



HARRIS

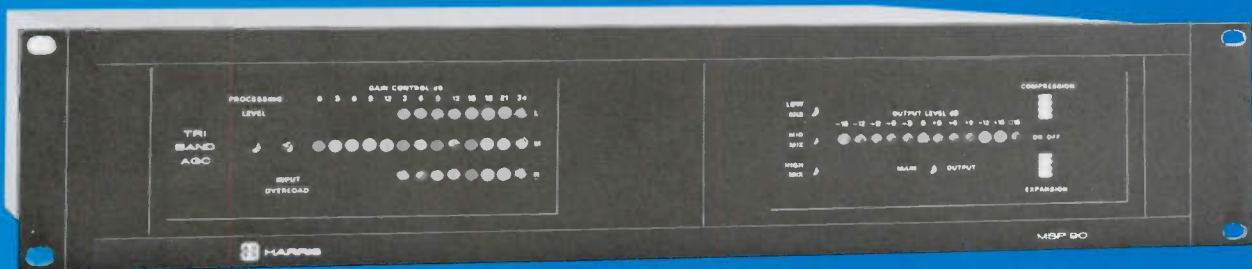
COMMUNICATION AND
INFORMATION PROCESSING

MSP-90 TRI BAND AGC Audio Processor

- **MSP-90 Tri Band AGC:** A true automatic gain amplifier, not just a compressor
- **Time averaged true RMS power control**
- **Phase coherent filtering with adjustable band to band crossover frequencies**
- **Program dependent attack time**
- **Front panel output mix controls enable equalization of audio chain for optimum results**
- **Ease of setup and operation**

With the development of the MSP-90 Tri Band AGC, Harris furthers the technical advancement of audio processing and offers the broadcaster an added opportunity to increase his coverage area through a louder signal and improved modulation.

Characterized by outstanding reliability, total flexibility, modular construction, and state-of-the-art circuitry, the Tri Band AGC boasts a performance level previously unattainable in a stand alone unit. In addition, the Tri Band AGC provides high quality and low distortion while maintaining the Harris reputation for cost sensitivity.



With a performance level far beyond old gated compressor type models, the Tri Band AGC is a true Automatic Gain Control amplifier system based upon complementary expansion and compression which totally eliminate irritating noise swish-up.

The time averaged RMS power control significantly increases signal power without affecting peak levels. Unlike less advanced RMS processors that rely on the use of non-linear LED-PHOTO-CELL combinations, advanced circuitry in the MSP-90 Tri Band AGC amplifier actually CALCULATES the RMS signal power, making it possible to maintain the timbre of musical signals while simultaneously increasing loudness.

Crossover anomalies and dead spots in frequency response, which are common in less sophisticated equipment, have been eliminated in the MSP-90 Tri Band AGC through the use of phase coherent, single pole, band to band filtering with adjustable turnover frequencies. Because the turnover frequencies of the Tri Band AGC are each adjustable over three octaves, the Harris AGC module has become the answer to the broadcasters' needs today and in the future.

Program dependent attack time assures minimum distortion at low frequencies and optimizes crisp, clear highs. The Tri Band processing plus RMS control eliminate the problems normally associated with record pops and clicks, thus guaranteeing the most trans-

parent operation possible.

The front panel output mix controls of the MSP-90 Tri Band AGC provide the broadcaster with the capability of altering the frequency response of the audio chain without the use of external equalizers. Adequate equalization for all formats and transmitting media is assured by the ± 10 dB control range of each band.

The Tri Band AGC amplifier module plugs easily into the rugged MSP-90 main frame to offer today's creative broadcaster unsurpassed audio performance coupled with flexibility and convenience. The conservatively rated, well-regulated primary power supply will operate on 115V or 230V, while protecting the amplifier module from brownouts and severe overvoltage surges.

MSP-90 TRI BAND AGC SPECIFICATIONS

INPUT: 600 ohm terminating. Maximum level +28 dBm. Compression threshold +4 dBm to -26 dBm.

OUTPUT: 600 ohm for 600 ohm load. Nominal output level +10 dBm. Maximum output level +18 dBm.

FREQUENCY RESPONSE: ± 1 dB, 20 Hz to 20 kHz, controls flat.

HARMONIC DISTORTION: (+10 dBm output) 0.25% maximum, 20 Hz to 20 kHz disabled; 0.5% maximum, 20 Hz to 20 kHz, enabled, slow.

