize the FM+HD stream to the ALFN tick. The Exgine board will also reboot if it does not receive an E2X packet within 10 seconds, or the E2X network cable is disconnected for 10 seconds. Typical reboot time for the Exgine board is 2.5 seconds to 4 minutes in SFN mode.

3•8•40•1 Configuring for SFN Operation

Use the following sequence to configure the FAX Exciter with Exgine for SFN operation:

STEP 1 From the FAX Exciter home screen, select the “Drive Chain” button or click on the “Exciter” box on the block diagram

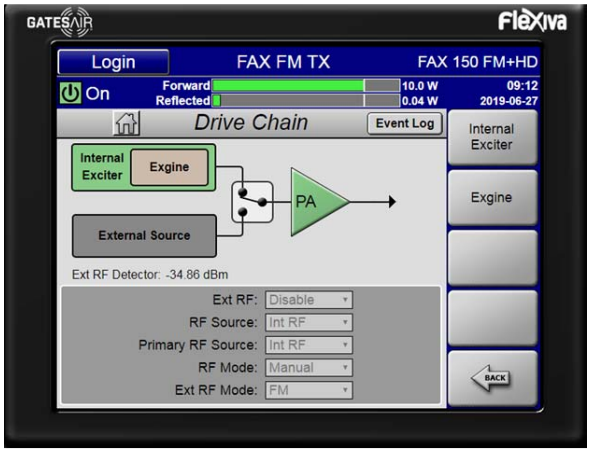


Figure 3-69 Drive Chain Screen

STEP 2 Select the “Internal Exciter” button or the “Internal Exciter” box on the block diagram.

Figure 3-70 Exciter Home

STEP 3 Click on the “Clock Ref” box on the block diagram.

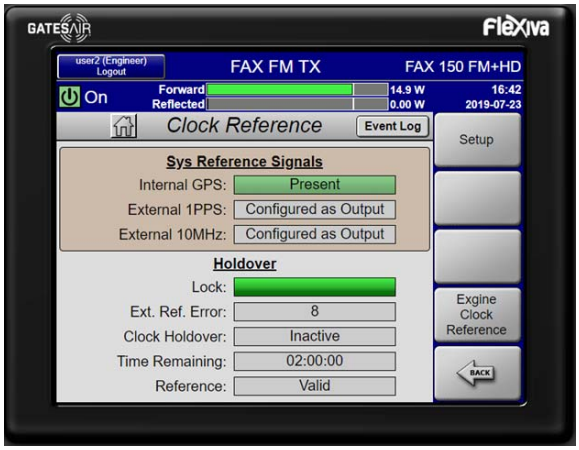


Figure 3-71 Clock Reference

WARNING: Disconnect primary power prior to servicing.

STEP 4 Click on the “Setup” button.

Figure 3-72 Clock Ref Setup

STEP 5 In the “BNC Setup” box, set the “External 1PPS” and the “External 10MHz” drop downs to be “Output”.

STEP 6 From the FAX Exciter home screen, select the “Drive Chain” button or click on the “Exciter” box on the block diagram.

STEP 7 Select the Exgine button or click on the Exgine bubble on the block diagram.

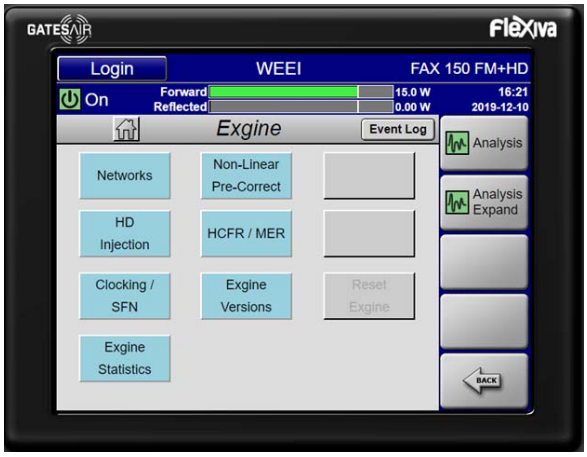


Figure 3-73 Exgine Landing Page

STEP 8 Select the “Clocking/SFN” button.

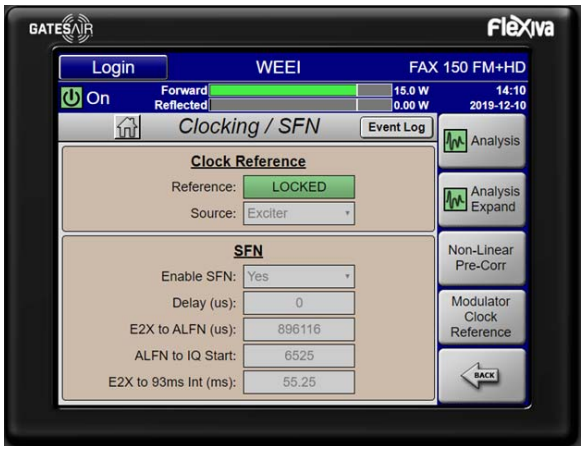


Figure 3-74 Clocking / SFN Screen

STEP 9 Set the clock reference source to “Exciter”.

STEP 10 Select “Yes” in the “Enable SFN:” dropdown. The Exgine board will reboot at this point.

WARNING: Disconnect primary power prior to servicing.

4 Section-4 Theory

4.1 FAX Compact Configuration Descriptions

This section contains detailed descriptions each model of FAX Compact transmitters. This series transmitter can be stand-alone rack mount transmitters or used as exciters in higher power transmitters.

The following descriptions and series of drawings are intended to provide general overall knowledge on how the FAX series of transmitters work. The FAX transmitter currently has three power level configurations: 50W-150W, 300W-1kW, and 2kW-3.5kW.

This series of transmitters can be operated in any one of three modes, which are:

- The analog FM mode, with the PA module(s) operating class C mode to maximize efficiency.
- The multiplex mode where analog FM and digital (HD) RF signals are both amplified in the same power amplifier(s). For this mode, the PA modules are operated class AB because digital HD requires linear amplifiers.
- Digital HD mode only. For this mode, the PA module(s) are also operated class AB.

The FAX Series Transmitters include a common built-in Exciter/Modulator and a common front panel LCD Display with front panel controls plus a remote GUI Interface. HD modes of operation require the optional Exgine card and a GatesAir Exporter. All of the interfaces to the transmitter and the GUI are identical for all models. The higher power models will have more meter readings due to having more amplifier and power supply modules.

4.2 Modulator Board Description

The Modulator Board is a full-scale high quality Digital FM Exciter which includes transmitter monitoring/control circuitry plus the back panel input connector assembly. Refer to Figure 4-1Modulator Board Block Diagram.

The heart of the Modulator Board is the fully programmable multi-tasking FPGA. It has 2 primary functions: take the audio inputs and generate the modulated Stereo/Mono FM signal, and to monitor/control the key operating functions of the transmitter. The Front Panel LCD Display Assembly interfaces directly with the FPGA to facilitate user interaction with the transmitter.

All of the I/O to the transmitter is via the Modulator board with the exception of RF out, AC input and Ethernet. The Modulator communicates via RS485 to the Control & Display board. The Modulator gets it's DC voltage from the Main power supply(s) in the system, the 48 VDC is then regulated on board to the other supplies required. There is a 12 VDC 7 Amp power supply that is distributed to other circuit cards as required in the system.

The User remote control and the Transmitter Interface to the high power amplifier is controlled by the Modulator. These Interfaces are detailed in other sections of this manual as to inputs, outputs and levels.

All of the analog audio signals, L&R,SCA's and MPX, that come into the Modulator are filtered, go through a balancing amp and sent to a A/D converter. The output of the A/D converter is sent to the FPGA. The AES audio is sample rate converted prior to the input of the FPGA.

The main reference clock for the Modulator board is a 40 MHz OCXO with a stability of ± 200 ppb from -20 to +70° C. The 40 MHz can be locked to GPS, external 10 MHz or an external 1 PPS signal. The 40 MHz is buffered and sent to the FPGA. The frequency is voltage controlled from the FPGA and and a D/A converter. The 40 MHz clock is also the reference for the 720 MHz PLL clock for the D/A converter for the generation of the FM signal from the I and Q signal at the output of the FPGA.

The FPGA generates the FM signal and modulates it with the incoming audio, SCA's and RDS (if used), this signal leaves the FPGA as I/Q. The I and Q signal is then converted to an analog signal in the 88-108 MHz range on the specified frequency. The D/A converted is filtered, goes through a RF relay that selects either internal modulator or external RF source. The selected RF signal passes to a variable attenuator that controls the level to the final amplifier section. The final amplifier can produce up to 4 watts output in the FM mode. There is a directional coupler that provides forward and reflected power samples for metering, protection and internal AGC.

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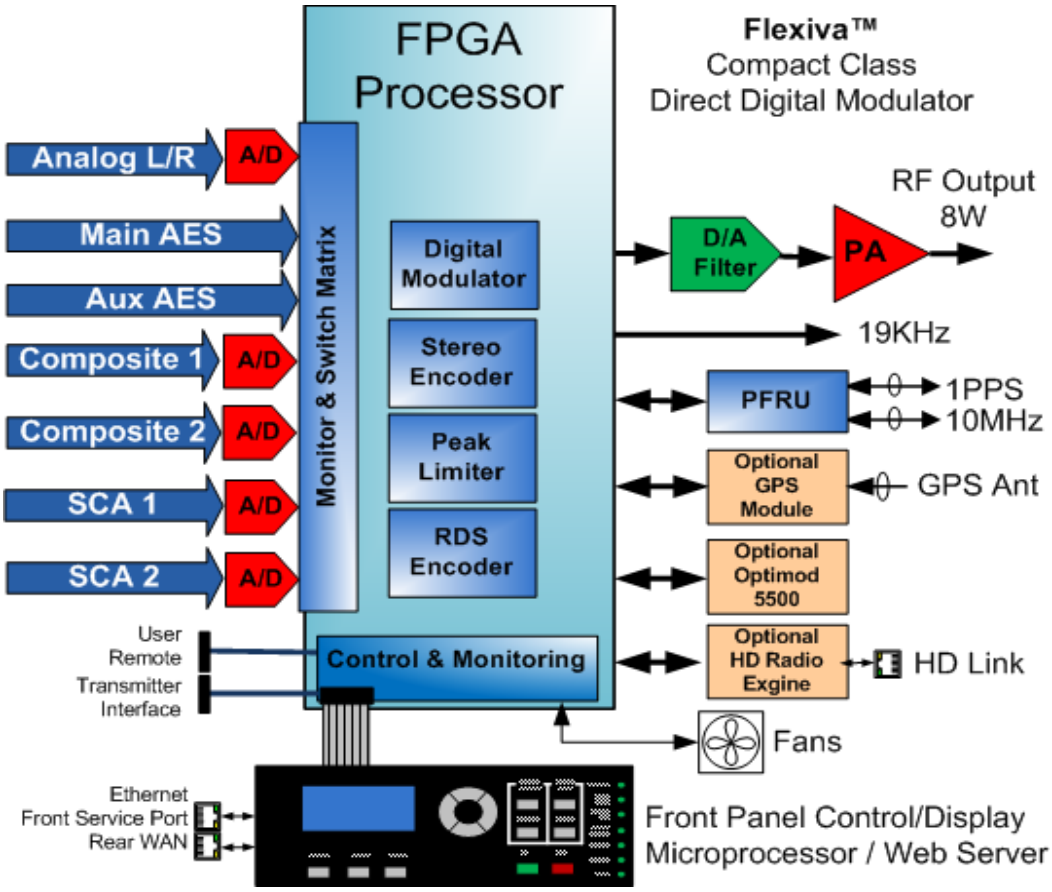

Figure 4-1 Modulator Board Block Diagram

4.3 Control and Display Board

The Control and Display board is another common board to all the FAX low power transmitters. The functions provided by it are common for all models. This includes front and rear Ethernet ports, transmitter ON/OFF and RS485 communications with the Modulator.

The Control and Display board communicates with the modulator to provide setup information entered by the user via the front panel, or remote GUI. It also gets back the status and meter readings from the modulator for display on the LCD. The communication is by RS485 using a GatesAir Protocol. Besides the RS485 communications the Control and Display has three other discreet lines that interface to the Modulator. Remote Reset sends a reset command to the FPGA on the Modulator board. TX ON/OFF which is the system on/off command from the ON/OFF hardware latch. This line is controlled by the front panel ON/OFF buttons, and ON/OFF from the remote GUI or SNMP. The Remote External Interlock from J10-24,25 on rear panel of the transmitter is fed to the ON/OFF hardware latch on the Control and Display board. Normally the interlock is closed to ground, when opened the line forces a OFF command on the hardware latch shutting the transmitter OFF. Once the Interlock is closed it requires the user to turn the transmitter back on manually.

The power supply for the Control and Display is 5 V and comes from the modulator. All other voltages are regulated on-board.

4.4 FAX 50W-150W Description

Figure 4-2 shows the block diagram of a FAX 50W-150W transmitter. It has one PA module that produces up to 165 Watts of RF power and has a built-in 320 (48 VDC @ 6.7 Amps) Watt power supply that is not hot-swappable. The power supply is factory set at 48 VDC and only adjustable by removing top cover of transmitter and setting a potentiometer. The power supply is power factor corrected, nominally >0.95.There are two cooling fans behind the front panel that take cool air in the front and exhaust hot air out the rear. The tach from the fans is buffered on the

PA board and sent to the Modulator. For a description of the Modulator and Control and Display board see Section 4.2 and Section 4.3 above.

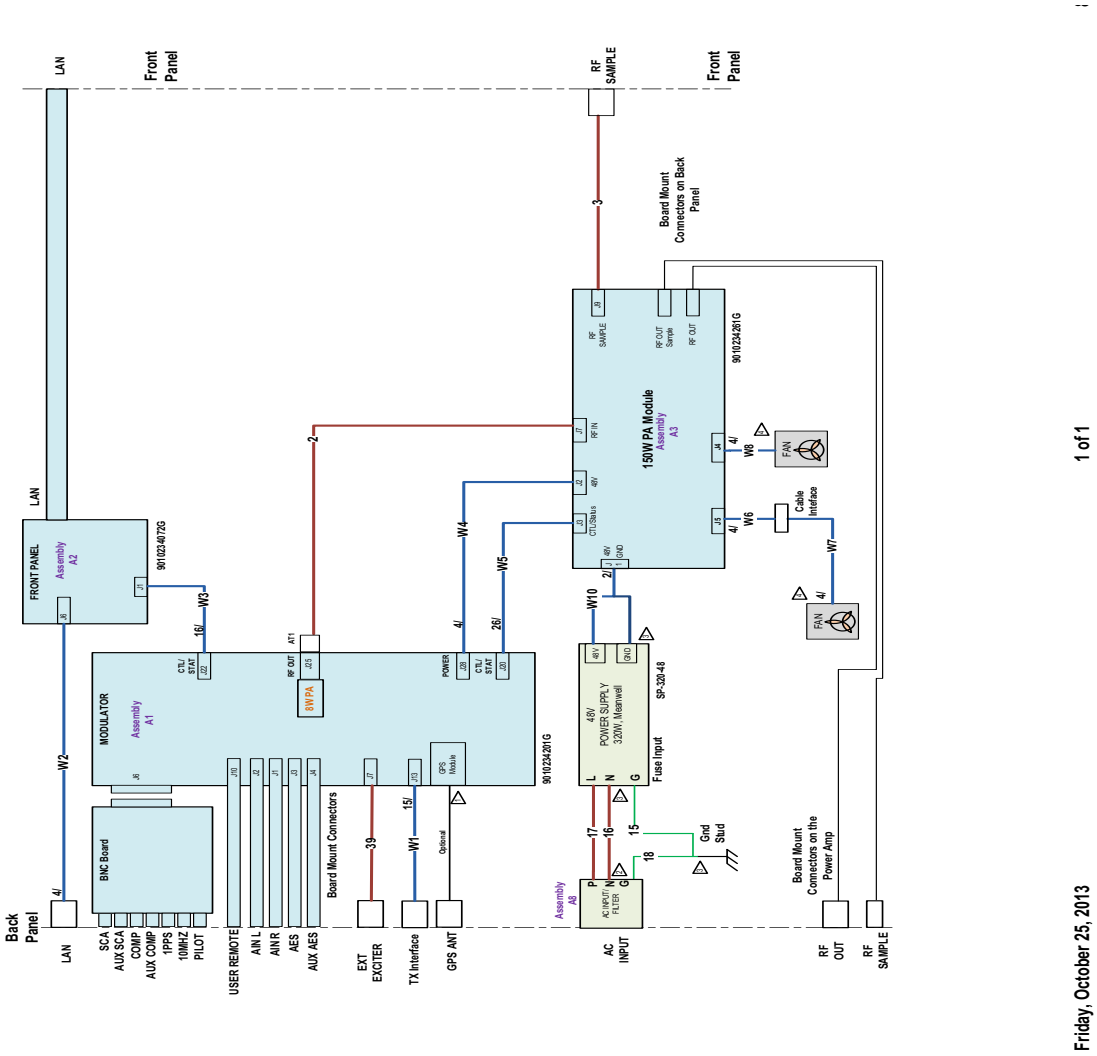

Figure 4-2 FAX 50W-150W Block Diagram

WARNING: Disconnect primary power prior to servicing.

