

5 Section-5 Theory

5.1 Introduction

This section contains detailed descriptions of the GX Series transmitter.

The following descriptions and series of drawings are intended to provide general overall knowledge on how the GX transmitter works. This series of transmitter operates in FM analog mode.

The GX Series Transmitters include a common built-in Modulator and a common front panel LCD display with front panel controls plus a remote GUI Interface. All of the interfaces to the transmitter and the GUI are identical for all GX models

5.2 Modulator/Control Board Description

Refer to Figure 1 as needed for the Modulator and Control circuit descriptions.

5.2.1 Modulator Circuits

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 4-1 Modulator 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.

The Modulator and the Front Panel Display gets it's DC voltage from the 12 volt power supply.

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 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 an RF relay that selects either internal modulator or external RF source. The selected RF signal passes to a variable attenuator that controls the level of RF amplifier circuitry on the Modulator board which can produce up to 8 watts output, but typically operates 1 watt or less.

5.2.2 Control Circuits

The control circuits of the FPGA on the Modulator/Control Board receives transmitter interface I/O via two other PCB assemblies. These assemblies are the Front Panel Display and the Final RF Amplifier.

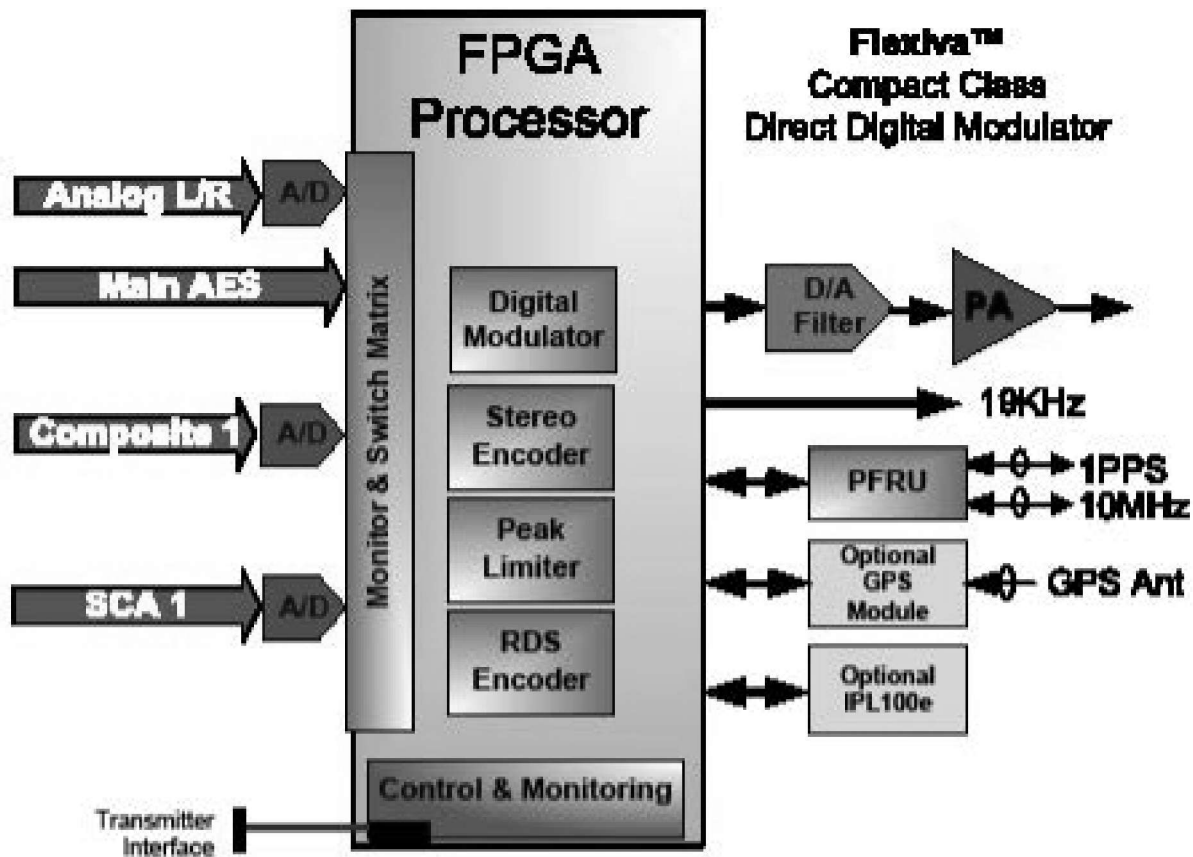


Figure 5-1 Modulator Block Diagram

5.3 Front Panel Display

The front panel Display assembly consists of an LCD touch screen display, pushbutton switches to provide on/off, and local/remote control and four status LEDs.

