Preliminary

USER MANUAL FOR THE

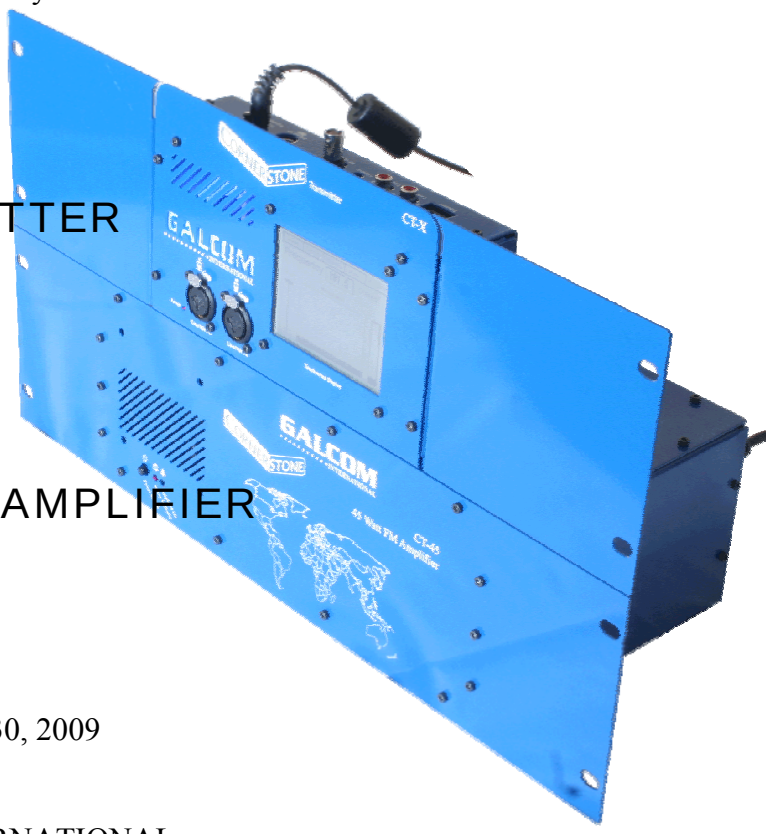
# CORNERSTONE TRANSMITTER

Model: CT-X

and the

# CORNERSTONE 45 WATT AMPLIFIER

Model: CT-45

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*Providing durable technical equipment for communicating the Gospel worldwide*

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# Section 1 – General Description

Galcom's Cornerstone Transmitter CT-X is a rugged, all digital transmitter designed for use around the world. It is a compact unit approximately 9" x 6" x 4" (23cm. x 15cm. x 10cm.) with a small attached stand for desk operation, or attachable wings for 19" rack mount. Inputs for microphones, CD player, MP3 player, internet connection, etc. are all built into the unit. A touch screen display allows for immediate access and input of all required settings as well as providing an on screen mixer.

As a stand alone unit the CT-X Transmitter can broadcast in FM 88 MHz - 108 MHz generally to a large auditorium. This unit is ideal for use in countries where technology and reliable electricity are limited. Its advanced digital design and user friendly touch screen operation make it easy to install and operate. With its rugged construction, it is designed for use in all climates and widely varying conditions.

The electrical power configuration for the CT-X operates on 100-230VAC while the CT-45 operates on 110 or 220 VAC. Where reliable power is not available, with the addition of a solar power supply, it can operate on 12-24 VDC and provide the power to the CT-X.

As its name implies, the Cornerstone Transmitter is the foundational unit for several additional amplifiers that will expand its reach to an entire city and beyond. The first amplifier in this series is the CT-45 which only operates in conjunction with the Cornerstone Transmitter CT-X. The expansion to a 450 Watt amplifier is planned in the future.

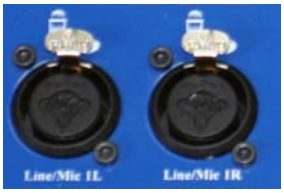
Some of the features of this system include a stereo encoder, an audio processer, six channel input, SCA, touch screen control, SWR monitoring, optional Ethernet card, complete mixing of inputs, pre-emphasis and a "save and restore" option for all settings.

The following pages provide detailed instructions for installing and operating this system.

# Section 2 – CT-X Transmitter Hardware

The CT-X Transmitter is a small, lightweight radio transmitter that is ideal for transmitting a short distance in auditoriums. With the addition of the CT-45 Amplifier the signal can be boosted to 45 Watts of power. The CT-X Transmitter is not designed for use with amplifiers from other manufacturers.

