

# Operating Manual

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## *SEPsoniX*

### **FM Broadcast Audio Processor**

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*model SEP-FM1*



**JT Communications, LLC**  
**Ocala, FL USA**

# IMPORTANT SAFETY INSTRUCTIONS

All the safety and operating instructions should be read before the device is operated.

**Retain Instructions:** The safety and operation instructions should be retained for future reference.

**Heed Warnings:** All warnings on the device and in the operating instructions should be adhered to.

**Follow Instructions:** All operation and user instructions should be followed.

**Water and Moisture:** The device should not be used near water (e.g., near a bathtub, washbowl, kitchen sink, laundry tub, wet floors, or near a swimming pool, etc.).

**Ventilation:** The device should be situated so that its location or position does not interfere with its proper ventilation. For example, it should not be operated on a bed, sofa, rug, or similar surface that may block the ventilation openings; or, placed in a built-in installation, such as a bookcase or cabinet that may impede the flow of air through the ventilation openings.

**Heat:** The device should be situated away from heat sources such as radiators, heat registers, stoves, or other devices that produce heat.

**Power Sources:** The device should be connected to a power supply only of the type described in the operating instructions or as marked on the device.

**Grounding or Polarization:** Precautions should be taken so that the grounding or polarization means of the device is not defeated.

**Power-Cord Protection:** Power-supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the device.

**Cleaning:** The device should be cleaned only as recommended by the manufacturer.

**Non-Use Periods:** The power cord of the device should be unplugged from the outlet when left unused for a long period of time.

**Object and Liquid Entry:** Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.

**Damage Requiring Service:** The device should be serviced by qualified service personnel when the power supply cord or the plug has been damaged; or objects have fallen, or liquid has been spilled into the device; or the device has been exposed to rain; or the device does not appear to operate normally or exhibits a marked change in performance; or the device has been dropped, or the enclosure has been damaged.

**Servicing:** The user should not attempt to service the device beyond that described in the operating instructions. All other servicing should be referred to qualified service personnel.

**The device should be used only with a cart or stand that is recommended by the manufacturer.**

Safety Instructions (European)

**Notice For U.K. Customers If Your Unit Is Equipped With A Power Cord.**

**WARNING: THIS device MUST BE EARTHED.**

The cores in the mains lead are coloured in accordance with the following code:

GREEN and YELLOW - Earth    BLUE - Neutral    BROWN – Live



## NOTICE TO CONSUMER:

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules, as of date of manufacture. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, you are encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

**Consult the dealer or an experienced radio electronics technician for help.**

# PLEASE READ THIS FIRST!

## Manual

The Operating Manual contains instructions to provide the proper operation of this unit. You will find these operations are most conveniently performed on the bench before you install the unit in the rack.

Please review the Manual, especially the installation section, before unpacking the unit.

## Trial/Demo Precautions

If your unit has been provided on a trial or demo basis:

You should observe the following precautions to avoid reconditioning charges in case you later wish to return the unit to your dealer.

Note the packing technique and save all packing materials. It is not wise to ship in other than the factory carton. (Replacements cost \$25.00).

- (1) Avoid scratching the paint or plating. Set the unit on soft, clean surfaces.
- (2) Do not cut the grounding pin from the line cord.
- (3) Use care and proper tools in removing and tightening screws to avoid burring the heads.
- (4) Use the nylon-washed rack screws supplied, if possible, to avoid damaging the panel. Support the unit when tightening the screws so that the threads do not scrape the paint inside the slotted holes.

## Packing

When you pack the unit for shipping:

- (1) Tighten all screws on any barrier strip(s) so the screws do not fall out from vibration.
- (2) Wrap the unit in its original plastic bag to avoid abrading the paint.
- (3) Seal the inner and outer cartons with tape.

If you are returning the unit permanently (for credit), be sure to enclose:

- The Manual,
- The Registration/Warranty Card
- The line cord,
- All miscellaneous hardware (including the rack screws).

Your dealer may charge you for any missing items.

If you are returning a unit for repair, do not enclose any of the above items.

Further advice on proper packing and shipping is included in the Manual (see Table of Contents).

## Trouble

If you have problems with installation or operation:

(1) Check everything you have done so far against the instructions in the Manual. The information contained in the Manual is based on our experience with **SEPsOniX** and broadcast stations.

(2) Check the other sections of the Manual (consult the Table of Contents and Index) to see if there might be some suggestions regarding your problem.

(3) After reading all applicable sections, you may call JT Communications LLC Customer Service for advice during normal Florida business hours. The number is (1) 352-236-0744.



### **WARNING**

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the radio Interference Regulations of the Canadian Department of Communications. (Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques (de la classe A) prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.)



### **IMPORTANT**

Perform the installation under conventional static control conditions. Basic damage prevention consists of minimizing generation, discharging any accumulated static charge on your body or work station and preventing that discharge from being sent to or through an electronic component. A static grounding strap (grounded through a protective resistor) and a static safe workbench with a conductive surface should be used. This will prevent any buildup or damaging static.

**JT Communications, LLC Ocala, FL USA 352-236-0744**  
**email: [broadcastsupport@jtcomms.com](mailto:broadcastsupport@jtcomms.com)**

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- 1- Introduction
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### 1- INTRODUCTION

The *SEPs*niX FM processor is a complete, single-rack mount instrument, which contains all the necessary functions for conventional FM broadcast audio processing. It incorporates many of the features found in the high dollar FM processors, yet includes additional features not found in those same high-dollar devices.

Some of those features include:

- Independent compressor out – to send signals to internet streams or external monitoring.
- Programmable FM signal generator – allowing the processed output to be monitored locally on an FM modulation monitor/FM tuner, particularly for in-studio processing requirements.
- No-latency design- this allows air talent to be able to listen to the the off-air audio in real-time.

The *SEPs*niX FM processor contains the following features:

- Stereo operation,
- Broadband, smooth-riding AGC,
- Two bands of limiting,
- Compression 'freeze'; eliminating audio breathing during gain changes,
- Ultra-fast true-stereo pre-emphasis limiter (50-75-100uS selectable)
- Stereo generator with digital balanced modulation of the 38kHz subcarrier,
- Adjustable composite transient peak suppressor with LED indicator,
- All controls front-panel multi-turn adjustments,
- LED indicators: input Vu, dual-color band limiting, HF limiting, Composite clip, Stereo ON,
- SCA/RDS input,
- XLR/Phone balanced inputs, RFI protected,
- Post-Compressor output (0 or -10db)
- Optional frequency-agile FM signal generator, 87.7-107.9MHz, 100kHz steps, -10dBm RF output level.
- 90-250VAC 50-60Hz AC input
- Single 1RU enclosure 12" depth.

