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**OPERATION MANUAL**

**5543A**  
DIGITAL AGILE  
TRANSMITTER

**AXCERA, LLC**

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## INSTALLATION PROCEDURE

### UNPACKING

Please inspect all material thoroughly upon arrival. Axcera certifies that upon leaving our facility the equipment was undamaged and in proper working order. The shipping container should be inspected for obvious damage indicative of rough handling.

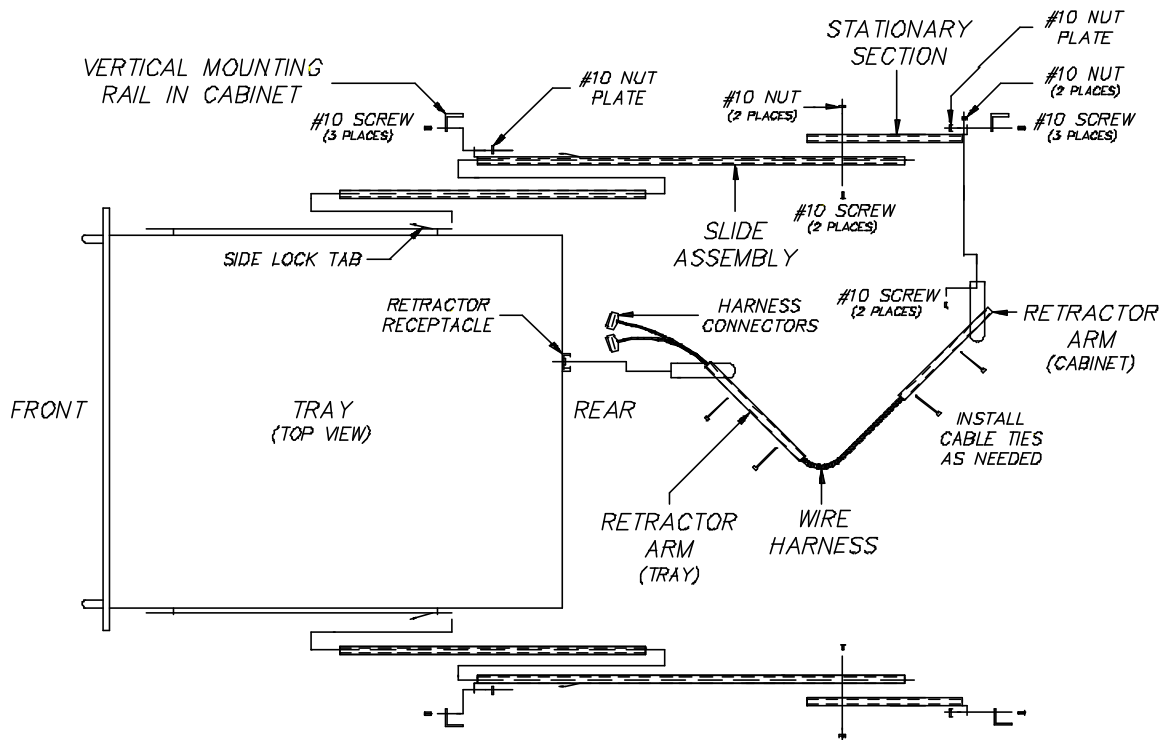
Remove the unit(s) from the shipping container and inspect for damage. Check for dents, and scratches, or a broken switch, meter or connector. Remove the top cover of the unit and again inspect for shipping damage. Extract all packing material from inside and around the unit. Check for loose hardware and connectors, retighten if needed. Any claims against in-transit damage should be directed to the carrier. Save all packing material in case it is needed in the future.

### INSTALLATION OF TRAY(S)

- ⇒ Units are shipped with chassis slides mounted to the each side. Included in the Installation Material Kit are two cabinet mount slide assemblies that will be mounted in the rack. Install the Tray slides into the cabinet. Refer to the "Cabinet Mounting Instructions Slides Drawing" which follows, for detailed instructions.
- ⇒ Slide the unit into the cabinet. If it does not slide in and out smoothly, some adjustment is necessary. Pull out the unit (only enough for clearance) and loosen the hardware holding the cable slides to the cabinet. Move the front of the Tray up or down or side to side to remove the rubbing. Retighten the hardware after the adjustment is complete.
- ⇒ Also included with the unit is a cable retractor assembly, which consists of two parts, a cabinet mount retractor and a tray mount retractor.
  - The cabinet mount retractor has a long aluminum channel hinged to a mounting piece with two bolts. This is mounted to the rear of the left hand, facing the front of the unit, cabinet mount slide assembly.
  - The retractor is a short aluminum channel hinged to a slide mount. This piece slides into a receptacle mounted to the rear panel of the unit.

These cable retractors work together to move the wire harness and coaxial cables in and out with the movement of the unit to avoid pinched wires.

- ⇒ After the units(s) are physically in place, the process of interfacing them into the system begins by making connections to the back of the units.



### CABINET MOUNTING INSTRUCTIONS FOR SLIDES DRAWING

## CONNECTIONS

Once all equipment is in place, making connection to the back of the tray (s) is a relatively simple process. Each wire is clearly marked with a number corresponding to the tray where it connects.

## NUMBERING

The numbering system used on wires that connect to the back of the trays is as follows:

**FIRST NUMBER - Channel designator**

**SECOND NUMBER - Connector on back of tray**

**EXAMPLE: A wire marked 2 10 would go to channel 2 in the group, connector J10**

Finally, verify that AC power (J1) is connected to each unit. Once this is complete, proceed to the initial turn on procedures.

**NOTE:** All Axcera products are designed for operation with either 115VAC or 208/230 VAC, 50/60 Hz input. Systems are shipped from the factory properly configured for the standard of the country of destination.

## SYSTEM DESCRIPTION

### FREQUENCY GENERATOR TRAY

The Frequency Generator tray is configured to control multiple VCXO's. within the 4 Channel VCXO assembly. The selected VCXO output is sent to the VHF Buffer/Combiner Board where the RF signal is amplified. The output of the VHF Buffer/Combiner Board is multiplied by four and filtered, then processed by the PLL Board. Once again the signal is multiplied and filtered producing an L.O. output to the agile upconverter. A liquid crystal display on the front panel provides access to various menus through the use of five soft touch keys.

### 10-WATT AGILE UPCONVERTER/AMPLIFIER

The 10-Watt Agile Upconverter/Amplifier accepts an input signal of +25 to +35 dBmV and is compatible with any QAM signal up to 256 and VSB up to 16. Operating frequency range is from 2572-2614 MHz. The signal is processed through the unit in a similar manner to that of an analog system with IF circuitry performing ALC, frequency response and delay correction as well as linearity correction. The RF signal is sampled, peak detected, and fed to a control amplifier before being connected to the output of the tray.

## INITIAL TURN ON

Prior to turning on the system, be sure all connections are in the correct place, and AC power is connected to the back of each tray. Next, follow the steps below:

⇒ Turn on each circuit breaker (CB1) located on the back of each unit beginning with the AC Distribution Panel.

⇒ Verify that each unit is in standby mode. Upon initial turn on, the following LED indicators should be on.

### FREQUENCY GENERATOR

- Operate and fault LED should flash twice and then go off.