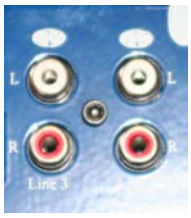

## *2.1 Front Audio Inputs*




There are two audio input plugs on the front of the transmitter labeled Line/Mic 1L and Line/Mic 2L. These are balanced line inputs. They will accept ¼" or XLR connectors, balanced or unbalanced cables, and line level or microphone level inputs. Ideally balanced XLR cables will be used for the input to the transmitter.

## *2.2 Rear Audio Inputs*

On the back of the transmitter there are an additional 4 audio inputs labeled Line 2 L, Line 2 R, Line 3 L, and Line 3 R. These accommodate RCA component level inputs.



## 2.3 Contrast Adjustment


On the back of the transmitter there is a contrast dial that can be adjusted with a small slot screwdriver. Turn the transmitter on and then adjust the dial until the touchscreen display is easily visible.

## 2.4 RF Output Connector


On the back of the transmitter is a BNC connector labeled RF Output. This is a 50 Ohm output port. This can be connected directly to an antenna for broadcast to an auditorium or it can be connected to the CT-45 Amplifier.

## 2.5 CT-X Digital IO Connector


On the back of the transmitter there is a connector plug labeled Digital IO. This is used when the transmitter will be controlling other devices such as the CT-1 (this is a 1 Watt unit) or CT-45 Amplifier and also for future options for the CT-X Transmitter.

## 2.6 Power Socket and Switch


On the back of the transmitter is a power socket labeled 5VDC Regulated. The CT-X Transmitter requires a regulated DC power supply. Use of power adapters other than the one provided with the Cornerstone Transmitter CT-X could cause damage to the transmitter and to the power adapter. Use only the power adapter supplied with the unit.

The toggle push button for turning the Cornerstone Transmitter on and off is labeled Power and is located on the top of the unit.

## *2.7 Ethernet Connection*

An Ethernet RJ-45 connector is located on the top of the transmitter. A separate network card can be installed into the Cornerstone Transmitter which will allow for remote monitoring and control of the Cornerstone Transmitter. Without the optional network card installed into the CT-X, the Ethernet connection will not function.

## *2.8 Case Configuration*

The CT-X case can be configured to sit flat on a table, to sit at a 45 degree angle or to be installed in a standard 19" rack.

### 2.8.1 Rack Mount Configuration

The Cornerstone Transmitter case can be configured to be mounted on a standard 19 inch rack. Included with the transmitter are two rack mount wings. These screw onto the sides of the transmitter.

### 2.8.2 45 Degree Desktop Configuration

The Cornerstone Transmitter comes with two wings that allow it to easily be used on a desktop. These wings screw onto either side of the Cornerstone Transmitter.

## *2.9 Cleaning the Transmitter*

Do not use solvents, glass cleaner or abrasives on the touchscreen display. The display screen can be damaged by harsh chemicals. To clean, gently wipe off the transmitter and display with a damp cloth.

### *2.10 Touchscreen Display*

On the front of the transmitter is a touch screen display. Included with the transmitter is a stylus. A gentle touch with the soft plastic end of the stylus is all that is needed to control all features of the Cornerstone Transmitter. Alternatively, the transmitter can be operated with the touch of a finger. Avoid putting excessive pressure on the glass touch screen. The touch screen display can be used in any lighting condition from direct sunlight to total darkness.

## Section 3 - CT-45 Hardware


The CT-45 Amplifier is a 45 Watt RF Amplifier. It is controlled by the CT-X Transmitter. The touch screen on the CT-X Amplifier must be used to control the CT-45 Amplifier.

The CT-45 Amplifier will only operate with the CT-X Transmitter. The CT-45 Amplifier cannot be used with other manufacturers' transmitters or exciters.

### *3.1 RF Input Connector*

On the back of the CT-45 Amplifier is a BNC RF input connector. This is connected to the CT-X Transmitter using 50 ohm BNC cable.

### *3.2 RF Output Connector*

On the back of the CT-45 Amplifier there is an N-Type connector for connection to the transmitting antenna. Using 50 ohm coax cable for the connection between the antenna and the amplifier, it is important to ensure the cable between the antenna and the amplifier is in good working condition. A short or open circuit can damage the CT-45 Amplifier.