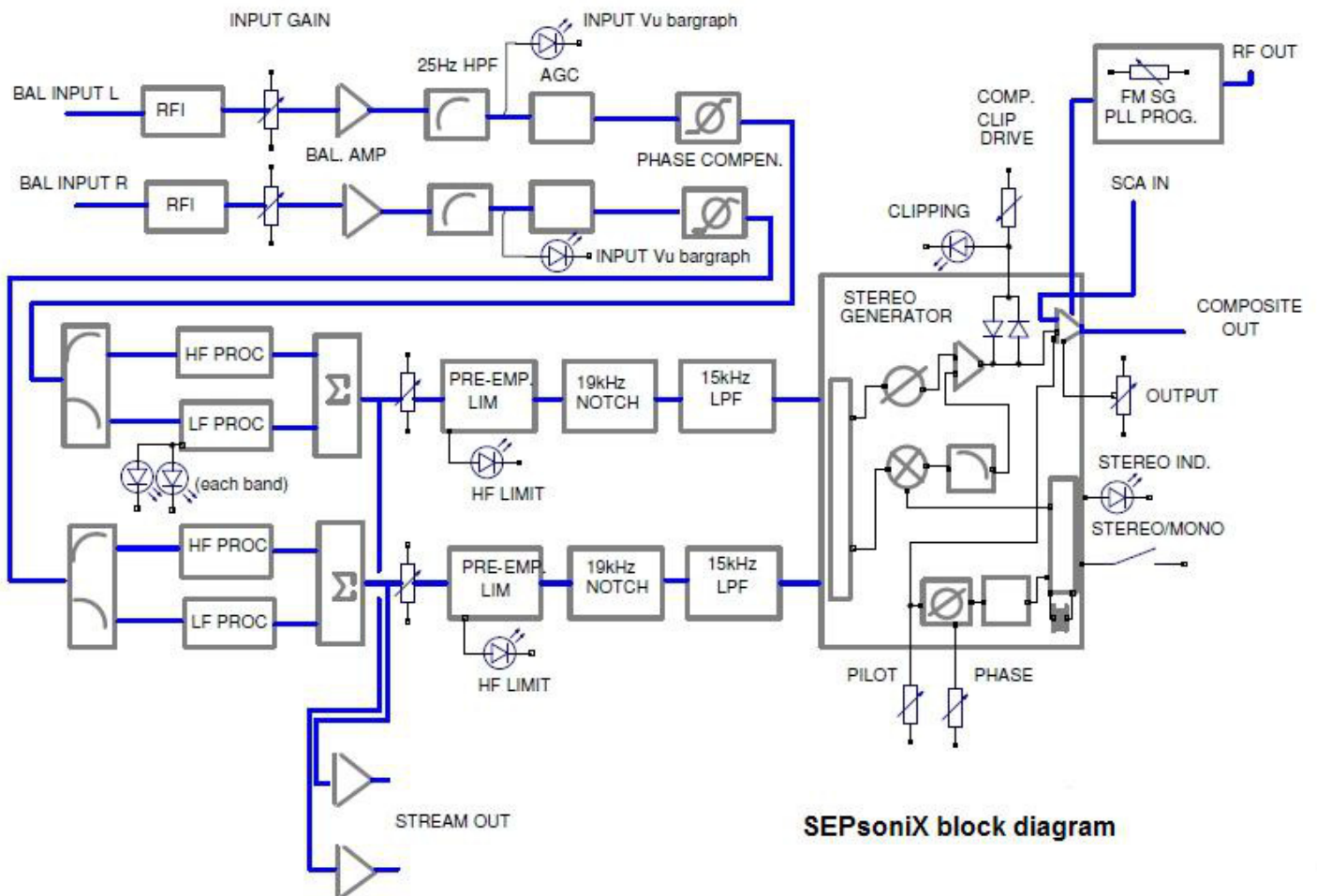
*SEPs*niX is designed to accept unprocessed audio, direct from a program source, and not require additional processing for desired on-air result, The functionality of the device is engineered to:

- 1) Control audio gain as much as 30dB, compressing the audio content and levels that may not be normally adjusted and monitored by the user,
- 2) Compensate for the effects of over-modulation from the effects of high-frequency pre-emphasis,, by use of ultra-fast pre-emphasis audio limiting, independently of L&R channels,
- 3) Prevent "ailising" distortions that may occur in the stereo generaton process, though the use of active 15kHz low-pass and 19kHz notch filtering of the audio,

- 4) Contain an FCC-compliant stereo generator,
- 5) Employ the use of an adjustable composite transient peak suppression circuit, preventing peaks of frequent recurrence from over-modulating the composite envelope, without affecting pilot injection,
- 6) Provide a stereo post-limiting output signal, for use in streaming applications, or external processed audio source,
- 7) Contain a frequency-agile, PLL synthesized signal generator (if installed), capable of sending processed audio to a modulation monitor or FM tuner, for the purpose of direct off-air monitoring,
- 8) Produce no measurable audio latency through the processing path.
- 9) Allow the user rapid setup and installation with no need for menus, touch-screens, or expansive setup procedures.

The **SEPsoniX** FM processor factory-set filters, time constants, and parameters are optimized for a variety of music formats, and create non-fatiguing audio quality, yet maintains a loudness factor in which the audio will remain competitive yet clean. The simplified installation and setup reduces the need to spend countless hours of adjustment, and reduces the need to undergo countless listening tests. With just a few minutes of adjustments, the **SEPsoniX** processor can be ready to provide years of service.

All voltage controlled gain stages utilize digital PWM (pulse-width modulation) technology, which provides superior gain control, eliminating the anomalies that occur with linear type gain control electronics, virtually temperature-independent, and extremely high gain linearity between left and right channels. Using 6x oversampling, the need for complicated PWM filtering circuitry is minimized.



**SEPsoniX block diagram**

The *SEPs*oniX FM processor contains several basic blocks to perform the necessary functions. Referring to the block diagram above it includes:

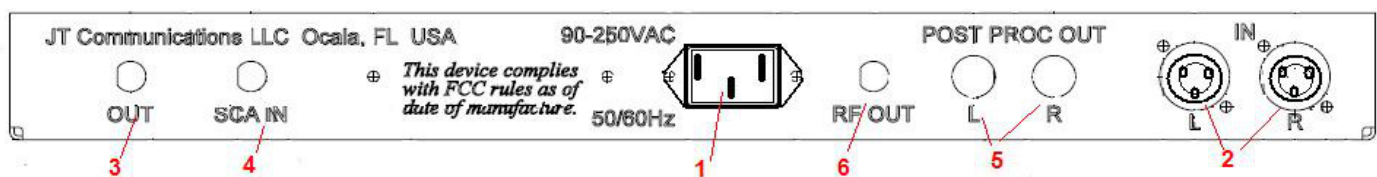
- 1) An input conditioning block, which consists of an RFI-protected audio input amplifier, adjustable to the nominal input signal. This is simplified by observing a front-panel LED Vu meter, and setting the levels for nominal readings. The input is then passed through a 25Hz, high-pass filter, with an 18dB/octave slope. This will reduce any audio subsonics that typically cause undesired results in audio processing, and on-air anomalies in some transmitters. Audio is then passed through an all-pass phase shift network, which helps compensate for asymmetrical audio peaks.
- 2) A broadband automatic gain control stage automatically adjusts for long range gain changes, as much as +/-15dB. The detection of the gain is dependent on the peak limiter stage content, and derives the control voltage from the output of the peak limiters. This allows for smoother gain-riding with varying program content.
- 3) A dual-band peak compressor, with factory-set time constants, which processes audio independently above and below 200Hz. Time constants are factory-adjusted so that the audio compression attack time is fast enough to respond to program content, and a responsive release time providing a non-fatiguing audio quality. Front-panel dual-colored LED's show the operation of the compressor stages, changing from green (normal) to high (red). Additionally, the use of compressor 'freeze' circuitry will cause any gain changes to be suspended whenever program content suddenly stops. This prevents the compressors from gain-riding during silent program content, reducing the 'breating' effect of compression release times, which results in noise build-up, and un-natural audio quality. The independent bands are then summed together, and passed through a safety low-pass filter, which eliminates any aliasing distortions that may occur into the pre-emphasis limiter, as well as any remaining switching products from the PWM stages.
- 4) The next block is an ultra-fast PWM-controlled pre-emphasis limiter, which responds to instantaneous high-frequency audio that exceeds the internal limits along the 75 $\mu$ S (50 $\mu$ S and 100 $\mu$ S internally programmable) pre-emphasis curve. The limiter is only affected by high frequencies (rather than the peak level of the pre-emphasized audio content), eliminating the possibility of modulation of high frequency content caused by low-frequency program content. The limit threshold is set internally, so that the limiting can occur with the correct balance between high and low-frequency program content. The user can adjust the input gain to the high-frequency limiter, if additional emphasis is desired on the program content, resulting in an increase in the total audio drive to the stereo generator, while increasing the amount of pre-emphasis limiting simultaneously. The amount of high-frequency limiting is indicated with front-panel LED's.
- 5) Processed audio is then routed through a 6-pole active 15kHz low-pass filter, which eliminates any frequency material that may be outside the desired audio passband. In addition, the use of an active 19kHz notch filter reduces the chances of any audio components interfering with the stereo 19kHz pilot signal.
- 6) Filtered audio is passed on to the stereo generator, which produces the stereo baseband signal. Front panel controls can enable the stereo pilot signal, indicated by an LED. When switched to MONO, the 19kHz pilot/38kHz carrier are fully turned off, and both Left and Right channels are summed into the main channel. This eliminates the need to combine both program channels to a single input, occasionally required with some conventional processors. The stereo generator utilizes the 'matrix' technique, as opposed to the 'switching' method. This eliminates the need for a costly baseband filter, and only needs to modulate the L-R component. When in Mono, L+R component is passed directly as a mono composite signal. The 38kHz L-R digital balanced modulator is superior to analog modulators, and is essentially drift-free with regard to carrier suppression and temperature variations. The stereo generator is internally factory aligned for optimum performance, and does not require re-calibration on a normal basis. Pilot phase and injection are adjustable with multi-turn front-panel controls.