### UPCONVERTER/AMPLIFIER

-PLL LOCKED

-IF INPUT PRESENT

-THERMAL INTERLOCK

-EXTERNAL 10 MHz PRESENT (optional)

⇒ After verifying that each unit is in standby mode and that the initial turn on LED indicators are on, press the OPR softkey located on the front of the Frequency Generator Tray. The following additional indicators should light:

### FREQUENCY GENERATOR

-OPERATE

### UPCONVERTER/AMPLIFIER

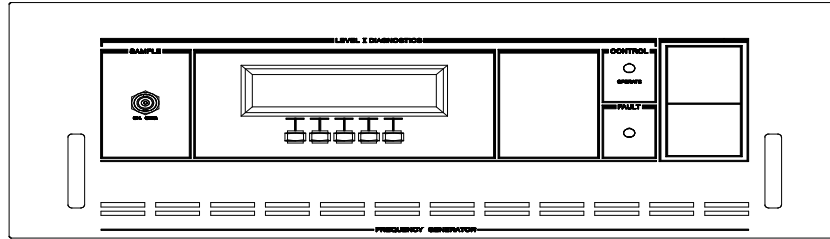
-ENABLE

-SWITCHING SUPPLIES

⇒ IN THE EVENT ANY RED LED'S ARE ON, RETURN THE UNIT TO STANDBY MODE AND CONTACT AXCERA SERVICE IMMEDIATELY.



## FRONT PANEL FREQUENCY GENERATOR TRAY



### SAMPLE

#### CH. OSC

Provides a sample from the channel oscillator.

### CONTROL

#### OPERATE

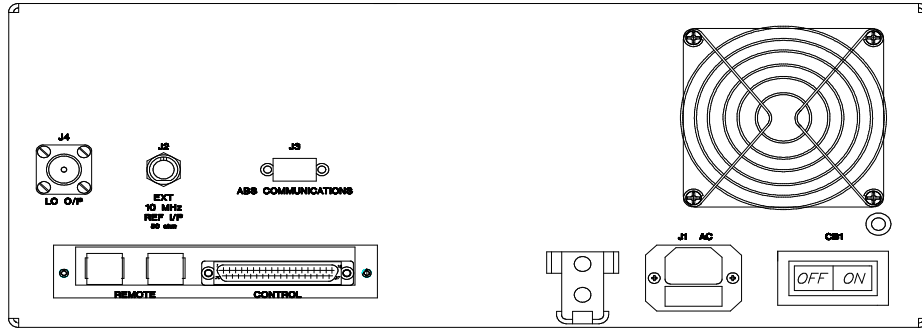
Indicates that the unit is operational

#### FAULT

Indicates a fault condition

Also included on the front panel is an LCD display with 5 soft-keys below it. The soft-keys allow access to various menus that are explained in the unit operation section of this manual.

## REAR PANEL FREQUENCY GENERATOR TRAY



**LO OUTPUT (J4)**

Provides a local oscillator output from the tray

**EXT 10 MHz REF I/P (J2)**

10 MHz reference input

**ABS COMMUNICATIONS (J3)**

Accesses Automatic Backup System

**REMOTE/CONTROL**

Provides remote/control functions

**AC (J1)**

AC input to the tray

**CB1**

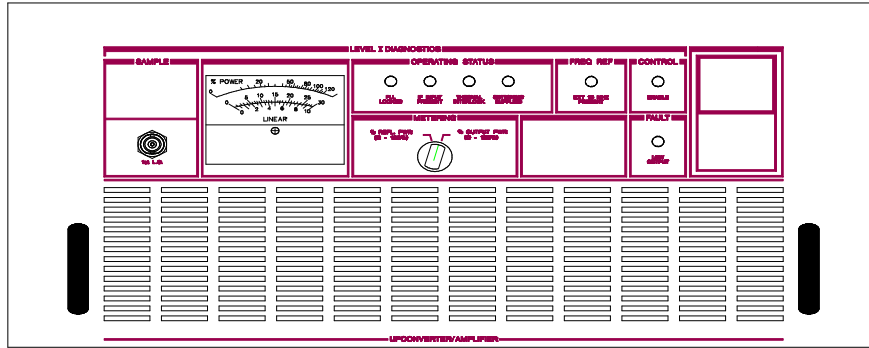
Circuit breaker protected ON/OFF switch



**INTERNAL LED INDICATORS FREQUENCY GENERATOR TRAY**

<b>ASSEMBLY</b>	<b>LED</b>	<b>INDICATES</b>
PLL BOARD	DS1 RED	PLL Unlocked
FREQUENCY GENERATOR CONTROL BOARD	DS3 RED	Fault
FREQUENCY GENERATOR CONTROL BOARD	DS2 GREEN	Unit is in operate mode
FREQUENCY GENERATOR CONTROL BOARD	DS1 GREEN	Activity status indicator which lights when specific commands are received or implemented by the microprocessor.

## FRONT PANEL UPCONVERTER/AMPLIFIER



### SAMPLE

**1ST L.O.** Provides a sample of the first L.O.

### OPERATING STATUS

**PLL LOCKED** The unit is phase locked to an internal or external reference

**IF INPUT PRESENT** An IF input is present

**THERMAL INTERLOCK** A thermal interlock has been achieved

**SWITCHING SUPPLIES** Switching power supplies are operational

### FREQ REF

**EXT 10 MHz PRESENT** An external 10 MHz source is present

### CONTROL

**ENABLE** Unit is operational

### FAULT

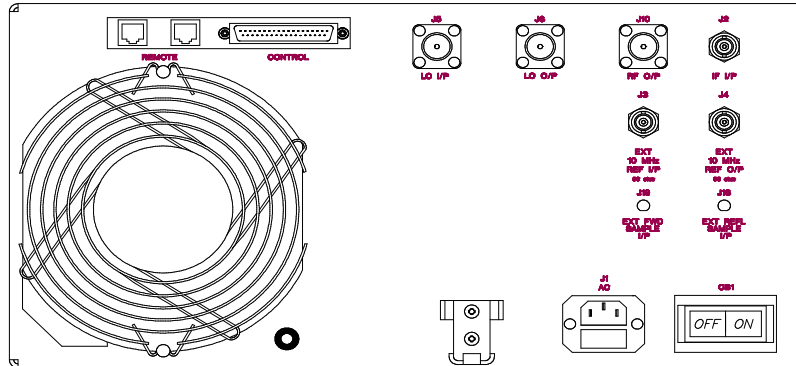
**LOW OUTPUT** Unit output is low

### METERING

**% REFL. PWR** Percentage of reflected power. Should be less than 10%.

**% OUTPUT PWR** Output power. Should be < 100%.

## REAR PANEL UPCONVERTER/AMPLIFIER



<b>LO I/P (J5)</b>	Provides an L.O. input into the unit.
<b>LO O/P (J6)</b>	L.O. output sample
<b>RF O/P (J10)</b>	RF output from the unit
<b>IF I/P (J2)</b>	IF input to the unit
<b>EXT 10 MHz REF I/P (J3)</b>	10 MHz reference input (source)
<b>EXT 10 MHz REF O/P (J4)</b>	10 MHz reference output (to Freq. Gen)
<b>EXT FWD SAMPLE I/P (J19)</b>	NOT USED
<b>EXT REFL SAMPLE I/P (J18)</b>	NOT USED
<b>AC (J1)</b>	AC input to the unit
<b>CB1</b>	Circuit breaker protected on/off switch
<b>REMOTE/CONTROL</b>	Accesses remote/control features

## UPCONVERTER/AMPLIFIER INTERNAL LED INDICATORS

ASSEMBLY	LED	INDICATES
ALC/AGC BOARD	DS1 RED	INPUT FAULT
ALC/AGC BOARD	DS2 RED	ALC FAULT
ALC/AGC BOARD	DS3 RED	MUTE
ALC/AGC BOARD	DS4 RED	AGC FAULT
VHF GENERATOR CONTROL BD	DS1 RED	PLL UNLOCKED
BIAS PROTECTION BOARD	DS1-DS7 GREEN	NORMAL OPERATING AND BIASING VOLTAGES PRESENT
DC POWER SUPPLY BOARD	DS1-DS7 GREEN	CORRECT VOLTAGES PRESENT
TRANSMITTER CONTROL BOARD	DS1 GREEN	ENABLED
TRANSMITTER CONTROL BOARD	DS2 GREEN	THERMAL INTERLOCK
TRANSMITTER CONTROL BOARD	DS3 GREEN	EXT. REFERENCE PRESENT
TRANSMITTER CONTROL BOARD	DS4 GREEN	IF PRESENT
TRANSMITTER CONTROL BOARD	DS5 GREEN	PLL LOCKED
TRANSMITTER CONTROL BOARD	DS6 RED	LOW OUTPUT
TRANSMITTER CONTROL BOARD	DS7-GREEN	SWITCHING POWER SUPPLIES GOOD
PEAL VS AVERAGE DETECTOR BOARD	DS1-RED	FAULT

## MAINTENANCE

### PROPER CARE OF THE SYSTEM

This product is designed with components that require no periodic maintenance except for cleaning and record keeping.