### *3.3 Power Connector*

The CT-45 Amplifier comes with a power cable that attaches to the power jack on the back of the transmitter and to a North American 110 VAC power receptacle. If planning to use the amplifier on 220 VAC toggle the switch on the back of the transmitter from the 110 position to the 220 position. Some countries may require different power cable or a plug converter.

## *3.4 CT-45 Digital IO Connector*

There is a round six pin connector on the back of the CT-45 Amplifier. This is used to connect the control interface cable between the CT-45 Amplifier and the CT-X Transmitter. This cable is a lower power data cable that enables the CT-X to monitor and control the operation of the CT-45 Amplifier. To operate the amplifier this cable must be connected to the transmitter. If it is unplugged while the amplifier is operating the CT-45 will turn the final output power off. In order to enable the amplifier the cable must be reconnected and then either reboot the CT-X Transmitter or the menu option "Modules": click on "CT-45" and then click on "Pwr On".

## *3.5 Main Power Toggle Switch*

There are both a main power toggle switch and a power switch for the CT-45 Amplifier. The main power toggle switch is located on the back of the amplifier. When this switch is turned off all power is disconnected from the amplifier. When this switch is turned on the amplifier will have power and if it is connected to the CT-X transmitter with the Digital IO Cable it will be able to be monitored and controlled by the CT-X transmitter however, to power up the amplifier both the main power toggle switch and the power switch must be on.

## *3.6 Power Switch*

The power switch is located on the front of the CT-45 Amplifier and is labeled "Power Switch". It is a locking pushbutton switch. It is in the "on" position if it is in and it is "off" if it is out. Both the main power toggle switch and the power switch must be on for the amplifier to be able to be powered up. Turning this switch off while the amplifier is operating will result in the final amp being turned off.


## 3.7 Power LED

There is a red power LED indicator on the front of the CT-45 Amplifier beside the Power Switch. It is labeled “Power Indicator”. There are three states for this LED.

| | | |
|---|---|---|
| LED Off | No Power | - One or both of the power switches are off |
| LED Flashing | Ready | - The CT-45 has power and is ready for the CT-X to power it up. |
| LED On | Power On | - The CT-45 is powered up |

## 3.8 Amplifier LED

To indicate the state of the amplifier, there is a green LED located beside the power led and labeled “Amplifier On”. This has two states.

| | |
|---|---|
| LED off | Amplifier is off |
| LED on | Amplifier is on |

The Cornerstone CT-X Software directly controls the operation of the amplifier. If the switches are both on then the amplifier must be turned on by the CT-X Transmitter.

# Section 4 - Step by Step Installation and Setup

## *4.1 Installing the CT-X Transmitter*


### 4.1.1 Unpacking the CT-X

The CT-X comes in a metal carry case.
Please verify the following is included inside the case:

- CT-X Transmitter
- Power Supply
- BNC Telescoping Antenna
- Stylus
- Left and Right 19” Rack Mount Wings
- Left and Right 45 Degree Wings
- Instruction Manual
- Hex Key
- Keys for the Case
- Strap for the Case

### 4.1.2 Installing in a 19” Rack

If installing the CT-X into a 19” rack use the included hex key to remove the six screws on either side of the transmitter. The Right 19” Rack Mount Wing is screwed onto the right side of the CT-X with the screws that were previously removed. The Left 19” Rack Mount wing screws onto the left side of the CT-X Transmitter using the screws that were previously removed. Tighten the screws finger tight being careful not to over tighten and strip the screws. It is best to leave an opening above the transmitter to make it easier to connect cables and keep the transmitter cool. It is recommended to install the transmitter into a 19” rack if the transmitter will be used with the CT-45 Amplifier.

### 4.1.3 Installing the 45 Degree Wings

Remove the six screws from both sides of the transmitter with the included hex key. Attach the right 45 Degree Wing to the right side of the transmitter. The feet should curve under the transmitter. Do the same for the left side of the transmitter. Tighten the screws finger tight being careful not to over tighten and strip the screws.

### 4.1.4 Connecting the cables to the CT-X Transmitter

Plug the power adapter into a suitable power outlet. This can be 110VAC or 220VAC. Connect the other end to the plug receptacle labeled “5V DC Regulated”.

