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FXi 60/250 Exciter

Setting the Maximum Scale Factor Application Guide Prevent Overdriving Transmitter PA Modules

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1 Purpose of this Document

The purpose of this document is to describe the necessary steps to set the Maximum Scale Factor (Automatic Gain Control – AGC) in the FXi 60/250 Exciter.

In the event that the FXi 60/250 Exciter and Transmitter stop receiving data from either an FSi 10 HD Signal Generator or XPi 10 Exporter (depending upon your HD system's architecture), the Transmitter's AGC circuitry will send a command to the Exciter to increase the AGC level. At the instant that data is restored, the Transmitter's PA Modules may be overdriven. Thus, it is necessary to set the Maximum AGC Scale Factor to a value that will prevent PA Modules from being overdriven when data is restored.

Events/items that may cause such a loss of data might include a momentarily loss of an STL link between the FSi 10 or XPi 10 and the FXi 60/250 Exciter, loss of Ethernet cable connection from the FSi 10 or XPi 10 and the FXi 60/250 Exciter, as well as rebooting of the FSi 10 or XPi 10 all while the Transmitter is enabled.

- **NOTE:** If the transmitter is switched to FM ONLY mode of operation, it is absolutely necessary to repeat the Maximum Scale Factor Setting procedure when returning to IBOC ONLY or FM + IBOC operation!
- **NOTE:** This application guide should ONLY be followed if the transmitter type is an FMi 31, FMi 73, FMi 106, FMi 201, FMi 301, or an FMi 402.

If the transmitter type is an FMi 703/FMi 1405, it is strongly suggested that the Transmitter be updated to the following:

Smartcore Software:

FMi 703 Transmitter running Smartcore Software v1.0.50 (or newer) - or -FMi 1405 Transmitter running Smartcore Software v2.1.20 (or newer)

Module Control Board Firmware:

U7 and U107 version 1.09 (or newer)

FXi 250 Firmware:

U41 on the DSP board version 2.0 (or newer)

See the following Technical Bulletins for further details:

http://www.bdcast.com/fgal/tech_bull/v1_0_51_software_update_fm10S_fmi70_BCEBUL.pdf

http://www.bdcast.com/fgal/tech_bull/v2_1_20_software_update_fm20S_fmi14_BCEBUL.pdf

Once the FMi 703 / FMi 1405 transmitter meets or exceeds these requirements, this document can be used to set the Maximum Scale Factor to 20000.



2 Tools / Items Needed

Personal Computer with Windows HyperTerminal Communication Program installed

Null Modem Cable

3 Estimated Setup Time

Providing that you have the tools listed above, it will take approximately 10 minutes to change an FXi 60/250's AGC Scale factor. The transmitter will remain on the air during the entire process.



4 Setting the AGC Scale Factor in the FXi 60/250 Exciter

- Step 1 Ensure that your Transmitter is currently operating in either IBOC ONLY or FM + IBOC mode.
- **Step 2** Ensure that the Transmitter is operating at the Transmitter's RF Power Output (TPO) level that you would normally operate it at.
- **Step 3** Next, go to the FXi Exciter GUI Main Menu and select **OPER MODE**.

Main Menu				
GENERAL VSWR TEMP FAULT PWR SUP FAULT EXCITER MUTE				
O WATTS O WATTS O.OO MHZ FWD PWR RFL PWR FREQUENCY	MOD- ULATION			
0 1 2 3 4 5 6 7 8 9 10 10% MODULATION SCALE	OPER MODE			
	RNAL CA1			

Figure 1 – FXi Main Menu

Step 4 – Select IBOC MENU.

Operating Mode	Menu	BACK
STEREO OPERATING MODE	STEREO	
PILOT MODE	ON	
PILOT LEVEL	<mark>10.0</mark> %	STEREO
HELP		
	BACK Backup one menu. NONO to enter the desired	MONO L+R
to enter the desired pilot injection level.	e the pilot. Select PILOT LEVEL	MONO LEFT
IBOC CONTROL STEP 1 - Select MENU to setup and configure IBO IP SETUP STEP 1 - Select P SETUP to enter IP, subnet, and g		MONO

Figure 2 – Operating Mode Menu



Step 5 – Record the IBOC OPERATING MODE and the present AGC SCALE reading.