Figure 4-3 shows the power amplifier board block diagram. The power amplifier consists of a single FET. It can be operated in Class C for FM Only or Class AB for HD modes. The PA output passes through a low pass filter to reduce harmonic content. The directional coupler provides samples for power metering, APC and VSWR protection. The front and rear RF samples are capacitively coupled directly at the output of the transmitter and are approximately -42 dBc.

All metering functions for the PA are multiplexed, converted to serial data and sent to the Modulator board.

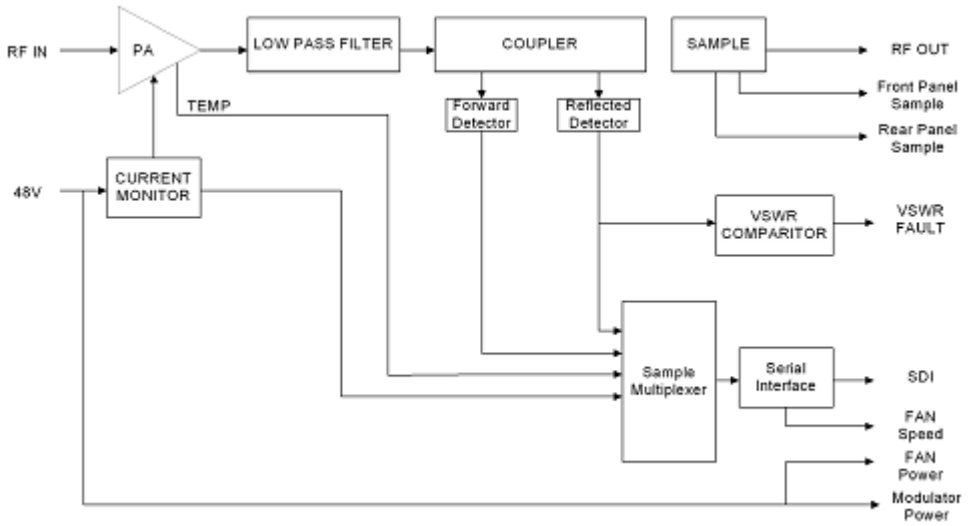

Figure 4-3 50-150 Watt PA Block Diagram

4.4.1 FAX 300W-1kW Description

Figure 4-4 shows the FAX300-1 kW transmitter block diagram. The FAX300/500 utilize one PA module, whereas the FAX1000 has two pallets, and thus a splitter and combiner. Both share a common chassis with a built-in power supply.

The power supply is can be adjusted from 44 to 52 VDC via the SETUP menu. The voltage is set depending on mode of operation for best efficiency and/or spectrum performance. The power supply is accessible by removing the front panel of the transmitter. Though it is not necessary to remove AC power to the transmitter while replacing the supply, since the transmitter has only one removing or failure will take you off the air. The power supply is power factor corrected, nominally >0.98. The power supply AC input and DC output are connected through the power supply interface board. The DC output is distributed to each of the PA Pallet(s), the Preamp/Splitter board (on 1kW only) and the Modulator board. All other voltages in the system are regulated on-board from the 48 VDC.

The Modulated RF out of the Modulator board feeds the pallet in the 300 / 500 watt models, or the Preamp/2-way splitter board for the FAX1kW. This board is used in all of the higher power FAX models over 1kW, only certain parts are populated and some parts are model dependent. The preamp is capable of up to 50 Watts and has a bias circuit that can be set for Class C or Class AB operation.

The input to the Modulator board goes through two RF pads, the attenuation of the pad is model dependent. The pad output is impedance matched to the input of the FET device which is in a push/pull configuration. The output of the RF device is filtered and sent directly to the pallet on 300 and 500 watts transmitters, or to a splitter on the 1kW transmitter. This splitter can have parts added to make it up to a 6-Way splitter. The temperature of the board is sensed and sent back to the Modulator for monitoring.

The splitter in turn feeds the two pallets in the 1kW transmitter that is then combined. These pallets are capable of up to 600 Watts from a single device.

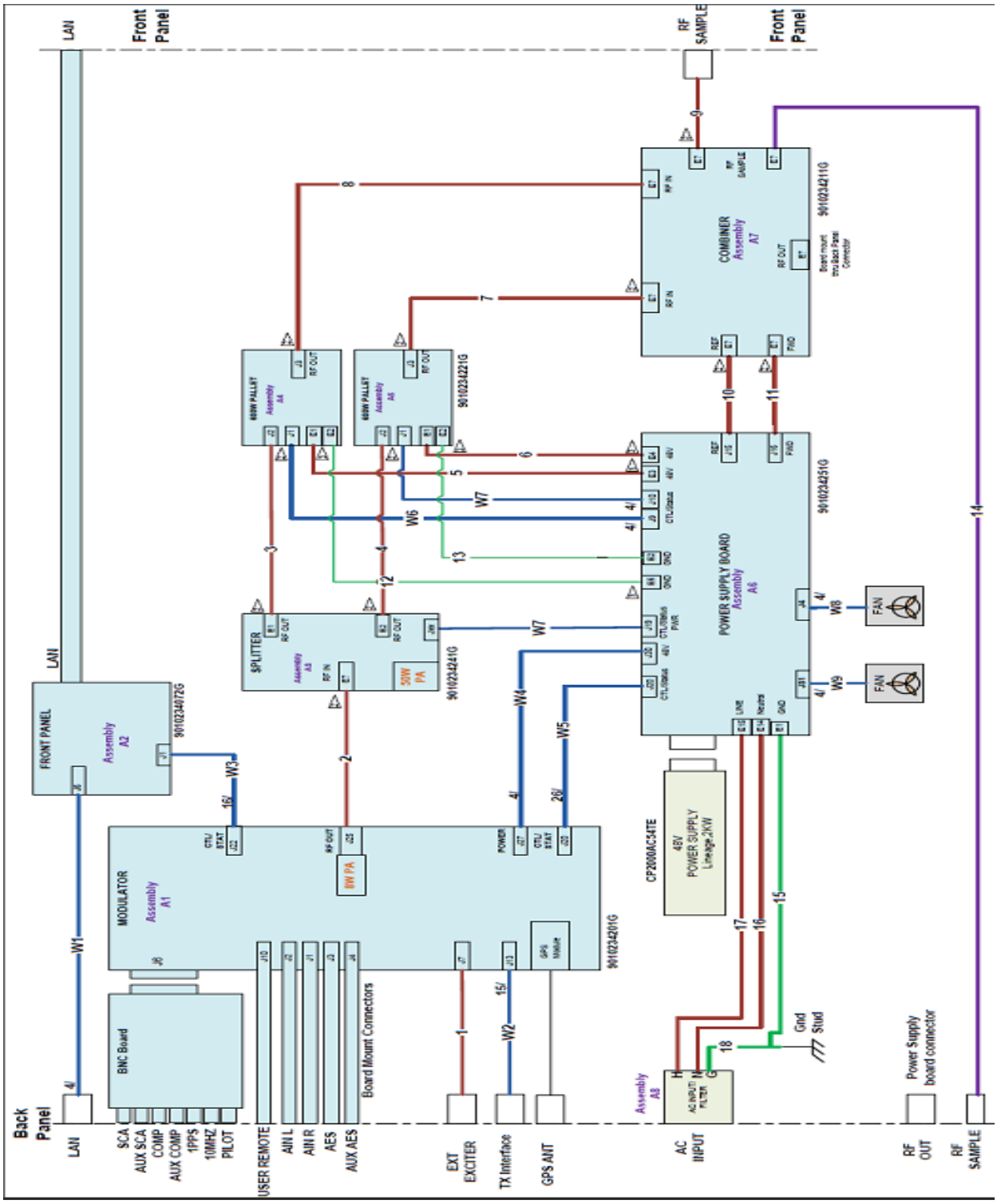

Figure 4-4 FAX 300W-1kW Block Diagram

WARNING: Disconnect primary power prior to servicing.

4.4.2 FAX 2kW-3.5kW Description

The following 2 figures show the RF block diagrams of FAX 2kW-3.5kW transmitters. These models are very similar with the main differences being the number of PAs, Power Supply Modules, and Fans. This power range contains 4 to 6 PA Pallets. Since the PA Pallets are capable of 600+ Watts of power each, 6 are used in the 3kW and in the 3.5kW models. The 2kW model uses 4 PAs.

The 2kW model contains 2 hot pluggable Power Supply Modules that are accessed behind the Front Panel. One Power Supply Module can easily supply enough energy to power 2 PA Pallets plus the rest of the transmitter. The 3kW and 3.5kW models use 3 Power Supply Modules. Simple control functions are included to turn the PAs on and off, set the mode of operation between class C for FM service and class A/B for FM+HD digital service, and various monitoring functions. The PAs are protected from over voltage, over current, over temperature, and VSWR. All metering and fault reports for the PAs are monitored and controlled by the LCD Control Board.

The block diagrams on the next 2 pages show the signal flow in a simplified matter with references to the appropriate drawings in the drawing package. Each block diagram is also in the drawing package: 2kW-**843-5614-003**, 3kW-**843-5614-004**.

The Block Diagrams show the Back Panel of the transmitter on the left side of the drawing and the Front Panel is shown on the right side. A 200-277V single phase AC Terminal Posts are located on the back-right of the transmitter chassis and they connect directly into Assembly A8 which contains input filtering to prevent stray voltage spikes from damaging the transmitter. From the filter, the AC is routed to the input of the Power Supply Interface Board Assembly A6. (Refer to sheet 9 of drawing **801-0234-211** location B8). This board is located in the lower back area of the transmitter chassis and it contains three 26 pin connectors (J1, J2, and J3) that Power Supply Modules plug into. (Refer to drawing **801-0234-211** sheet 9). Location 6, 7, and 8D show the pins through which AC is supplied to the plug-in modules. The rest of sheet 9 shows the VDC output lines/pins and the data/control lines/pins from the modules. Hot pluggable Power Supply Modules are rated at 2,000 Watts at 48VDC.

Block Diagram drawings: The Power Supply Interface Board distributes the 48VDC to the PA(s), the Modulator Assembly, the RF Splitter Assembly, and the Fans. Connector J30 on A6 provides 48VDC to the Modulator Assembly via J28. J19 provides 48VDC and 5VDC to the RF Splitter Assembly via J1. The Splitter contains a 50 Watt intermediate RF Amplifier to drive the PAs. The Modulator Board, via J22, feeds +5VDC to the Front Panel LCD Display board via J1.

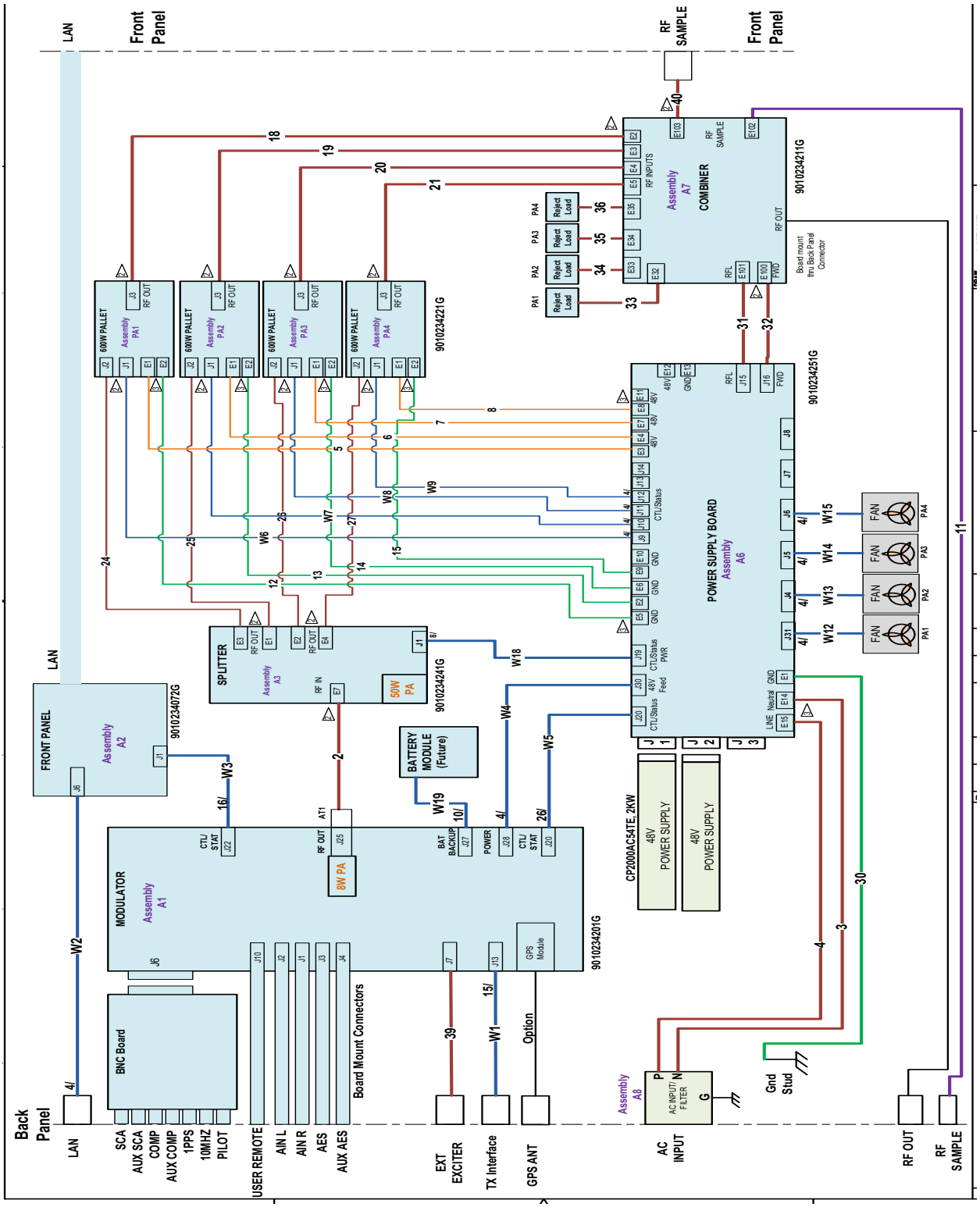

Figure 4-5 FAX 2kW Block Diagram

WARNING: Disconnect primary power prior to servicing.