The amount of cleaning necessary depends greatly on the conditions in the transmitter room. While the electronics have been designed to function well even if covered with dust, heavy buildups of dirt and insects will impede the effectiveness of the cooling and lead to shutdown or premature failure.

When it is apparent that the front panel is becoming dust covered, the top cover should be opened and the accumulated foreign material removed. A small, soft brush used in conjunction with a plastic wand-like attachment on a small vacuum cleaner is an excellent way to suction the dirt out. Alcohol and other cleaning agents should not be used unless you can be certain that the solvents will not damage components or markings on the transmitter and boards. Water based cleaners can be used, if only a small amount of moisture is used. The fans and heatsinks should be cleaned carefully.

Occasionally check that all RF connections are secure, but be careful not to overtighten.

Data should be recorded for all meter readings on a regular basis. It is suggested that data be recorded once each month and that it be retained in a rugged folder or envelope for the life of the equipment.

### TROUBLESHOOTING PROCEDURE

<b>AGILE UPCONVERTER/AMPLIFIER</b>		
<b>SYMPTOM</b>	<b>CAUSE</b>	<b>REMEDY</b>
<b><u>FRONT PANEL</u></b>		
<b>VHF PLL LOCKED LED out</b>	<ol style="list-style-type: none"> <li>1. PLL is unlocked</li> <li>2. Carrier frequency is out of spec</li> </ol>	<ol style="list-style-type: none"> <li>1. Adjust UHF Generator</li> <li>2. Call Axcera Customer Service</li> </ol>
<b>THERMAL INTERLOCK LED out</b>	<ol style="list-style-type: none"> <li>1. Transmitter has overheated</li> </ol>	<ol style="list-style-type: none"> <li>1. Check Fan</li> <li>2. Check Air conditioning system</li> </ol>
<b>EXT 10 MHz PRESENT LED out</b>	<ol style="list-style-type: none"> <li>1. No 10 MHz signal present</li> </ol>	<ol style="list-style-type: none"> <li>1. Check 10 MHz signal to back of transmitter</li> </ol>
<b>SWITCHING POWER SUPPLIES LED out</b>	<ol style="list-style-type: none"> <li>1. Wrong input/output voltages</li> </ol>	<ol style="list-style-type: none"> <li>1. Check AC line input voltage to power supply</li> <li>2. Check output voltage from power supply (10VDC)</li> <li>3. Call Axcera Customer Service</li> </ol>
<b>IF INPUT PRESENT LED out</b>	<ol style="list-style-type: none"> <li>1. No input to transmitter</li> </ol>	<ol style="list-style-type: none"> <li>1. Check input level to back of transmitter</li> </ol>
<b>LOW OUTPUT LED on</b>		<ol style="list-style-type: none"> <li>1. Call Axcera Customer Service</li> </ol>
<b>Unit will not go to enable mode</b>	<ol style="list-style-type: none"> <li>1. Fault in control interface</li> <li>2. Loss of thermal interlock</li> </ol>	<ol style="list-style-type: none"> <li>1. Check control connector on back of tray (if used)</li> <li>2. Call Axcera Customer Service</li> </ol>
<b><u>REAR PANEL</u></b>		
<b>Fan not running</b>	<ol style="list-style-type: none"> <li>1. Loss of AC power</li> <li>2. Obstructions Present</li> </ol>	<ol style="list-style-type: none"> <li>1. Remove any fan obstructions</li> <li>2. Verify AC power source operational</li> <li>3. Call Axcera Customer Service</li> </ol>

<b><u>INSIDE TRAY</u></b>		
ALC/AGC Board Red LED(s) on	1. Make note of which LED(s) on (DS1-DS4)	1. Call Axcera Customer Service
VHF Generator Control Board RED LED on	1. PLL unlocked	1. Adjust UHF Generator 2. Call Axcera Customer Service
Six Section Bias Protection Board Green LED(s) DS1-DS7 off	1. Check fuses F1,F3-F7	1. Call Axcera Customer Service
DC Power Supply Board Green LED(s) DS1-DS7 off	1. Correct voltages are not present	1 Call Axcera Customer Service
Transmitter Control Board DS1 Yellow LED on	1. Transmitter is in standby mode	1. Switch to operate mode
Transmitter Control Board Green LED(s) DS2-DS8 off	1. Check front panel for transmitter fault or green LED's off	1. Call Axcera Customer Service
Transmitter Control Board Red LED DS7 on	1. Low output	1. Call Axcera Customer Service

<b>FREQUENCY GENERATOR TRAY</b>		
<b><u>SYMPTOM</u></b>	<b><u>CAUSE</u></b>	<b><u>REMEDY</u></b>
<b><u>FRONT PANEL</u></b>		
FAULT LED on	1. System malfunction 2. Microprocessor error	1. Switch to manual mode 2. Call Axcera Customer Service
<b><u>INSIDE TRAY</u></b>		
Fault	1. Use fault menu to detect errors	1. Call Axcera Customer Service if assistance is required.

## ALIGNMENT PROCEDURES

### GENERAL:

Due to the complex and delicate nature of this digital equipment, very few adjustments can be made in the field. **Do not** attempt to make any adjustments without proper test equipment.

### REQUIRED TEST EQUIPMENT

- DVM
- Frequency Counter
- Spectrum Analyzer

For settings other than those covered in this section, a network analyzer and other equipment is required. If you have any questions on how to adjust your system contact Axcera Customer Service.

### OSCILLATOR CALIBRATION:

The FCC requires that the transmitter carrier frequency should be checked once each month. If the carrier is found to be off frequency, the following procedure should be performed. The data resulting from this procedure should be logged for future reference. A frequency counter that is capable of  $5 \times 10^{-9}$  stability and a voltmeter are required.