Remember, the Transmitter must be operating at the TPO level that you would normally operate it at!

Record the present AGC Scale reading.

Note: The present AGC Scale reading will appear here if the FXi 60/250 Exciter is running software v2.0.35 or newer.

If running an older version, you will need to use Hyperterminal's "e" command to see the present Scale Factor reading.

See Steps 10-21 for Hyperterminal connection instructions and 25 for the "e" command.

		IBOC Mer	าน	MAIN	Note the present IBOC
1	120C OPER	ATING MODE	BOC ONLY		Operating Mode
	MAIN PRO	GRAM SERVICE MODE	MP1		
	STATUS	EXCITER LINK 🧧 D		BACK	
		10 MHz LOCK 🔲 🗛	GC SCALE 6800		
	HELP			EM	
	MAIN Go bac	k to Main menu. B	ACK Backup one menu.	ONLY	
	EM 9	ING MODE SETUP			
	Select IBOC	ONLY ONLY to enter the des	sired IBOC operating mode.		
	IBOC SETUP A	IBO	to setup for IBOC test modes	IBOC ONLY	
	STATUS DISPL	163			
		ODE - Displays main channel servic ink message activity - DSP - Display			
	DSP message act	ivity. 10 MHz LOCK - Displays 10 M scale factor during IBOC operation	Hz lock status, AGC SCALE -	FM & IBOC	
	,				
				BOC ETUP	
	SEIECT SETUP STATUS DISPL MAIN PRO SER M Displays exciter li DSP message act	AYS ODE - Displays main channel servic ink message activity. DSP - Display ivity. 10 MHz LOCK - Displays 10 M	27 to setup for IBOC test modes. 29 mode. EXCITER LINK - 29 DSP activity. ALARM - Displays 14 lock status. AGC SCALE - 1. IBOC 1	FM & IBOC	

Figure 3 – Record the AGC SCALE at Normal Operating RF Output Power

Step 6 – Increase the RF output of the transmitter in the range of 5% (minimum) to 15% (maximum) above the current TPO level of your transmitter.

Note that the smaller the increase, such as 5%, may ultimately inhibit the transmitter's ability to automatically compensate for environmental temperature variations. If your transmitter is subject to outside variations in ambient room temperature, then this may require a setting near the upper end, such as 15%, of the range.

Units shipped from the BE factory now are preset with a Max scale factor 15% above the TPO on your order. This is set at an ambient room temperature of 21C.

Step 7 – Go back to the FXi Exciter GUI Main Menu and select **OPER MODE**.

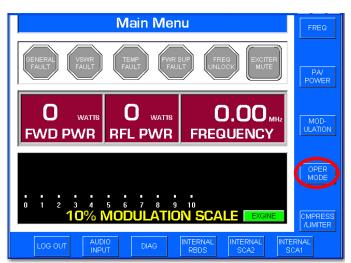


Figure 4 – FXi Main Menu



STEREO	
ON	
<u>10.0</u> %	STEREO
BACK Backup one menu. To enter the desired	MONO L+R
he pilot. Select PILOT LEVEL	MONO
) system parameters.	LEFT
eway data.	MONO RIGHT
;	BACK Backup one menu. to enter the desired ne pilot. Select PLOT LEVEL

Figure 5 – Operating Mode Menu

Step 9 – Record the present AGC SCALE reading.

Remember, the transmitter must now be operating in the range of 5 - 15% above the TPO level that you would normally operate it at!

	IBOC Me	nu	MAT
IBOC OPER	ATING MODE	IBOC ONLY	ī 🗡
MAIN PRO	GRAM SERVICE MODE	MP1	/
STATUS	EXCITER LINK	AGC SCALE 7000	BACK
	k to Main menu. NG MODE SETUP	BACK Backup one menu.	FM ONLY
Select FM & BOC	IBOC FM ONLY ONLY to enter the de ND TEST	esired IBOC operating mode.	IBOC ONLY
Displays exciter I DSP message act	ODE - Displays main channel servi	ays DSP activity. ALARM - Displays MHz lock status. AGC SCALE -	FM & IBOC

Record the present AGC Scale reading (this number should be slightly larger than the number recorded in Step 5 at Normal TPO)

Note: The present AGC Scale reading will appear here if the FXi 60/250 Exciter is running software v2.0.35 or newer.