- 7) A composite transient peak-suppression limiter (AKA "composite clipper") protects the composite signal from exceeding the allowable FM deviation limits set by the radio broadcasting rules. Front-panel control adjustable, and utilizing an LED indicator, the LED provides the user a visual gauge as to the degree of transient peak-suppression occurring in the composite transient limit process. The transient suppression limiter does not affect the 19kHz pilot injection, and will not cause any effect on the 19kHz pilot signal. The pilot signal (and a fixed external SCA/RDS input on the rear panel) are summed into the peak-suppression output, and final output of the composite signal is split, and one path routes to an adjustable front-panel control for the main composite output on the rear panel.
- 8) The second split of the final output is routed to an internal frequency-agile FM signal generator (if installed). The FM signal generator is capable of delivering an RF output to a rear panel jack, for the purpose of monitoring the processed audio on a local FM monitor or tuner. The nominal output level (typ. -10dBv) is sufficient to drive the receiver input of a modulation monitor, without the need for any RF amplification to the monitor. Contained on the signal generator is a set of DIP switches to set the frequency between 87.7-107.9Mhz in 100kHz increments, and a modulation calibration adjustment for final modulation adjustment.
- 9) The compressor output (L,R) is routed to a set of unbalanced rear-mounted jacks, for the purpose of sending processed audio to a monitor or audio streaming device. The line output can be internally set for either 0dB or -10dB. This audio follows the dual-band compressor output.

## 2- INSTALLATION

It is important that the **SEPsoniX** chassis be properly connected to a good earth ground. At very high frequencies (VHF), wire leads do not provide sufficient grounding. The best method is to ground the **SEPsoniX** to a well-grounded equipment rack, which should be connected to the station or building ground with wide strapping. To make a good electrical contact between the **SEPsoniX** chassis and equipment rack, it may be necessary to scrape the paint from the **SEPsoniX** mounting flanges and rack cabinet. If necessary, measure the resistance between the rack and **SEPsoniX** chassis, and assure that it is less than 0.5 ohm.

## REAR PANEL DESCRIPTION



*Refer to the diagram above diagram for the rear panel description.*

**1- AC Power in-** Connect to AC power source (90-250 VAC) using the supplied grounded IEC power cable. If you are wiring directly to AC mains, follow this color code:

<u>wire color</u>	<u>function</u>
Green or Green/Yellow:	Earth (Ground)
Brown or Black	AC hot
Blue or White	AC neutral

*note: Internal power supply is fuse protected against overloads and shorts. **Do NOT replace with a fuse of higer rating than specified.***

**2- Audio Inputs (L & R)**- These are female XLR or female TRS 1/4" jacks, with the following pinout

xlr pin	1/4" plug	description
1	sleeve	earth ground
2	tip	audio in +
3	ring	audio in -

In a high RF environment, it is recommended that a fully-balanced source connect to the input jacks of the *SEPs oniX*, using a well shielded cable (similar to Belden 8451). Connect shield of cable at both ends for best performance. In addition, your source should also be well grounded to earth.

In low RF environments, it is best to connect the shield at one end only. Avoid unbalanced connections, but if necessary, limit length to less than 20 feet. When connecting to an un-balanced source, do not connect the audio (-) lead directly to the *SEPs oniX* chassis. Instead, tie the (-) lead at the source ground, and do not connect the shield at the source.

*SEPs oniX* will operate over a wide range of audio inputs, ranging from -10dbV (re:0.775v) to +24dbV. Try to avoid input levels greater than +20dbV, as adjusting the input level correctly may be difficult to achieve.

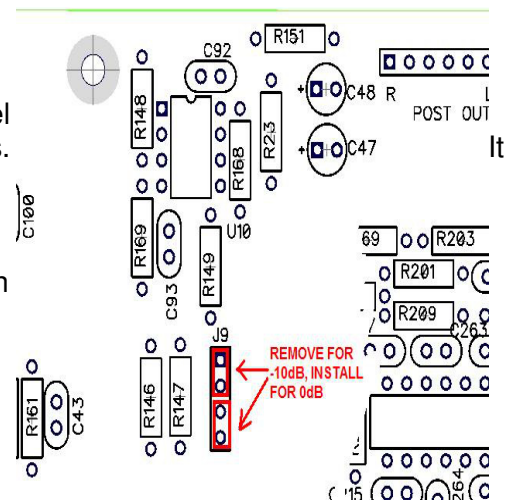
It is very important that the input connectors are wired in phase, otherwise your mono audio will cancel, and you will only hear 'echos' or very hollow sounding audio in the main channel.

The audio inputs are at a 10K (bridging) resistive load, and should originate from a low impedance source (typically 600 ohm loads from most audio equipment is standard).

**3- Composite out**- This output is capable of driving at least 4v p-p into a 2k load. It is recommended to use a 6' or less well shielded 50-75 ohm coaxial cable length between the *SEPs oniX* and FM transmitter.

**4- SCA/RDS in**- This 10k-ohm resistive input allows for subcarrier/multiplex insertion of the main signal, and is mixed with the pilot injection signal in the *SEPs oniX*. Signals such as SCA or RDS can be inserted at this input, and the external drive level must be adjusted for proper injection into the multiplexed signal.

