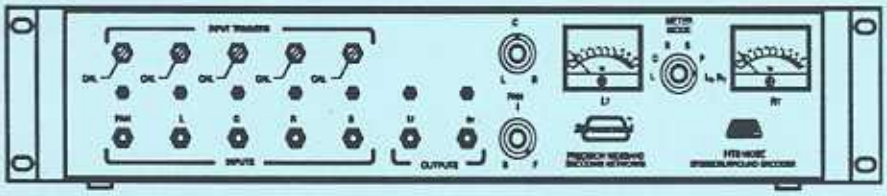
Operating Manual

HTS100SE
STEREOSURROUND® ENCODER

Precision Wideband Encoding Networks



Stereosurround®

MULTI-CHANNEL ENCODING

SHURE®
Shure HTS
222 Hartrey Avenue, Evanston, Illinois 60202-3696
High Resolution Products for Home Theater and Professional Applications

HTS100SE
STEREOSURROUND ENCODER

THE ENCODING PROCESS

The HTS100SE Stereosurround Encoder employs the Shure HTS Stereosurround process, an outgrowth of motion picture surround sound technology specifically refined for use in broadcast, in music recording, and in all kinds of audio/video productions, including HDTV. In the Stereosurround process, precision wideband matrix networks encode four channels into two conventional stereo channels. Stereosurround encoding is a 4–2–4 matrix process designed to effectively create four audio channels while using only two actual storage or transmission channels. It is nonsymmetrical in the sense that the decoding portion involves adaptive matrix modification (steering) logic circuits to make the system output perform as if four independent discrete channels are employed throughout. The HTS100SE has been designed as a companion product to the Shure HTS200SD Stereosurround Decoder which features patented Acra-Vector® decoding logic. In addition, the encoded productions are also fully compatible with a wide variety of today's surround decoders (including Dolby Stereo®, Dolby Surround®, and Ultra Stereo® types), as well as with two-speaker stereo and single-speaker mono reproduction equipment.

Stereosurround makes it possible to create acoustic ambience and spatial realism in productions, bringing added excitement and impact to the listening experience. Even more important than its creation of environmental and ambient sounds, the Stereosurround encoding process vastly improves frontal imaging, beyond what is possible with conventional two-speaker stereo. Although the process is designed to give maximum performance benefit to consumers with sophisticated decoding equipment, the same production is compatible with two-speaker stereo and single-speaker monophonic reproducing systems.

The Stereosurround production process is a technological art form with the following capabilities:

1. Accurate localization of dialog, music, and sound effects across a three-loudspeaker front sound stage for listeners seated in a wide listening area.
2. Unambiguous rear sound localization of specific music and sound effects.
3. Creation of interior sounds that surround the listener with environmental or ambience effects from all directions.
4. Smooth panning capabilities across the front sound stage, and between front, interior, and rear locations.
5. Simultaneous reproduction of localized or panned sounds and interior sounds.

ENCODER CHARACTERISTICS

The HTS100SE Encoder is a unity gain device, with active balanced inputs and outputs, capable of handling +24 dBm levels. All inputs and outputs can also be operated unbalanced, with either "+" or "–" shorted to ground.

Two sets of inputs and outputs are provided, one set on the front and one on the back panel of the unit. Front panel connectors are TT and 1/4-inch stereo phone jacks; back panel connectors are three-pin XLR types. The front panel TT and 1/4-inch jacks are paralleled. Front and back inputs and outputs are all individually buffered.

In addition to the four main inputs (Left, Center, Right, and Surround) on front and rear panels, a fifth Pan input is provided. Two front panel controls allow panning the input signal from Left to Right through the Center position and from Front to Surround through an Interior position. An Encoder block diagram is shown in Figure 1.