For stereo operation connect the RIGHT balanced line output from the studio equipment to the front of the CT-X Transmitter receptacle labeled “Line/Mic 1R”. Connect the LEFT balanced line output from the studio equipment to the front of the CT-X Transmitter receptacle labeled “Line/Mic 1L”.

Balanced line inputs are highly recommended however, if they are not available then unbalanced ¼” cables can be used in the “Line/Mic 1R” and “Line/Mic1L” receptacles. Component inputs can be used on the top of the CT-X transmitter. They are labeled “Line 2 R”, “Line 2 L”, “Line 3 R”, and “Line 3 L”.

If the transmitter is being used as a stand alone device then connect the antenna to the BNC jack on the top of the CT-X labeled “RF Output”.

### 4.1.5 Unpacking the CT-45 Amplifier

Please verify the following is included:

- CT-45 Amplifier
- Power cable for North America
- BNC Cable
- Digital IO Cable (6 pin cable)
- Instruction Manual
- Testing Results


### 4.1.6 Installing the CT-45 into a 19” Rack

If when the CT-45 is installed into the rack access to the back of the CT-45 will be difficult or impossible proceed to 4.1.6 and connect the Amplifier before installing into the rack.
We recommend leaving one rack unit open above and below the CT-45 for cooling. Screw the CT-45 into the rack leaving one unit free above and below the CT-X Transmitter.

### 4.1.7 Connecting the CT-X Transmitter to the CT-45 Amplifier

Connect the BNC cable supplied with the Amplifier from the “RF Output” plug on the CT-X Transmitter to the “RF Input” plug on the CT-45 Amplifier.

Verify the position of the power supply voltage selection switch. It is either 115 Volts or 220 Volts. Connect the power cable between the amplifier and the wall receptacle.

Connect the 6 pin Digital IO Cable between the transmitter and the Amplifier.

Connect the Amplifier to the antenna cable. Make sure this is an N-Type fitting and that the cable is properly inserted and tightened both to the Amplifier and the Antenna.

### 4.1.8 Verify the hardware installation

Turn on the CT-X Transmitter. It will immediately beep. The display shows the version of the software on the top line and it will show the progress as the transmitter boots up. Upon successful boot the transmitter will beep twice and go to the modulation display screen.

If the CT-45 Amplifier is attached then turn the rear Main Power Toggle Switch to the “on” position and make sure the Power Switch on the front of the CT-45 is pushed in. Verify the red power light on the front of the CT-45 is flashing. On the CT-X touchscreen display click on “Modules”. Verify that under the Modules menu there is an option for “CT-45”.

# Section 5 – Software Operation (CT-X & CT-45)

The CT-X is an entirely digital transmitter. It uses three digital signal processors to digitally synthesize a radio wave. The main processor is responsible for the user interface and communicating with the other two processors. The second processor of the three is the Audio processor. This processor is responsible for the audio mixing, the filtering, the pre-emphasis and the dynamic range control. The third processor is the RF processor. Its entire job is to modulate the carrier wave.

## *5.1 Quick setup*

After the CT-X is set up according to the instructions in section 4.1 it is time to configure the transmitter using the touchscreen display. This section is intended to help get the transmitter up and running without having to deal with all the extra options available. For this quick setup we are assuming that the front two inputs (Line/Mic 1L and Line/Mic 1R) are being used for the audio input from a line level balanced mixer.

Turn the Cornerstone Transmitter on and wait until it is finished booting. It will display the menu at the top of the screen, the frequency in the middle and the modulation graph at the bottom.

- Click on the **Settings** menu and then choose the option **Frequency**
    - There is a Frequency box, Stereo box and Bandwidth box displayed
  - Click on the **Frequency box**
    - There will be a number pad displayed similar to a calculator
  - Enter the desired frequency and click on Enter
    - Note: The short left arrow is the backspace key and the large one is the Enter key.
    - The backspace may need to be pressed to clear the previous frequency
    - After pressing Enter you should see the new frequency in the frequency box
  - Verify the **Stereo box** is checked
  - Verify the **Bandwidth box** is set to 100%
  - Click OK
    - It will returned to the screen showing Frequency and Modulation
- Click on the **Settings** menu and then choose the **Input** option
  - Verify that the slider **1 Left** and **1 Right** are near the top
  - Verify that both **Mic level input** boxes are not checked
  - Click OK

- Click on the **Settings** menu and then choose the **Audio** option
    - Verify that the FM 75 μS Pre-emphasis box is checked
    - Click OK
- Click on the **Settings** menu and then choose the **Mix** option
        - This should show the mixing matrix
        - This is used to mix the various inputs to the desired outputs
    - Verify that the only boxes that are checked are **Input 1 Left** to **Output Left** and **Input 1 Right** to **Output Right**
        - This is the top right box and the second from the top, second from the right
    - Click OK
- Click on the **Settings** menu and the choose the **Subcarrier** option
    - Verify that all of the bandwidth boxes (on the right) are set to 0
    - Click OK

## *5.2 Views Menu*

The views menu allows various screens to be selected that give information about the transmitter.