INTERMODULATION DISTORTION: (+10 dBm output) 0.25% maximum disabled; 0.5% maximum, enabled, slow; SMPTE.

NOISE: (20 Hz to 20 kHz) Signal-to-noise better than 70 dB below compression threshold.

EXPANSION RANGE: Selectable at 3 dB, 6 dB, 9 dB or 12 dB.

EXPANSION SLOPE: 2:1.

EXPANSION THRESHOLD: ± 5 dB from normal -20 dBm.

EXPANSION ATTACK TIME: 0.1, 0.2, 0.3, 0.5 or 1 second.

EXPANSION RECOVERY TIME: 0.25, 0.5, 1, 2, 4, 8 or 16 second(s).

COMPRESSION RANGE: 24 dB.

COMPRESSION SLOPE: Selectable at 24:1, 12:1, 6:1 or 3:1.

COMPRESSION TYPE: True RMS power control.

COMPRESSION ATTACK TIME: Program dependent, 2.5 m Sec. to 250 m Sec.

COMPRESSION RECOVERY TIME: 0.25, 0.5, 1, 2, 4, 8 or 16 second(s).

OUTPUT MIX: Each band can be varied ± 10 dB from nominally flat.

BAND SPLITTING: Phase linear, selectable; low frequency crossover 75, 95, 105, 135, 160, 230 or 320 Hz; high frequency crossover 1680, 2180, 2450, 3060, 3700, 5300 or 7200 Hz.

ORDERING INFORMATION

MSP-90 TRI BAND AGC with main frame (monaural)	994-8357-001
MSP-90 TRI BAND AGC with main frame (stereo)	994-8358-001
MSP-90 TRI BAND AGC Module.....	992-5603-001

HARRIS CORPORATION Broadcast Products Division
P. O. Box 4290, Quincy, Illinois 62301 U.S.A.

PHASE FIXER SPECIFICATIONS

ENCODER SPECIFICATIONS

AUDIO INPUT: Active, balanced.
INPUT IMPEDANCE: 600 ohms or bridging.
AUDIO OUTPUT: Active, balanced.
LOAD IMPEDANCE: 300 ohms or greater.
OUTPUT IMPEDANCE: 50 ohms.
GAIN: Unity, ± 6 dB.
COUPLING: AC.
MAXIMUM INPUT LEVEL: +26 dBv.
MAXIMUM OUTPUT LEVEL: +24 dBm into 600 ohms.
DISTORTION: THD less than 0.2%, 30 Hz to 15 kHz at +4 dBm and +24 dBm output into 600 ohms. Measurement bandwidth 3 Hz to 30 kHz. IMD less than 0.2% at +4 dBm and +24 dBm output into 600 ohms, 60 Hz and 7000 Hz in a 4:1 ratio.
NOISE: Less than -70 dBm output, 20 Hz to 20 kHz measurement bandwidth.
FREQUENCY RESPONSE: 30 Hz to 15 kHz, ± 1.5 dB.
INJECTION SIGNAL: Harris standard ATBC pilot signal; 19,000 kHz ($\pm 0.1\%$) sine wave, 60% ($\pm 5\%$) double sideband amplitude modulated by a 296.875 Hz ($\pm 0.1\%$) sine wave. Modulation distortion to be less than 0.5% THD. Spurious output to be less than -85 dBm from 10 Hz to 18 kHz and 20 kHz to 300 kHz, with pilot signal set to -23 dBm output. Interchannel modulation envelope delay to be less than 4 microseconds. On "Pilot Off" command, modulation to end 100 milliseconds before carrier.
INJECTION LEVEL: Adjustable from -30 dBm to -15 dBm at output terminals, into a 600 ohm load.
NOTCH FILTER: Internal 19 kHz filter to prevent unintentional "double encoding". Greater than 25 dB attenuation at 19 kHz. Notch filter (and all active electronics) removed in "BYPASS" mode to allow dubbing of pilot signal from one tape to another.
BYPASS: Internal relay connects input connector directly to output connector, bypassing all internal electronics. Loss of power defaults "BYPASS" mode.
REMOTE CONTROL: Rear panel barrier strip connections allow one external input for the "PILOT ON" function and two external inputs for the "PILOT OFF" function. Remote control senses "0 volts DC" between two high impedance input terminals. Maximum common mode input is 80 volts peak. Remote control inputs are RFI and transient protected.
CONNECTORS: 1) Audio input and output on 3 pin "XLR" type connectors, USA professional standard. 2) Remote control on barrier strip.
MOUNTING: 1) desk top; 12 inches wide, 3.5 inches tall, 8 inches deep. 2) rack mounting; 19 inches wide, 3.5 inches tall, 8 inches deep.
WEIGHT: 5.25 pounds.
SAFE STORAGE AND OPERATING TEMPERATURE, AMBIENT: 10° to 50°C.
POWER REQUIREMENTS: 117 or 234 volts AC $\pm 10\%$, 50-60 Hz, 15 watts.
FRONT PANEL CONTROLS AND INDICATORS: Illuminated push-button switches for "BYPASS", "PILOT OFF" and "PILOT ON".