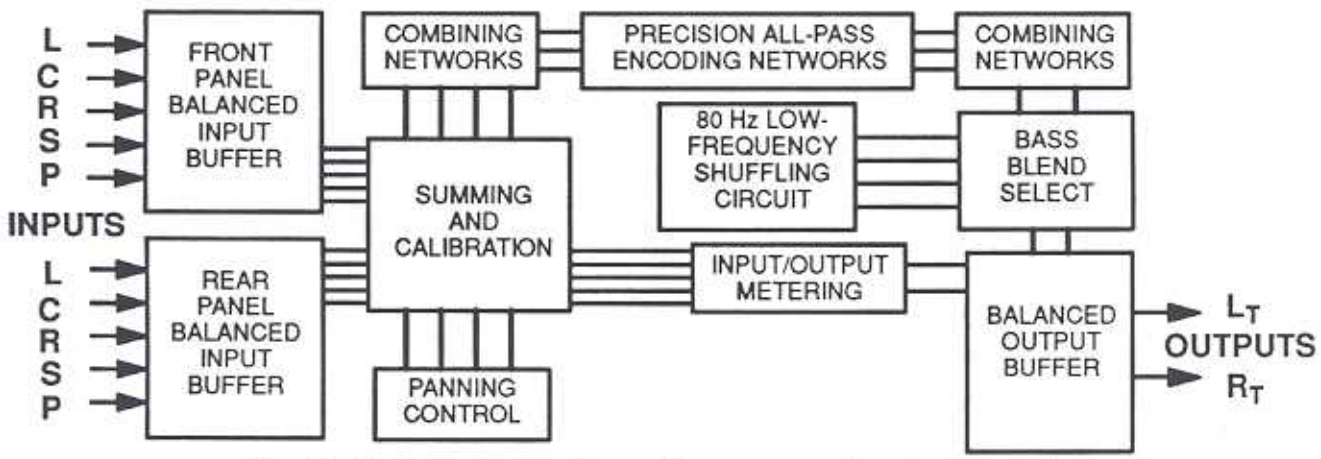


Fig. 1. Stereosurround encoder system signal processing.

The Encoder is equipped with a Bass Blend Circuit shipped in the Off or inactivated position. When the Bass Blend Circuit is Off, the low-frequency response for all signals extends to approximately 4 Hz. When the Bass Blend Circuit is switched On*, it provides a 12 dB/octave rolloff of low-frequency **difference** signals, while maintaining a flat response for low-frequency sum signals in the L_T and R_T outputs. At 80 Hz, when the Bass Blend is On, response is down 6 dB for difference signals, while 10 dB left-to-right separation is maintained at this frequency.

Metering is provided for all inputs and outputs. A rotary switch selects the desired metering point. The first five positions, labeled L, C, R, S, and P are used to meter **input** levels. In these positions, the Left meter shows the combined level of all inputs to the selected position. The Right meter is Off. In the sixth position, L_T/R_T, the Left meter indicates the total Left **output** level and the Right meter indicates the total Right **output** level. An internal meter-sensitivity switch* allows switching "0 VU" between + 4 dBm and +8 dBm (shipped with meter set at 0 VU = + 4 dBm).

Trimmer controls allow a ± 2 dB range of adjustment for each input. The controls operate on the combined feed to the input. The detented "CAL" position indicates 0 dB of gain.

COMPATIBILITY WITH CONSUMER FOUR-, TWO-, AND SINGLE-CHANNEL REPRODUCTION SYSTEMS

FOUR-CHANNEL SYSTEMS

Full benefits of the Stereosurround process will be realized by the listener with a Shure HTS Acra-Vector Logic Decoder. In addition, Stereosurround productions are also compatible with a wide variety of other logic and non-logic decoders such as those identified as Dolby Surround®, Dolby Surround Pro·Logic®, Dolby Stereo®, and Ultra Stereo®. Consequently, all listeners will benefit to the extent permitted by the capabilities of their particular decoding and reproducing systems. For instance, surround systems **without** enhancement logic will decode the production, but with reduced separation between channels. The Stereosurround encoding signal flow block diagram in Figure 2 shows that all original signals are present in the two storage or transmission channels L_T and R_T.