### 5.2.1 Views / Frequency

This is the default display when the transmitter is turned on and when a setting is changed.

This display shows the current frequency at the top of the screen. It shows the modulation graph at the bottom of the screen. There is a slider on the left that controls how quickly the modulation graph updates. The bar on the right shows the current modulation.

### 5.2.2 Views / All

This view shows all the settings for the transmitter in text format.

### 5.2.3 Views / Temperature

This view shows two temperatures. The first temperature is the Direct Digital Synthesizer temperature. This temperature should be <= 65.0 degrees Celsius.

The second temperature is the ambient temperature in the case. This temperature should be <= 55.0 degrees Celsius.

### 5.2.4 Views / Levels

This view shows an overview of all of the audio input levels to quickly verify they are an in acceptable range.

## *5.3 Settings Menu*

The settings menu controls the operation of the Cornerstone Transmitter.

### 5.3.1 Settings / Frequency

This controls the carrier frequency for the transmitter. It also controls whether the transmitter is in Stereo and whether the transmitter scales down its bandwidth.

The Frequency can be changed from 70 MHz to 108 MHz however, not all frequencies are supported by all amplifiers. For example, the CT-45 Amplifier will only allow frequencies in the range of 88 – 108 MHz. If you try to enable the amplifier with a frequency outside of that range you will see an error message.

The Stereo check box is used to turn on the stereo carrier. It will inject a 19 kHz stereo carrier at 9% total modulation. You will notice that if you turn the stereo carrier on and then look at the Views / Frequency there will be modulation even if there is no audio input.

The Bandwidth box is used to limit the total bandwidth. This is useful for narrow band speech translation. Turn the stereo option off when you are using narrow band because stereo is not support in narrow band transmission.

### 5.3.2 Settings/Input

You use the input sliders to control the input level of the audio. Sliding the slider to the top increases the volume and sliding it to the bottom decreases the volume.

You will see the numbers 1, 2 and 3 across the top of the screen. These correspond to the physical inputs on the Cornerstone Transmitter. Each input is broken into a Left and Right channel. Channel 1 Left is the control for the input on the bottom right of the Cornerstone Transmitter labeled "Line/Mic 1L". Channel 1 Right is the control for "Line/Mic 1R". Channel 2 Left is the control for the white RCA input on the top of the Cornerstone Transmitter labeled "Line 2 L". Channel 2 Right is the red connector labeled "Line 2 R". Channel 3 Left controls the white RCA input labeled "Line 3 L" and channel 3 Right controls the red RCA input labeled "Line 3 R". Sliding the slider to the top allows the audio into that input and sliding the slider all the way to the bottom will mute that channel.

There are two check boxes labeled "Mic level input" under the sliders "1 Left" and "1 Right". These are used to connect a microphone directly to the Cornerstone Transmitter. This is useful when using the Cornerstone Transmitter for speech translation.

### 5.3.3 Settings/Audio

This screen allows you to control the pre-emphasis used with the transmitter. Clicking on the 75 μS Pre-emphasis box will put a checkmark in the box and turn on the 75 μS pre-emphasis. Likewise, clicking on the 50 μS Pre-emphasis box will turn on the 50 μS pre-emphasis. To turn off the pre-emphasis click on the box that is checked to clear the checkmark. Please note that you cannot turn on 75 μS pre-emphasis and 50 μS pre-emphasis at the same time.

Compression will control the audio level to maximize the volume without causing distortion. The Compression targets 90% modulation. To enable compression click on the compression check box as needed for FM, SCA 1 or SCA 2 and verify it has a check mark.

DRC stands for Dynamic Range Compression. It is similar to compression but has a quicker response time. To enable DRC click on the DRC check box for FM, SCA 1, or SCA2 and verify there is a checkmark in that box.