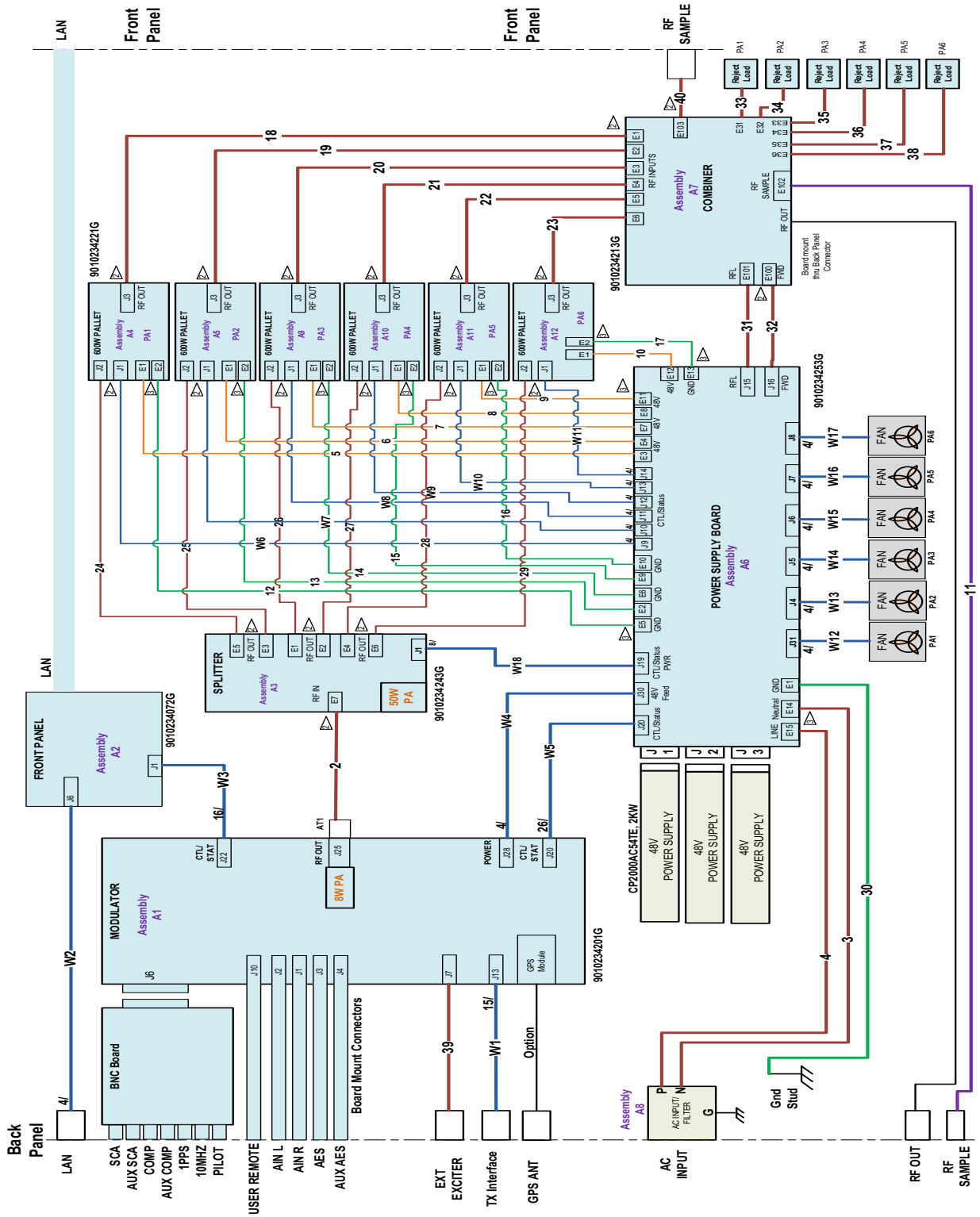

Figure 4-6 FAX 3kW-3.5kW Block Diagram

5 Section-5 Maintenance

5.1 Introduction

This section provides maintenance, calibration and board replacement procedures for qualified technical personnel. This section assumes that the Engineer performing the maintenance has a working knowledge of the transmitter and Section 3 of this manual in particular.

Routine maintenance of the FAX series transmitter consists of regular cleaning and the monitoring of power, VSWR, voltages, and current readings to detect any deviations that might indicate a developing problem. To maximize equipment reliability and longevity, it is important to develop and stick to a well designed maintenance routine.

A transmitter's performance and longevity will be maximized if it is properly maintained by a well-trained, technically skilled individual. To this end, GatesAir offers a variety of training classes specific to Flexiva FAX series transmitters. Contact your GatesAir representative or visit the GatesAir website at **www.gatesair.com** for more information on training offerings.

5.1.1 Safety Precautions

The transmitter chassis is composed of three general zones: the front zone as accessed by removing the front panel, the splitter and PA Pallet(s) by removing the top cover, and the rear section containing the Modulator-power supply interface-combiner assemblies. there's also an upper and lower area. The Modulator, splitter, PA's and combiner occupy the upper layer. The power supplies and power supply interface board occupies the lower area underneath the upper assemblies.

The front panel can be removed while the transmitter is running for access to the hot pluggable Power Supply Modules. On the FAX 2kW-3.5kW transmitters, the PS modules may be replaced while the transmitter is operating.

Note

The 300W-1kW transmitters only have 1 Hot Pluggable PS module. Removing it while on the air will shut down the transmitter. The transmitter will automatically power back up in the Standby Mode (OFF) when the PS module is replaced. The "ON" button will need to be pressed to return to full on-air operation The 50W-150W transmitters have an internal power supply that cannot be removed while in operation.

The top cover requires a Phillips screwdriver to remove and gain access to the internal assemblies. Never remove while the transmitter is operating. It is very dangerous to attempt to make measurements or to replace components in the back PA area with the mains power applied. If cover is removed while the transmitter is operating, the transmitter will eventually overheat and shutdown. Remove AC power before servicing the transmitter, other than replacement of a PS module(s).

Warning

NEVER PERFORM TRANSMITTER MAINTENANCE WHILE ALONE AND/OR NOT FULLY ALERT. SERIOUS BODILY INJURY OR DEATH COULD RESULT FROM FAILURE TO OBSERVE PROPER SAFETY PRECAUTIONS.

5.2 Dipswitch and Jumper Settings

The following tables are jumper and switch settings throughout the FAX transmitter. Under the column in each table labelled Default/User, if the filed does not show "/User" then the jumper or switch setting is not user configurable and should not be moved.

Table 5-1 Control & Display Board Switch S15

Switch	Name	Schematic Sheet	Default/ User Setting	Description
S15-1	SW Control Disable	7	OFF	Disables all Software Control of Hardware
S15-2	FP Enable	5	ON/User	Locks front panel control when Remote is enabled
S15-3	Remote Enable LED	6	ON/User	Sets Remote Enable LED to Green
S15-4	Remote Enable LED	6	OFF/User	Sets Remote Enable LED to Red
S15-5	SW APC Enable	4	OFF	Enables Software control of APC (Future)
S15-6	N/A	N/A	N/A	NOT USED
S15-7	RS485 TERM	15	ON	Terminates RS485 Bus; When used with FAX high power S15-7 in the FAX HP transmitter should be off so line is not double terminated
S15-8	CAN TERM	15	OFF	Terminates CAN Bus

Table 5-2 Modulator Board Jumpers

Jumper	Default	1-2	2-3	Description
JP1	2-3	50 ohms	HI Z	1 pps termination Impedance selection
JP2	2-3	50 ohms	HI Z	AUX Composite input impedance selection
JP3	2-3	50 ohms	HI Z	Main Composite input impedance selection
JP4	1-2	5 VDC	3.3 VDC	Voltage to GPS Antenna
JP5	1-2	Exciter	Test	Must be 1-2 only
JP6	1-2	Exciter	Test	Must be 1-2 only
JP7	1-2	Exciter	Test	Must be 1-2 only
JP8	1-2	Exciter	Test	Must be 1-2 only
JP9	1-2	HI Z	600 Ohms	Analog Left Impedence
JP10	1-2	HI Z	600 Ohms	Analog Right Impedence
JP11	1-2	50 ohms	HI Z	10 MHz termination Impedance selection.

Table 5-3 Modulator SW1 (Rear Panel)

SW1 Section	UP/DN	Description
Left	DN	Normal operating position
Left	UP	If this section is switched to the UP position and the AC power to the unit is cycled the transmitter will revert to the factory pre-test state and will not operate correctly.
Right	DN	Indicates unit is Exciter A when used as an exciter in dual exciter configurations
Right	UP	Indicates unit is Exciter B when used as an exciter in dual exciter configurations

Figure 5-1 SW1 Switch

Warning

ENSURE THAT SW1 RESET SECTION (LEFT) SHOWN IS ALWAYS IN THE DOWN POSITION. IF THIS SECTION GETS SWITCHED UP AND AC POWER IS CYCLED, THE TRANSMITTER WILL REVERT TO THE FACTORY PRE-TEST STATE AND WILL NOT OPERATE.

5.3 Configuration File and Software Upload

5.3.1 Config File Save/Upload

Once your transmitter has been installed and configured properly it is a good idea to save the configuration file in case the need to upload it in the future comes up. The information is stored on the Modulator board, in case of failure of that card you will need to upload a saved configuration. This file should be saved each time there is a change made to configuration of the system. Use a file naming scheme that allows for easy access to the correct file and date it.

Note

Power Calibration is not stored in the configuration file. If the Modulator or the board the forward and reflected power detectors are located on have been replaced the transmitter will require calibration.

5.3.2 Save Config File

STEP 1 Connect the PC to the transmitter using a Ethernet cable to either the front or rear Ethernet port. See Section 3 for Network setup and login information.

STEP 2 Open a web browser and establish a connection, once there is a connection from the HOME page navigate to the System>> ISP menu and click on the Configuration tab. See Figure 5-2.

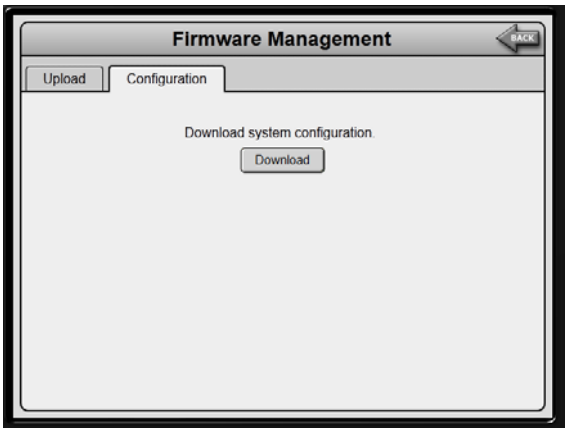

Figure 5-2 FAX GUI ISP Screen

STEP 3 Click the Download button. A dialog box should open asking to Open or Save the file. Click Save radio button and then OK button.

STEP 4 Another dialog box should open and the default name is eeprom.s19. It is best to rename the file with a name that includes a date, such as "5-1-13-installation.s19"

STEP 5 Once renamed, browse to the location to save the file and click SAVE.

5.3.3 Upload Config File

STEP 1 Connect the PC to the transmitter using a Ethernet cable to either the front or rear Ethernet port. See Section 3 for Network setup and login information.

STEP 2 Navigate to the System>>ISP menu and click the Upload tab. See Figure 5-3.

STEP 3 Click Browse and locate the correct file for the upload. he default name given by the FAX is eeprom.s19. This name may vary if the name was changed when saved from transmitter. Also note that it is best to have this file located on your hard disk drive not on a removable stick.

STEP 4 Click on the file, then Open and the box should populate with the file location and name.

STEP 5 Click Upload button and the file should upload. While the file is uploading the box should have a similar dialog to Figure 5-3 on the left.

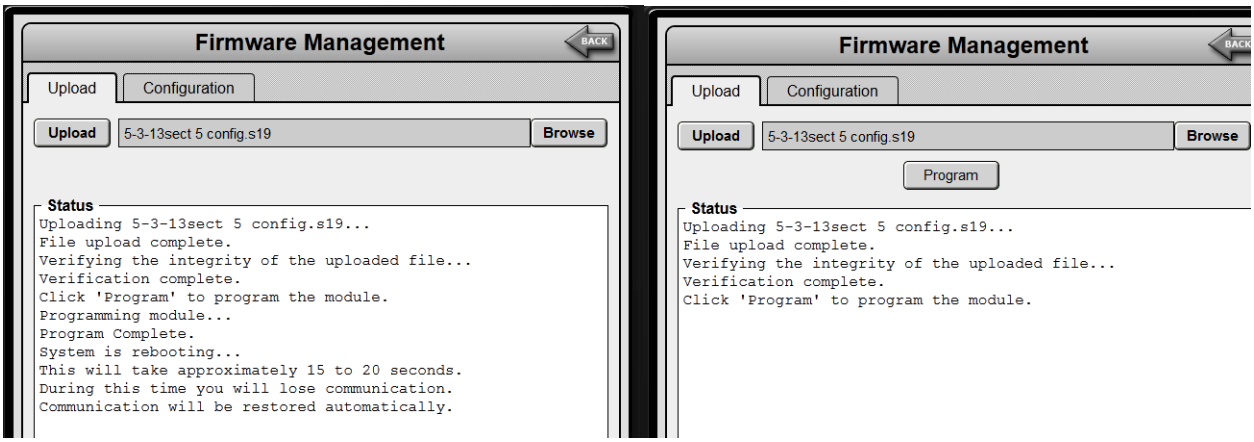

Figure 5-3 FAX ISP Program Screen

STEP 6 Once the file upload is complete the screen should appear similar to Figure 5-2 on the right. Click on the PROGRAM button, it will take 15 - 20 seconds for the config file to be programmed into memory. Once programming is complete the FAX will automatically reboot.

5.3.4 Software Update Procedure

The following steps detail the procedure to update the FAX series transmitter software. You will need a PC to the Ethernet port to perform this procedure. Once the software has been uploaded and programmed the transmitter will reboot and the station will be off the air for a brief period.

These files can be obtained on the GatesAir Customer Portal. All customers should register at the website to obtain any updated software, manual and documentation packages.

FAX Software part numbers (The filename will contain the revision level of the code):

FAXLP Complete Build - 8611154072 (Includes all components required)
WEB GUI - 8611154032
Control & Display Application code - 8611154022
Modulator Application Code - 8611154042
FPGA and Bootloader Code - 8611154052

STEP 1 Connect the PC to the transmitter using a Ethernet cable to either the front or rear Ethernet port. See Section 3 for Network setup information.

STEP 2 Open a web browser (Firefox preferred) and establish a connection to the transmitter.

STEP 3 Once the connection is made go back to the address bar and type in /isp after the IP Address. For example if using the front panel Ethernet port type 192.168.117.88/isp. Screen should appear as in Figure 5-4.

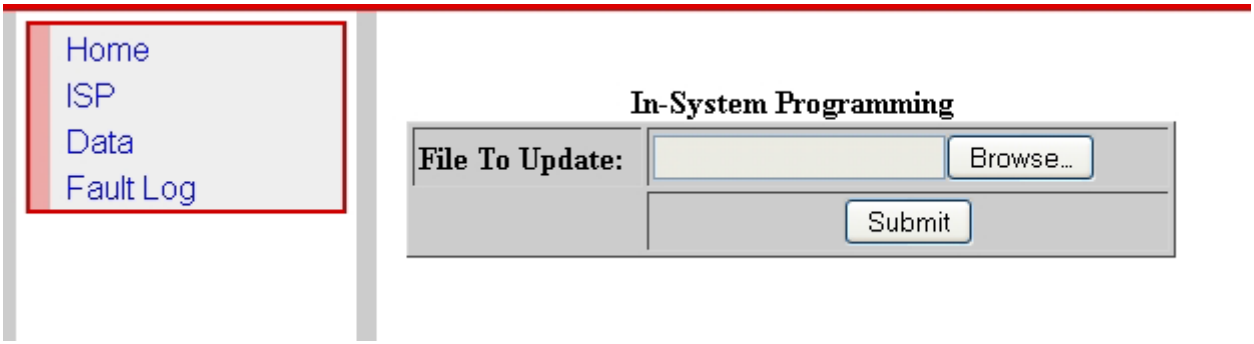

Figure 5-4 FAX isp Home Screen

STEP 4 Click Browse and locate the correct file for the upload. This file should be named something like LPFM_BUILD_A40.s19. This name may vary some depending on rev levels and which piece of the code is being uploaded. Also note that it is best to have this file located on your hard disk drive not on a removable stick.