The front panel cover can be removed to gain access to the Display and on larger GX models, the PA power supply and Fan can be accessed.

5.4 RF Final Amplifier & Power Supplies

On the GX50, the required power supplies for the modulator, control and RF circuits are mounted on the RF Final Amplifier Assembly. On larger GX LP models such as the GX1K, the power supplies are mounted separately and wired to the RF Amp assembly. Supply voltages for modulator, display and cooling fans and routed to provide their power requirements.

The Final Amplifier RF output is routed to low pass circuitry for any additional spurious attenuation required and then to it's output connector mounted on the rear of the chassis.

4.3.2.0.2 CPU Stats - Usage Logger

- Select: **Home > Setup > Service > CPU > Logger** will open the (%) **Logger** screen.

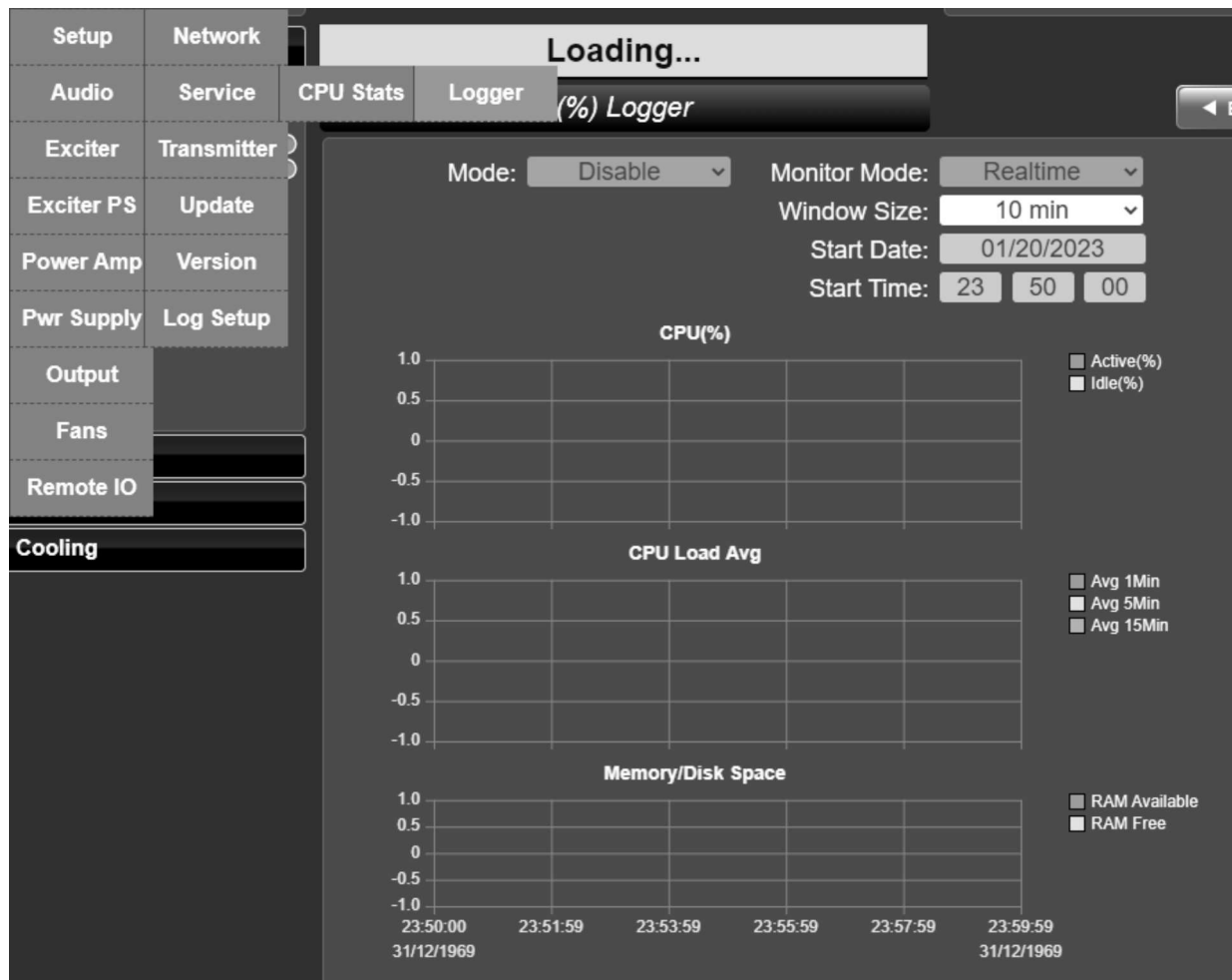
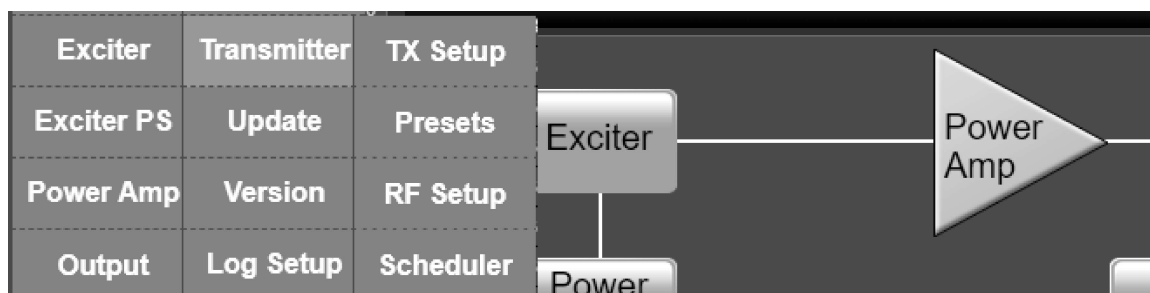