TWO-CHANNEL SYSTEMS

In two-speaker stereo reproducing systems, left and right information will be accurately assigned, while the center channel will appear in both outputs at a reduced level, thus creating a phantom center image. The surround information will also appear in both channels, at a reduced level, with opposite polarity, which typically results in a diffuse image, realistic for ambient information.

SINGLE-CHANNEL SYSTEMS

Monophonic systems will reproduce all signals with the exception of the surround channel input. The effect is completely acceptable to the listener, since pans to and from the surround position will cause the production element to fade out and in, resulting in a credible image. In addition, in production practice, a compatible surround image can be created by panning near, but not all the way to the surround position. In such cases, a portion of the surround element of the mix is present in the mono $L_T + R_T$ signal.

*Access to internal parts permitted only by qualified service personnel.

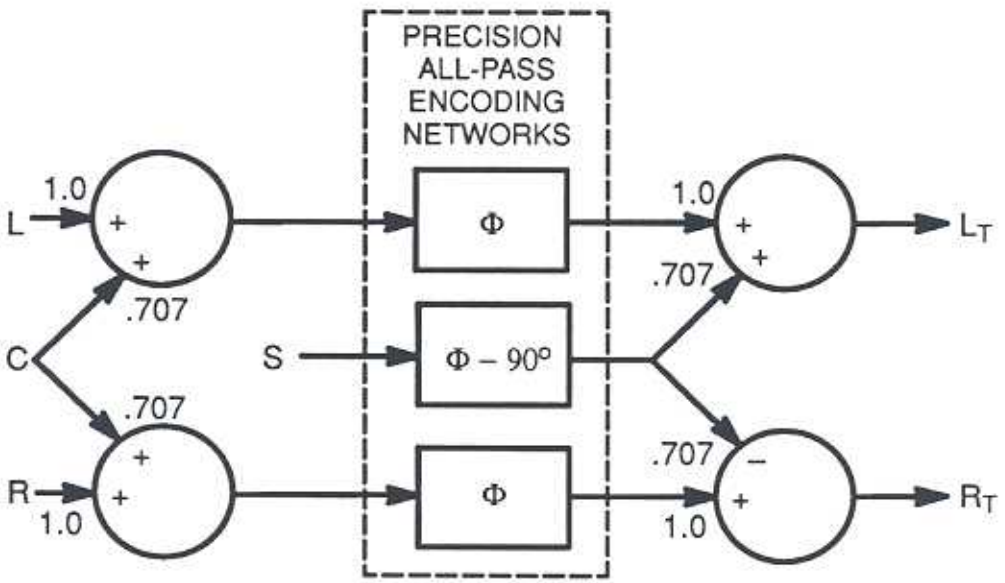


Fig. 2. Stereosurround Encoding Signal Flow

OPERATION

The Stereosurround process is an ideal post production process because the mixing engineer can refine the mix to obtain maximum benefit from the technique. Excellent results are also obtainable from live or live-to-tape productions provided the audio elements are predictable and known mixing incompatibilities are avoided.

A basic element of any Stereosurround production is the establishment of a monitoring environment that allows the mixing engineer to properly audition the Stereosurround mix. Such a setup is shown in Figure 3. All three front loudspeakers should ideally be the same or have very similar tonal characteristics. They should be located at the same listening height with the Center speaker as close as possible to the video monitor (if used) and located just above or just below the screen. Because of the Center channel, the Left and Right loudspeakers can be more widely spaced than for conventional two-speaker productions. (Consequently, it is usually desirable to audition the two-speaker compatibility of a Stereosurround production with the left and right speakers moved inward.)

Reproduction of the single surround channel is best done with a group of loudspeakers in order to create a diffuse sound field. Four speakers are shown in Figure 3; however, two can often be used in small production environments. The speakers should be positioned so that the sound mixer is free to move around with no significant change in the perceived level of the Surround channel. Best results are generally obtained with speakers located high off the floor (5 to 8 feet) in order to reduce disruption of the sound field by other listeners as they move near an individual loudspeaker. A practical check on surround channel reproduction is to move around the desired listening space, checking for uniform sound level while reproducing a pink noise source.