STEP 5 Click on the file and the box should populate with its location on the disk. Press SUBMIT. The file will begin to upload, do not press any keys until the screen appears like Figure 5-5. The file size will vary depending on Rev and which piece of code is being uploaded. The amount of time to upload and program will vary.

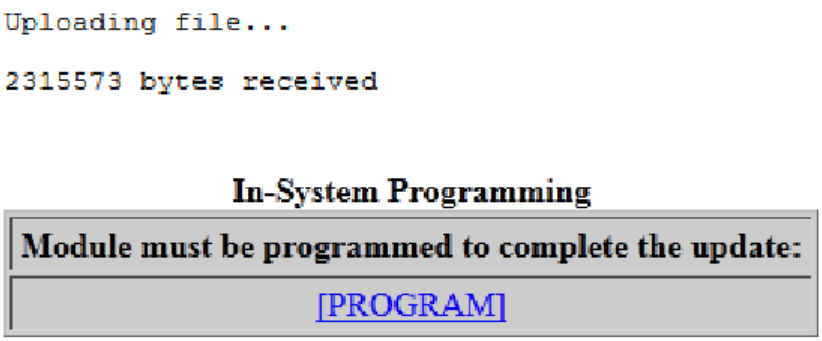

Figure 5-5 isp Program Screen

STEP 6 The code is now in memory inside the transmitter but has not been programmed. Click on the PROGRAM button, the message "Programming Flash..." and "Rebooting..." should appear on GUI. The transmitter LCD will have the message "ISP in Progress Front Panel Locked"

STEP 7 It typically takes a few minutes for the process to complete depending on the file size uploaded. Transmitter should reboot.

STEP 8 Go back to the IP address of the transmitter and Login, verify the code took by navigating to the System>>Version screen. Verify the software revisions.

5.3.5 Modulator Board Recovery

At some point it may be necessary to recover the transmitter back to a basic software load known as the “Golden Image”. This level of software is a last resort effort to recover your transmitter in the event of a software crash. The “Golden Image” is not an operational load of code, but rather a basic platform that will allow you to communicate with the modulator again and reload the required software. Reimaging will not erase calibration data or feature keys, but will cause an extended outage while on the air. No tools are required to load the golden image; however a computer and desired FAX software build files are a necessity. Software builds can be downloaded from the GatesAir website at www.gatesair.com.

STEP 1. Turn transmitter “Off”. (No RF output)

STEP 2. Remove AC power from the transmitter.

STEP 3. On the back of the unit flip the left dipswitch (SW1-1) to the up position. The right switch SW1-2 is used for exciter identification and does not need changed. See Figure 5-1

STEP 4. Apply AC power to the transmitter.

STEP 5. When power is applied to the transmitter the modulator will load the golden image. This will take a minute or two. When the process is complete there will be a “Mod in Backup Image” fault in the log.

STEP 6. Return to the rear of the transmitter and switch SW1-1 back to the down position. This is very important! If left in up position the transmitter will load the Golden Image every time the power is cycled.

STEP 7. Because the golden image is not an operational software platform, software will still need loaded into the system. Refer to 5.3.4 Software Update Procedure for software installation instructions.

5.4 Basic Maintenance Procedures

The maintenance procedures provided in this section may be routinely performed by operators with basic technical skills. No special equipment or training is required.

5.4.1 Air Filter Replacement

The front panel air filter(s) require periodic replacement. How often depends on the air quality at the site. When the filter is filled with dust/dirt, it will reduce the air flow to the point where the modules will overheat, then shut down. A spare filter media can be purchased, so that a new piece(s) may be rotated into service while the original piece(s) are being washed and allowed to dry.

Warning

DO NOT UNDER ANY CIRCUMSTANCE INSTALL A WET OR MOIST FILTER IN THE TRANSMITTER. CONTACT GATESAIR SERVICE TO PURCHASE ADDITIONAL FILTER MEDIA, AS NECESSARY.

5.4.2 Periodic Cleaning and Inspection

The FAX Transmitters, should be periodically opened, inspected for dust buildup, and cleaned. This inspection should also check for signs of progressive damage, such as cracking cables or evidence of heat stress/burning.

STEP 1 While transmitter is still operating at full power, inspect all external transmission line sections for localized discolorations or “hot spots” that are warm/hot to the touch. If localized heating is found, switch off transmitter, open transmission line, and inspect for loose bullets (anchor connectors), split bullets, contaminations, or other irregularities.

STEP 2 Press front panel OFF button to switch transmitter Off.

STEP 3 Remove all AC Mains power to transmitter by removing the AC Power cord on the 50W-1kW models.

STEP 4 On the 2kW-3.5kW models, take steps to ensure AC Mains connection is securely locked out and inadvertent Mains re-application is not possible while maintenance is being performed. (use Lockout Tagout procedures)

STEP 5 Inspect the transmitter AC Mains input connections for tightness, corrosion, or signs of localized burning.

STEP 6 Verify no loose hardware has fallen to bottom of chassis over time.

STEP 7 Vacuum any dust accumulations.

STEP 8 Vacuum any dust accumulations from output assembly. If necessary, use a paintbrush to help dislodge dust/dirt buildup.

STEP 9 Vacuum any dust accumulations from chassis fan blades and PS module fan blades.

STEP 10 Illuminate inside of transmitter and inspect all cables for signs of cracking, abrasions, or heat discoloration.

STEP 11 Inspect all exposed PC boards for signs of heat discoloration or rings of dried solder flux, an indication of partial solder melting.

STEP 12 Verify all push-on (faston) connections are fully seated on all assemblies.

STEP 13 Install top cover.

STEP 14 Apply AC mains power.

STEP 15 Press front panel ON button to turn transmitter on.

STEP 16 Verify transmitter returns to full power and no alarms are reported.

STEP 17 As desired, use off-air opportunity to verify integrity of all safety interlock circuits such as station load temp sensor, patch panel position switches, coaxial switch position switches, etc.

STEP 18 As desired, use off-air opportunity to operate transmitter into station test load and verify test load integrity.

STEP 19 As desired, use off-air opportunity to verify reserve exciter and exciter switchover functionality (where applicable).

STEP 20 Note any findings and resolutions in station maintenance log.

5.4.3 Power Supply Module Replacement

On the FAX 2 kW-3.5kW transmitters, the PS modules are hot-pluggable and may be swapped at any time while the transmitter is operating. Any PS module may be swapped with a PS module in another position. On FAX 50 - 1 kW there is only one power supply, if it fails the transmitter will be off-air

The power supplies on the FAX300 to FAX3k can be accessed from the front panel by loosening the two thumbscrews and removing the front panel, see Figure 5-6. The silver spring releases the handle of the supply and it can then be pulled out of the unit. The FAX1K is shown, the FAX2K and higher power models the supplies are in the same location.

Warning

ON OLDER UNITS THE SUPPLY IS NOT LATCHED INTO THE TRANSMITTER AND CAN FALL OUT IF THE UNIT IS TIPPED FORWARD WITH THE FRONT PANEL OFF.

Note

On newer units, ensure the plastic handle snaps back over the silver spring, this latches the supply into the transmitter.

Figure 5-6 FAX1K Power Supply

5•4•3•1 FAX 50W-150W Power Supply Module Replacement

The 50W-150W FAX transmitters contains a built in 320W Meanwell power supply which can only be accessed by removing the cover of the transmitter.

STEP 1 Ensure AC power is removed from the unit. Remove top cover to access the power supply module.

STEP 2 Remove the wires from the terminal strip on the end of the module. The clear plastic shield just snaps off by pulling out. Figure 5-7 shows the wiring configuration for reference. It may be necessary to remove the Ethernet cable to get the supply out.

STEP 3 Remove the 5 Phillips screws that secure the module from the bottom of the chassis. Keep the screws close by to install the replacement supply.

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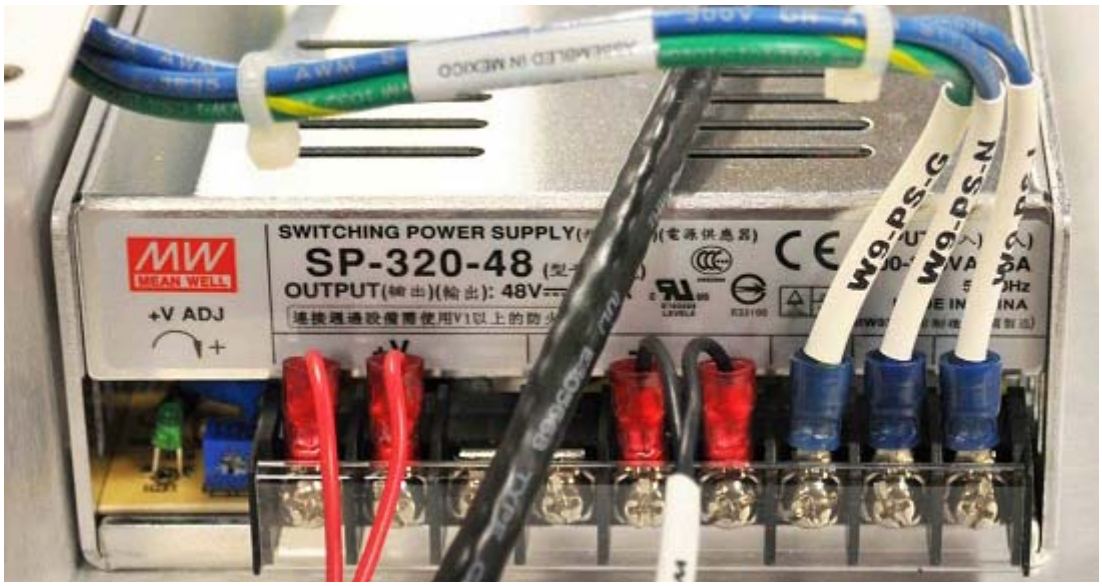


Figure 5-7 Power Supply Wire Terminals

STEP 4 Attach all wires to the new supply terminal strip. Replace plastic shield.

STEP 5 Place the replacement supply into position. Install the 5 Phillips screws from the bottom side of the chassis. DO NOT tighten the screws until all 5 are partially installed.

WARNING: Disconnect primary power prior to servicing.

STEP 6 Replace cover and reinstall the transmitter.

5.5 Circuit Board Replacement Procedures

The following pages explain how to remove and replace the circuit board sub-assemblies of the FAX Series of transmitters.

Note

The chassis layouts of the FAX Transmitters vary depending on the power levels of the different models. The procedures will be similar, however, there will be some differences in location of assemblies, the number of cables used etc. Be sure to read the entire replacement procedure before performing it.

5.5.1 Power Amplifier Assembly Replacement

The following instructions explain how to replace the PA assembly.

Figure 5-8 PA Assembly

STEP 1 Remove all AC power to the transmitter.

STEP 2 Remove the top cover.

STEP 3 Remove the shield top if equipped (later model PA assemblies have a metal shield).

STEP 4 Unsolder the RF input and output coax center; conductors first, then the shields.

STEP 5 Unsolder just the center conductor from the RF load, then use a 3mm Hex wrench to detach the shield tab.

STEP 6 Remove the wire harness connector from J1.

STEP 7 Using a Philips screwdriver, remove the GND and VDD wires from the circuit board. Note which wire was attached to each.

STEP 8 Remove the 5 screws around the parameter of the heat sink, noting any stand-offs or spacers that may be under the heat sink.

STEP 9 Carefully remove the assembly.

STEP 10 Install the replacement PA Assembly in the reverse order. Begin by inserting all 5 screws and spacers if present with just a few turns each. Then tighten down. Do not over-tighten.

STEP 11 Attach the reject load tab to the Hex screw.

STEP 12 Carefully solder the coax cables in place. Be sure shields do not extend beyond their solder pads. Solder the shield first, then the center conductor.

STEP 13 Insert control connector J1, attach the cables to GND and VDD.

STEP 14 Replace the shield lid if present.

5.5.2 FAX1K Power Splitter Assembly Replacement

The following instructions explain how to replace the Splitter Assembly in the top area of the chassis. There are 6 Hex screws that secure the Splitter assembly to the chassis.

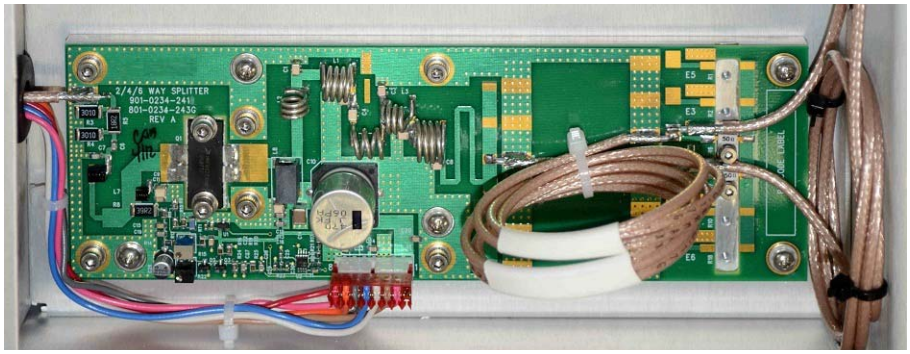


Figure 5-9 Splitter Assembly

STEP 1 Remove all AC power to the transmitter.

STEP 2 Remove the top cover.

STEP 3 Remove the power/control connector J1

STEP 4 Make note of each coaxial cable's position. Carefully unsolder the coax cables.

STEP 5 Remove the 6 Hex screws holding the assembly in place.

STEP 6 Carefully remove the assembly.

STEP 7 Install the replacement Splitter Assembly in the reverse order. Begin by inserting all 6 Hex screws with just a few turns each. Then tighten down. Do not over tighten.

STEP 8 Carefully solder the coax cable in place. Be sure shields do not extend beyond their solder pads.

STEP 9 Insert power/control connector J1

WARNING: Disconnect primary power prior to servicing.

5.5.3 FAX1K RF Combiner Assembly Replacement

There are 8 Phillips screws that secure the RF Combiner to the chassis. There are also multiple coax cables that must be carefully unsoldered.

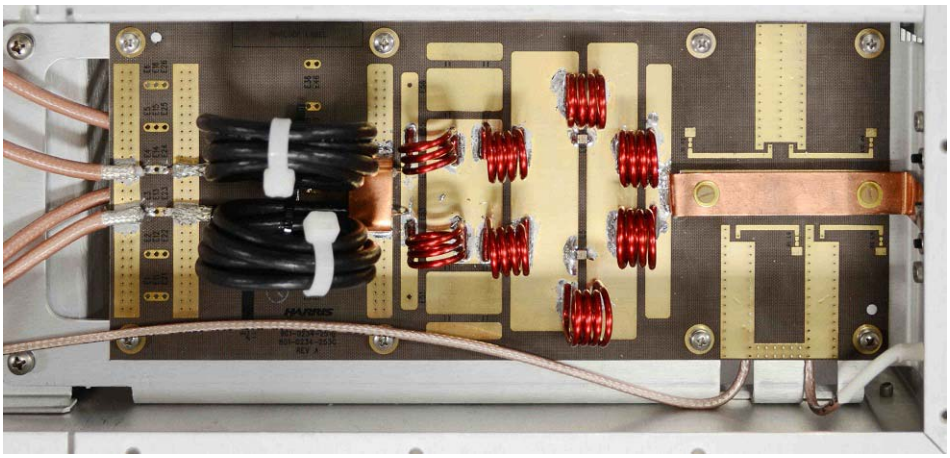


Figure 5-10 RF Combiner Assembly

STEP 1 Remove all AC power to the transmitter

STEP 2 Remove the top cover to expose the RF Combiner Assembly.