DECODER SPECIFICATIONS

AUDIO INPUT: Active, balanced.
INPUT IMPEDANCE: 600 ohms or bridging.
AUDIO OUTPUT: Active, balanced.

LOAD IMPEDANCE: 300 ohms or greater.
OUTPUT IMPEDANCE: 50 ohms.
GAIN: Unity, ± 6 dB.
COUPLING: AC.
MAXIMUM INPUT LEVEL: +26 dBv.
MAXIMUM OUTPUT LEVEL: +24 dBm into 600 ohms.
VU METER CALIBRATION RANGE: 0 VU = 0 dBm to +10 dBm into 600 ohms.
DISTORTION: *Delay in-line;* THD less than .5%, 30 Hz to 15 kHz at +4 dBm and +24 dBm output into 600 ohms. Measurement bandwidth 3 Hz to 30 kHz. IMD less than 1% at +4 dBm and +24 dBm output into 600 ohms, 60 Hz and 7000 Hz in a 4:1 ratio. *Delay bypassed;* THD less than 0.2%, 30 Hz to 15 kHz at +4 dBm and +24 dBm output into 600 ohms. Measurement bandwidth 3 Hz to 30 kHz. IMD less than 0.2% at +4 dBm and +24 dBm output into 600 ohms, 60 Hz and 7000 Hz in a 4:1 ratio.
NOISE: *Delay in-line;* less than -64 dBm output, 3 Hz to 30 kHz measurement bandwidth. *Delay bypassed;* less than -80 dBm output, 3 Hz to 30 kHz measurement bandwidth.
FREQUENCY RESPONSE: (notch filter bypassed) *Delay in-line;* 30 Hz to 15 kHz, ± 1.5 dB. *Delay Bypassed;* 30 Hz to 15 kHz, ± 1.0 dB.
DELAY MEANS: A-D, RAM storage, D-A; 16 bit linear.
DELAY SAMPLE RATE: 79 kHz, $\pm 10\%$.
PRE-EMPHASIS/DC-COMPENSATION: None.
DELAY BYPASS SWITCHING TYPE: Electronic fast cross-fade. Switching time approximately 10 milliseconds.
POWER REQUIREMENTS: 117 or 234 volts AC $\pm 10\%$, 50-60 Hz, 65 watts.
SAFE STORAGE AND OPERATING TEMPERATURE, AMBIENT: 10° to 50°C.
OPERATING TEMPERATURE RANGE AFTER CALIBRATION, AMBIENT: +/ -15°C.
REMOTE CONTROL: External "Disable" control; either voltage or contact closure sensing.
CONNECTORS: 1) Audio input and output on 3 pin "XLR" type connectors, USA standard. 2) Remote control on barrier strip. 3) IEC power cord connector.
EXTENDER BOARD: Supplied with unit.
MOUNTING: 19" wide, 5 1/4" high, 15" deep, overall.
WEIGHT: 19 pounds.
DELAY CORRECTION: *Accuracy:* Corrects to within 16.6 microseconds of absolute correct interchannel delay error with adequately recoverable pilot signal. *Correction Speed:* Correction will be made to within 16.6 microseconds of final value within 4 seconds after a 100 microsecond step change in interchannel delay error.
FLUTTER REDUCTION: Greater than a 4:1 improvement ratio to a reference flutter signal consisting of a 3150 Hz sine wave, frequency modulated by a 7.5 Hz sine wave to an indicated flutter level of 0.15% weighted, RMS.
FRONT PANEL INDICATORS: 1) "PILOT" indicates whenever a valid pilot signal is present at the input terminals. 2) "LOCK" indicates when delay correction has been achieved to within approximately 16.6 microseconds of final value. 3) "DISABLE" indicates when the unit is in the "disable" or non-correcting mode. 4) "AUTO" indicates when the unit is in the automatic switching mode.
METERS: Two VU meters and one multimeter.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