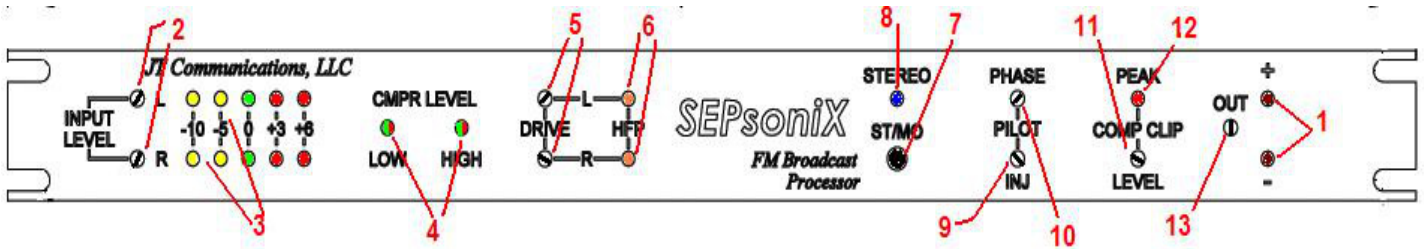
**5- Post Process Out**- This is an isolated post-compressor output. This output can connect directly to most computer sound card AUX/Line level inputs. It is recommended to use the -10dB level set for computer feeds. has a drive impedance of 2k ohms. Care should be taken when connecting this output in a high RF field, and audio isolation transformers may be needed to reduce the potential for ground loops. This output is an unbalanced line level post-compressor output, and can be set to either 0dB or -10dB below reference level. See diagram on right for for the jumper detail.----->  
You can alternately connect to a streaming source, or audio amplifier, for local/remote monitoring.



**6- RF OUT**- This is the RF output of the frequency-agile signal generator(if installed), and will drive a 50-75 ohm load, with an average output level of -10dBm re:1mW. This output will allow the user to monitor the audio performance, or for use as an in-studio monitor on an FM receiver with an antenna RF input jack, such as a modulation monitor RF input **NOTE: THIS RF OUTPUT IS NOT INTENDED TO BE CONNECTED TO AN ANTENNA FOR USE AS A TRANSMITTING DEVICE!**



## FRONT PANEL DESCRIPTION



Refer to the diagram above diagram for the front panel description.

**1- Power indicators-** These LED's will indicate when AC power is applied, and they will both illuminate. If either LED is out, there is an internal issue with the power supply circuitry, and the unit will not operate properly.

**2- Input gain controls (L&R)-** These multi-turn controls adjust the audio input level, as indicated by the **(3) LED Vu meters**. Adjust input for 0Vu, with peaks to +3 to +6 range. *Avoid excess peaks above +6, as this will cause higher levels of compression, which may not be desired.* Input can operate at high peaks, however, compression will be greatly increased, and may cause a more 'dense' sound.

**4- Compression level indicators-** These dual-colored LED's show the approximate amount of compression for the Low and High bands. When green, this indicates approx 6dB of compression, and red is 15dB or over. These are dependent on the program content, input levels, and spectral energy in the dynamics.

**5- Drive (L&R)-** These multi-turn controls increase the drive to the HF limiter, which also increases the amount of HF limiting that will occur. Increasing the level of these controls will also increase the drive to the composite transient suppressor circuitry.

**6- HF Limit indicators (L&R)-** These LED's will illuminate as the intensity of HF limiting increases. The amount of HF limiting is program and level dependent, and may vary widely with a diversity of program content. Increasing the Drive (5) control will increase the density on the HF material, as well as increase the drive to the composite peak suppressor circuitry.

**7 & 8 - Stereo/Mono selector & Stereo LED indicator-** This pushbutton, when depressed, will place the *SEPsoniX* in stereo mode, and when released, mono. This switch (when in MONO) disables the master oscillator for the stereo subcarrier and pilot. The Stereo LED indicator is connected to the oscillator circuitry, and shows active oscillation when illuminated. When in mono, the Left and Right channels are summed, and the entire sub-carrier is shut down, only allowing main channel (L+R) to exit the *SEPsoniX* output.

**9-Pilot Level adjustment-** This multi-turn control adjusts the pilot injection level, and should be carefully set with the proper monitoring equipment.

**10- Pilot Phase adjustment-** This control adjusts the phase relationship between the pilot and subcarrier frequencies, and should be set for maximum separation between left and right channels.

**11 & 12- Transient peak suppressor drive (Comp Clip level) & Composite Clip indicator-** This control adjusts the amount of signal drive to the peak suppressor (AKA "composite clipping") and should be used with discretion. The Composite Clip indicator LED will illuminate on transients at the clip level, and the increased brilliance will indicate more aggressive clipping. *NOTE: The use of composite clipping should be used with discretion, as excess clipping will affect stereo separation, and increased peak distortion of severely over-driven.* Increasing the DRIVE (5) controls will also increase the amount of clipping. A variation between the DRIVE and CLIP LEVEL can affect the density of high frequency limiting-to-clipping ratio, and subjective testing should be conducted to obtain desired result.

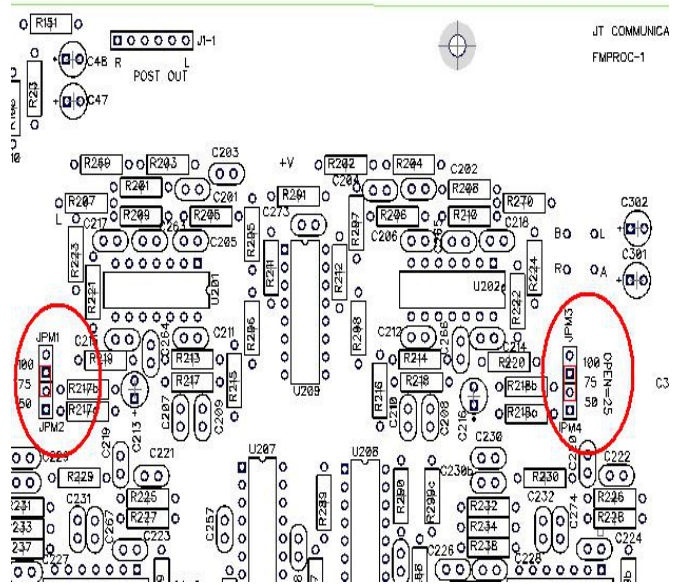
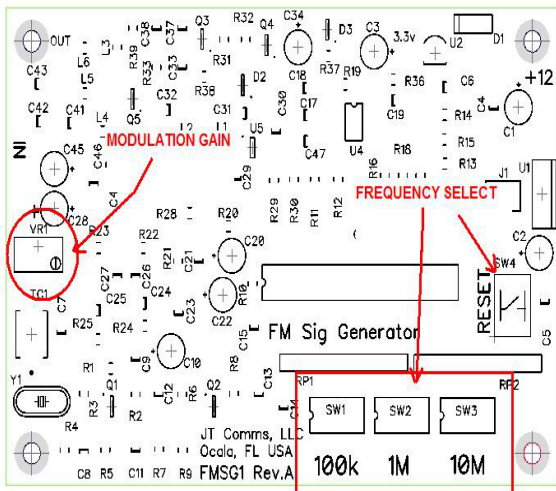
Occasional flashing will be normal, and byproducts are not easily heard unless the flashing intensity is long and steady flashing of peaks over the clip threshold. What will be noticed is a 'scratching' sound in the stereo image, appearing in both channels simultaneously. Increased clipping will add to this sound until the separation is degraded to a point of sonic inferiority.