We recommend having both Compression and DRC enabled.

### 5.3.4 Settings/Mix

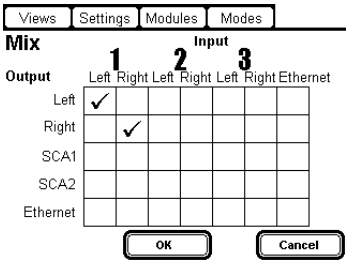
This is likely the most difficult setting to configure however, the mixing matrix will give you great flexibility configuring your transmitter. This is a mixing grid. It takes the physical inputs and maps them to various possible transmitter outputs.

The inputs are listed at the top of the matrix. They are labeled 1 Left, 1 Right, 2 Left, 2 Right, 3 Left, 3 Right, and Ethernet.

The outputs are listed on the left side of the matrix. They are labeled Left, Right, SCA1, SCA2, Ethernet.

Here is an example of how to mix input 2 Left to SCA1. Find the column under Input, 2, Left and follow it down until you are at the row SCA2. Click on that square and verify it now has a checkmark. Now all the audio coming into the Cornerstone transmitter through the top connector labeled "Line 2 L" will be transmitted on the SCA2 channel. Don't forget to move "Input 2 Left" slider to the top under the Settings/Input menu and to configure the SCA output under the Settings/SCA menu.

The most common configuration for this screen is to mix the input from the front two audio inputs labeled "Line/Mic 1L" and "Line/Mic 1R" to the main radio left and right channel.




### 5.3.5 Settings/Password

Use this screen to change the password for locking features on the transmitter.

### 5.3.6 Settings/Temperature

The transmitter will constantly monitor the DDS temperature, ambient temperature and the temperatures for any modules attached such as the CT-45 Amplifier. You can configure the levels here.

### 5.3.7 Settings/Clock

Set the time and date.
The time is in 24 hour format.
The date is set by day, month, year.

### 5.3.8 Settings/Subcarrier

The Cornerstone allows two audio subcarrier channels and an RBDS subcarrier channel.

Please note that there are limits on the subcarrier bandwidth. If you enter a combination of bandwidths or frequencies that are above the maximum allowable bandwidth the Cornerstone Transmitter will decrease the bandwidth to the allowable level.

For example, when in stereo mode, if you choose to have SCA1 at 67 kHz with a bandwidth of 10% and SCA2 with a bandwidth of 30% the value for the SCA2 bandwidth will be changed to the highest allowable level and now show as 10%.

### 5.3.9 Settings/Files

You can save all of the changes that have been made to the transmitter in one of ten files. To save the settings click on the slot number (0 – 9) that you want to save them in and then click on "SAVE".

To load a saved setting click on the slot number (0 – 9) that you want to recall and then click "LOAD".

Each time the transmitter is turned on it will have the same settings as when it was last turned off.

## *5.4 Modules menu*

The modules menu allows you to view and control other devices connected to the Cornerstone Transmitter CT-X. This menu will be empty unless the CT-X is connected to a module such as the CT-45 Amplifier by means of a Digital IO cable.

### 5.4.1 Modules/CT-45

The CT-45 option appears under the Modules menu only when the Cornerstone Transmitter CT-X is turned on, the CT-45 Amplifier is turned on and the Digital IO cable is connecting the two units.

The top of the screen shows the software version number for the CT-45

The "Target Pwr" box is used to control what wattage the amplifier will transmit. It has a range of 0 to 50.

Under the target power box are status lines that tell what state the amplifier is in:

- "Power Ok:" this indicates the condition of the power supply. When the power supply is off it will show the value "Low". If the CT-45 Amplifier detects a problem with the power it will switch to the "Low" state.
- "Enable Switch:" this indicates the position of the push button switch on the front of the CT-45. When the switch is in it will display "Enabled" and when the switch is out it will display "Disabled".
- "Temperature:" this will show if a temperature error or warning has occurred. Normally it will display "OK".
- "PLL Lock:" this shows that the CT-45 Amplifier is locked onto the RF signal from the CT-45 Transmitter. If the signal is ever lost and the CT-45 loses lock then the CT-45 will disable the amplifier. This displays "Locked" or "Unlocked".
- "Amplifier on:" this shows the state of the amplifier. When the amplifier is on this will displayed "ON" and the green light on the front of the Amplifier will be illuminated.