Figure 4-34 CPU Stats Logger Screen

4.3.3 Transmitter Pull-down Buttons

The Transmitter button navigates you to the TX Setup, Presets, RF Setup are Scheduler buttons.

- Select: **Home > Setup > Transmitter** to navigate to these transmitter setup screens



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TX Setup Button

Selecting the **TX Setup** button opens the Transmitter Setup screen to access fields for APC, Frequency, RF Gain and a quick link to additional Modulator settings.

Transmitter Setup

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Transmitter Type:

Transmitter

▼

Frequency(MHz):

101.00

APC Mode:

Internal APC

▼

External APC Gain (%):

0.0

External APC Limit:

3000

External APC Voltage:

0.004 V

Internal APC Gain (%):

100.0

RF Gain @TPO(dB):

14

RF Gain (dB):

13.5

APC Voltage:

2.954 V

Mod Setup

Figure 4-35 Transmitter Setup Screen

Table 4-13 Transmitter Setup

Item	Explanation
Transmitter Type:	Select Transmitter or Exciter. (Modulator is also listed, but not active in GXLP)
Frequency(MHz):	Frequency setting for the transmitter. The transmitter can be configured to operate in either the band 76 MHz to 88 MHz (low band) or 87.5 MHz to 108 MHz (high band).
APC Mode:	Selectable. Internal or External. Internal mode handles power control internally to reach TPO. External mode is used with an external APC voltage for power control.
External APC Gain (%):	Used during the setup process to set power out for a specific external APC voltage.
External APC Limit:	When External is selected, sets the upper limit of RF power output.
External APC Voltage:	Displays the APC voltage level when External is selected.
Internal APC Gain (%):	0-100 % Used to set the UC Attenuation voltage in the range of 3.0 +/-0.1 VDC at TPO.
RF Gain @ TPO (dB):	Sets the Step Attenuator to allow for maximum power limit.
RF Gain (dB):	Displays the active gain.
APC Voltage:	0 to 5 VDC (Only if APC Mode is set to Internal); voltage to the variable attenuator on modulator set by Internal APC Gain. Set to 3.0 +/-0.1 VDC at TPO during factory test.
Mod Setup Button	Quick link to navigate to Modulator Screen