STEP 3 Using a small Phillips screwdriver, remove the screw that secures the flat copper strap to the back of the RF Output connector.

STEP 4 Using the small slot screwdriver, remove the 2 nylon screws holding the copper strap (from the RF Output connector) to the printed wiring board.

STEP 5 Carefully unsolder the end of the strap from the pwb. Be careful not to bend the strap.

STEP 6 Carefully unsolder all PA coax cables from the top side of the board. Take note of each cables position. Use masking tape and a marker to label the cables. The positions are labeled E1 - E6 on the pwb.

STEP 7 Remove the 8 Phillips screws securing the board to the chassis.

STEP 8 Carefully lift the board out.

STEP 9 Turn board over and carefully unsolder the PA coax cables on the back side. Note each cable's position.

STEP 10 Reverse the above steps to install the new assembly except for the copper strap. Screw the copper strap down before soldering it to the pwb. Hint: Don't tighten the screws until all 3 are started.

5.5.4 Modulator Board Assembly Replacement

The Modulator Board is part of an assembly that includes its own aluminum mounting chassis and the back panel input connector assembly with the BNC board attached. It will be necessary to remove any expansion cards from the failed Modulator assembly and install them on the new card.

Note

Remove all input cables connected to the Modulator back panel assembly. If not done already, label the input cables as to the connector each one is removed from. This will save time re-installing them and minimize errors.

On the Modulator board there is a configuration file that saves the setup, this should always be saved on a computer once the transmitter is installed and running on the air. Saving this file and uploading it when needed will save time to manually reconfigure the transmitter. The factory saves the configuration at final test, contact GatesAir Customer Service. See Section 5.3 for download/upload procedure.

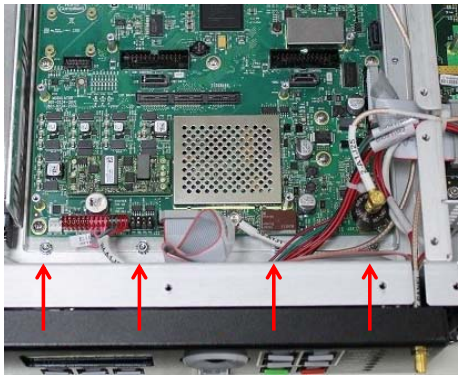
STEP 1 Remove all AC power from the transmitter.

STEP 2 Remove the top cover.

STEP 3 Remove the 4 phillips screws securing the Modulator assembly back panel to the main chassis. The 4 screws are located around the edge of the panel, 2 on each side

STEP 4 Remove the following cables from the Modulator Board: J20, J25, J22, J27 and J28.

STEP 5 The Modulator assembly is secured in place by 4 nuts on the front edge of the sheet metal assembly. The studs are in slots and the nuts only need to be loose not removed for the assembly to slide out. Loosen the nuts with a 1/8" nut driver underneath the chassis. The assembly should now slide out the rear of the chassis.



Loosen nuts 4 places

WARNING: Disconnect primary power prior to servicing.

STEP 6 Set the jumpers on the replacement board to match the faulty board.

STEP 7 Set the position of switch S1 (rear panel) on the replacement board to match the faulty board. **Note that S1 left side should ALWAYS be in the DOWN position**

STEP 8 Remove any expansion cards from the faulty board and place them on the new assembly and secure in place as necessary.

STEP 9 Re-install the Modulator tray and replace and tighten all hardware.

STEP 10 Replace all cables both internal and external.

STEP 11 Re-apply AC to the transmitter.

STEP 12 If a configuration file was stored, upload it back into the transmitter. If no config file has been stored, it will be necessary to re-configure the entire transmitter at this time, set frequency, audio setup,etc.

STEP 13 Adjust the carrier frequency of the transmitter, see Section 5.6.4

STEP 14 Rebias the amplifiers, See Section 5.6.?

STEP 15 Calibrate forward and reflected power, see Section 5.6.1

5.5.5 PS Interface Board Assembly Replacement

In the 300W to 3.5kW models, the Power Supply Interface Board is mounted on the lower back area of the transmitter chassis, underneath the Modulator Assembly. The Modulator Assembly must be removed to gain access to the Power Supply Interface Board.

STEP 1 Remove all AC power from the transmitter.

STEP 2 Remove the Front Panel to the Transmitter by loosening the 4 Front Panel Thumbscrews.

STEP 3 Remove all plug-in Power Supply Modules from the front.

STEP 4 Remove the top cover from the transmitter.

STEP 5 Follow the procedure to remove the Modulator Board Assembly.

STEP 6 Remove the FWD and REFL Sample cables from the back of the PS Interface Board.

STEP 7 Remove the cable connectors.

STEP 8 Remove the individual AC and Ground wires from their post.

Note

Be sure to note where each wire was connected.

STEP 9 Remove the Phillips screws securing the board to the chassis.

STEP 10 There are 3 jumper blocks on this board: JP1, JP2, and JP3. Note on paper the location of any and all jumpers installed.

STEP 11 Remove the jumpers (if any are used) one at a time and insert into the replacement board at the exact same location. Double check to make sure the jumper is in the proper slot.

STEP 12 Reverse the above procedure to install the replacement board.

Caution

BE SURE THE AC AND GROUND WIRES ARE SECURED TIGHTLY TO THEIR POSTS. A LOOSE CONNECTION WILL CAUSE ARCING AND DAMAGE THE BOARD.

5.5.6 LCD Control Panel Replacement

The following procedure explains how to replace the Front Panel LCD Control Assembly.

STEP 1 Remove all AC power from the transmitter.

STEP 2 Remove the front cover by loosening the thumbscrews.

STEP 3 Remove the 2 Phillips screws that secure the Control Panel to the chassis, see Figure 5-11. Carefully pull the Control Panel out. There are several cables connected to the back of this panel, carefully remove them

STEP 4 Using the small wrench, carefully remove the RF Sample connector from the front panel cover.

STEP 5 Check the replacement assembly for a CR2032 Time and Date Battery. Be sure a battery is installed.

STEP 6 Check the S15 Dipswitch settings. Make sure the S15 switches on the replacement assembly match the switch settings on the removed assembly.

STEP 7 Reverse the above procedure to install the replacement assembly.

5.5.7 Date and Time Battery

The date/time battery (20mm, 3V, lithium coin battery CR2032) is normally installed at the factory. Check and verify battery is installed. The battery mounts on the front panel Display/Control board. Perform the following steps to install or replace the battery.

STEP 1 Remove all AC power from the transmitter.

STEP 2 Remove the front cover by loosening the thumbscrews.

STEP 3 Remove the 2 Phillips screws that secure the Control Panel to the chassis. Carefully pull the Control Panel out to gain access to the battery.

Figure 5-11 Control and Display Board Access

STEP 4 Remove battery from package (Pt. No. 660-0054-000) and slide battery into holder, with positive side up against clip, until it is fully seated.

WARNING: Disconnect primary power prior to servicing.

STEP 5 Reverse the above procedure to install the board assembly.

5.6 Transmitter Calibration Procedures

The following sections describe in detail the steps required to calibrate the transmitter system.

Note

Reflected power requires a special shorted stub and a known good dummy load to be used during the calibration process. Contact field service for more information.

Warning

IF THE FAX IS USED AS AN EXCITER, DO NOT ATTEMPT TO CALIBRATE FORWARD OR REFLECTED RF POWER IN THE TRANSMITTER. THE FAX EXCITER MUST BE CONNECTED TO A DUMMY LOAD PRIOR TO ATTEMPTING TO CALIBRATE THE UNIT.

5.6.1 Forward Pwr Cal Single Frequency

The RF Forward power is calibrated accurately to a calibrated standard prior to shipment from GatesAir. Under normal conditions calibration should not be required. If the output directional coupler has been replaced in the field, calibration will be required.

In the calibration procedure there are two power points that must be calibrated, 10% of transmitter TPO setting and 100% of TPO setting. Calibrating at two points assures meter accuracy across the entire power range of the model without having to re-calibrate.

If the transmitter is to be used at multiple frequencies in the FM Band 87.5 to 108 MHz then RF Tilt Calibration will be required. Skip to Section 5.6.2 to perform this type of calibration.

To accurately calibrate the forward power on all FAX models at a single frequency use the following procedure:

STEP 1 Connect a power measuring device to the RF output of the transmitter. This device must be capable of accurately measuring power at the transmitter frequency. Ensure the power measuring setup is connected to a dummy load or antenna that is capable of handling at least TPO of the model under calibration.

Note

If calibrating in HD Mode make sure the external power meter is capable of accurately measuring digital power.

STEP 2 On the transmitter front panel set the following parameters:

a. In the SETUP>TX CONFIGURE menu, set TPO to the power the transmitter is to be calibrated at

b. In the SETUP>TX CONFIGURE menu, set PWR SET to match the TPO setting; this sets the actual power out when the transmitter is turned ON

c. In the SETUP>TX CONFIGURE menu, set APC Mode to INT APC.

d. In the SETUP>TX CONTROL menu, set INT APC GAIN to 100%;

Note

This setting will be adjusted later in the procedure to set the APC Voltage (Formerly UC ATTENUATION voltage) once calibration is complete. The UC ATTENUATION voltage only can be viewed by connecting to the GUI via Ethernet port.

e. In the SETUP>TX CONTROL menu, set RF GAIN to match the Factory Test Data Sheet setting.

STEP 3 Go to SETUP>TX CALIBRATE>TX FWD PWR CAL menu

STEP 4 Turn the transmitter ON

STEP 5 Highlight SET ATTEN and press ENTER. STATUS should display PHASE 1

STEP 6 Highlight SET ATTEN again and begin adjusting this setting up or down using navigation buttons (Not Raise/Lower Power buttons) to achieve 10% of the TPO (Step 3 a above) setting on the external power measuring device. Press ENTER

Note

The power will not start increasing on the external meter until the SET ATTEN number is approximately 250 or more. This will be model dependent.

STEP 7 Highlight CALIBRATE, change to YES and press ENTER. Phase1 is complete and the STATUS should display PHASE 2.

STEP 8 Highlight SET ATTEN and begin adjusting this setting up to achieve 100% (TPO setting in Step 3a above) power on the external power measuring device. Press ENTER

STEP 9 Highlight CALIBRATE change to YES and Press ENTER. Phase two is complete and the STATUS should display READY.

STEP 10 Transmitter power meter and external power meter should now match.

STEP 11 Connect the transmitter to a Computer via Ethernet. From the HOME screen navigate to the OUTPUT screen. Change the “Set Power” Field to the power the transmitter was calibrated at plus 10%, i.e. calibrated @ 100 Watts set to 110 Watts.

STEP 12 From the HOME screen navigate to System>System Setup screen. Using the Internal RF Gain (dB) setting, set the APC Voltage (UC ATTENUATION voltage) as close to 2.5 VDC as possible. This is a course adjustment and 2.5 VDC will not be obtained exactly, slightly lower than 2.5 VDC is ok.

STEP 13 Now adjust the Internal APC Gain (%) setting so the UC ATTENUATION voltage is 3.0 ±0.1 VDC. For the setting to take effect you will have to navigate away from the field. It will take a few steps to achieve 3 VDC.

STEP 14 Go back to the OUTPUT screen and change "Set Power" to the TPO the transmitter will run at.

STEP 15 If unit is using External APC it will be necessary to set that up in the SETUP>TX CONTFIGURE Menu.

STEP 16 End of procedure

5.6.2 Forward Pwr Cal Wideband (TX FWD PWR TILT)

The wideband calibration procedure should be used if the FAX is to be used in a N+1 system as the +1 transmitter or if it is required to operate at multiple frequencies in the band without re-calibration, for example as a backup to multiple channels in the FM band.

In the calibration procedure there are two power points that must be calibrated, 10% of transmitter TPO setting and 100% of TPO setting. Calibrating at two points assures meter accuracy across the entire power range of the model without having to re-calibrate.

Since the transmitter is to be used at multiple frequencies in the FM Band 87.5 to 108 MHz, RF Tilt Calibration will be required. To perform this calibration a dummy load or the antenna attached to the transmitter must be capable of wideband 88 to 108 MHz operation in the FM Band.

To accurately calibrate the forward power on all FAX models for wideband operation use the following procedure:

STEP 1 Connect a power measuring device to the RF output of the transmitter. This device must be capable of accurately measuring power across the entire FM band 88 to 108 MHz. Ensure the power measuring setup is connected to a dummy load or antenna that is capable of handling at least TPO of the model under calibration.

STEP 2 Go to SETUP>TX CONFIGURE menu, set FREQ to 98 MHz

STEP 3 Go to SETUP>TX CALIBRATE>TX FWD PWR TILT and set FWD PWR TILT to 0. Then change SET to YES and press ENTER

STEP 4 On the transmitter front panel set the following parameters:

a. In the SETUP>TX CONFIGURE menu, set TPO to power the transmitter is to be calibrated at

b. In the SETUP>TX CONFIGURE menu, set PWR SET to match the TPO setting; this sets the actual power out when the transmitter is turned ON

c. In the SETUP>TX CONFIGURE menu, set APC Mode to INT APC.

d. In the SETUP>TX CONTROL menu, set INT APC GAIN to 100%

Note

This setting will be adjusted later in the procedure to set the APC Voltage (Formerly UC ATTENUATION voltage) once calibration is complete. The APC Voltage (UC ATTENUATION voltage) only can be viewed by connecting to the GUI via Ethernet port.

e. In the SETUP>TX CONTROL menu, set RF GAIN to match the Factory Test Data Sheet setting.

STEP 5 Go to SETUP>TX CALIBRATE>TX FWD PWR CAL menu

STEP 6 Turn the transmitter ON

STEP 7 Highlight SET ATTEN and press ENTER. STATUS should display PHASE 1

STEP 8 Highlight SET ATTEN again and begin adjusting this setting up or down using navigation buttons (Not Raise/Lower Power buttons) to achieve 10% of the TPO (Step 3 a above) setting on the external power measuring device. Press ENTER

Note

The power will not start increasing on the external meter until the SET ATTEN number is above 250 or possibly more. This will be model dependant.

STEP 9 Highlight CALIBRATE change to YES and press ENTER. Phase1 is complete and the STATUS should display PHASE 2.

STEP 10 Highlight SET ATTEN and begin adjusting this setting up to achieve 100% (TPO setting in Step 3a above) power on the external power measuring device. Press ENTER

STEP 11 Highlight CALIBRATE change to YES and Press ENTER. Phase two is complete and the STATUS should display READY.

STEP 12 Transmitter power meter and external power meter should now match.

STEP 13 Turn the transmitter OFF, go to SETUP>TX CONFIGURE. Record the external power meter readings at 88 and108 MHz. Depending on power meter it may be necessary to calibrate external power meter at each frequency.

STEP 14 Set the transmitter to the frequency that had the largest change in metered power.

STEP 15 Turn the transmitter ON, go to SETUP>TX CALIBRATE>TX FWD PWR TILT, adjust the TILT setting so the external meter is equal to the power in Step 4a (TPO). The setting does not take effect until SET is changed to YES and ENTER is pressed. This step may take a few tries to get the number correct. The range of the TILT setting is -127 to +127. Typically the number will be less than 20.