There are readings on the right of the screen:

- "SWR" this indicates the standing wave ratio at the output of the transmitter. It is important to check the SWR at the antenna because it can be different than the SWR reading at the transmitter due to losses in the antenna cable. This will only display a value when the amplifier is on and the green "Amplifer On" light on the front of the CT-45 is illuminated.
- "Fwd Pwr" this shows the output power of the CT-45 in watts.
- "Rfl Pwr" this shows the reflected power returning back to the CT-45 in watts.
- "Amb Temp" this shows the ambient temperature of the CT-45 in Celsius. It will only display a temperature when the power is enabled.
- "Amp1 Temp" this will show the temperature of the first amplifier in the CT-45 in Celsius.
- "Amp2 Temp" this will show the temperature of the second amplifer in the CT-45 in Celsius.

There is a button at the bottom of the screen labeled "AMP Power". When the amplifier is turned off it will show "Pwr On" inside the button. Clicking the "Pwr On" button will

cause the CT-45 Amplifier to turn on the power supply, make sure the PLL is locked and then turn on the amplifier.

When the amplifier is turned on the "Amp Power" button will display "Pwr Off". Clicking the "Pwr Off" button will turn the amplifier off and then turn the power supply for the CT-45 off.

Please check the following before powering up the amplifier:

1) The Cornerstone Transmitter CT-X is installed correctly
2) The Cornerstone Amplifier CT-45 is installed correctly
3) The frequency and audio settings have been entered into the CT-X
4) Verify the connection from the CT-45 to the antenna.

## *5.5 Modes*

There are two modes for the CT-X Transmitter. The advanced mode gives you the most options.

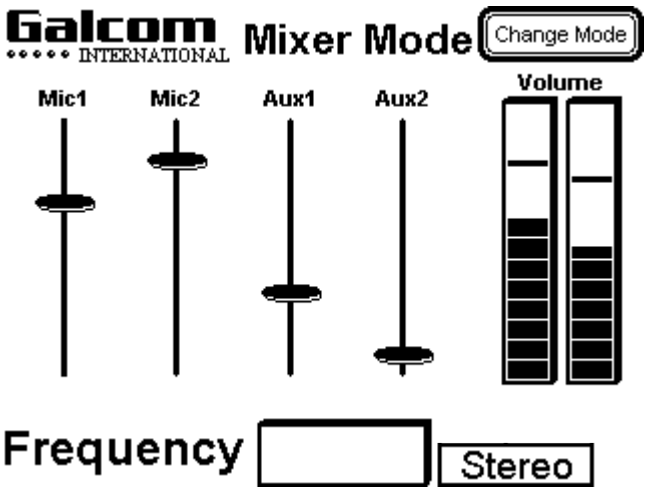
### 5.5.1 Modes/Advanced

The Advanced mode allows for complete control for the transmitter. It allows for configuration of external modules such as the CT-45 Amplifier.

### 5.5.2 Modes/Mixer

This mode will switch to a mixer mode. You will get a warning message that settings will be changed. The mixer mode disables many features such as subcarrier and it will also change most of the settings. See Section 6 for more information.

# Section 6 – Mixer Mode




The mixer mode will allow for the mixing of two microphones and two auxiliary devices to the main output of the transmitter.

## *6.1 Operation of mixer mode*

Clicking the button "Change Mode" will change back to advanced mode.

The Mic1 slider controls the volume of the microphone plugged into the "Line/Mic 1L" jack on the front of the CT-X Transmitter.

The Mic2 slider is for the "Line/Mic 1R" jack on the front of the transmitter.

The Aux1 slider controls the volume of the "Line 2 R" and "Line 2 L" port on the top of the Cornerstone Transmitter.

The Aux2 slider controls the volume of the "Line 3 R" and "Line 3 L" port on the top of the Cornerstone Transmitter.

The current frequency is displayed in the frequency box.

If the transmitter is in Stereo mode the Stereo box will be shown.