#### CALCULATE CENTER CARRIER FREQUENCY. (FOR FREQUENCY GENERATOR TRAY)

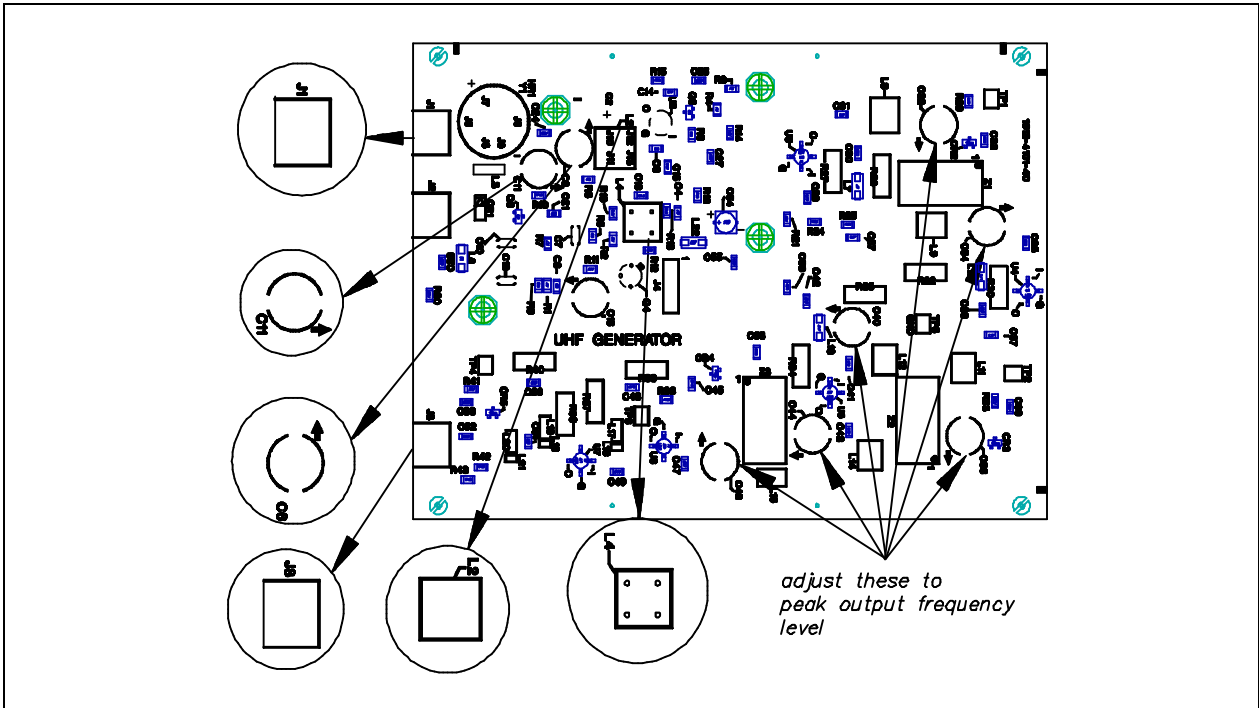
- ⇒ Measure the VCXO frequency ( $f_{(s)}$ ) at the BNC connector on the front panel (10 digits).
- ⇒ Using a 10 digit calculator, perform the following calculation:

$$\begin{array}{cc} [ 16 \times f_{(s)} ] + 539 \text{ MHz} & \\ (2^{\text{nd}} \text{ L.O.}) & (1^{\text{st}} \text{ L.O.}) \end{array}$$

The result should be the desired center carrier frequency,  $\pm 500$  Hz (Axcera spec.) or  $\pm 1000$  Hz (FCC spec.)

- ⇒ In the event the frequency appears to be incorrect, check the agile upconverter front panel VHF PLL indicator, if it is **OFF** contact Axcera Customer Service.

## UHF GENERATOR BOARD (A15-A1) 1512-1101



## ALIGNMENT PROCEDURE

1. Connect the main output from the channel oscillator section of the UHF Generator Board (J1) to a spectrum analyzer, tuned to the crystal frequency and peak the tuning capacitors C6 and C11 for maximum output. Tune L3 and L2 for maximum output. The output level should be  $+5 \text{ dBm} \pm 2 \text{ dB}$ .

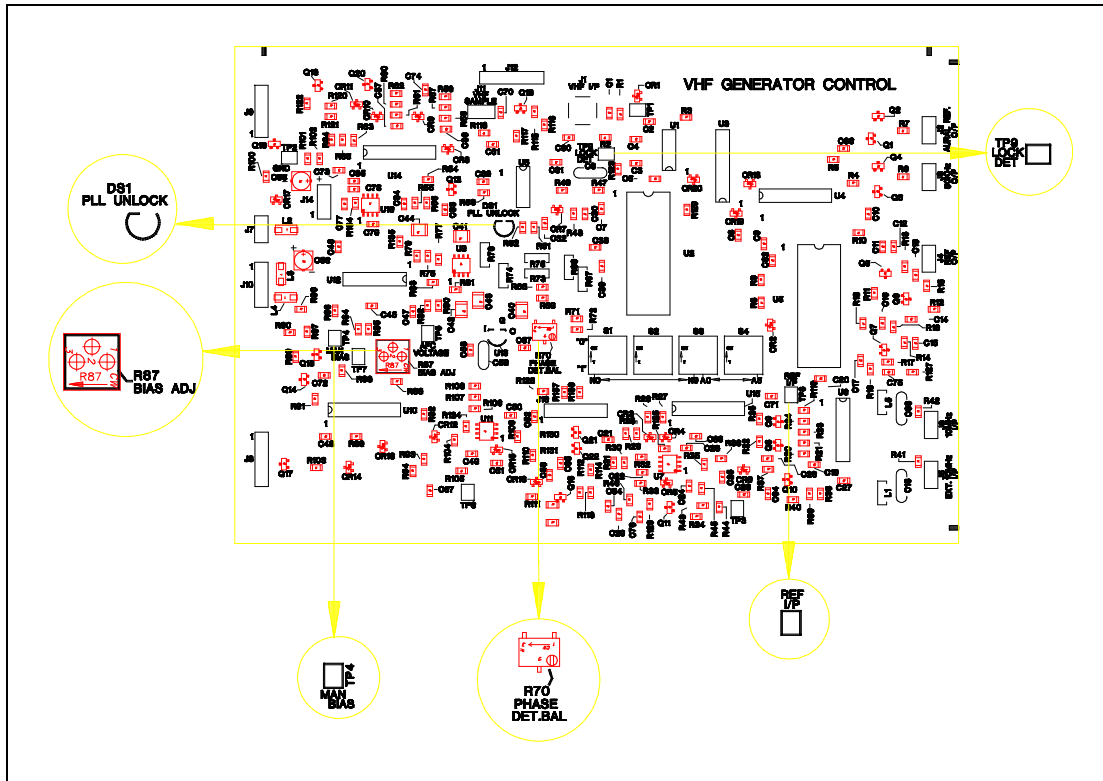
While monitoring with a DVM, maximize each of the following test point voltages by tuning the broadband multipliers in sequence.

2. TP1: Tune C32 for maximum (Typical 0.6 VDC).  
 TP2: Tune C34 and C38 for maximum (Typical 1.2 VDC).  
 TP3: Tune C40 and C44 for maximum (Typical 2.0 VDC).  
 TP4: Tune C46 for maximum.  
 TP4: Re-peak C38, C40, C44 and C46 (Typical 3.5 VDC).
3. Connect a spectrum analyzer, tuned to 8 times the crystal frequency, to the UHF Generator output (J3). Monitor the output while peaking the tuning capacitors for maximum output.
4. The output level at J2 should be  $+15 \text{ dBm} \pm 2 \text{ dB}$ .