**13- Output level-** This is the final output drive to the exciter/FM transmitter. The multi-turn control will provide fine resolution of the audio envelope driving the exciter, and should be setup with a modulation analyzer or other means to assure FM deviation does not exceed the legal limits.

*Note: Increasing this control increases the TOTAL modulation to the transmitter, including: Pilot, External Multiplex audio, and processed audio (post clipped).*

**INTERNAL CONTROLS**

**1- Pre-emphasis select-** These jumpers, factory set at 75µS, select the pre-emphasis curve for the pre-emphasis range. They can be set for 50, 75, or 100µS for left and right channels. They are located on the main board, in the middle section. ----->



**<-2- FM Signal Generator modulation/frequency set-**

These controls are located on the FM signal generator PC board, in front of the the rear-panel audio input PC board. Switches are read on power-up, or when RESET button is depressed on the PC board.

Connect modulation monitor source to RF output jack on the **SEPsoniX** rear panel. Set modulation to desired level by adjusting the **Modulation Gain** control on the left-hand side of the board. Clockwise rotation increases modulation percentage.

**3- OPERATION**

**MAIN SIGNAL FLOW SETUP**

*To best setup the **SEPsoniX** desired operation, it is recommended to connect an oscilloscope to the composite output jack before placing the unit on the air. You can also monitor the audio result from the internal FM signal generator RF output, by conneting a radio receiver or modulation monitor to the RF output jack of the **SEPsoniX**. This will prevent the chance of overmodulation or annoyances to the listeners while making adjustments. By observing the output on the scope, you will be able to adjust output levels more proportionately, as well as see any undesired effects of over-processed audio.*

Once your **SEPsaniX** is installed and operational, supply desired program content to the input jacks, and adjust front panel input gain controls to desired Vu readings. You should start to see the compression LED's flashing green and red, depending upon program dynamics, program content, and input levels. HF limiting LED's will also flash, depending on the levels/program content, etc., and drive level settings to the HF limiter.

You can place the **SEPsaniX** in Stereo, and the Stereo LED will illuminate. Set the pilot level to optimum initial setting, as it may require re-adjustment once desired output "envelope" is set. Placing the switch in Mono will sum left and right channels, and remove all stereo sub-carriers. (Switching between Stereo/Mono *will NOT affect any external Multiplexed insertion signals*).

Optimum separation is obtained by adjusting the PILOT PHASE control. To properly adjust, disconnect one audio input channel, and adjust the PILOT PHASE control until the disconnected channel audio reaches a 'null'.

Observe the Composite Clip LED; increasing the HF Drive will cause the Clip LED to also increase in intensity to some degree. Adjusting the composite clip drive level will cause the output to approach a point where noticeable 'flat-topping' of the waveform will occur, with the pilot riding along the top of the flat-topped wave. This is the point where the transients will not be any greater than the "flat topped" reference level.

Increasing the amount of flat-topping (by increasing either the CLIP drive or HF drive) will increase perceived loudness without increasing modulation peaks, but excess flat-topping will cause degradation of stereo image/separation. Adjust the amount of clipping with discretion, and desired result. Excessive flat-topping may cause audible distortion on some program content, and should be avoided as to reduce listener fatigue.

If more HF limiting is desired, you can increase the HF drive controls, and reduce the CLIP drive until a desired sound is obtained. Subjective listening will result in the best and desired result.

Once desired output envelope is obtained, connect Composite Output to transmitter, and adjust modulation for desired deviation with OUT control.

## **POST PROCESSING OUTPUT SETUP**

Connect external audio device (computer, network stream, etc) to RCA jacks on rear panel. These jacks are recessed so that accidental impacts will not damage the connectors. Since this is an unbalanced output, be sure connections to audio devices do not produce any ground loops; it may be necessary to install audio isolation transformers (Triad TY-145P will work well if connected to high-Z input) to reduce the chance of audio ground loops. Observe polarity on transformers for proper phasing into equipment.

The output level is fixed at either 0dB or -10dB below reference, and can be changed with the configuration jumpers detailed in section 2 (Installation).

## **FM SIGNAL GENERATOR PROGRAMMING** (if installed)

The frequency selection process is set by three 4-position DIP switches. Each set controls the frequency in decades of 100kHz, 1MHz, and 80, 90, or 100MHz increments.

Each set range is a count between 0-9, and any numbers greater than 9 will default to the value of 9. Any attempt to set a frequency outside the range specified in the frequency limits will result in either the lowest or highest frequency available. The count uses inverted logic, where ON= 0 and OFF=1. Binary math is used to set the desired frequency. For example, if 99.5 Mhz is desired, the DIP switches (LSB on the left) would be 0101 0110 01x0 (0.5 9 90)

The DIP switch farthest to the right is a "Locked Reset" setting, and if set to ON, will keep microprocessor disabled in a permanent locked mode. This will prevent any setting of the RF output frequency. Leave this switch in the OFF position when using the Signal Generator.

