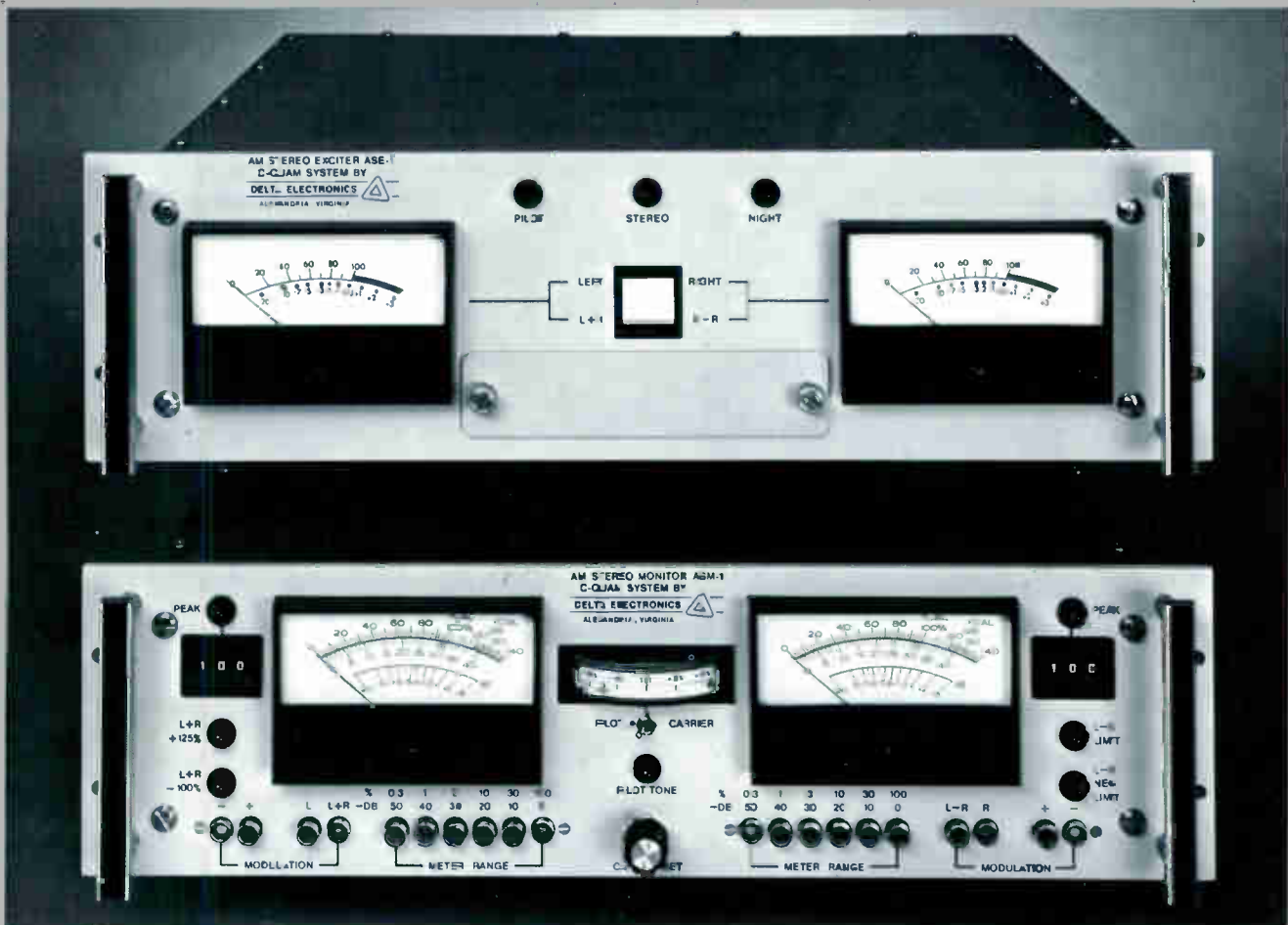


C-QUAM[®]

AM Stereo System



Improved ASE-1 AM Stereo Exciter ASM-1 AM Stereo Modulation Monitor

- FCC Laboratory tested and type-accepted
- Easily interfaces to most transmitters
- Improved stereo separation and frequency response
- Internationally accepted as the system of choice for AM stereo

- Precision equipment; rugged and reliable Delta construction

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DELTA ELECTRONICS INC.