If running an older version, you will need to use Hyperterminal's "e" command to see the present Scale Factor reading.

See Steps 10-21 for Hyperterminal connection instructions and 25 for the "e" command.

Figure 6 – Record the AGC SCALE at "5 -15% above" Normal Operating RF Output Power



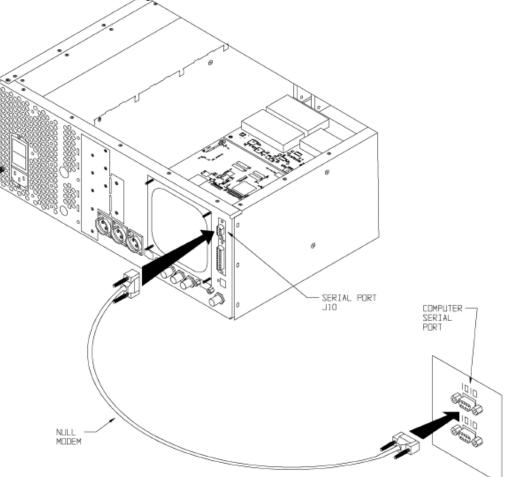


Figure 7 – PC to FXi Serial Port Null Modem Cable Connection

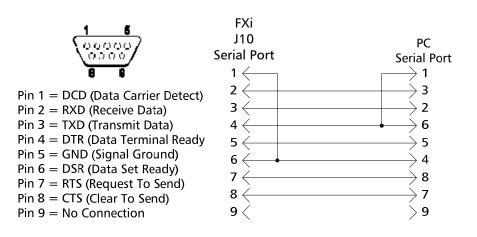


Figure 8 – Serial Cable / Null Modem Adapter Pinout



- Step 11 From the Desktop go to: START-> ALL PROGRAMS-> ACCESSORIES-> COMMUNICATION-> HYPERTERMINAL and click the mouse.
- **Step 12** The HyperTerminal dialog box should now be displayed. In the **CONNECTION DESCRIPTION** box, enter the name of the shortcut that you want to be created such as *FXi* Connection.
- **Step 13** Select and click **OK**.
- **Step 14** The **CONNECT TO** dialog box will now appear. In the **CONNECT USING** dialog box, ensure that the correct COM Port is selected (typically **COM 1** is used) and then click **OK**.
- Step 15 The COM1 PROPERTIES dialog box will appear. Move the cursor to the BITS PER SECOND dialog box and select 19200.
- **Step 16** Move the cursor to the **DATA BITS** dialog box and select **8**.
- Step 17 Move the cursor to the PARITY dialog box and select NONE.
- **Step 18** Move the cursor to the **STOP BITS** dialog box and select **1**.
- Step 19 Move the cursor to the FLOW CONTROL dialog box and select NONE.
- **Step 20** Select **OK** and the HyperTerminal communication window will appear.
- **Step 21** Type "?" and the **Supplemental Command Menu** will then appear.