LEGEND: 1=ON 0=OFF x=don't care y=LEAVE OFF

FREQ	100kHz				1MHz				10MHz			FREQ	100kHz				1MHz				10MHz											
pos	1	2	3	4	1	2	3	4	1	2	3	4	1	2	x	y	pos	1	2	3	4	1	2	3	4	1	2	x	y			
87.7	0	0	0	1	0	0	0	1	0	1	--	93.4	1	1	0	1	0	0	1	1	1	0	--	99.1	0	1	1	1	0	1	0	--
87.8	1	1	1	0	0	0	0	1	0	1	--	93.5	0	1	0	1	0	0	1	1	1	0	--	99.2	1	0	1	1	0	1	0	--
87.9	1	1	1	0	0	0	0	1	0	1	--	93.6	1	0	0	1	0	0	1	1	1	0	--	99.3	0	0	1	1	0	1	0	--
88.0	1	1	1	1	1	1	1	0	0	1	--	93.7	0	0	0	1	0	0	1	1	1	0	--	99.4	1	1	0	1	0	1	0	--
88.1	0	1	1	1	1	1	1	0	0	1	--	93.8	1	1	1	0	0	0	1	1	1	0	--	99.5	0	1	0	1	0	1	0	--
88.2	1	0	1	1	1	1	1	0	0	1	--	93.9	0	1	1	0	0	0	1	1	1	0	--	99.6	1	0	0	1	0	1	1	--
88.3	0	0	1	1	1	1	1	0	0	1	--	94.0	1	1	1	1	1	1	0	1	1	0	--	99.7	0	0	0	1	0	1	1	--
88.4	1	1	0	1	1	1	1	0	0	1	--	94.1	0	1	1	1	1	1	0	1	1	0	--	99.8	1	1	1	0	0	1	1	--
88.5	0	1	0	1	1	1	1	0	0	1	--	94.2	1	0	1	1	1	1	0	1	1	0	--	99.9	0	1	1	0	0	1	1	--
88.6	1	0	0	1	1	1	1	0	0	1	--	94.3	0	0	1	1	1	1	0	1	1	0	--	100.0	1	1	1	1	1	1	1	--
88.7	0	0	0	1	1	1	1	0	0	1	--	94.4	1	1	0	1	1	1	0	1	1	0	--	100.1	0	1	1	1	1	1	1	--
88.8	1	1	1	0	1	1	1	0	0	1	--	94.5	0	1	0	1	1	1	0	1	1	0	--	100.2	1	0	1	1	1	1	1	--
88.9	0	1	1	0	1	1	1	0	0	1	--	94.6	1	0	0	1	1	1	0	1	1	0	--	100.3	0	0	1	1	1	1	1	--
89.0	1	1	1	1	0	1	1	0	0	1	--	94.7	0	0	0	1	1	1	0	1	1	0	--	100.4	1	1	0	1	1	1	1	--
89.1	0	1	1	1	0	1	1	0	0	1	--	94.8	1	1	1	0	1	1	0	1	1	0	--	100.5	0	1	1	0	1	1	1	--
89.2	1	0	1	1	0	1	1	0	0	1	--	94.9	0	1	1	0	1	1	0	1	1	0	--	100.6	1	0	0	1	1	1	1	--
89.3	0	0	1	1	0	1	1	0	0	1	--	95.0	1	1	1	1	0	1	0	1	1	0	--	100.7	0	0	0	1	1	1	1	--
89.4	1	1	0	1	0	1	1	0	0	1	--	95.1	0	1	1	1	0	1	0	1	1	0	--	100.8	1	1	1	0	1	1	1	--
89.5	0	1	1	1	0	1	1	0	0	1	--	95.2	1	0	1	1	0	1	0	1	1	0	--	100.9	0	1	1	0	1	1	1	--
89.6	1	0	0	1	0	1	1	0	0	1	--	95.3	0	0	1	1	0	1	0	1	1	0	--	101.0	1	1	1	1	0	1	1	--
89.7	0	0	0	1	0	1	1	0	0	1	--	95.4	1	1	0	1	0	1	0	1	1	0	--	101.1	0	1	1	1	0	1	1	--
89.8	0	0	0	1	0	1	1	0	0	1	--	95.5	0	1	0	1	0	1	0	1	1	0	--	101.2	0	1	1	1	0	1	1	--
89.9	1	1	1	0	0	1	1	0	0	1	--	95.6	1	0	0	1	0	1	0	1	1	0	--	101.3	1	0	1	1	0	1	1	--
90.0	1	1	1	1	1	1	1	1	1	0	--	95.7	0	0	0	1	0	1	0	1	1	0	--	101.4	1	1	0	1	0	1	1	--
90.1	0	1	1	1	1	1	1	1	1	0	--	95.8	1	1	1	0	0	1	0	1	1	0	--	101.5	0	1	1	1	0	1	1	--
90.2	1	0	1	1	1	1	1	1	1	0	--	95.9	0	1	1	0	0	1	0	1	1	0	--	101.6	1	0	0	1	0	1	1	--
90.3	0	0	1	1	1	1	1	1	1	0	--	96.0	1	1	1	1	1	0	0	1	1	0	--	101.7	0	0	0	1	0	1	1	--
90.4	1	1	0	1	1	1	1	1	1	0	--	96.1	0	1	1	1	1	0	0	1	1	0	--	101.8	1	1	1	0	1	1	1	--
90.5	0	1	0	1	1	1	1	1	1	0	--	96.2	1	0	1	1	1	0	0	1	1	0	--	101.9	0	1	1	0	1	1	1	--
90.6	1	0	0	1	1	1	1	1	1	0	--	96.3	0	0	1	1	1	1	0	1	1	0	--	102.0	1	1	1	1	1	0	1	--
90.7	0	0	0	1	1	1	1	1	1	0	--	96.4	1	1	0	1	1	1	1	0	1	0	--	102.1	0	1	1	1	1	0	1	--
90.8	1	1	1	0	1	1	1	1	1	0	--	96.5	0	1	0	1	1	1	1	0	1	0	--	102.2	1	0	1	1	1	0	1	--
90.9	0	1	1	0	1	1	1	1	1	0	--	96.6	1	0	0	1	1	1	1	0	1	0	--	102.3	0	0	1	1	1	0	1	--
91.0	1	1	1	1	0	1	1	1	1	0	--	96.7	0	0	0	1	1	0	0	1	1	0	--	102.4	1	1	0	1	1	0	1	--
91.1	0	1	1	1	0	1	1	1	1	0	--	96.8	1	1	1	0	1	0	0	1	1	0	--	102.5	0	1	1	0	1	0	1	--
91.2	1	0	1	1	0	1	1	1	1	0	--	96.9	0	1	1	0	1	0	0	1	1	0	--	102.6	1	0	0	0	1	0	1	--
91.3	0	0	1	1	0	1	1	1	1	0	--	97.0	1	1	1	1	0	1	1	0	1	0	--	102.7	0	0	0	1	1	0	1	--
91.4	1	1	0	1	0	1	1	1	1	0	--	97.1	0	1	1	1	0	0	1	1	0	1	--	102.8	1	1	1	0	1	0	1	--
91.5	0	1	0	1	0	1	1	1	1	0	--	97.2	1	0	1	1	0	0	1	1	0	1	--	102.9	0	1	1	0	1	0	1	--
91.6	1	0	0	1	0	1	1	1	1	0	--	97.3	0	0	1	1	0	0	1	1	0	1	--	103.0	1	1	1	1	0	0	1	--
91.7	0	0	0	1	0	1	1	1	1	0	--	97.4	1	1	0	1	0	0	1	1	0	1	--	103.1	0	1	1	1	0	0	1	--
91.8	1	1	1	0	0	1	1	1	1	0	--	97.5	0	1	1	1	0	0	1	1	0	1	--	103.2	1	0	1	1	0	0	1	--
91.9	0	1	1	0	0	1	1	1	1	0	--	97.6	1	0	0	1	0	1	1	0	1	0	--	103.3	0	0	1	1	0	0	1	--
92.0	1	1	1	1	1	0	1	1	1	0	--	97.7	0	0	0	1	0	1	1	0	1	0	--	103.4	1	1	0	1	0	0	1	--
92.1	0	1	1	1	1	0	1	1	1	0	--	97.8	1	1	1	0	0	1	1	0	1	0	--	103.5	0	1	0	1	0	0	1	--
92.2	1	0	1	1	1	0	1	1	1	0	--	97.9	0	1	1	0	0	1	1	0	1	0	--	103.6	1	0	0	1	0	0	1	--
92.3	0	0	1	1	1	0	1	1	1	0	--	98.0	1	1	1	1	1	1	0	1	0	1	--	103.7	0	0	0	1	0	0	1	--
92.4	1	1	0	1	1	0	1	1	1	0	--	98.1	0	1	1	1	1	1	0	1	0	1	--	103.8	1	1	1	0	1	0	1	--
92.5	0	1	0	1	1	0	1	1	1	0	--	98.2	1	0	1	1	1	1	0	1	0	1	--	103.9	0	1	1	0	1	0	1	--
92.6	1	0	0	1	1	0	1	1	1	0	--	89.3	0	0	1	1	1	1	1	0	1	0	--	104.0	1	1	1	1	1	1	0	--
92.7	0	0	0	0	1	0	1	1	1	0	--	98.4	1	1	0	1	1	1	1	0	1	0	--	104.1	0	1	1	1	1	1	0	--
92.8	1	1	1	0	1	0	1	1	1	0	--	98.5	0	1	0	1	1	1	1	0	1	0	--	104.2	1	0	1	1	1	1	0	--
92.9	0	1	1	0	1	0	1	1	1	0	--	98.6	1	0	0	1	1	1	1	0	1	0	--	104.3	0	0	1	1	1	1	0	--
93.0	1	1	1	1	0	0	1	1	1	0	--	98.7	0	0	0	1	1	1	1	0	1	0	--	104.4	1	1	0	1	1	1	0	--
93.1	0	1	1	1	0	0	1	1	1	0	--	98.8	1	1	1	0	1	1	1	0	1	0	--	104.5	0	1	0	1	1	1	0	--
93.2	1	0	1	1	0	0	1	1	1	0	--	98.9	0	1	1	1	0	0	1	1	0	1	--	104.6	1	0	0	1	1	1	0	--
93.3	1	0	1	1	0	0	1	1	1	0	--	99.0	1	1	1	1	0	0	1	1	0	1	--	104.7								

c

To program RF frequency, set DIP switches in accordance with chart, then either reset power, or press RESET button on PCB. Signal generator will then advance to programmed frequency, and remain on this frequency each time the power is cycled.