STEP 16 Once the TILT is set, go to SETUP>TX CONFIGURE and set FREQ to other end of the band. Verify the power on the external meter matches the TPO +/- 4%. Repeat tilt setting until the power across the 88 - 108 MHz band is accurate.

STEP 17 Go to SETUP>>TX CONFIGURE>>SET POWER to 100% of TPO for your model, i.e. 1 kW = 1100 Watts.

STEP 18 Connect the transmitter to a Computer via Ethernet. From the HOME screen navigate to the OUTPUT screen. Change the “Set Power” Field to the power the transmitter was calibrated at plus 10%, i.e. calibrated @ 100 Watts set to 110 Watts.

STEP 19 From the HOME screen navigate to System>System Service screen. The APC Voltage (UC ATTENUATION voltage) needs to be recorded at 88, 98 and 108 MHz.

STEP 20 With the transmitter set to the frequency that had the highest voltage, using the RF Gain field, adjust the number until the APC Voltage (UC ATTENUATION voltage) is as close to 2.5 VDC as possible. This is a coarse adjustment and 2.5 VDC will not be obtained exactly.

STEP 21 Now adjust the Internal APC Gain (%) setting so the UC ATTENUATION voltage is 3.0 ±0.1 VDC. For the setting to take effect you will have to navigate away from the field. It will take a few steps to achieve 3 VDC.

STEP 22 Verify all three frequencies are between 2.5 and 3 VDC.

STEP 23 Set Transmitter to correct frequency.

STEP 24 Go back to the OUTPUT screen and change "Set Power" to the TPO the transmitter will run at.

STEP 25 End of procedure.

5.6.3 Reflected Power Calibration

This procedure requires the use of a special shorted stub to produce 1.5:1 VSWR. This item can be purchased from GatesAir, contact Customer Service or the Parts Department for availability.

Shorted Stub Kit - 922-1212-524 (FAX3.5K Requires 1 5/8” to N adapter - Not included)

This procedure also requires the use of a known good dummy load with a VSWR of better than 1.05:1 and capable of handling the power from the FAX model being calibrated.

Prior to starting the reflected calibration, forward calibration in Section 5.6.1 or Section 5.6.2 should already have been completed.

STEP 1 Ensure transmitter is connected to a known good dummy load without the shorted stub.

STEP 2 On the transmitter front panel set the following parameters:

a. In the SETUP>TX CONFIGURE menu set TPO to the nameplate power, i.e. FAX1k to 1000 Watts

b. In the SETUP>TX CONFIGURE menu set PWR SET to match the Table 5-4 per the model being calibrated

STEP 3 Turn the transmitter ON ensure transmitter operates at PWR SET setting into the load

Table 5-4 Model Forward Power Setting for Reflected Calibration

Model	Forward PWR SET
50 W	24 W
150 W	70 W
300 W	140 W
500 W	233 W
1 kW	465 W
2 kW	930 W
3 kW	1400 W
3.5 kW	1628 W

Table 5-5 Model Reflected Power Calibration Point

Model	Reflected Meter
FAX50	1 W
FAX150	2.8 W
FAX300	5.5 W
FAX500	9 W
FAX1K	18 W
FAX2K	36 W
FAX3K	55 W
FAX3.5K	66 W

Note

Calibration at 1.5:1 at a reduced power is equivalent to 1.3:1 at full nameplate power for each model.

STEP 4 Turn transmitter OFF and connect shorted stub on the back of the transmitter. Re-attach the load

STEP 5 Go to SETUP>TX CALIBTRATE>TX RFLD PWR CAL menu. Set VSWR PROTECT to OFF

STEP 6 Turn transmitter back ON and verify the power setting from Table 5-2 on the power meter on the transmitter.

STEP 7 Change CALIBRATE to YES

STEP 8 Press the POWER button on the front of the transmitter, verify the Reflected Power Meter per Table 5-5 below (Note: These values will not be exact but should be within 5%):

STEP 9 Turn transmitter OFF, remove stub and reconnect load or antenna.

5.6.4 Adjust Carrier Frequency (Fine adjust)

Adjusting the transmitter carrier frequency requires a computer connected via the front or rear Ethernet port. Refer to Section 3 for connection and login information. The frequency is set at the factory but should be checked on occasion to verify it meets the stations requirements.

Note

Ensure the RF level is not to high, if required use pads so as not to overdrive the front end of the counter

STEP 1 Connect a calibrated frequency counter to one of the RF samples on the FAX trasmitter, either the front or rear sample is adequate.

STEP 2 On the transmitter GUI, navigate to the Exciter>>Internal Exciter>>Clock Ref>>Setup. You must be logged in and Remote must be enabled to make an adjustment

STEP 3 Before making any adjustments the transmitter should be operating for 24 hours to ensure the oscillator stability.

STEP 4 Using the + or - button, adjust the transmitter frequency to your stations carrier frequency.

5.6.5 Power Supply Voltage Set (FAX1K and up)

The FAX transmitter allows the user to se the DC voltage output of the power supplies to obtain either best overall efficiency in the Class C (FM) mode or for best spectral performance in Class AB(HD modes). The FAX allows the power supplies to be set in the range of 44 VDC to 52 VDC. In Class C the lower the voltage typically the better the efficiency. In Class AB care should be taken not to lower the voltage to a point that the RF output spectrum exceeds the mask. If changing this setting in HD modes turn RTAC off and verify the spectrum performance has not significantly degraded when changing the voltage. The power supply voltage setting is stored for each mode (FM, FM+HD and HD), if using more than one mode the voltage must be set for each.

STEP 1 Go to SETUP>TX CALIBRATE>POWER SUPPLY SET

STEP 2 Ensure Modulation type is correct.

STEP 3 Change the PS VOLTS to the desired voltage. It is not necessary to turn transmitter off to change the voltage.

STEP 4 Change SET to Yes and press enter button.

5.6.6 Rebias Amplifier (Modulator Board Only)

When replacing the Modulator board in the FAX Compact series transmitter or the final Power Amplifier in the FAX50/150 a Rebias of the amplifiers is necessary. In FAX300 and higher power models this procedure will only be necessary when replacing the Modulator Board.

5.6.7 Spectrum Tilt Setup

Spectrum Tilt is setup for best Synchronous AM noise performance. Adjustment of this parameter will require the use of an analyzer that is capable of measuring Synchronous AM noise from a FM transmitter.

STEP 1 Connect an analyzer capable of measuring Synchronous AM to the RF Monitor sample of the transmitter. See manual of analyzer for setup information

STEP 2 On the FAX LCD screen navigate to SETUP>EXCITER SETUP>SPECTRUM TILT ON. Change this to YES

STEP 3 Navigate one line up to SPECTRUM TILT, highlight this filed and change the number in one direction or the other until the noise on the analyzer begins to lower.

STEP 4 Continue in that direction (+ or -) until a null is found. If you go past the null return the number back to the null.

STEP 5 Press the enter button to save the setting.

6 Section-6 Diagnostics

6.1 Introduction

This section contains diagnostic and troubleshooting information for the Flexiva FAX Compact Series of Transmitters.

Should difficulties arise with your FAX transmitter, use the information in this section to help locate and correct the problem.

6.2 Troubleshooting Tables

This section provides troubleshooting tables for FAX Compact Series transmitters covered in this manual. The reader is encouraged to carefully study the table in its entirety -- even if the transmitter is operating without any problems at the present time. Becoming familiar with the following information will be helpful to diagnose and repair problems should any arise in the future.

6.2.1 LED Indicator Explanation

GREEN: System is normal, does not need any attention

AMBER: System WARNING. Transmitter is operating but there's a problem. Warning should be investigated and resolved ASAP.

RED: System FAULT. Something in the transmitter system has faulted and is not operating properly and possibly off-air. Should be investigated and fixed immediately.

6.2.2 Transmitter Front Panel Controller LED Indicators

Figure 6-1 shows the FAX transmitter front panel operating with no Faults and the Remote Control Disabled. Table 6-1 provides an explanation of Status LEDs based on its illuminated color and troubleshooting tips to resolve warnings and Faults when they occur.

Figure 6-1 FAX Front Panel Status LED's

Also available on the front panel is an RF Sample port. This is a convenient way to sample the RF output for test purposes. This sample is from the directional coupler at the RF output of the transmitter. The approximate level is -42 dBc.

WARNING: Disconnect primary power prior to servicing.

Table 6-1 Front Panel LED Troubleshooting Table

Symptom	Cause and Solution
EXCITER LED is Green	Transmitter is ON and the Modulator is operating with no alarms or faults.
EXCITER LED is Yellow	Transmitter is ON but warnings are being reported from the Modulator Board.
EXCITER LED is Red	Transmitter Modulator has faulted
DRIVE CHAIN LED is Green	The transmitter is ON. Exciter(Modulator) and IPA are operating normally with no alarms or faults reported.
DRIVE CHAIN LED is Yellow	The transmitter is ON and there is an alarm in the Exciter/Modulator or IPA.
DRIVE CHAIN LED is Red	The transmitter is ON or OFF. Check the Exciter LED, if it is yellow or red, check LCD Display Fault Menu for further troubleshooting.
POWER AMP LED is Green	The transmitter is ON and all PA Pallets are operating with no alarms or faults.
POWER AMP LED is Yellow	The transmitter is ON and one or more PA Pallets have generated an alarm. Check the LCD Display Fault Menu for PA Temperature, Foldback etc.
POWER AMP LED is Red	The transmitter could be ON or OFF and one or more PA modules have faulted off. Refer to Section 5 of this manual for PA replacement procedure.
POWER SUPPLY LED is Green	The transmitter is reporting no power supply alarms or faults.
POWER SUPPLY LED is Yellow	One or more Power Supply modules have generated an alarm. Remove front panel and check the LEDs on the front of each Power Supply Module.
POWER SUPPLY LED is Red	One or more Power Supply Modules has a fault. Remove the front panel and check the LEDs on the front of each PS. If necessary, replace a Power Supply Module.
OUTPUT LED is Green	Transmitter and Modulator are operating normally with no alarms being reported.
OUTPUT LED is Yellow	Transmitter is ON but alarms are being reported. Check the LCD Display Fault Menu for possible Fault information. Check the VSWR reading. Also check STATUS menu for Voltage, Current, Temperature readings etc.
OUTPUT LED is Red	Transmitter is switched OFF or is switched ON but no PS modules are activated (all PA modules are OFF). Press front panel ON button to re-start transmitter. If nothing happens, Consult FAULT Menu for any reported Table Faults.
SYSTEM LED is Green	Transmitter and Modulator are ON and operating normally with no alarms being reported.
SYSTEM LED is Yellow	Transmitter is ON but alarms are being reported. Consult the LCD Display for any reported alarms.
SYSTEM LED is Red	Transmitter is switched OFF or is ON but no PS modules are activated (all PA modules are OFF). Press front panel ON button to re-start transmitter. If nothing happens, Consult LCD Display entries for any reported alarms in Table .
MUTE LED is Green	Transmitter and Modulator are switched ON and operating normally with no alarms being reported.
MUTE LED is Red	Transmitter is ON but the RF Output has been Muted (all PA modules are off). Press front panel ON button to re-start transmitter. If nothing happens, Consult LCD Display entries for any reported alarms. Check Interlock connections.

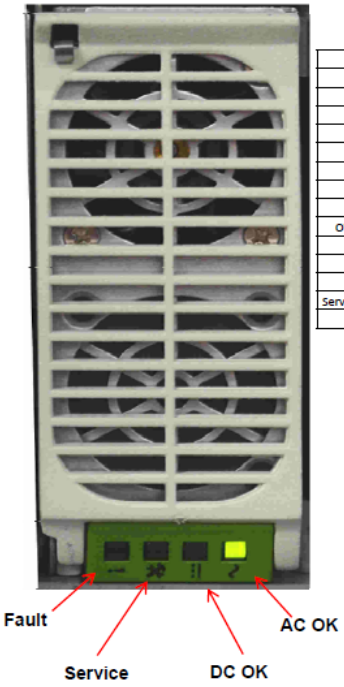
Press STATUS, then scroll down to Power Supplies and press ENTER. Scrolling through the screens provides pertinent information regarding each Power Supply Module.

Note that the Transmitter Forward Output and Reflected Power levels remain visible at the top of the display.

6.2.3 Power Supply Faults

Figure 6-2 shows the power supply fault chart. Refer to the LED's on the FAX power supply and cross reference to find out specifically the power supply condition or fault. The power supply has three fault outputs that are tied together on the Power Supply Interface board as one generic PS Fault.

FAX Power Supplies



Condition	AC OK GREEN	DC OK GREEN	Service AMBER	Fault RED	FAULT	OTW	PFW
OK	ON	ON	OFF	OFF	1	1	1
Thermal Alarm	ON	ON	ON	OFF	1	0	1
THERMAL SHUTDOWN	ON	OFF	ON	ON	0	0	0
Defective Fan	ON	OFF	OFF	OFF	0	1	0
Blown AC Fuse	ON	OFF	OFF	ON	0	1	0
No AC <15 mS	OFF	ON	OFF	OFF	1	1	0
AC Present but OOL	Blinks	OFF	OFF	OFF	1	1	0
AC Not Present	OFF	OFF	OFF	OFF	1	1	0
Boost Stage Fail	ON	OFF	OFF	ON	0	1	0
OVR Volts Latched Shtdwn	ON	OFF	OFF	ON	0	1	0
Over Current	ON	Blinks	OFF	OFF	1	1	0
NON-Cat Internal Fail	ON	ON	OFF	ON	0	1	1
Standby (remote)	ON	OFF	OFF	OFF	1	1	0
Service Request (PMBus Mode)	ON	ON	Blinks	OFF	1	1	1
Comm Fault (RS485)	ON	ON	OFF	Blinks	1	1	1

All Fault outputs on PS are open drain; 1=logic HI pulled up to +5 VDC on PS Interface Card in Transmitter (See Sheet 5 of Schematic)

Figure 6-2 FAX Power Supply Fault Matrix

6.2.4 IB Fault

An IB Fault is a current imbalance between pallets within the PA. If it cannot be cleared with a power cycle (remove power, wait 15 seconds then reapply power), then the amplifier will need to be replaced.

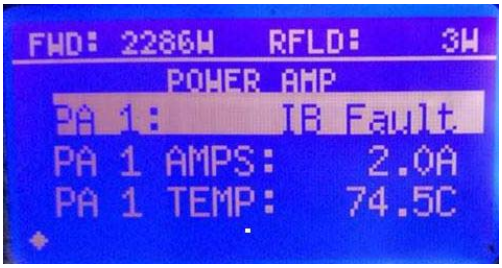


Figure 6-3 IB Fault LCD Screen

6.3 FAX Data Download

The following procedure will download all data points (approximately 550) within the FAX transmitter to an Excel spreadsheet.

WARNING: Disconnect primary power prior to servicing.

STEP 1 Connect computer to either front or rear Ethernet port of the FAX.

STEP 2 Open a blank spreadsheet.

STEP 3 On the File menu click Open and in the filename box type the following, "http// xxx.xxx.xxx.xxx/data.xml". Insert IP address for x's, see Figure 6-4.