**WARNING:** Performing step 1 in this procedure may change phase noise of oscillator.



VHF GENERATOR CONTROL BOARD (A14) 1555-1214



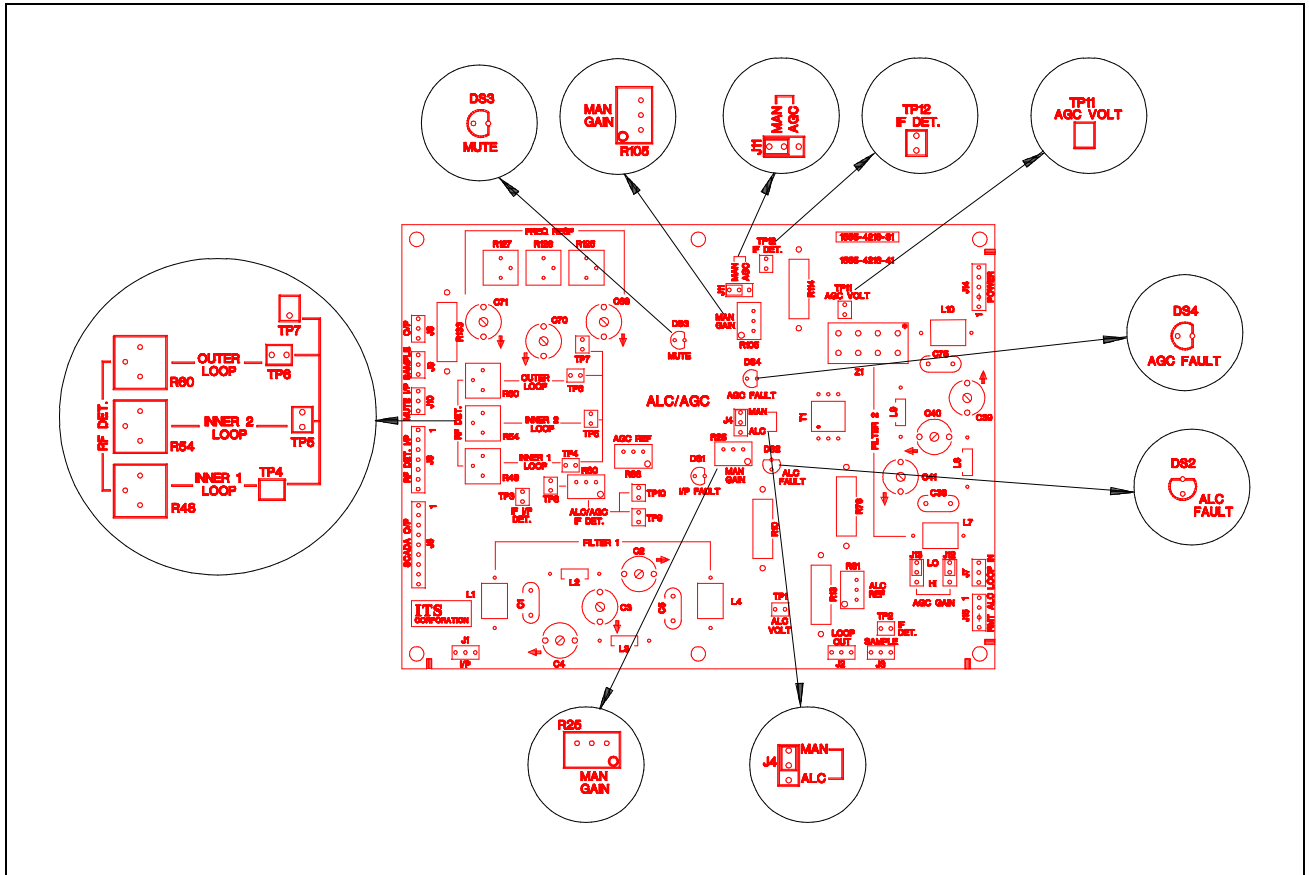
ALIGNMENT PROCEDURE

1. Disconnect the PLL reference frequency by removing the plug at J5 and/or J6.
2. Connect a digital volt meter between TP4 (+) and ground (-). Adjust the manual bias potentiometer (R87) for a reading of -3 VDC at TP4.
3. Connect a frequency counter to J11 to measure the VHF frequency (if frequency adjustments are necessary, call Axcera Customer Service.)
4. Set PLL programming per required channel frequency (See programming chart on following page).
5. Connect an oscilloscope between pin 28 of U2 or TP9 (+) and ground (-).
6. Reconnect the plugs at J5 and/or J6 and minimize the spike amplitude that will be observed on the oscilloscope using the phase detector balance potentiometer R70.

**PROGRAMMING CHART FOR VHF GENERATOR CONTROL BOARD  
FREQUENCY AGILE APPLICATIONS**

FORMAT	VISUAL IF MHz	OSCILLATOR FREQUENCY $F_c - L.O. + F_{IF} / 8$	S1	S2	S3	S4
NTSC	44	72.87500	0100	0100	0100	1001
PAL	36	72.76875	1000	0100	0110	0011