*Note: Setting DIP switches greater than 9 on 100kHz or 1MHz switches will default to a value of 9.*

FREQ	100kHz				1MHz				10MHz			FREQ	100kHz				1MHz				10MHz				
pos	1	2	3	4	1	2	3	4	1	2	x	y	pos	1	2	3	4	1	2	3	4	1	2	x	y
104.8	1	1	1	0	1	1	0	1	0	0	-	-	104.8	1	1	1	0	1	1	0	1	0	0	-	-
104.9	0	1	1	0	1	1	0	1	0	0	-	-	104.9	0	1	1	0	1	1	0	1	0	0	-	-
105.0	1	1	1	1	0	1	0	1	0	0	-	-	105.0	1	1	1	1	0	1	0	1	0	0	-	-
105.1	0	1	1	1	0	1	0	1	0	0	-	-	105.1	0	1	1	1	0	1	0	1	0	0	-	-
105.2	1	0	1	1	0	1	0	1	0	0	-	-	105.2	1	0	1	1	0	1	0	1	0	0	-	-
105.3	0	0	1	1	0	1	0	1	0	0	-	-	105.3	0	0	1	1	0	1	0	1	0	0	-	-
105.4	1	1	0	1	0	1	0	1	0	0	-	-	105.4	1	1	0	1	0	1	0	1	0	0	-	-
105.5	0	1	0	1	0	1	0	1	0	0	-	-	105.5	0	1	0	1	0	1	0	1	0	0	-	-
105.6	1	0	0	1	0	1	0	1	0	0	-	-	105.6	1	0	0	1	0	1	0	1	0	0	-	-
105.7	0	0	0	1	1	1	0	1	0	0	-	-	105.7	0	0	0	1	1	1	0	1	0	0	-	-
105.8	1	1	1	0	1	1	0	1	0	0	-	-	105.8	1	1	1	0	1	1	0	1	0	0	-	-
105.9	0	1	1	0	1	1	0	1	0	0	-	-	105.9	0	1	1	0	1	1	0	1	0	0	-	-
106.0	1	1	1	1	1	0	0	1	0	0	-	-	106.0	1	1	1	1	1	0	0	1	0	0	-	-
106.1	0	1	1	1	1	0	0	1	0	0	-	-	106.1	0	1	1	1	1	0	0	1	0	0	-	-
106.2	1	0	1	1	1	0	0	1	0	0	-	-	106.2	1	0	1	1	1	0	0	1	0	0	-	-
106.3	0	0	1	1	1	0	0	1	0	0	-	-	106.3	0	0	1	1	1	0	0	1	0	0	-	-
106.4	1	1	0	1	1	0	0	1	0	0	-	-	106.4	1	1	0	1	1	0	0	1	0	0	-	-

**note: when changing frequency, it may be necessary to re-calibrate modulation level. Due to change in VCO voltage, modulation sensitivity changes with frequency**

**ADJUSTMENT RANGES:**

Input range: -15 to +25dBv re: 0.775v RMS 600 ohm source  
 HF Drive range: up to 6dB.  
 Stereo Pilot range: fully adjustable at any output setting for guranteed 8-10% injection settings.  
 Comp transienet limit range: up to 6dB.  
 Output range: with full compression @ 1kHz: <100uV P-P to 8V P-P?.  
 Signal Genertor tuning range: any frequency from 87.7MHz to 107.9 Mhz, in 100 kHz steps.

**FACTORY SETTINGS:**

The **SEPsoniX** is factory set to the following adjustments:

Input level 0vU @ 400Hz: 0dBv re:0.775v 600 ohms  
 HF Drive: 50% of range (-3dB)  
 Output level: 4v P-P, into 1k ohm load  
 Mode: Stereo  
 Pilot injection: 9% injection of 2V RMS output level.  
 Composite clip level: 2dB clipping  
 FM generator frequency: 107.9 Mhz  
 FM generator audio level: Calibrated to +/- 75kHz deviation with compisite processing and stereo pilot engaged.

**ADDITIONAL PRE-PROCESSING DEVICES**

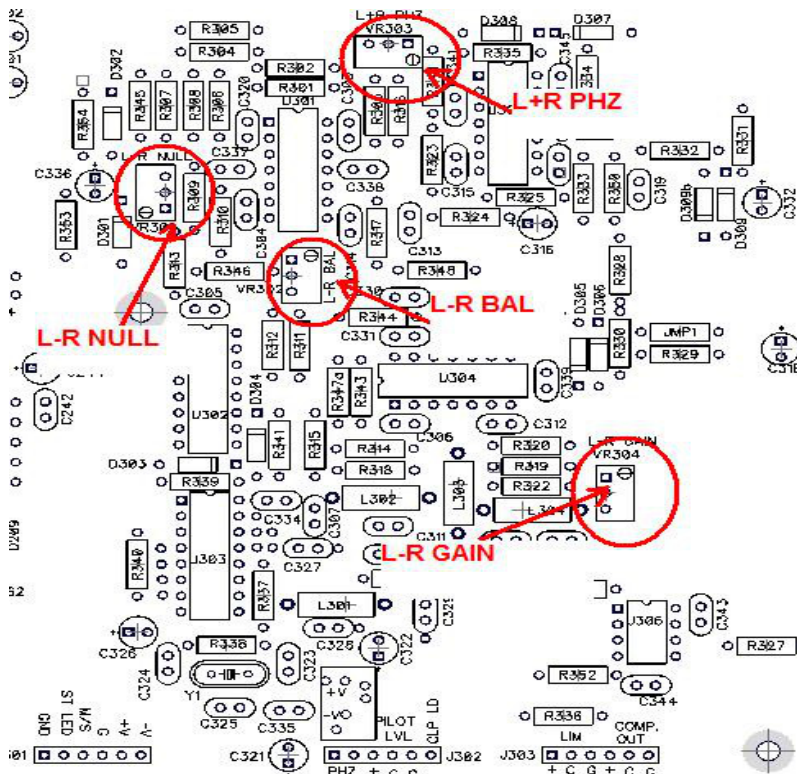
It may be desired to connect additional audio tailoring to the **SEPsoniX**, for the purpose of additional program frequency equalization, dynamics processing, or other audio effects for spealized requirements. When doing this, the additional tailoring will affect how **SEPsoniX** responds, including reacting to frequency emphasis, gain-riding, or preceived loudness. Keep in mind; over-compensating for program content may or may not provide desired results, and subjective listening tests should be conducted before determinig how much external tailoring is needed for expected performance.