Because the encoding process is linear, more than one encoder can be used during a production provided that all the L_T and R_T outputs of each decoder are summed as a part of the final decoding and monitoring process (thus, $L_{T1} + L_{T2} + L_{T3} + ... + L_{Tn} = L_{Ttotal}$ and $R_{T1} + R_{T2} + R_{T3} + ... + R_{Tn} = R_{Ttotal}$). This capability is of particular value in made-for-television or video productions where there may be a need to alter the production mix at a later time, particularly with respect to additional language releases. In such cases, three encoders are used, one each for dialog, music, and effects (DME), and their outputs recorded on a six-track format. Similarly, in a multi-site live production environment, separate encoders may be used for each location and combined at the production mixer location. Figures 4 and 5 are typical setup block diagrams for post production and live or live-to-tape applications.

The following are a number of useful mixing techniques and observations:

1. Because 4–2–4 matrix systems are not discrete and localization problems can occur, start by mixing the most dominant sound elements first.
2. When using compression or limiting on dialogue or a vocalist, avoid processing any additional ambient signals through the same compressor/limiter, in order to avoid the dominant sound's causing the ambient sounds to pump up and down. With a multichannel reproduction system, this result is particularly bothersome.
3. Keep in mind that it is possible to continuously pan signals between the front and surround locations, and that it is not necessary to pan a program ele-

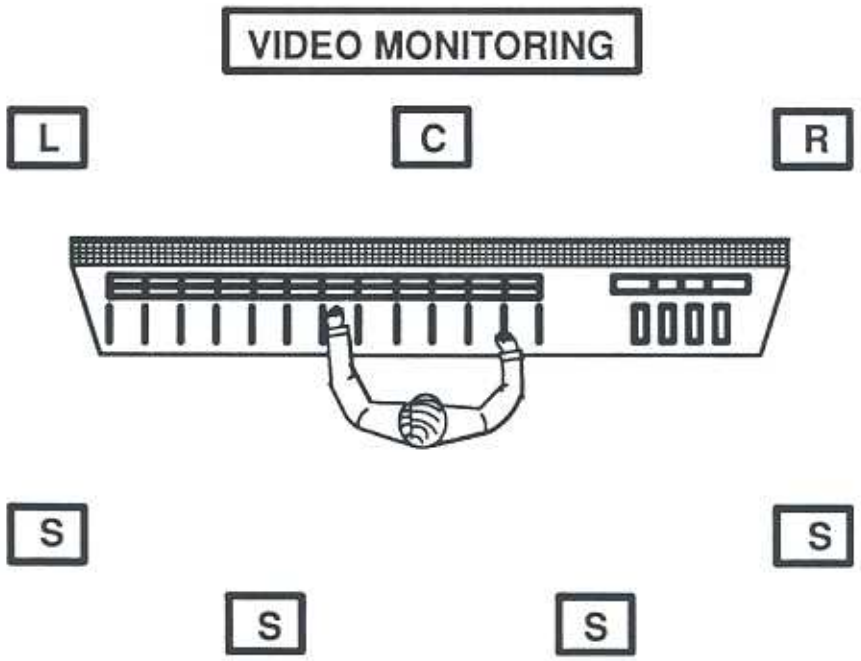


Figure 3. Stereosurround Loudspeaker Monitoring Locations

ment completely to the surround position in order to obtain a noticeable rearward or surround sense to the mix.

4. When mixing music, start by mixing sound elements directly to the L, C, and R positions and mixing effects to the interior position. Use separate effects devices for each element. Once the mix has been roughed in, further adjustments can be considered.
5. If problems occur regarding localization interactions between two or more sound elements, consider panning one of the signals more toward the interior position, altering its timing, or reducing its amplitude.
6. When using multiple microphones in situations where two or more microphones may pick up the same signal, make sure to maintain an in-phase relationship from each microphone's acoustic input to its mixing console output to the encoder. This will greatly reduce the possibility of undesired out-of-phase information being mixed into the interior or surround position.