ORDERING INFORMATION

Phase Fixer Audio Time Base Corrector (typical system consists of two encoders and one decoder)

Phase Fixer Encoder 994-8904-001
Phase Fixer Decoder 994-8903-001

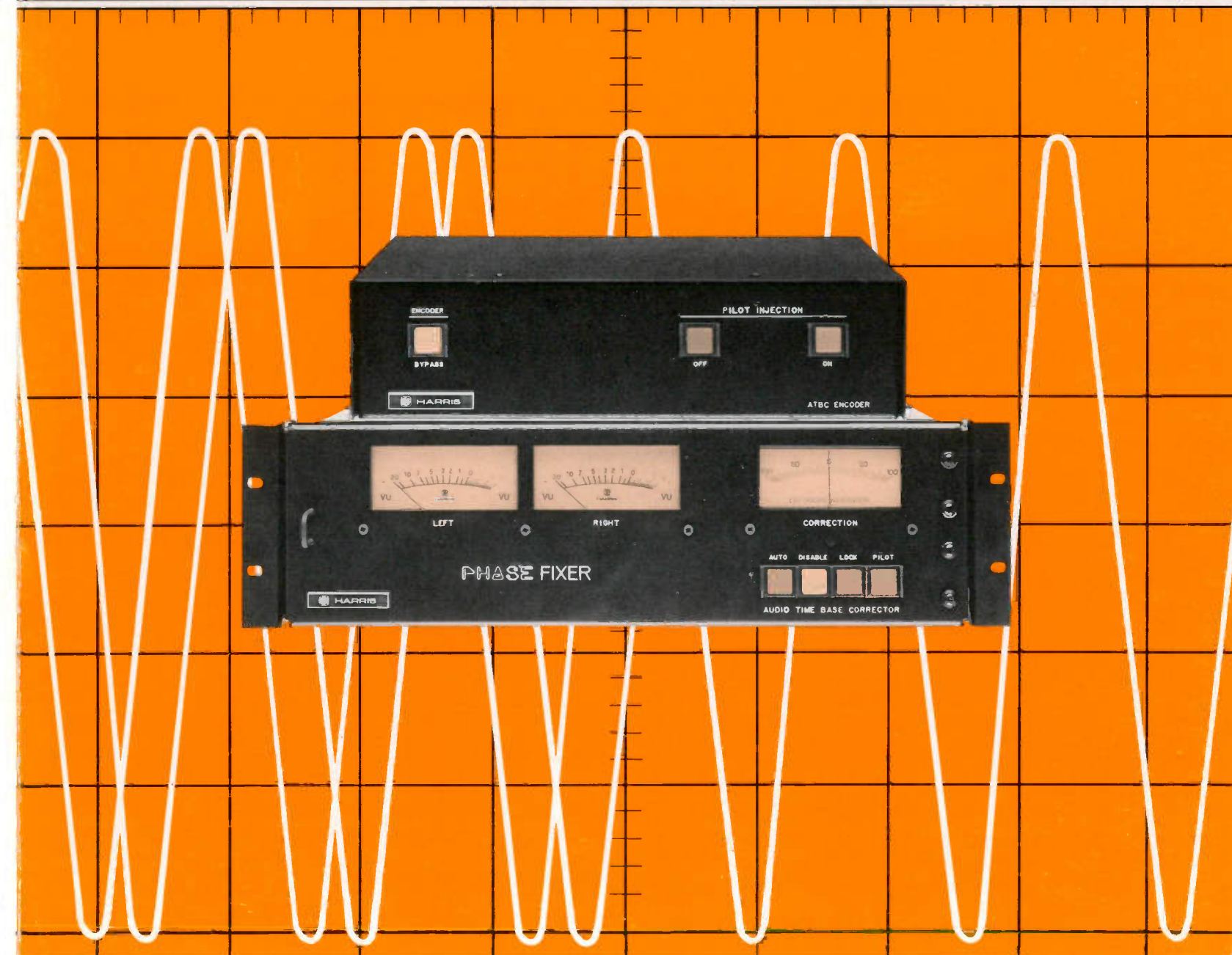
HARRIS CORPORATION STUDIO DIVISION
P. O. BOX 4290, QUINCY, ILLINOIS 62305-4290 U.S.A. 217/222-8200