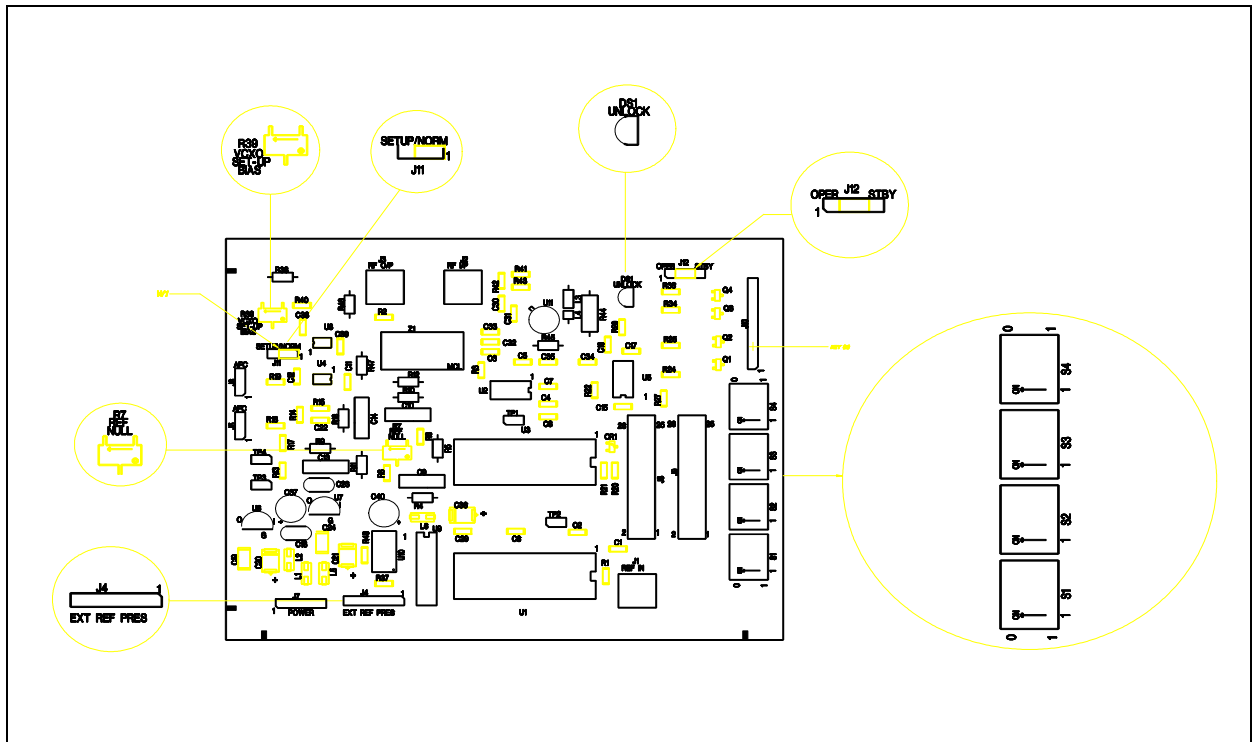
ALC/AGC BOARD 1555-1216



**PROCEDURE TO DISABLE/ENABLE ALC & AGC:**

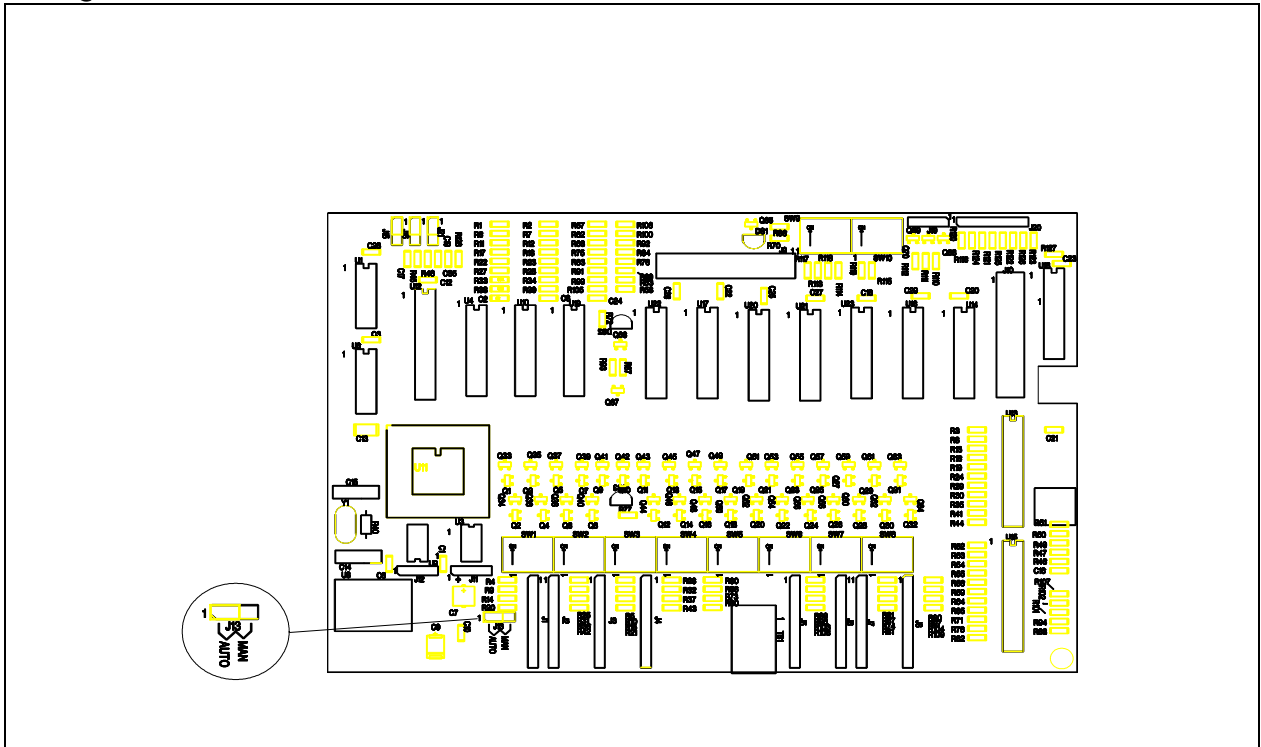
1. Apply a QAM IF signal to the upconverter tray and place the unit into OPERATE mode. Verify that the output power meter indicates 100%.
2. On the 1555-1216 ALC/AGC board, move jumper on J11 from AGC to MAN and adjust R105 for 100%, if necessary.
3. Move jumper on J4 from ALC to MAN and adjust R25 for 100%, if necessary.
4. To return the transmitter to normal automatic operation, move the two jumpers on the ALC/AGC board in the upconverter back to the ALC and AGC positions.

## PLL BOARD 1527-1402



## ALIGNMENT PROCEDURE

1. Disconnect the PLL reference by removing the plug at J1.
2. Move jumper W1 to setup position
3. Connect a digital voltmeter between TP4 (+) and ground (-). Adjust the VCXO set-up bias potentiometer R39 for a reading of -3.3VDC at TP4.
4. Connect a frequency counter to J5 located on the front panel of the frequency generator tray.
5. Measure the VHF frequency. (if frequency adjustments are necessary call Axcera Customer Service.
6. Set PLL programming as per required channel frequency (see programming chart on schematic)
7. Return jumper W1 to normal position.

**FREQUENCY GENERATOR CONTROL BOARD 1527-1401****ALIGNMENT PROCEDURE**

1. In the event of a microprocessor failure, and that a manual backup is required, move jumper J13 to the manual position.
2. Set S1-S8 according to the programming chart on the following page. In automatic mode all switches should be set at 1. (1 = off)

**OSCILLATOR GATING CHART FOR FREQUENCY GENERATOR BOARD**

<b>CH.</b>	<b>S1</b>	<b>S2</b>	<b>S3</b>	<b>S4</b>	<b>S5</b>	<b>S6</b>	<b>S7</b>	<b>S8</b>
<b>A4</b>	0000	0000	0010	0000	0000	0000	0000	0000
<b>B4</b>	0000	0000	0000	0010	0000	0000	0000	0000
<b>C4</b>	0000	0000	0001	0000	0000	0000	0000	0000
<b>D4</b>	0000	0000	0000	0001	0000	0000	0000	0000
<b>G4</b>	0000	0000	0000	0000	1000	0000	0000	0000
<b>F4</b>	0000	0000	0000	0000	0000	1000	0000	0000
<b>E4</b>	0000	0000	0000	0000	0100	0000	0000	0000

**NOTE: ON=0 OFF=1. FOR AUTOMATIC MODE SET ALL SWITCHES TO "OFF" = 1**

## MATERIAL RETURN PROCEDURE

In order to efficiently handle equipment or components returned for repair or sent out on loan, Axcera requests that each returned item be accompanied by a Return Material Authorization Number (RMA#).

To obtain an RMA follow the procedures below:

- Call Axcera Customer Service at (724) 873-8100 or FAX (724) 873-8105
- A Service Engineer will provide you with an RMA#
- Write the RMA# on the packing list or in the case of repairs, a note describing the reason for return. Also, be sure to include contact information.
- Send ALL RMA items to the following address

AXCERA, LLC  
103 FREEDOM DRIVE  
P.O. BOX 525  
LAWRENCE, PA 15055-0525

## TELEPHONE TECHNICAL SUPPORT

Axcera currently provides free telephone technical support. When calling, be prepared to provide the following information:

- Transmitter model # AND Serial #
- Status of front panel LED's (are any red LED's on ?)
- Have a copy of your operation manual ready prior to calling

**From 8:00 AM - 5:00 PM EST call (724) 873-8100 for technical support**

## **PROPER PACKING OF MATERIALS**

When returning materials to Axcera, it is extremely important to pack them properly. Due to the delicate nature of components contained within the equipment, major damage can occur without proper packing. Please adhere to the following guidelines when returning materials.

- Save the boxes in which the transmitter was shipped. Each tray is sent double boxed and enclosed in foam padding. Use the same packing method when returning materials.**
  
- In the event original packing materials are not available call Axcera at (724) 873-8100 to request proper shipping materials. The necessary items will be sent out immediately.**

**Failure to properly pack any returned materials may result in damage to the equipment. Axcera is not responsible for damaged equipment under these circumstances. Many freight companies will not compensate for damages when items are not packed properly. Please pack items properly!**



# LIMITED WARRANTY

## ONE YEAR

Seller warrants each new product manufactured and sold by Seller against defects in material and workmanship under normal use and service, for a period of one (1) year from the date of shipment from Seller's plant, when operated in accordance with Seller's operating instructions. This warranty shall not apply to tubes, fuses, batteries, or bulbs.

Warranties are valid only when and if (a) Seller receives prompt written notice of breach within the period of warranty, (b) the defective product is properly packed and returned by the Buyer (transportation and insurance prepaid), and (c) Seller determines, in its sole judgment, that the product is defective and not subject to any misuse, neglect, improper installation, negligence, accident, or (unless authorized in writing by Seller) repair or alteration. Seller's exclusive liability for any personal and/or property damage (including direct, consequential or incidental) caused by the breach of any or all warranties, shall be limited to the following: (a) repairing or replacing (in Seller's sole discretion) any defective parts free of charge (F.O.B. Seller's plant), and/or (b) crediting (in Seller's sole discretion) all or a portion of the purchase price to the Buyer.