Delta C-QUAM Stereo

Delta's C-QUAM® Stereo Exciter and Stereo Modulation Monitor produce an AM stereo quadrature modulated signal having superior separation and low distortion throughout the audio spectrum. The ASE-1 Exciter and ASM-1 Monitor C-QUAM System is completely compatible with existing monaural receivers and multimode decoder receivers.

Delta's C-QUAM Stereo transmission system is a full spectrum system providing separation from 50 Hz to over 10 kHz. Its signal can be demodulated by simple envelope detectors to produce a low distortion monophonic audio signal while stereo receivers demodulate the same signal to full stereo. All listeners receive a clean, low distortion audio signal.

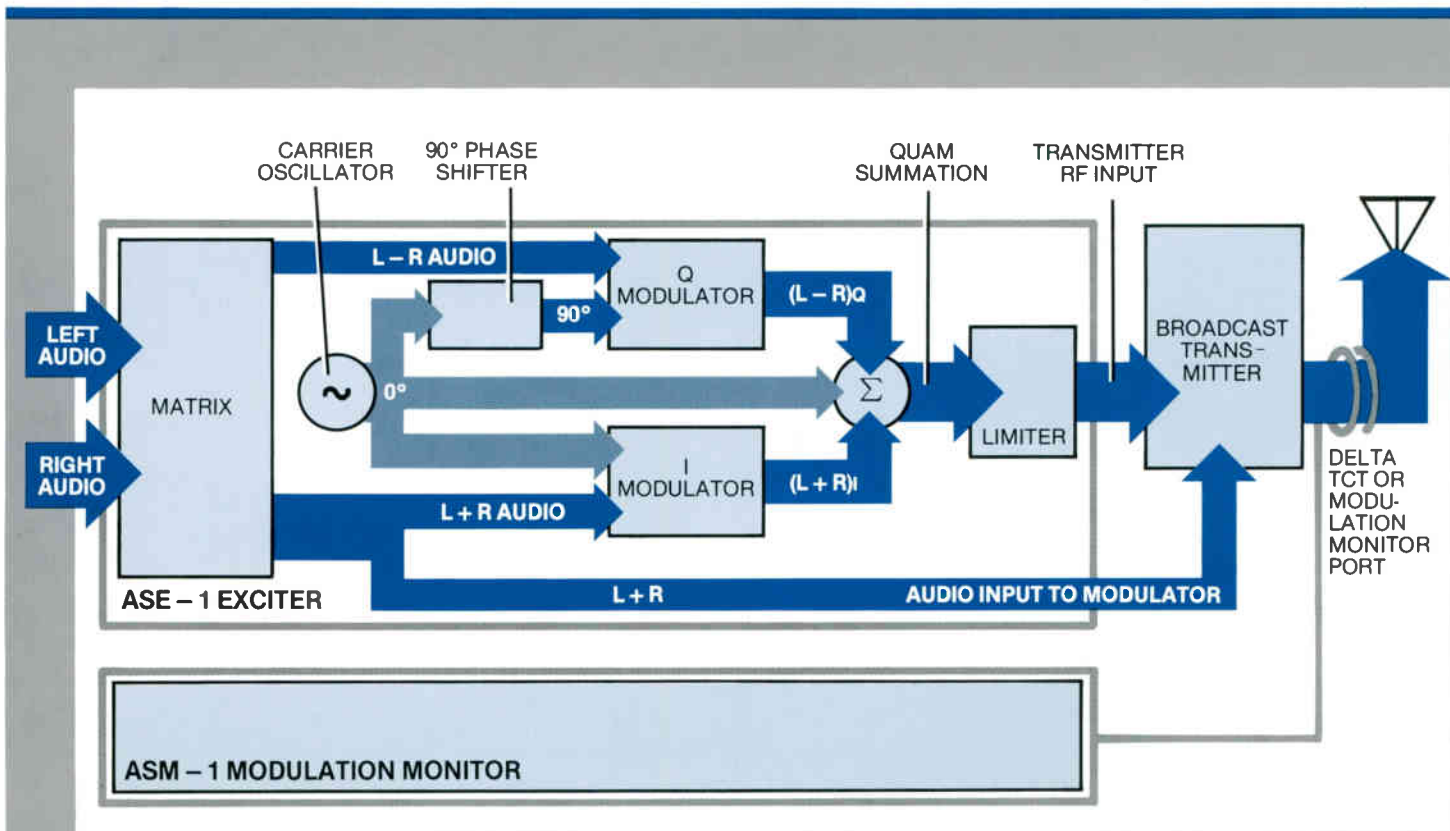
ASE-1 AM Stereo Exciter

C-QUAM System AM Stereo transmits fully compatible signal with no compromise in quality