HARRIS

DIGITAL AUDIO TIME BASE CORRECTOR

PHASE FIXER



Harris Phase Fixer: Finally, a successful method to combat stereo phase error and flutter

- Eliminates audible phasing errors on encoded stereo carts and tapes
- Reduces flutter to insignificant levels on encoded stereo carts and tapes
- Uses true 16-bit digital audio delay to achieve low noise, high fidelity audio time base error correction
- High sampling rate of 79 kHz allows use of gentle Butterworth filters for less group delay and more natural sound
- XLR type audio input/output connectors for excellent RFI immunity and easy bypassing
- Immediate recarting of library not required; automatic action permits intermix and gradual conversion

The Harris Phase Fixer corrects two of the most vexing problems encountered with broadcast audio tapes: Stereo phase error and flutter. The system consists of two rack-mounted units. The first, a pilot encoder, injects an audible signal on the audio as it is recorded onto tape. The second unit is the common point decoder. When an encoded tape is played, the time base corrector is automatically enabled to reduce stereo phase error and flutter to insignificant levels.

Feedback control techniques in the Phase Fixer reduce absolute phase error to under 16 micro seconds. This relates to less than 3 dB of loss at 15 kHz, compared with total cancellation at 5 or 6 kHz without the system. Unlike other correlating approaches, the Phase Fixer is a true encoding/decoding system. It eliminates cancellation drop-outs and retrieves missing musical notes. The sound of your source material will be dramatically improved.

ENCODER

Tapes are encoded with a precision 19 kHz pilot tone on each of the stereo tracks at a level 27 dB below the normal signal level. This 19 kHz pilot is modulated with a 297 Hz signal to prevent the decoder from locking onto an incorrect cycle of the pilot. The low encoding level, along with the spectral purity of the encoding tones, prevents any degradation of the programming. In addition, the encoding tones are removed after the final decoding process.

The encoder has rear connector pins for command signals from the tape recorder, which allows it to operate in a "hands-off" mode. It will inject the pilot each time the machine is operated in the record mode. The encoder may be manually disabled by the operator by using the front panel "Disable" switch for tapes that are to be made with no pilot, or when you want to duplicate pre-encoded material and use the original pilot to correct all reproducers in the chain from origination to on-air.

Harris visualizes the day when most of the commercial messages, jingles, etc. will be encoded in the production houses to reduce phase error and flutter in the original programming.

DECODER

The Phase Fixer decoder contains twin 16-bit digital delay lines, one for each stereo channel. The system incorporates high quality Burr Brown PCM-75 A/D converters and PCM-53 D/A converters specifically designed for digital audio use, operating at a 79 kHz sampling frequency. Sampling theory requires that a frequency be only 2X the highest frequency to be processed through the system. Phase Fixer uses a frequency 4X the highest audio frequency. Low sampling frequencies dictate the use of very steep, sharp cutoff, closely spaced filters. In contrast, the high sampling frequency of the Phase Fixer allows for higher cutoff points (28 kHz), and lower order, gentler filters (6th order Butterworth).

These aid in a more natural sound due to lower levels of group delay within the audio passband of the programming being processed through the digital audio portion of the decoder.

The Harris Phase Fixer will reduce flutter by up to 10:1. A major improvement for both mono and stereo listeners, this can make your cart machine sound as good as a high quality reel-to-reel unit. This is accomplished by looking at the FM modulation component of the 19 kHz pilot and generating the delay control signal in a manner which cancels the flutter signal. It should be obvious that non-encoded material, or programming where the flutter is on the original source material, will not be improved. However, even with good machines and proper maintenance, you may occasionally experience problems due to poor speed regulation, dirt on the capstan or pinch roller, or poor cartridge tape movement, which can be improved by the new Phase Fixer.