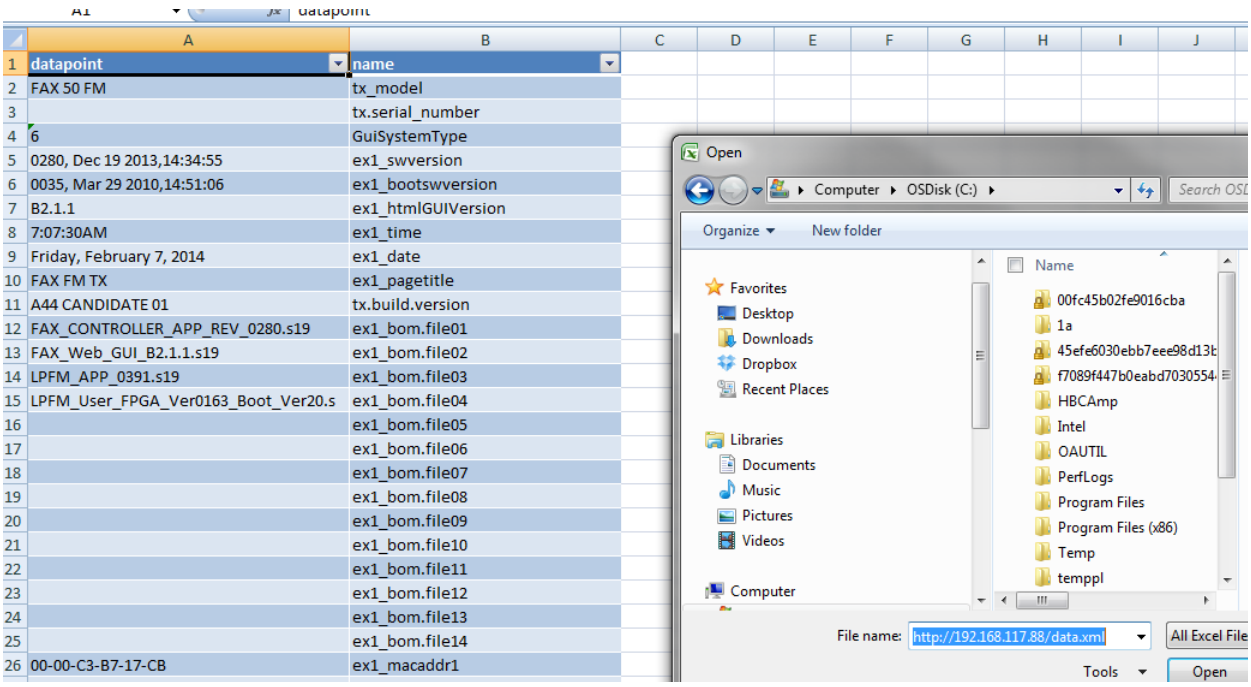


Figure 6-4 Data Point Download

STEP 4 Click Open and a dialog box should open, select "As an XML table" then click OK.

STEP 5 The data points should load into excel and look like the left column in Figure 6-4. The right hand is the data and the left column will be the name of the data points.

6.4 Fan Status

The fan speed will increase due many parameters including System, Exgine, IPA and PA temperature. The following table describes the fan response with PA temperature.

Table 6-2 Fan Speed versus PA Temperature

TEMPERATURE	FAN RESPONSE
Below 67.5° C	Fan speed decreases slowly.
67.5° - 70° C	Fan maintains speed.
Above 70° C	Fan speed increases rapidly.

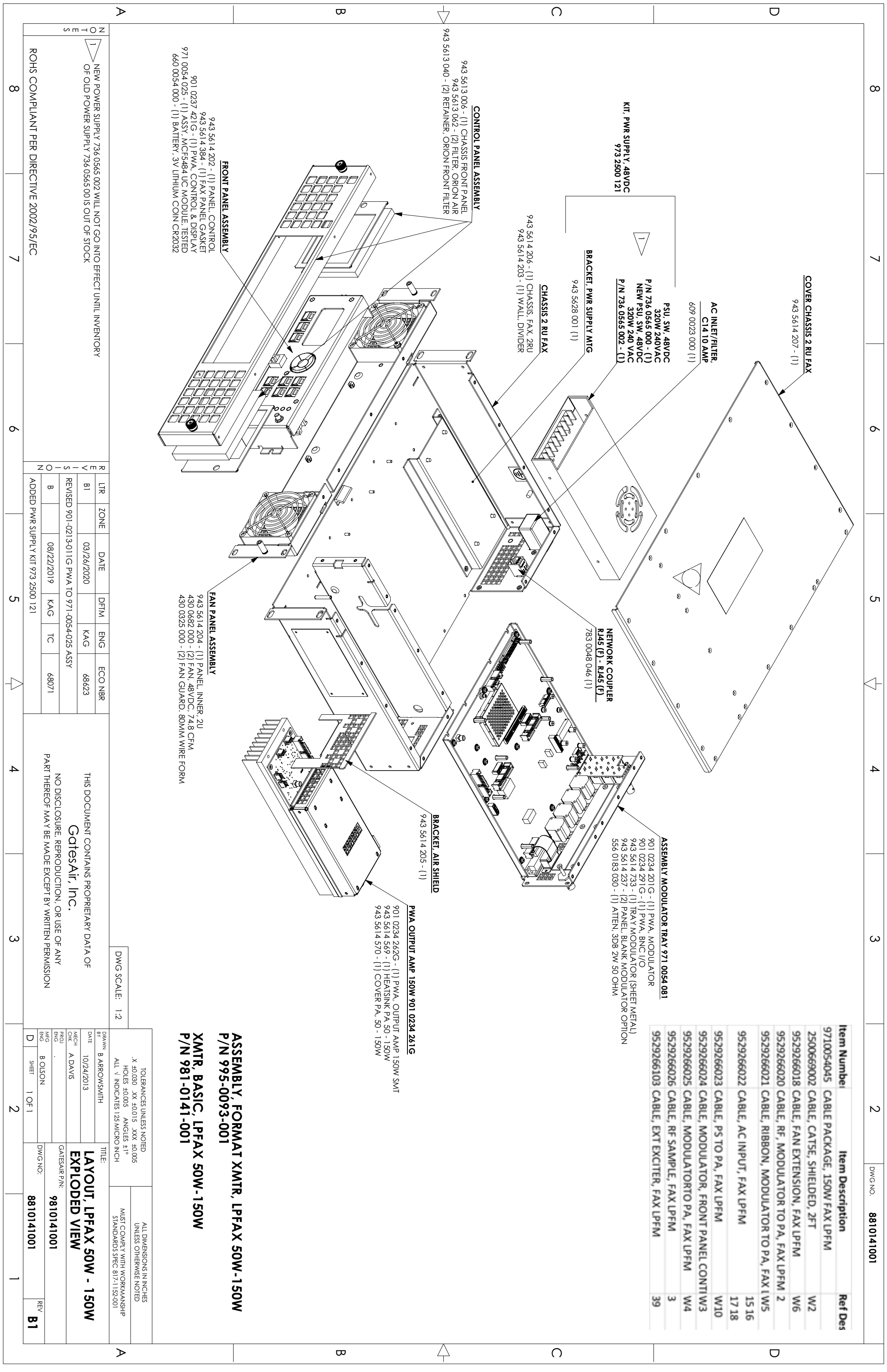
7 Section-7 Parts List

7.1 Exploded View FAX Compact Transmitters

Figure 7-1 through Figure 7-6 are the Exploded view each FAX Compact transmitter. The parts given are not an exhaustive parts list but are the field replaceable parts for each assembly and sub-assembly in the unit. If the need comes up that requires a part not listed, the numbers for that assembly can be given to a GatesAir representative who can assist in finding the correct part.

Table 7-1 FAX High Level Part Numbers

Part Number	Description
981-0141-001	Basic LPFAX50-150 W Transmitter
981-0141-007	Basic LPFAX300/500 W Transmitter
981-0141-002	Basic LPFAX1 kW Transmitter
981-0141-008	Basic LPFAX2 kW Transmitter
981-0141-006	Basic LPFAX3 kW Transmitter
981-0141-005	Basic LPFAX3.5 kW Transmitter
922-1212-524	1/4 Wave Calibration Stub Kit (3.5K requires 1 5/8” to N adapter - Not Included)


COVER CHASSIS 2 RU FAX
943 5614 207 - (1)
AC INLET/FILTER, C14 10 AMP
609 0023 000 (1)
KIT, PWR SUPPLY, 48VDC 973 2500 121
PSU, SW, 48VDC 320W 240VAC P/N 736 0565 000 - (1)
NEW PSU, SW, 48VDC 320W 240 VAC P/N 736 0565 002 - (1)
BRACKET, PWR SUPPLY MTG
943 5628 001 (1)
CHASSIS 2 RU FAX
943 5614 206 - (1) CHASSIS, FAX, 2RU
943 5614 203 - (1) WALL DIVIDER
CONTROL PANEL ASSEMBLY
943 5613 006 - (1) CHASSIS FRONT PANEL
943 5613 062 - (2) FILTER, ORION AIR
943 5613 040 - (2) RETAINER, ORION FRONT FILTER
FRONT PANEL ASSEMBLY
943 5614 202 - (1) PANEL, CONTROL
943 5614 384 - (1) FAX PANEL GASKET
901 0237 421G - (1) PWA, CONTROL & DISPLAY
971 0054 025 - (1) ASSY, MCF5484 UC MODULE TESTED
660 0054 000 - (1) BATTERY, 3V LITHIUM COIN CR2032
FAN PANEL ASSEMBLY
943 5614 204 - (1) PANEL, INNER, 2U
430 0682 000 - (2) FAN, 48VDC, 74.8 CFM
430 0325 000 - (2) FAN GUARD, 80MM WIRE FORM
NETWORK COUPLER RJ45 (F) - RJ45 (F)
783 0048 046 (1)
ASSEMBLY MODULATOR TRAY 971 0054 081
901 0234 201G - (1) PWA, MODULATOR
901 0234 291G - (1) PWA, BNC I/O
943 5614 233 - (1) TRAY MODULATOR (SHEET METAL)
943 5614 227 - (1) PANEL, BLANK MODULATOR OPTION
556 0183 030 - (1) ATTEN, 3DB 2W 50 OHM
BRACKET, AIR SHIELD
943 5614 205 - (1)
PWA OUTPUT AMP 150W 901 0234 261G
901 0234 262G - (1) PWA, OUTPUT AMP 150W SMT
943 5614 569 - (1) HEATSINK PA, 50 - 150W
943 5614 570 - (1) COVER PA, 50 - 150W
ASSEMBLY, FORMAT XMTR, LPFAX 50W-150W
P/N 995-0093-001
XMTR, BASIC, LPFAX 50W-150W
P/N 981-0141-001
NOTES
1. NEW POWER SUPPLY 736 0565 002 WILL NOT GO INTO EFFECT UNTIL INVENTORY OF OLD POWER SUPPLY 736 0565 00 IS OUT OF STOCK
ROHS COMPLIANT PER DIRECTIVE 2002/95/EC
REVISION: LTR | ZONE | DATE | DFTM | ENG | ECO NBR
B1 | | 03/26/2020 | | KAG | 68623
REVISED 901-0213-011G PWA TO 971-0054-025 ASSY
B | | 08/22/2019 | KAG | TC | 68071
ADDED PWR SUPPLY KIT 973 2500 121
DWG SCALE: 1:2
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NO DISCLOSURE, REPRODUCTION, OR USE OF ANY PART THEREOF MAY BE MADE EXCEPT BY WRITTEN PERMISSION
TITLE: LAYOUT, LPFAX 50W - 150W EXPLODED VIEW
GATESAIR P/N: 981014100I
DWG NO: 881014100I
REV B1
SHEET 1 OF 1
DWG NO. 881014100I

Item Number	Item Description	Ref Des
9710054045	CABLE PACKAGE, 150W FAX LPFM	
2500669002	CABLE, CAT5E, SHIELDED, 2FT	W2
9529266018	CABLE, FAN EXTENSION, FAX LPFM	W6
9529266020	CABLE, RF, MODULATOR TO PA, FAX LPFM	2
9529266021	CABLE, RIBBON, MODULATOR TO PA, FAX L	W5
		15 16
9529266022	CABLE, AC INPUT, FAX LPFM	
		17 18
9529266023	CABLE, PS TO PA, FAX LPFM	W10
9529266024	CABLE, MODULATOR, FRONT PANEL CONT	W3
9529266025	CABLE, MODULATORTO PA, FAX LPFM	W4
9529266026	CABLE, RF SAMPLE, FAX LPFM	3
9529266103	CABLE, EXT EXCITER, FAX LPFM	39

Figure 7-1 FAX50/150 Exploded View

WARNING: Disconnect primary power prior to servicing.