The ASE-1 C-QUAM Exciter produces the signals needed for stereo operation of an AM broadcast transmitter. From stereo audio input, the Exciter generates an audio drive signal for the transmitter's modulator and an RF signal to replace the transmitter's crystal oscillator output. The resulting transmitter output is a quadrature amplitude modulated signal that is compatible with all existing AM detectors.

The simplified block diagram below illustrates operation of the C-QUAM ASE-1 Exciter.

Left and right audio input to the Exciter are equalized to match the transmitter response curves and matrixed to produce L+R and L-R audio signals. The L+R audio and a zero-phase carrier are fed to an in-phase, "I", suppressed carrier modulator. The L-R audio and a quadrature carrier are fed to a quadrature, "Q", suppressed carrier modulator. A 25 Hz pilot tone used to turn on the stereo decoders also is fed to the "Q" modulator. The output signals of these modulators are summed and the zero-phase carrier is re-inserted to produce a quadrature amplitude modulated (QUAM) signal. The QUAM signal is then stripped of its amplitude variations by a limiter, leaving only a phase angle modulated carrier. This carrier is input to the RF chain of the broadcast transmitter, replacing the crystal oscillator signal. The L+R audio from the Exciter is input to the



transmitter's modulator. Here the phase angle modulated carrier is amplitude modulated by the L+R audio to produce the C-QUAM signal.

Envelope detectors sense only the AM component of the C-QUAM signal, thus they produce pure, undistorted L+R (mono) audio. Stereo decoders demodulate the C-QUAM signal to derive an L-R signal as well as the L+R signal. The L-R and L+R signals are combined to generate left and right stereo audio.

ASE-1 Exciter circuitry includes all required processing features. Limiters are provided to prevent excessive positive and negative modulation. A blend processor makes high single channel modulation possible, by blending a little of each channel with the other. Additional processing is not necessary. Unlike FM stereo, C-QUAM AM modulation does not require pre-emphasis.

Meters and convenient controls simplify use of the ASE-1. Large lighted meters display either left and right audio levels or L + R and L-R audio levels, in dB and percentage modulation. The mode switch selects stereo or mono operation. The pilot switch controls the 25 Hz tone, allowing the tone to be turned off as required in testing. The switch labeled Day/Night selects one of two audio equalization circuits, adjusted to match separate, alternate transmitters. The equalization circuits also can be remotely selected through contacts on the rear panel.

ASM-1 AM Stereo Modulation Monitor

Companion Modulation Monitor helps to maintain and ensure AM broadcast system performance.

The ASM-1 Stereo Modulation Monitor houses a high performance C-QUAM decoder which demodulates the RF sample. The ASM-1 provides all the demodulated signals necessary for annual proof of performance when used with standard AM proof equipment.

The demodulated signals available on the rear panel of the Monitor include L+R, L-R, Envelope Detector Output, and Left and Right audio, both balanced and unbalanced. The 25 Hz pilot tone used in the C-QUAM system also is available on a rear panel connector.

Front panel meters display the pushbutton selected parameters: positive and negative L+R, L-R, L and R modulation levels. Peak flashers indicate -100%, +125%, L-R Limit, and negative limit modulation conditions. Two additional thumbwheel controlled peak flashers can be set to flash at any desired level of modulation. The modulation meters and the thumbwheel controlled peak flashers are accessible through rear panel connectors for remote indication.

Continued commitment to a growing AM Stereo market

Delta Electronics is a leading manufacturer of quality broadcast and RF instrumentation products. Over the past twenty years, Delta has earned an enviable reputation for superior performance with broadcasters, HF communications users, and government agencies around the world. Products such as Delta's OIB-1 Operating Impedance Bridge have become industry standards, while other Delta innovations such as the TCA series RF ammeters have led the way to improved measurement methodology.