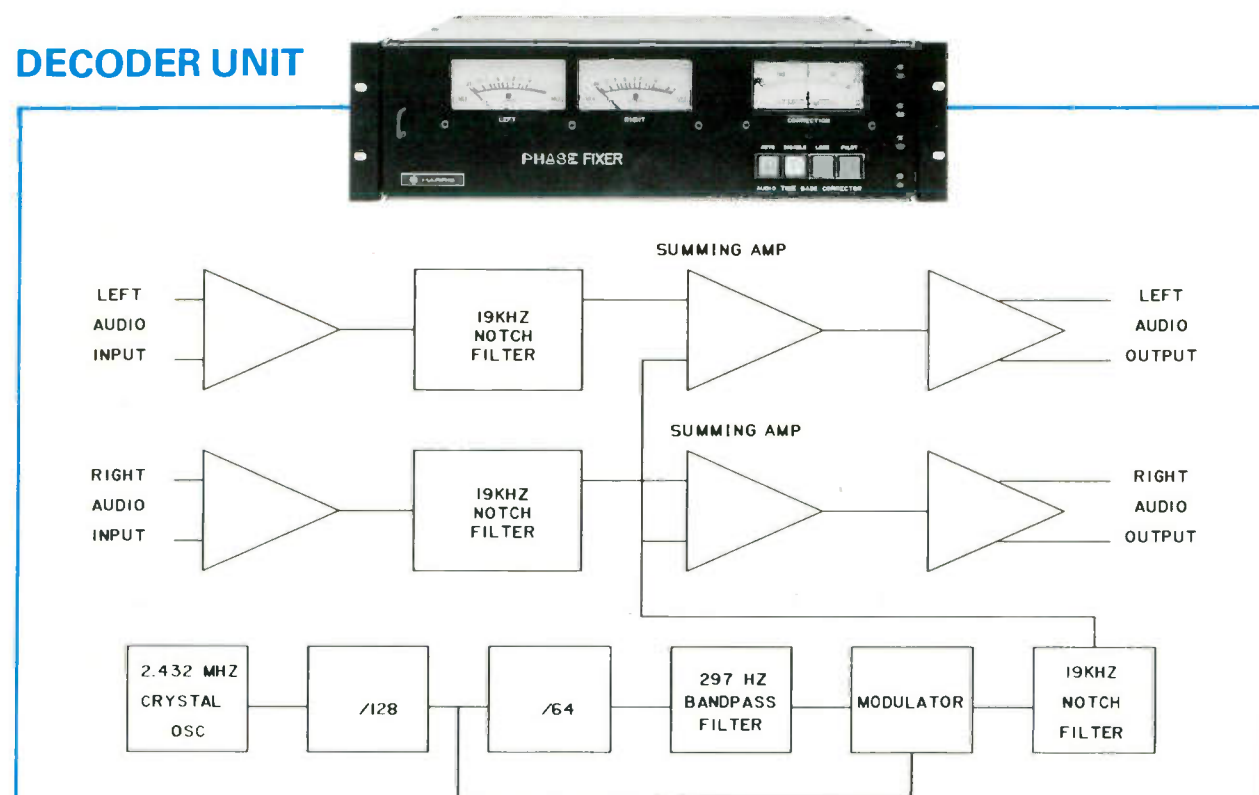
On tapes with no pilot tone, the decoder simply passes the signal through with no action and no delay. When a pilot tone is sensed in the active mode, it goes through about a 50 millisecond transition into the built in 27 millisecond delay in the active system. The decoder may be locked out of the active mode by action of the front panel Disable switch, or by a command signal from the console when the control room mic is activated. This feature allows operator talkover of pilot encoded tapes without distracting echo effects. The external command signal may be either battery or ground switching capable of 2 ma sinking current.