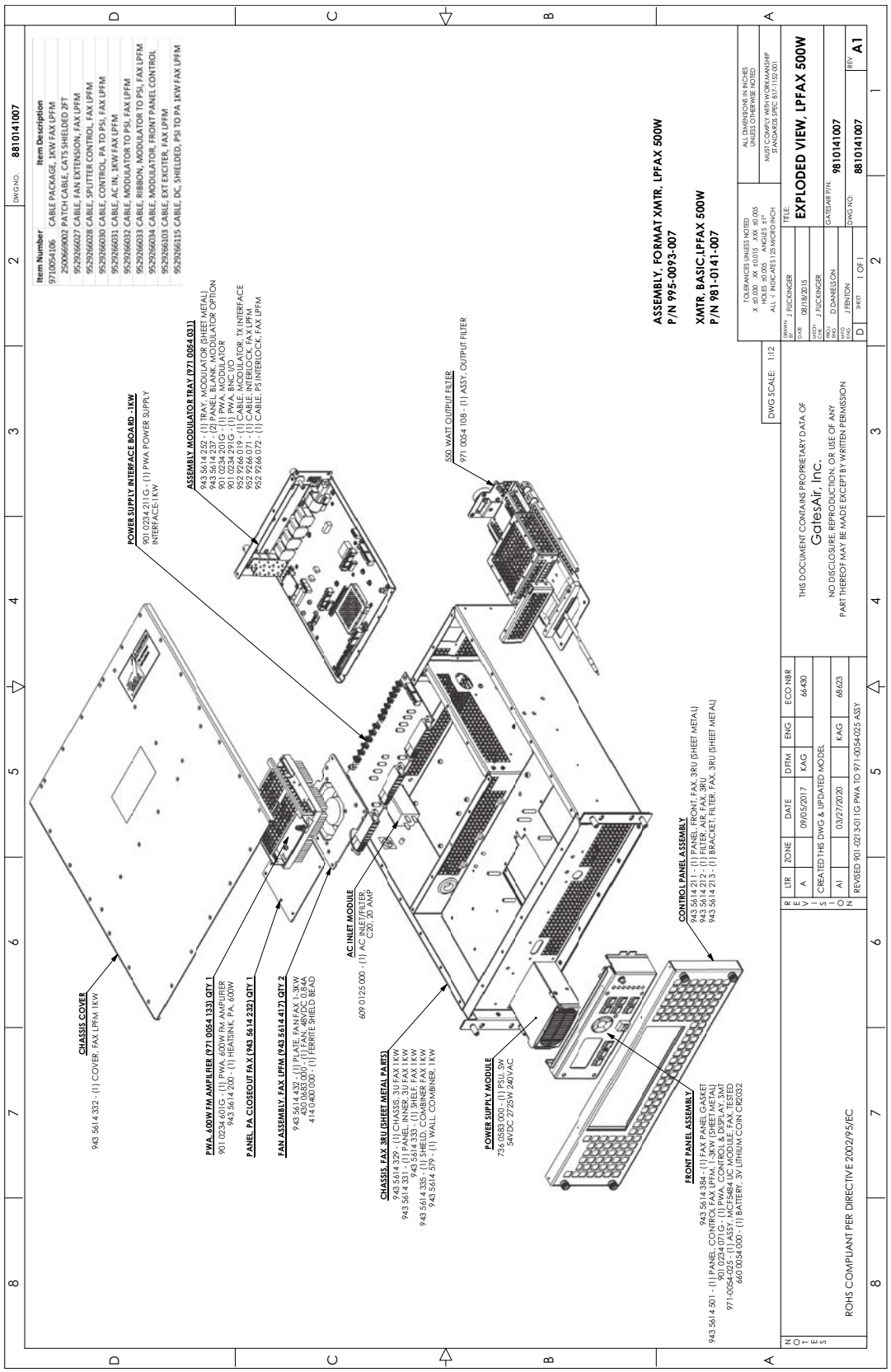

Figure 7-2 FAX300/500 Exploded View

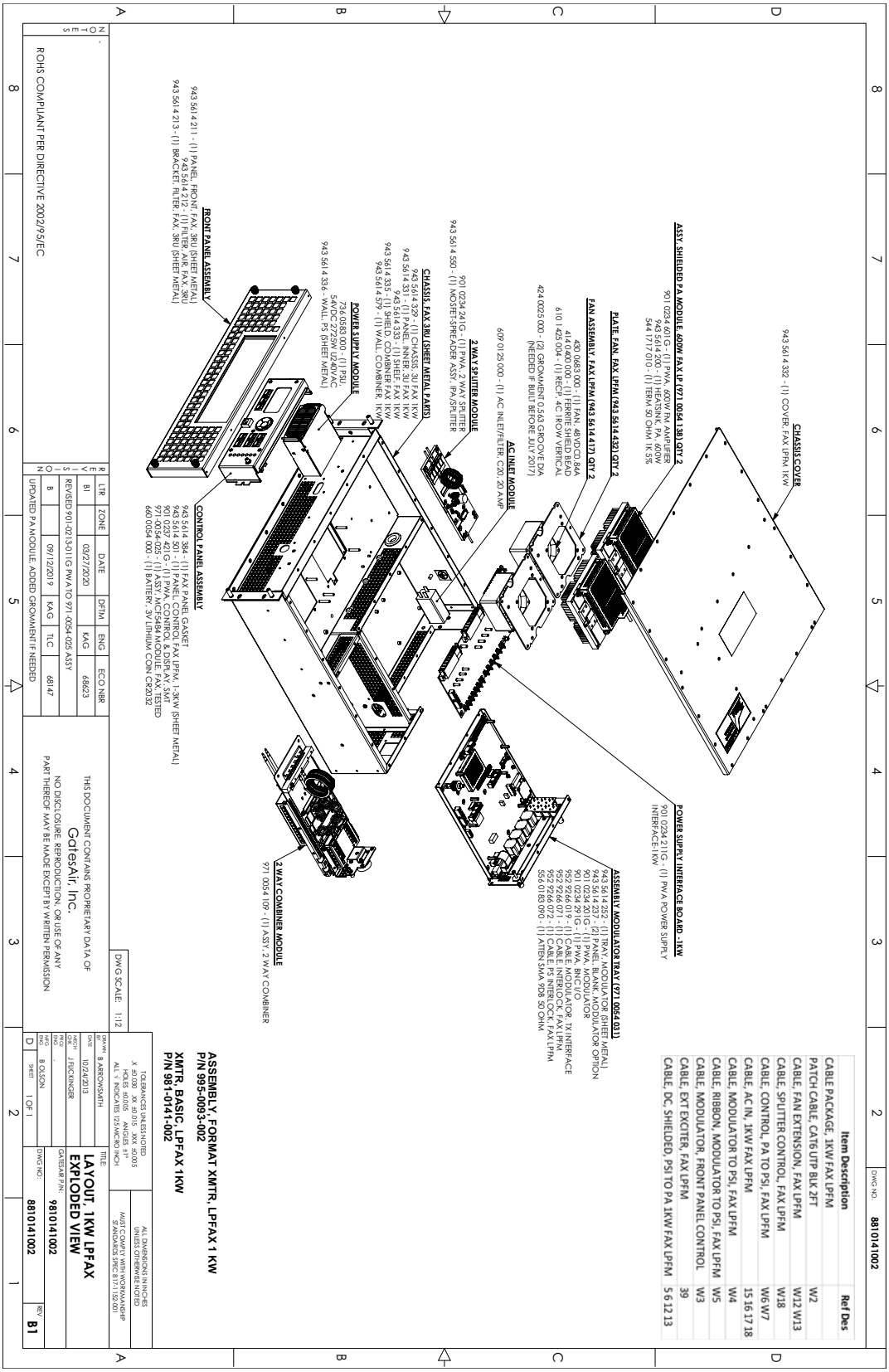

Figure 7-3 FAX 1k Exploded View

WARNING: Disconnect primary power prior to servicing.

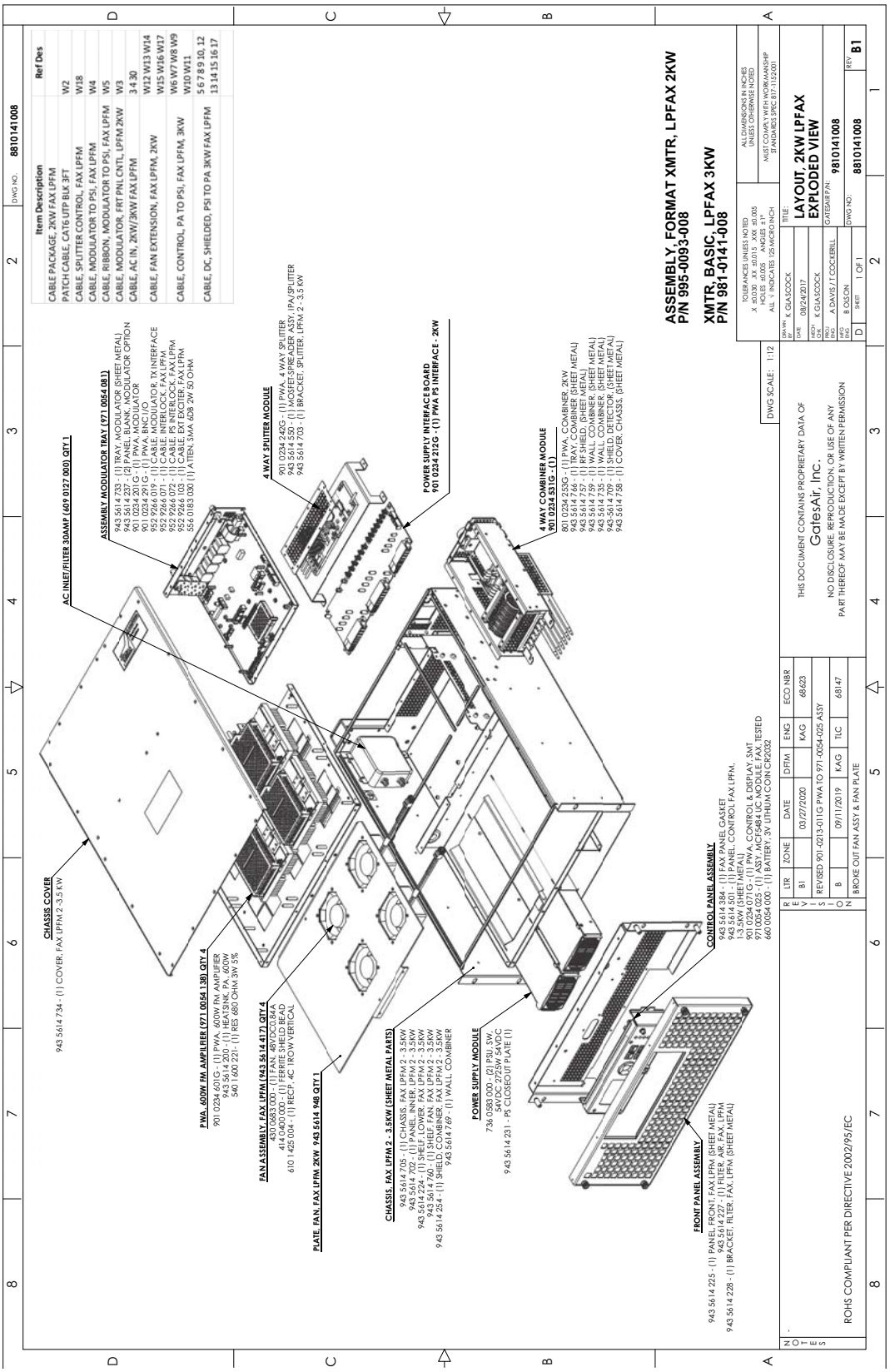

Figure 7-4 FAX2k Exploded View

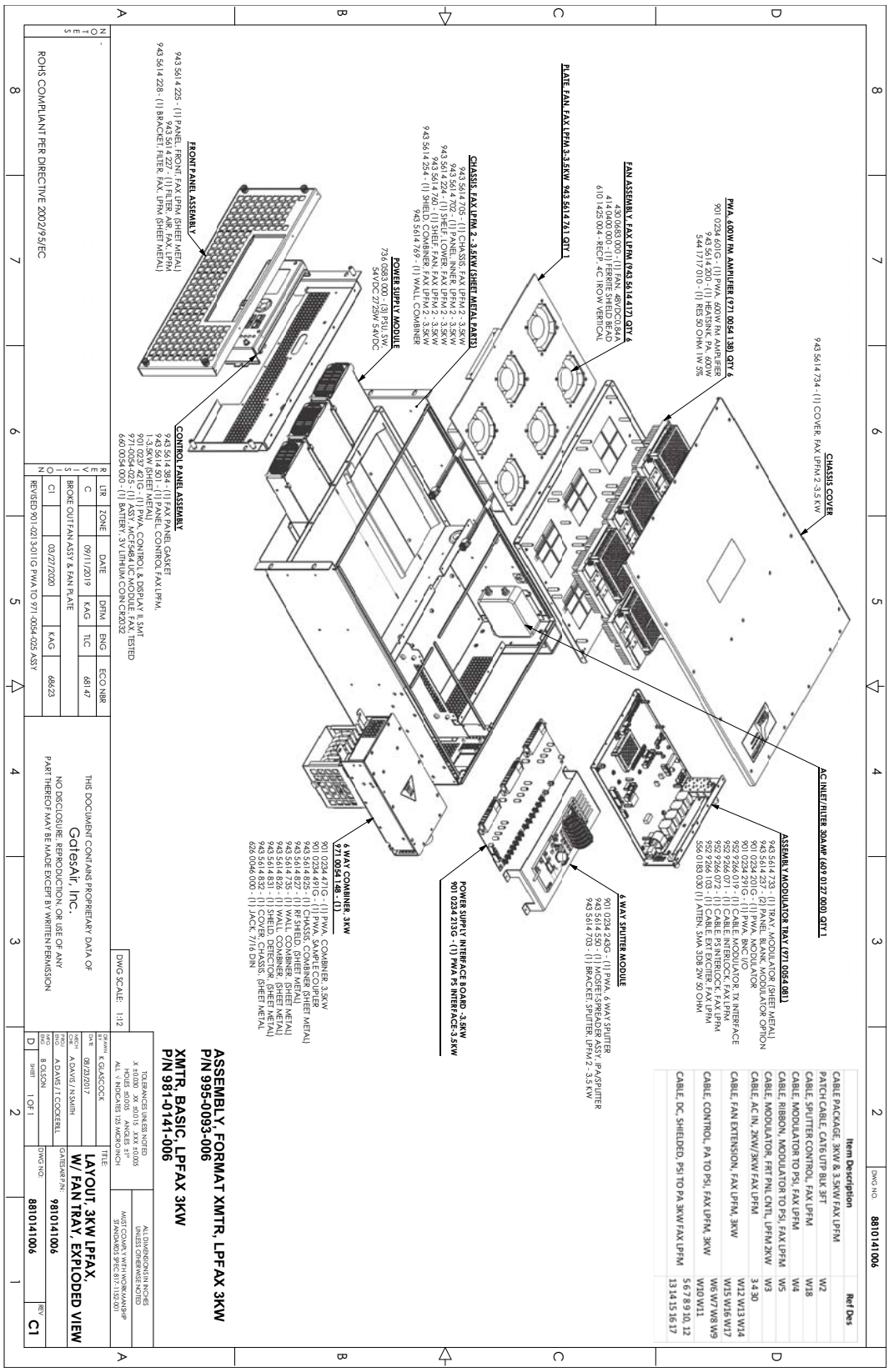

Figure 7-5 FAX3k Exploded View

WARNING: Disconnect primary power prior to servicing.

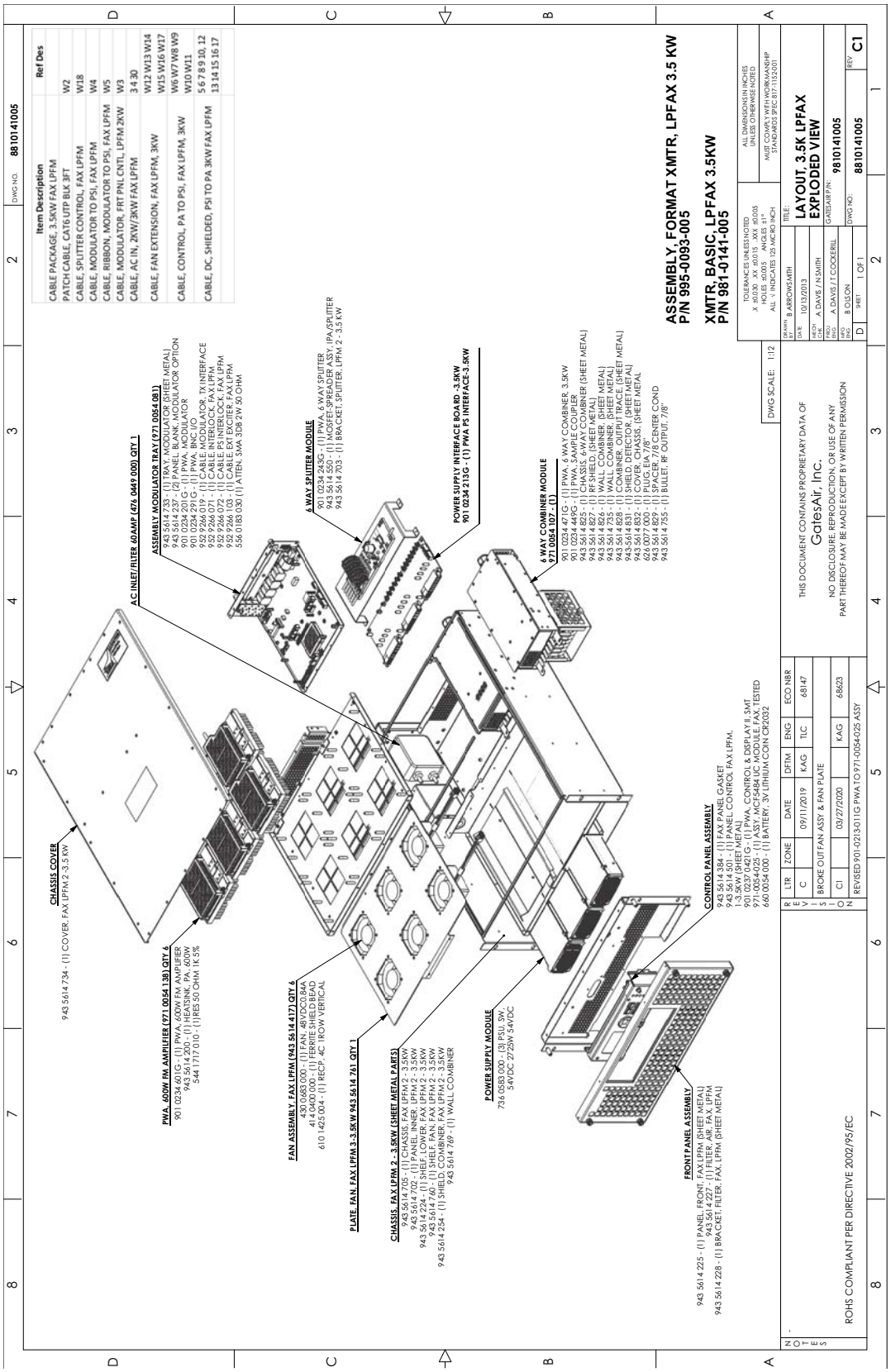

Figure 7-6 FAX3.5K Exploded View

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Customer Portal: http://support.gatesair.com

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