A further example of our commitment to AM Stereo, developed in concert with our program of product innovation, is our CQS-3 AM Stereo digital synthesizer. This unit provides for the direct digital synthesis of precision test signals and has been supplied to leading C-QUAM receiver manufacturers as well as integrated circuit manufacturers, both domestic and foreign. Additionally, we have under development a precision test generator for the radio repair and service technician.



Delta Model CQS-3 AM Stereo Synthesizer.

SYSTEM SPECIFICATIONS

The following is typical closed loop performance of the Exciter operating into the Monitor.

Stereo Separation at 50% single channel:

40 dB minimum 50 Hz to 5 kHz
30 dB minimum 5 kHz + to 10 kHz
25 dB minimum 10 kHz + to 15 kHz

Stereo Separation at 70% single channel:

35 dB minimum 100 Hz to 5 kHz

Frequency Response:

50 Hz to 10 kHz ± 0.5 dB any modulation
10 kHz + to 15 kHz ± 1 dB any modulation

Harmonic Distortion

L = R monaural 0.5% max., at 95% mod.
L = -R pure stereo 0.5% typical at 100% mod.
L, R single channel 1.0% typical at 70% mod.*

EXCITER

Audio Input:

Right 0 dBm to 10 dBm balanced 600 Ohms
Left 0 dBm to 10 dBm balanced 600 Ohms
Both inputs adjustable with factory installed pad per customer requirements.

Meter Functions:

$(L + R)_Q$ and $(L - R)_Q$ or L and R meter functions switched at the front panel between meters.
 $(L + R)_I$ can be monitored on $(L + R)$ meter by using $(L + R)$ Env switch under the cover on the front panel.

Meter Range:

-20 to +3 dB
0 dB = 100% modulation

RF Outputs:

Dual square wave to 38 V p-p into 50 ohms.
Dual TTL level outputs

$(L + R)$ Outputs:

Dual output, adjustable under cover on front panel via 10-turn potentiometer up to 16 dBm, 600 ohms balanced.

Stereo-Monaural:

Switched under cover on front panel. Switches L = R for monaural. Stereo or monaural mode is indicated by LED on front panel. May also be remotely switched via rear panel terminals.

Phase Equalization:

Internally adjustable phase equalization is provided to compensate for phase variations in the transmitter chain. Two paths are available for Day/Night or Main/Aux modes.

Sample Transmitter Output:

A sample transmitter output is provided on the rear panel for diagnostic, comparison of station's transmitter characteristics. This output contains all the modulation aspects $(L + R)_Q$, $(L + R)_I$, and $(L - R)_Q$. Sample transmitter output 2 volts peak-to-peak into 50 ohms.

MONITOR

RF Input:

Frequency crystal controlled
Input level 1 volt to 10 volts RMS
Impedance 50 ohms

Modulation Meters:

Meter range 0 to 140% -20 dB to +2dB
Attenuator range 0 to -50 dB in -10 dB steps
Accuracy at 100% modulation 400 Hz $\pm 2\%$ Meters switchable to + or - L, R, $(L + R)$, $(L - R)$

Peak Modulation Indicators:

$(L + R)$ Group:

-100% indicator internally set to flash when modulation exceeds -99%
+125% indicator internally set to flash when modulation exceeds +124%
Peak Indicator adjustable via thumbwheel switches from 30% to 150%. Modulation indicators selectable via pushbutton switches + or -

$(L - R)$ Group:

Negative limit set internally to flash at 1.46 radians or 83.67°
 $(L - R)$ limit set internally to flash when phase modulation exceeds 99%
Peak flasher adjustable via thumbwheel switches for 30% to 125%

Output BNC connectors on rear:

Remote Flashers $(L + R)$, $(L - R)$
Remote Meters $(L + R)$, $(L - R)$
Left Audio 600 ohms balanced and unbalanced
Right Audio 600 ohms balanced and unbalanced
 $(L + R)$, $(L - R)$, and 25 Hz Pilot tone

*NOTE: This is equivalent of 140% modulation, 70% envelope modulation, simultaneous with 70% stereo information.

Specifications subject to change without notice.

DELTA ELECTRONICS

5730 General Washington Drive • P.O. Box 11268
Alexandria, Virginia 22312
Telephone: (703) 354-3350 • Telex: 90-1963