SIMPLE CIRCUIT LAYOUT, EASY ADJUSTMENTS

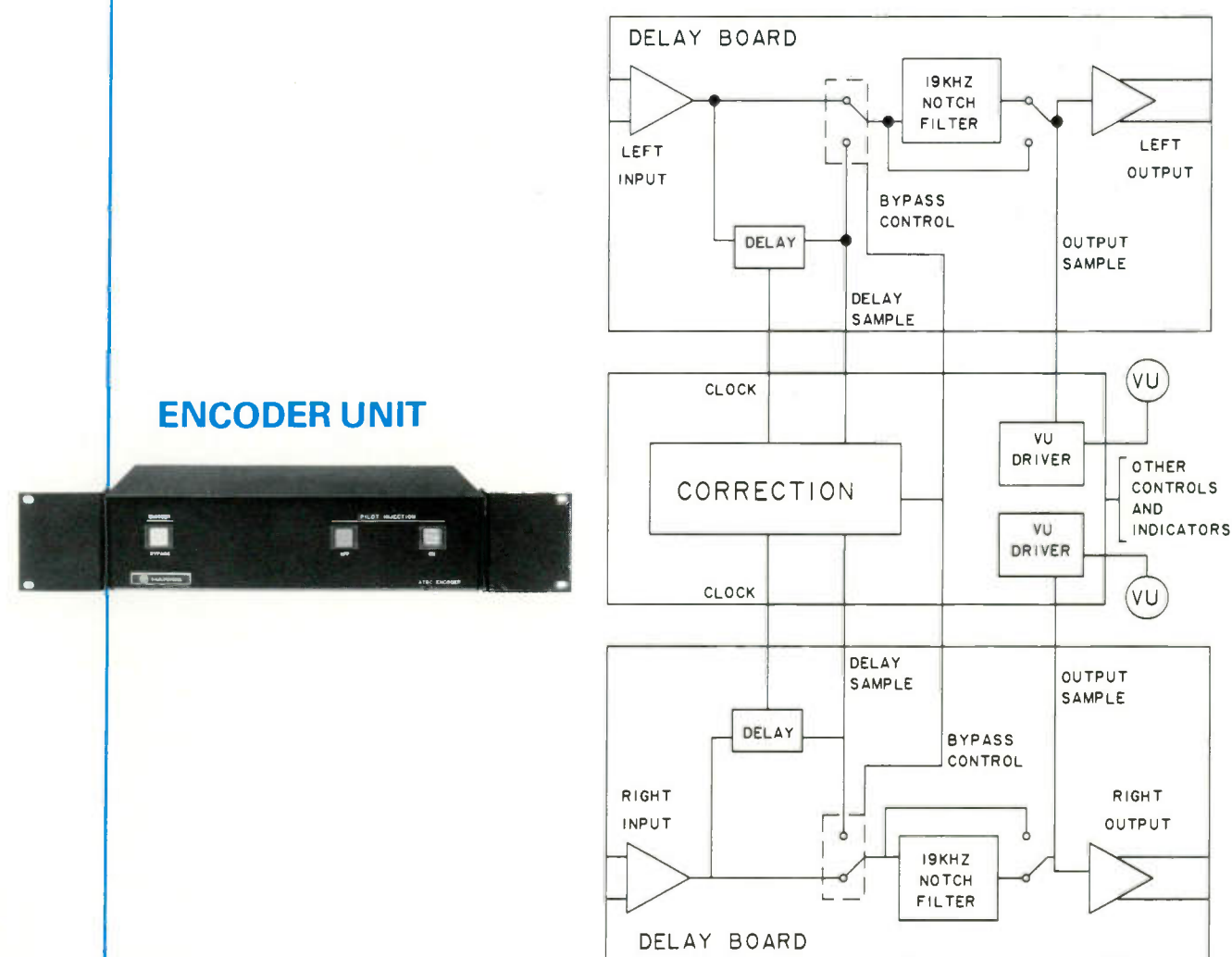
The major portion of the active electronics is contained on three plug-in printed circuit boards. These are comprised of two digital delay boards and one control board. An extender card is included for easy maintenance. The built in multimeter provides additional diagnostic capabilities. Two internal VU meters allow monitoring of the delay corrected output signal, and can be easily adjusted for alternate operating levels. A straightforward linear power supply provides the +/- 15v and +5v required in the unit. Transformer winding changes easily accommodate 220v AC operation.