Supplemental command menu Use these commands only with extreme caution a = Turn apc on and off when APC is internal b = Program the function of the remote input called RAISE POWER d = Set delay for returning to AES/EBU input e = Dump Engineering APC variables a Tarm special 6M mode on and off i = Set the maximum scale factor for the current operting mode J Pregnam the function of the remote input called LOWER POWER k = Program the function of the remote input called LOWER POWER k = Program the function of the remote input called Primary Audio In 1 = List amplitude correction table g = List phase correction table m = Meter readings dump F and f = FM scale factor raise and lower in hybrid mode S and s = IBOC scale factor raise and lower in IBOC only mode ^ = Put scale factor raise/lower into low/high speed + and - = Adjust the PA bias level I = increase and J = decrease IBOC level in hybrid mode 0 = increase and o = decrease the delay in detecting an AES/EBU fault x = Set up test point in FPGA u = Upload new control code to the flash memory H = Dumper the function of the remote and lower in lable Applied Power on the function of the remote input called Power on the function of the remote input called Power on table a = Upload new control code to the flash memory H = Dumper the function of the remote input called Power on table Power on the function of the remote input called Power on table to the flash memory H = Dumper the function of the remote input called Power on table Power on the function of the remote power on table Power on the function of the remote power on table Power on the function of the remote power on table power on the function of the remote power on table power on the function of the remote power on the function of the remote power on the function of the remote power on table power on the function of the remote power on table power on the function of the remote power on table power on the function of the remote power on table power on table power on table power on table	File Edit View Call	Transfer Help	
Use these commands only with extreme caution a = Turn apc on and off when APC is internal b = Program the function of the remote input called RAISE POWER d = Set delay for returning to AES/EBU input e = Dump Engineering APC variables g = Tarn special 6M mode on and off i = Set the maximum scale factor for the current operting mode Drogram the function of the remote input called LOWER POWER k = Program the function of the remote input called LOWER POWER k = Program the function of the remote input called Primary Audio In 1 = List amplitude correction table m = Meter readings dump F and f = FM scale factor raise and lower in hybrid mode S and s = IBOC scale factor raise and lower in IBOC only mode ^ = Put scale factor raise/lower into low/high speed + and - = Adjust the PA bias level I = increase and 1 = decrease IBOC level in hybrid mode 0 = increase and o = decrease the delay in detecting an AES/EBU fault x = Set up test point in FPGA u = Upload new control code to the flash memory	0 🖻 🗇 🖇 🗅 🖰		
z = Turn the auto download on and off	Use these com a = Turn apc b = Program t d = Set delay e = Dump Engi g = Tarn spec i = Set the m j = Program t k = Program t l = List ampl g = List phas m = Meter rea F and f = FM S and s = IBO ~ = Put scale + and - = Adj [= increase 0 = increase x = Set up te u = Upload ne y = Program t	Mands only with extreme caution on and off when APC is internal be function of the remote input called RAISE POWER for returning to AES/EBU input meering APC variables cal GM mode on and off aximum scale factor for the current operting mode be function of the remote input called LOWER POWER the function of the remote input called Primary Audio In tude correction table correction table cale factor raise and lower in hybrid mode cale factor raise and lower in IBOC only mode factor raise/lower into low/high speed ust the PA bias level and 1 = decrease IBOC level in hybrid mode and o = decrease the delay in detecting an AES/EBU fault of control code to the flash memory be function of the remote input called Backup Audio In	



Step 22 – Press "i" (lower case) on the keyboard of the PC to change the scale factor of the "current" IBOC Operating Mode.



Step 23 – After pressing "i", the following command prompt will appear. Enter the AGC Scale setting recorded in Step 9 (7000 for this example) and press Enter.

FXi Connection - HyperTermina	al						
File Edit View Call Transfer Help							
□☞ 중 ▫ " 답							1.00
i Set the maximum scale fac Please enter the maximum 81d maximum value is: 716 7000	value to	e IBOC o be allow	nly mo ed for	ode. BOO	Cscale.		
Connected 0:00:24 ANSIW	19200 8-N-1	SCROLL	CAPS	NUM	Capture	Print echo	

Figure 10 – "i" Command to Change Maximum Scale Factor

- **Step 24** Lower the transmitter's RF Output Power level back to where you would normally operate it at.
- **Step 25** To verify that the scale factor was changed, press "e" (lower case) on the keyboard.

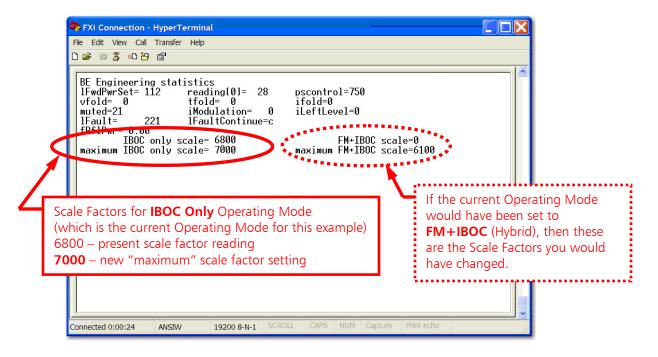


Figure 11 - "e" Command to Review Engineering Statistics



5 Related Documents

Other Application Guides that are closely related to this guide that may prove beneficial:

- FXi 60/250 U41 FW Upgrade Application Guide; 597-0541-009
- FMi 31/73/106/201/301/402 HD Spectrum Application Guide; 597-5001-002
- FMi 703/1405 HD Spectrum Tuning Application Guide; 597-1012-009
- FXi Exciter HD Injection Level Adjustment; 597-0541-010

6 **RF Technical Services Contact Information**

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