Developing a mix using the Stereosurround process is similar to two-speaker stereo and single-speaker monophonic mixing, once the configuration of the mixing board and source assignments have been made. In a typical setup, connect the outputs from the mixing console to the five input buses of the Encoder so that each console fader is assigned to or panned between any two input buses. With this condition established, the signal controlled by each fader can then be panned in the "mixing space" to the desired position as the mix is being monitored.

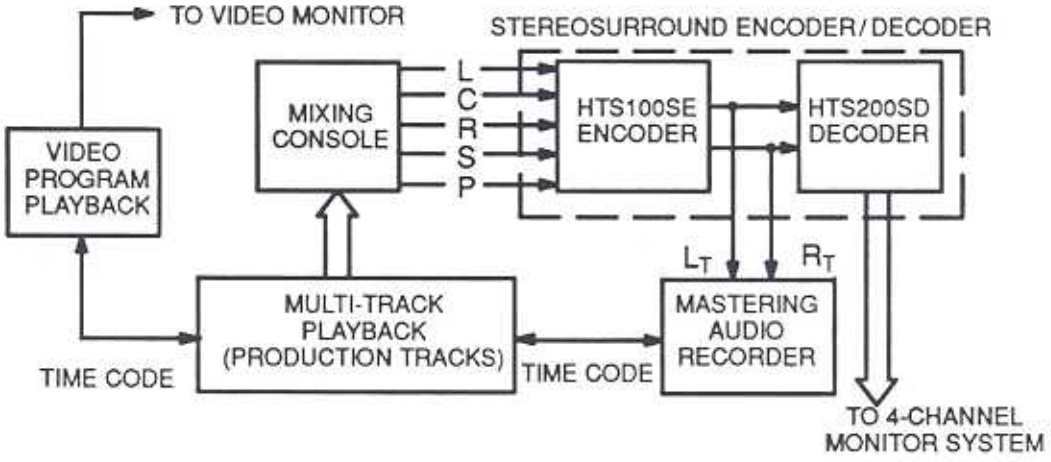


Fig. 4. Stereosurround post-production equipment block diagram.

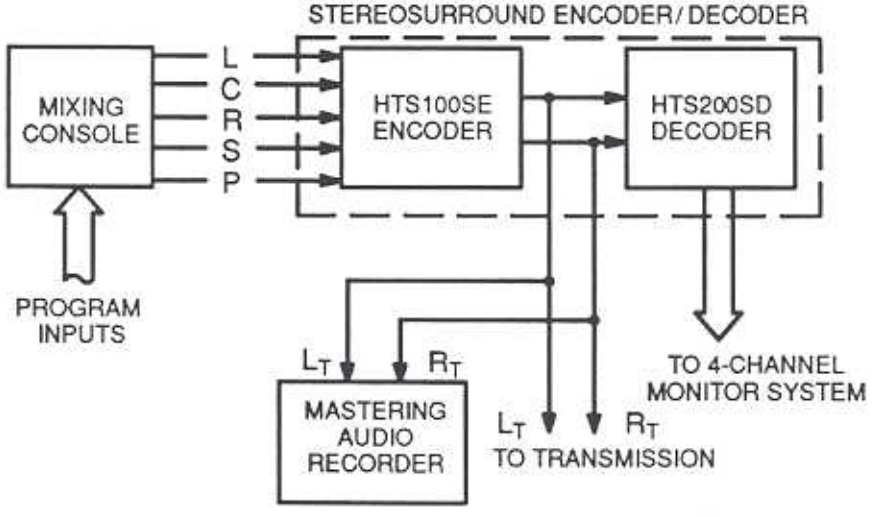


Fig. 5. Stereosurround live or live-to-tape production block diagram.

SERVICE INSTRUCTIONS

CAUTION

These servicing instructions are for use by qualified personnel only. To avoid electric shock do not perform any servicing other than that contained in the Operating Instructions unless you are qualified to do so. Refer all servicing to qualified service personnel.