Equipment furnished by Seller, but not bearing its trade name, shall bear no warranties other than the special hours-of-use or other warranties extended by or enforceable against the manufacturer at the time of delivery to the buyer. **NO WARRANTIES, WHETHER STATUTORY, EXPRESSED OR IMPLIED, AND NO WARRANTIES OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR FREEDOM FROM INFRINGEMENT, OR THE LIKE, OTHER THAN AS SPECIFIED IN PATENT LIABILITY ARTICLES, AND IN THIS ARTICLE, SHALL APPLY TO THE EQUIPMENT FURNISHED HEREUNDER.**

**ABBREVIATIONS/ACRONYMS**

<b>A/D</b>	Analog to digital	<b>SNR</b>	Signal to Noise Ratio
<b>AC</b>	Alternating Current	<b>VCXO</b>	Voltage Controlled Crystal Oscillator
<b>ALC</b>	Automatic Level Control	<b>VSB</b>	Vestigial Sideband
<b>AM</b>	Amplitude modulation		
<b>AGC</b>	Automatic Gain Control		
<b>AWG</b>	American wire gauge		
<b>BER</b>	Bit Error Rate		
<b>DC</b>	Direct Current		
<b>D/A</b>	Digital to analog		
<b>dB</b>	Decibel		
<b>dBm</b>	Decibel referenced to 1 milliwatt		
<b>dBmV</b>	Decibel referenced to 1 millivolt		
<b>dBw</b>	Decibel referenced to 1 watt		
<b>FEC</b>	Forward Error Correction		
<b>FM</b>	Frequency modulation		
<b>Hz</b>	Hertz		
<b>ICPM</b>	Incidental Carrier Phase Modulation		
<b>I/P</b>	Input		
<b>IF</b>	Intermediate Frequency		
<b>LED</b>	Light emitting diode		
<b>MPEG2</b>	Motion Pictures Expert Group 2		
<b>O/P</b>	Output		
<b>PLL</b>	Phase Locked Loop		
<b>PCB</b>	Printed circuit board		
<b>QAM</b>	Quadrature Amplitude Modulation		
<b>RF</b>	Radio Frequency		

## USEFUL CONVERSION FACTORS

TO CONVERT FROM	TO	MULTIPLY BY
mile (US statute)	kilometer (km)	1.609347
inch (in)	millimeter (mm)	25.4
inch (in)	centimeter (cm)	2.54
inch (in)	meter (m)	0.0254
foot (ft)	meter (m)	0.3048
yard (yd)	meter (m)	0.9144
mile per hour (mph)	kilometer per hour(km/hr)	1.60934
mile per hour (mph)	meter per second (m/s)	0.44704
pound (lb)	kilogram (kg)	0.4535924
gallon (gal)	liter	3.7854118
U.S. liquid (One U.S. gallon equals 0.8327 Canadian gallon)		
fluid ounce (fl oz)	milliliters (ml)	29.57353
British Thermal Unit per hour (Btu/hr)	watt (W)	0.2930711
horsepower (hp)	watt (W)	746

## NOMENCLATURE OF FREQUENCY BANDS

FREQUENCY RANGE	DESIGNATION
3 to 30 kHz	VLF - Very Low Frequency
30 to 300 kHz	LF - Low Frequency
300 to 3000 kHz	MF - Medium Frequency
3 to 30 MHz	HF - High Frequency
30 to 300 MHz	VHF - Very High Frequency
300 to 3000 MHz	UHF - Ultrahigh Frequency
3 to 30 GHz	SHF - Superhigh Frequency
30 to 300 GHz	EHF - Extremely High Frequency

## LETTER DESIGNATIONS FOR UPPER FREQUENCY BANDS

LETTER	FREQ. BAND
L	1000 - 2000 MHz
S	2000 - 4000 MHz
C	4000 - 8000 MHz
X	8000 - 12000 MHz
Ku	12 - 18 GHz
K	18 - 27 GHz
Ka	27 - 40 GHz
V	40 - 75 GHz
W	75 - 110 GHz

## dBm, dBw, dBmV, dBμV, AND VOLTAGE EXPRESSED IN WATTS

50 ohm system

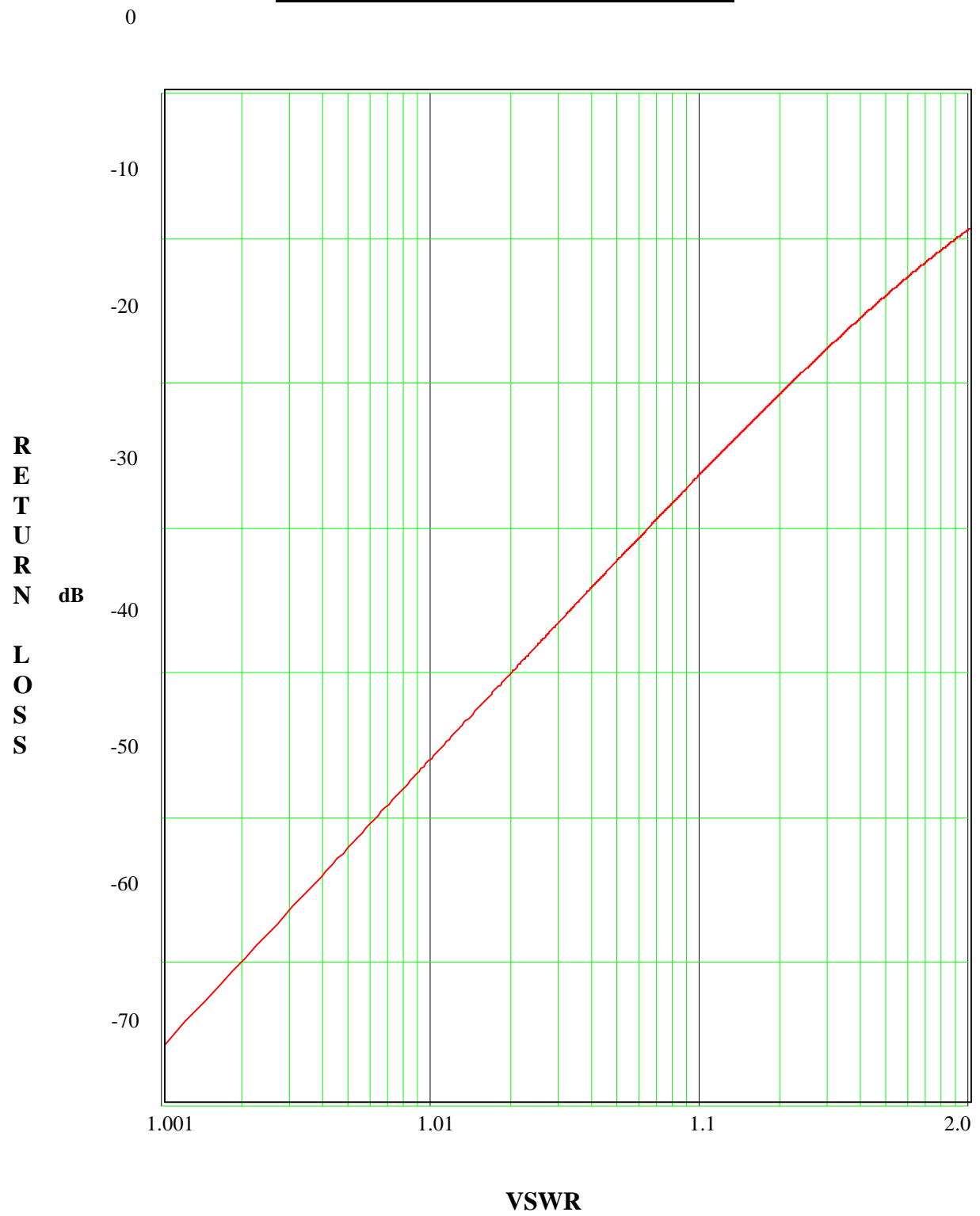
WATTS	PREFIX	dBm	dBw	dBmV	dBμV	VOLTAGE
1,000,000,000,000	1 TERAWATT	+150	+120			
100,000,000,000	100 GIGAWATTS	+140	+110			
10,000,000,000	10 GIGAWATTS	+130	+100			
1,000,000,000	1 GIGAWATT	+120	+ 99			
100,000,000	100 MEGAWATTS	+110	+ 80			
10,000,000	10 MEGAWATTS	+100	+ 70			
1,000,000	1 MEGAWATT	+ 90	+ 60			
100,000	100 KILOWATTS	+ 80	+ 50			
10,000	10 KILOWATTS	+ 70	+ 40			
1,000	1 KILOWATT	+ 60	+ 30			
100	1 HECTROWATT	+ 50	+ 20			
50		+ 47	+ 17			
20		+ 43	+ 13			
10	1 DECAWATT	+ 40	+ 10			
1	1 WATT	+ 30	0	+ 77	+137	7.07V
0.1	1 DECIWATT	+ 20	- 10	+ 67	+127	2.24V
0.01	1 CENTIWATT	+ 10	- 20	+ 57	+117	0.707V
0.001	1 MILLIWATT	0	- 30	+ 47	+107	224mV
0.0001	100 MICROWATTS	- 10	- 40			
0.00001	10 MICROWATTS	- 20	- 50			
0.000001	1 MICROWATT	- 30	- 60			
0.0000001	100 NANOWATTS	- 40	- 70			
0.00000001	10 NANOWATTS	- 50	- 80			
0.000000001	1 NANOWATT	- 60	- 90			
0.0000000001	100 PICOWATTS	- 70	-100			
0.00000000001	10 PICOWATTS	- 80	-110			
0.000000000001	1 PICOWATT	- 90	-120			