## 5- TROUBLESHOOTING

### stereo generator calibration procedure:

If it becomes necessary to re-calibrate the stereo generator, you will need at least a 20MHz oscilloscope, and a sinewave audio generator. To re-calibrate:

- 1) Connect signal generator to input terminals of device, set frequency to 400Hz, sinewave output, line level out( 1vRMS is satisfactory),
- 2) Adjust input levels on front panel until dual color compressor LED's are barely indicating green illumination.
- 3) Connect oscilloscope to composite output, and set waveform for visible deflection of approx 1/2 full vertical scale range.
- 4) Set unit to Stereo mode, Blue stereo LED should illuminate.
- 5) Set pilot level fully CCW so that no observable pilot signal is seen on output.
- 6) Disconnect audio inputs, and increase sensitivity on scope so that the noise floor can be seen.
- 7) Adjust **L-R NULL** for *minimum* output, or as low as visibly possible. You can alternately connect a low-frequency spectrum analyzer to the composite output, and adjust the 38kHz carrier level for minimum output. Re-set vertical gain of oscilloscope to setting in step (3) above.
- 8) Connect audio Right channel and observe oscilloscope. Adjust **L-R GAIN** for flat baseline.
- 9) Increase audio frequency to 10kHz, but reduce audio generator input level by 15dB. Avoid HF limiter LED's from illuminating, and reduce audio level further to refrain from HF limiting action.
- 10) Adjust **L+R PHZ** for as flat a baseline as possible. Reset audio generator to 400 Hz, and increase level as in step (1) above.
- 11) Disconnect left audio in, and connect Left audio in.
- 12) Adjust **L-R BAL** for flat baseline
- 13) Repeat steps (8) and (11/12) so that baseline is equally flat for left and right channels. Repeat step (10).



## **6- Specifications**

### Processor:

Configuration: mono or stereo  
Input connectors: L & R XLR or 1/4" TRS balanced  
Input impedance: 10k ohms, resistive, AC coupled, RFI protected  
Max useable input level: +27dBm, re 0.775vRMS.  
Input HP filter: 18dB/octave 25Hz high-pass  
AGC range: +/-15dB, depending upon compression levels, follows compressor gain.

### Compressor/limiter

Bands: Two, PWM-controlled  
Crossover frequency: 200 Hz, active filtered, zero-phase crossover configuration.  
Compression ratios: Factory-set time constants on attack and release.  
Gain freeze: Time-constant holding, when program content stops.

### HF Limiter:

Type: Active, PWM gain controlled; follows along pre-emphasis curve  
Pre-emphasis: 50, 75, or 100uS, jumper configurable  
Pre-emphasis limiting: Ultra-fast full-wave peak analog detection.  
Composite transient processing speed: <4nS.

### Stereo generator:

Pilot protection: Active 6-pole 15kHz Butterworth lowpass, followed by active twin-tee 19kHz notch  
Pilot frequency/stability: 19000 Hz, +/- 1 Hz max over temperature  
38kHz supression: >60dB below reference carrier  
Stereo Separation: typ. 50 dB, 30 Hz – 15 kHz  
Pilot injection level adjustment range: infinite (full range)  
Processing delay: no perceivable delay  
Composite output connector: BNC  
Composute output impedance: 50 ohms, short-circuit protected  
Load impedance: 600 ohms or greater  
External SCA/RDS input: 10k ohm resistive, BNC connection

### Post-processing output:

Post-processing output jack: RCA, unbalanced, L & R  
Post-processing output level: 0dB or -10dB (jumper programable) re: nominal output

### FM signal generator ( if installed ) :

type: Direct FM, PLL, DIP switch programmable.  
input level: user adjustable  
frequency range: 87.7Mhz- 107.9Mhz, in 100 kHz steps  
output level: typ -10dBm (re:1mW)  
output impedance: 50-75 ohms

### Overall:

AC Power requirement: 90-250VAC, 50/60 Hz  
Operating temp. Range: 0 to +50 degrees C  
Humidity: 0–95% RH, non-condensing.  
Max. Altitude: 35,000 feet  
Overall dimensions: 19" 1 R.U. (1.75") x 12" D.  
Shipping weight: 7 Lbs (3.175Kg)  
RFI/EMI: Tested according to FCC Part 15 Class A device.

## **6- Warranty**

### **ONE-YEAR LIMITED WARRANTY ON PARTS AND LABOR-**

**Covers Product purchased as new only.**

*JT COMMUNICATIONS LLC provides a warranty to the original purchaser of new*

*Products against defects in materials and workmanship for a period of*

**One (1) year of normal usage.**

**This warranty is not transferrable.**

*If a Product covered by this warranty is determined to be defective within the warranty period, JT COMMUNICATIONS LLC will, unless otherwise required by applicable law, either repair or exchange the Product at its sole option and discretion.*

#### **How to Obtain Warranty Service**

*(An RMA required) To obtain warranty service, contact JT COMMUNICATIONS LLC Technical Support via email: [TechSupport@jtcomms.com](mailto:TechSupport@jtcomms.com) or by telephone at 352-236-0744(USA) from 9:00AM to 5:00PM Monday through Friday (holidays excluded), Eastern Time zone.*

*PRE-AUTHORIZATION MUST BE OBTAINED BEFORE SENDING PRODUCT TO A JT COMMUNICATIONS LLC SERVICE CENTER. Proof of purchase in the form of a purchase receipt or copy thereof is required to show that a Product is within the warranty period.*

*Exchange: Should JT COMMUNICATIONS LLC elect to exchange a Product due to a covered defect during the warranty period, the replacement unit may at JT COMMUNICATIONS LLC's Sole option and discretion, be new or one which has been recertified, reconditioned, refurbished or otherwise remanufactured from new or used parts and is functionally equivalent to the original Product.*

*Repair: Parts and Labor There will be no charge for parts or labor to repair a Product for a covered defect during the warranty period. Replacement parts may, at JT COMMUNICATIONS LLC's sole option and discretion, be new, used, reconditioned, refurbished or otherwise remanufactured or recertified as functionally equivalent replacement parts.*

*Remaining Warranty: Repaired or exchanged units are warranted for the remaining portion of the Product's original warranty or for ninety (90) days from warranty service or exchange, whichever is longer. Any upgrade to the original Product will be covered only for the duration of the original warranty period.*

*Returning a Product for Warranty Service: After obtaining pre-authorization from JT COMMUNICATIONS LLC Technical Support (see above), defective Products within the warranty period must be sent to a JT COMMUNICATIONS LLC service center to obtain warranty service. JT COMMUNICATIONS LLC is not responsible for transportation costs to the service center, but JT COMMUNICATIONS LLC will cover return shipping to the customer. Products returned to JT COMMUNICATIONS LLC's service centers must be shipped in either the original carton box and shipping material or packaging that provides an equal degree of protection. JT COMMUNICATIONS LLC Technical Support will provide instructions for packing and shipping the covered Product to the JT COMMUNICATIONS LLC service center.*

*Exclusions- This warranty does not cover, for example: abuse, accident, acts of God, and protective coatings, cosmetic damage (e.g. scratches, dents, cracks), odor, damage caused by misuse with other products (e.g. accessories, housing, parts or software), damages from shipping, improper installation or operation, failure to follow installation/operation instructions, improper voltage supply or power surges, operating with higher than rated fuse, lack of reasonable use, misuse, modifications or alterations, normal wear and tear or aging, as well as installation and set-up issues or any tampering. Product repairs attempted by anyone other than by a JT COMMUNICATIONS LLC authorized service center. Products with unreadable or removed serial numbers or requiring routine maintenance are not covered.*

*This one year limited warranty does not cover Products sold "AS IS", "FACTORY RE-CERTIFIED", or by a non-authorized reseller.*

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