INTERNAL SWITCH ADJUSTMENTS

Two internal switch adjustments are possible. Disconnect the Encoder from the power supply before opening the top. Then remove the four Phillips head screws attaching the top cover to the Encoder, and remove the cover. **Before reconnecting the Encoder to the power supply, replace the cover and tighten the screws.**

BASS BLEND CIRCUIT ACTIVATION

To activate the Bass Blend Circuit, locate its control switch on the largest pc board as shown on Figure 6. Move the switch from Off to On. When the Circuit is On, difference signals will roll off at 12 dB/octave below 80 Hz. (See the explanation on page 3 in the Encoder Characteristics section.)

VU METER ADJUSTMENT

The HTS100SE is shipped with both VU Meters set for 0 VU = + 4 dBm. To change the 0 VU setting to + 8 dBm, locate the switch on the smaller pc board as shown on Figure 6 and move the switch from +4 to + 8.

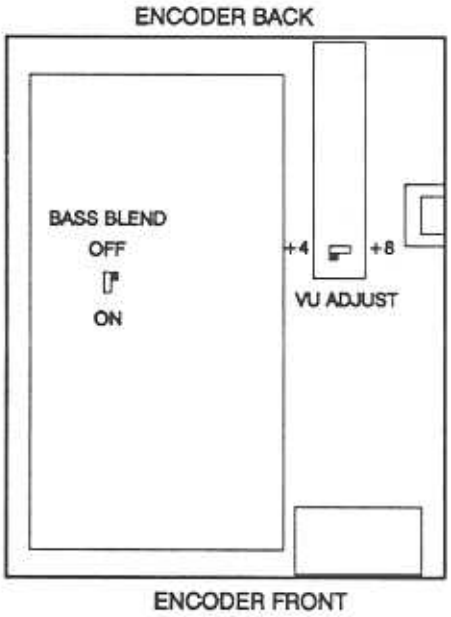


Fig. 6. HTS100SE Encoder, Internal PC Board and Switch Locations

SPECIFICATIONS

Frequency Response
4 Hz to 100 kHz, +0, –3 dB, all inputs

Input Clipping Level
+24 dBm (Balanced connections)

Input Level Trim Adjustment Range
± 2 dB

Input Impedance

Balanced Input	20 kilohms
Unbalanced Input	10 kilohms

Output Clipping Level
+ 24 dBm

Output Impedance

Balanced Output	75 ohms
Unbalanced Output	75 ohms

Gain (at 1 kHz)
Balanced input to balanced output: 0 dB
Balanced input to unbalanced output: –.4 dB

Total Harmonic Distortion
Less than .01% at 1 kHz at +4 dBm
Less than 0.1% 20 Hz to 20 kHz at +4 dBm

Output Noise
–88 dBm typical unweighted, 20 Hz to 20 kHz

Signal Polarity
Non-inverting at all outputs (Due to the nature of the encoding process, it is normal for the inputs to the Surround channel to appear at the outputs with opposite polarity.)

Input Connectors
Front Panel: 1/4-in. stereo phone jacks and stereo TT jacks; phone and TT jacks paralleled for each input
Back Panel: 3-pin XLR-type connectors
(Pin 1 of XLR = sleeve; Pin 2 = tip; Pin 3 = Ring of TT and 1/4 in.phone jacks)

Front Panel Controls
Input Trimmers: Rotary with detented Calibration position; Affects all connectors for each input;
Pan Controls:
Upper Control: Continuous pan from full Left through Center to full Right
Lower Control: Continuous pan from full Surround through Interior to full Front

Output Connectors
Front Panel: 1/4-in. stereo phone jacks and stereo TT jacks; phone and TT jacks paralleled for each output
Back Panel: 3-pin XLR-type connectors
Front and back panel outputs are individually buffered
(Pin 1 of XLR = sleeve; Pin 2 = tip; Pin 3 = Ring of TT and 1/4 in.phone jacks)