# Section 7 - Technical Specifications

## *7.1 Cornerstone Transmitter CT-X*

Model: CT-X

Power:
- 5.0 VDC (Includes 110VAC / 220VAC adapter)
- Regulated Voltage
- 2.5mm Cannon plug
- Internal self-resetting 1.2 Amp fuse
- Power switch
- 2.5 Watt power supply
- Power light on front of case
- Current Draw: 70 mA @ 110 Volts

Chassis:
- Rugged design
- Powder coated steel
- Wing attachments to fit in a 19" rack (3 Units)
- 45 degree leg attachments for desk use

Display:
- 320 x 240 Resolution
- Black and White
- Backlight
- Transflective (Can be used in sunlight or total darkness)
- Contrast adjustment

Touchscreen
- High resolution touchscreen panel
- Single point, pressure sensitive touch
- Can use stylus or finger

Digital IO Port
- Provides communication to other components such as the CT-45 Watt amplifier
- Future expansion (Such as radio programmer)

RF Output:
- Output Power: -8 dBm, .09 V RMS, 160 $\mu W$ (into 50 Ohm Load)
- Over voltage protection
- High pass filter
- FM Stereo
- FM Mono
- FM Subcarrier
- BNC jack
- Digitally synthesized output
- Frequency Stability: +/- 0.3 kHz over temperature range
- Subcarrier Frequency Stability: +/- 0.3 kHz

Optional Ethernet Card:

- Stream audio to the internet
- Stream audio from the internet
- Built in web page
- Remote control of transmitter from any web browser
- Remote software upgradeable

Audio Inputs

- Audio Input 1 Left and 1 Right
  - 2 x Dual XLR / ¼" jack
  - Balanced or unbalanced input
  - Mono or stereo ¼" plug
  - Line level or Microphone level input
  - 600 Ohm
- Audio Input 2 Left and 2 Right
  - 2 x RCA jack (L & R)
  - Unbalanced component input
  - 10K Ohm
- Audio Input 3 Left and 3 Right
  - 2 x RCA jack (L & R)
  - Unbalanced component input
  - 10K Ohm

Audio Processing:

- Pre-emphasis
  - Off, 50 µS, or 75 µS
- Compression
- Dynamic Range Compression

Audio Mixing:

- 8 Input channels (1L, 1R, 2L, 2R, 3L, 3R, Internet L, Internet R)
- 6 Output channels (FM L, FM R, SCA1, SCA2, Internet L, Internet R)
- Mix any input or combination of input channels to any output channel

Software includes a 'Mixing Mode' program:

- One screen mixes two microphones and two auxiliary audio inputs to the FM output
- Adjustable on-screen sliders
- Entire radio show can be mixed from the touch screen of the transmitter

Temperature

- Monitor the ambient temperature
- Monitor the DDS temperature
- Warn when high temperature (Audio and visual warning)
- Shut down the transmitter if temperature reaches an unacceptable level
- Operational between 0 Celsius to 50 Celsius (Recommended below 25 Celsius)

Time and Date clock

- Record the time and date of errors (such as unacceptable temperature)

Includes:

- Durable padded carrying case
- Telescoping antenna
- Stylus
- AC Adapter (110V/220V with many common worldwide plugs)
- Instruction Book
- Rackmount wings

- 45 degree legs

## *7.2 Cornerstone Amplifier CT-45*

Model: CT-45

The Cornerstone Amplifier CT-45 will only operate with the Cornerstone Transmitter CT-X.

Power:
- 120 Volt or 220 Volt AC
- Voltage selector on back
- Power switch on front
- Power light on front
- Current Draw: 930 mA @ 110 Volts (Includes the Cornerstone Transmitter CT-X)

Chassis:
- Powder coated steel
- Rugged design
- 19” Rack mount (3 Units)
- Quiet fan design

Digital IO
- Connection to control amplifier via the Cornerstone CT-X
- Must be connected in order to power up the amplifier

RF Input
- BNC input

RF Output
- Type N output
- FM Signal to Noise: -75dB
- AM Signal to Noise: -69dB
- FM Signal to Noise below 50Hz: -75dB
- Frequency Stability: +/- 0.3 kHz over temperature range

Temperature
- Temperatures monitored via cornerstone CT-X
- Monitor the ambient temperature
- Monitor power supply temperature
- Monitor final amplifier temperature
- Warn when high temperature (Audio and visual warning)
- Shut down the amplifier in case of over temperature
- Operational between 0 Celsius to 50 Celsius (Recommended below 25 Celsius)

Output Power
- >=45 Watts Output (88 – 108 MHz)
- SWR monitored via the cornerstone CT-X
- Monitor forward power at the amplifier
- Monitor reflected power at the amplifier
- Monitor the SWR at the amplifier
- Amplifier On output power light on front
- Warn when high SWR
- Shut down the amplifier in case of SWR >2.5:1