## TEMPERATURE CONVERSION

$$^{\circ}\text{F} = 32 + [(9/5) ^{\circ}\text{C}]$$

$$^{\circ}\text{C} = [(5/9) (^{\circ}\text{F} - 32)]$$

## RETURN LOSS VS. VSWR



## 5540A Series MMDS/BRS/EBS Frequency Agile Transmitter



- Digital/Analog MMDS/BRS/EBS frequency agile transmitter
- Automatic or keypad channel entry provides fast and accurate channel selection
- Feedforward amplifiers ensure excellent BER performance
- Compatible with 256 QAM or NTSC modulation
- Remote Operation Capability
- Manufactured with reliable surface mount technology (SMT)

## 5540A Series MMDS/BRS/EBS Frequency Agile Transmitter

### **Automatic or Keypad Channel Entry**

Frequency agile transmitters are used to backup primary transmitters. Axcera's automatic backup system permits 1 to 31 channels to be backed up per agile transmitter. The front panel displays the backup channel number and allows for manual channel selection. Five transmitter models give operators the flexibility to select from 5 to 100 watts of average power, or from 10 to 280 watts peak power.

### **256 QAM or NTSC Compatible**

5540A transmitters are compatible with any level of QAM modulation up to and including M=256 and NTSC.

### **Excellent BER Performance**

Crystal oscillators are utilized to provide excellent phase noise. Feedforward and advanced equalization techniques are employed to meet the digital spectral mask out-of-band performance specifications while minimizing power consumption.

### **Anytime, Anywhere Communication and Backup**

With the remote operating systems, operators have real time remote and local control of the ABS and site. Graphic user interfaces operate on the Windows operating system.

### **Turnkey Solutions and 24-Hour Support**

At Axcera, our transmitters, amplifiers and channel combiners are manufactured and tested as a system to achieve the ultimate in performance and value. Our system integration group can document, install and commission your entire digital MMDS transmitter system. Axcera field engineers are available to oversee analog to digital system conversions and provide on-site training. We offer a comprehensive range of support services that are designed to keep your transmitter system producing revenue year after year.

## Product Specifications

### RF Performance

	5543A	5544A	5545A	5548A	5549A
RF Output Power(PEP watts)	50	70	120	220	400
RF Output Power Digital (Avg. watts 64/256 QAM)	5-10	15	25	50	100
RF Output Power Analog (Pk watts with 15 dB Aural)	10-20	50	100	160	280
RF Output Frequency	Any 6MHz Channel 2500-2686 MHz, 2305-2360 MHz				
RF Output Impedance	50 Ohms				
Phase Noise (1Hz Bandwidth @ 10 kHz from Carrier)	-110 dBc (single sideband measurement)				
Frequency Translation Stability <sup>1</sup>	±500 Hz (precise ± 1 Hz optional)				
Signal to Noise Ratio (6 MHz Bandwidth)	52 dB				
Frequency Response	±0.5 dB over one channel				
Output Power Variation	+0.5/-1.0 dB over 200 MHz bandwidth				
Group Delay	40 nsec peak-peak (Measured with 1 MHz delay aperture)				
Gain Linearity (AM-AM) <sup>2</sup>	0.2 dB/dB				
Phase Linearity (AM-PM) <sup>2</sup>	1°/dB				
Discrete Inband Spurious Products	-60 dB relative to average power				
Out of Band Spurious Products <sup>3</sup>	Per FCC digital spectral mask; per FCC or CCIR system (analog)				
IF Input Frequency	41-47 MHz or 32-40 MHz				
IF Input Impedance	75 or 50 Ohms (specify)				
IF Input Level	+25 to +35 dBmV (-23 to -13 dBm) average; add 6 dB for analog PEP				
Inputs/Connectors	IF Input/BNC; 10 MHz Ref Input/BNC; Control/D; SCADA/RJ45 (2 connectors)				
Outputs/Connectors	RF Output/N; Channel Oscillator Sample Output/BNC; LO Output/N				

### General

	5543A	5544A	5545A	5548A	5549A
Operational Temperature Range <sup>4</sup>	0°C to 45°C				
Specified Temperature Range <sup>4</sup>	15°C to 35°C				
Relative Humidity	0 to 95% non-condensing				
Dimensions (WxDxH) <sup>5</sup>	19"x21"x15.75" (48.3x53.3x40 cm)	19"x21"x26.25" (48.3x53.3x66.7 cm)	19"x21"x26.25" (48.3x53.3x66.7 cm)	19"x21"x26.25" (48.3x53.3x66.7 cm)	19"x21"x36.75" (48.3x53.3x93.3 cm)
Line Voltage <sup>6</sup>	117 VAC ±10%, 60 Hz or 208/240 VAC ±10%, 50/60 Hz				
Power Consumption (Watts)	1245	1245	1870	3175	5700
Power Consumption (VA)	1530	1530	2210	3620	6400
Weight	130 lbs. (59 kgs.)	130 lbs. (59 kgs.)	155 lbs. (70 kgs.)	195 lbs. (87 kgs.)	315 lbs. (141 kgs.)
Analog FCC Identifier <sup>7</sup>	--	--	--	--	--
Digital FCC Identifier (CJJ79XITS-)	7014	7014	7013	7013	7016

### Monitoring

Output Power	Front panel meter displays forward power, reflected power
Front Panel Indicators	Backup Channel, Operate/Standby Mode Status, PLL Locked Status, Temperature Fault Status, Transmitter Fault Status

<sup>1</sup> When interfaced with 5060 10 MHz system reference or GPS precise reference.

<sup>2</sup> Specified at 6 dB above digital average power.

<sup>3</sup> Measured at output of Axcera Channel Combiner.

<sup>4</sup> RF performance specifications guaranteed over specified temperature range. Units will run reliably over operational temperature range but may deviate from specifications.

<sup>5</sup> Includes frequency agile generator tray and upconverter/amplifier tray.

<sup>6</sup> All models excluding 5542A require 208/240 VAC ±10%, 50/60 Hz.

<sup>7</sup> These devices have not been approved by the FCC.