VU Meters
Factory set at 0 VU = + 4 dBm, internally switch–adjustable to + 8 dBm (for adjustment by qualified service personnel only); see VU Meter Adjustment section

Bass Blend Circuit
Switch On (for adjustment by qualified service personnel only): 12 dB/octave rolloff of $L_T - R_T$ signals, down 6 dB at 80 Hz; flat for $L_T + R_T$ signals; 10 dB left-to-right separation at 80 Hz; see Bass Blend Circuit section
Switch Off (as shipped): low-frequency response for all signals is flat down to approximately 4 Hz

Operating Voltage
120 Vac ± 10 %, 60 Hz, 36 W

Power Connector
IEC 320 type, 10 A rated
Externally replaceable fuse; replace only with same type 0.3 A, 125 VAC fuse

Power Cord
Supplied, with IEC 320 type mating connector, 3 x 18 AWG cable, NEMA 5-15P plug

Certifications
Listed by Underwriters Laboratories Inc.

Dimensions
88.9 mm H x 419 mm W x 406 mm D (3-1/2 x 16-1/2 x 16 in.), 19-inch rack mountable

Net Weight
3.9 kg (8-1/2 lb)

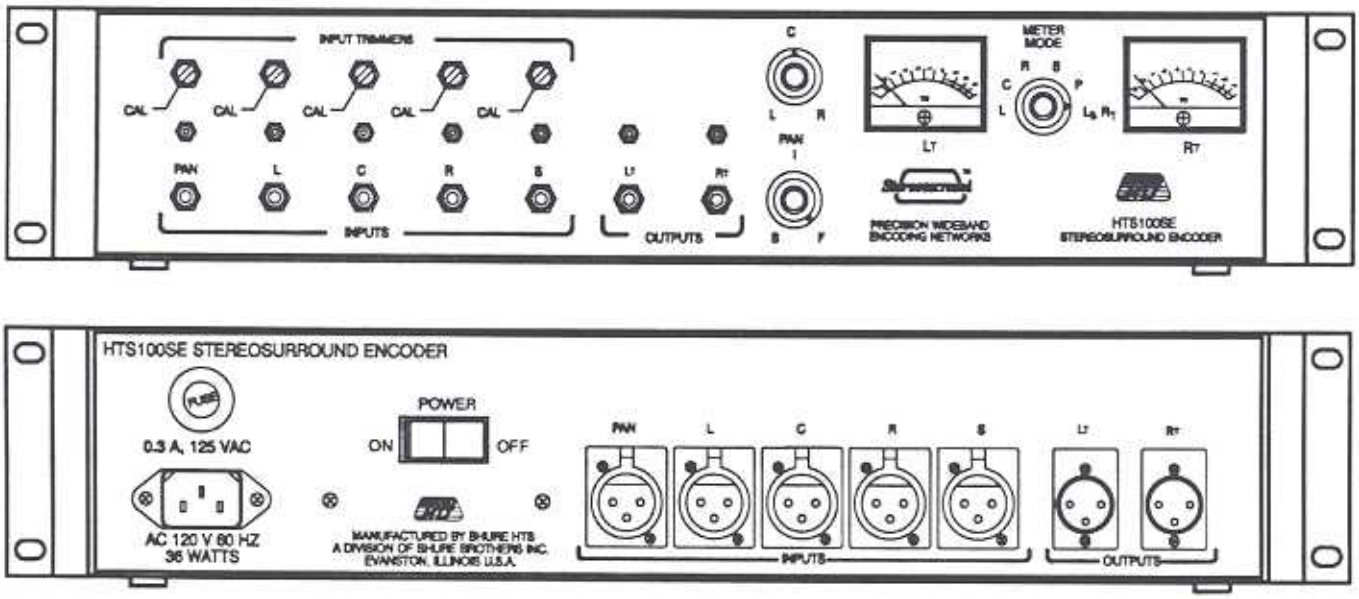


Fig. 7. Front and back panels of HTS100SE Stereosurround Encoder