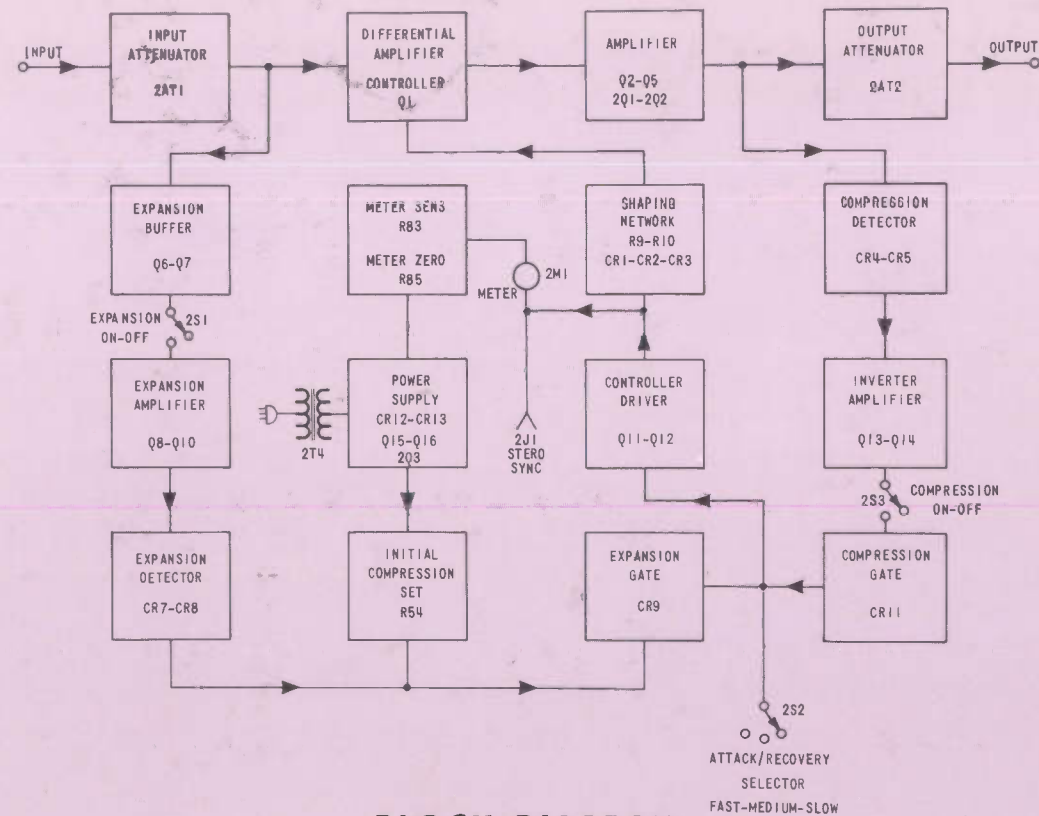
All connections are made through rear panel XLR type connectors, which provide reliability, good RFI protection and easy bypassing if you need to move an encoder from one location to another. All required mating XLR type connectors are furnished as part of the decoder.

DECODER UNIT



ENCODER UNIT





BLOCK DIAGRAM

GATES

SOLID STATESMAN
AUTOMATIC GAIN
CONTROL AMPLIFIER

SPECIFICATIONS

GAIN: All figures given with no attenuation in input and output controls (wide open).

MAXIMUM GAIN: 50 dB \pm 2 dB @ 1 kHz with maximum expansion.

NOMINAL GAIN: 35 dB \pm 2 dB @ 1 kHz with nominal signal (15 dB of compression) or no signal condition.

MINIMUM GAIN: 20 dB \pm 2 dB @ 1 kHz with full (30 dB) compression.

FREQUENCY RESPONSE: \pm 1.0 dB, 30 Hz to 16 kHz with or without compression.

NOISE: 70 dB below the threshold of compression.

COMPRESSION ATTACK TIME: 30 dB, selectable. Fast: 100 μ Sec. Medium: 1-2 M Sec. Slow: 30 M Sec.

COMPRESSION RECOVERY TIMES: 30 dB, dependent upon compression attack time. Fast: 12 Sec. Medium: 22 Sec. Slow: 53 Sec.

EXPANSION ATTACK TIMES: 15 dB, dependent upon compression attack time. Fast: 7.5 Sec. Medium: 15 Sec. Slow: 35 Sec.

EXPANSION RECOVERY TIMES: 15 dB, dependent upon compression attack time. Fast: 4 Sec. Medium: 5 Sec. Slow: 10 Sec.

AMOUNT OF COMPRESSION: 30 dB.

AMOUNT OF EXPANSION: 15 dB.

COMPRESSION RATIO: Better than 30:1, a 30 dB increase in the input signal will produce less than 1 dB rise in the output level.

INPUT LEVEL: -15 dBm to +25 dBm for 15 dB of compression.

OUTPUT LEVEL: Adjustable to +20 dBm maximum with compression, +30 dBm amplifier maximum.

INPUT AND OUTPUT IMPEDANCE: 600 ohms, balanced or unbalanced.

DIMENSIONS: 3 1/2" H x 13 5/8" D x 19" W (Standard rack).

WEIGHT: 14 lbs. net. 23 lbs. shipping.

TEMPERATURE RANGE: -20°C. to +55°C. -4°F. to +131°F.

INPUT VOLTAGE: 117/234 V, 50/60 Hz.

INPUT POWER: 5 watts.

ORDERING INFORMATION

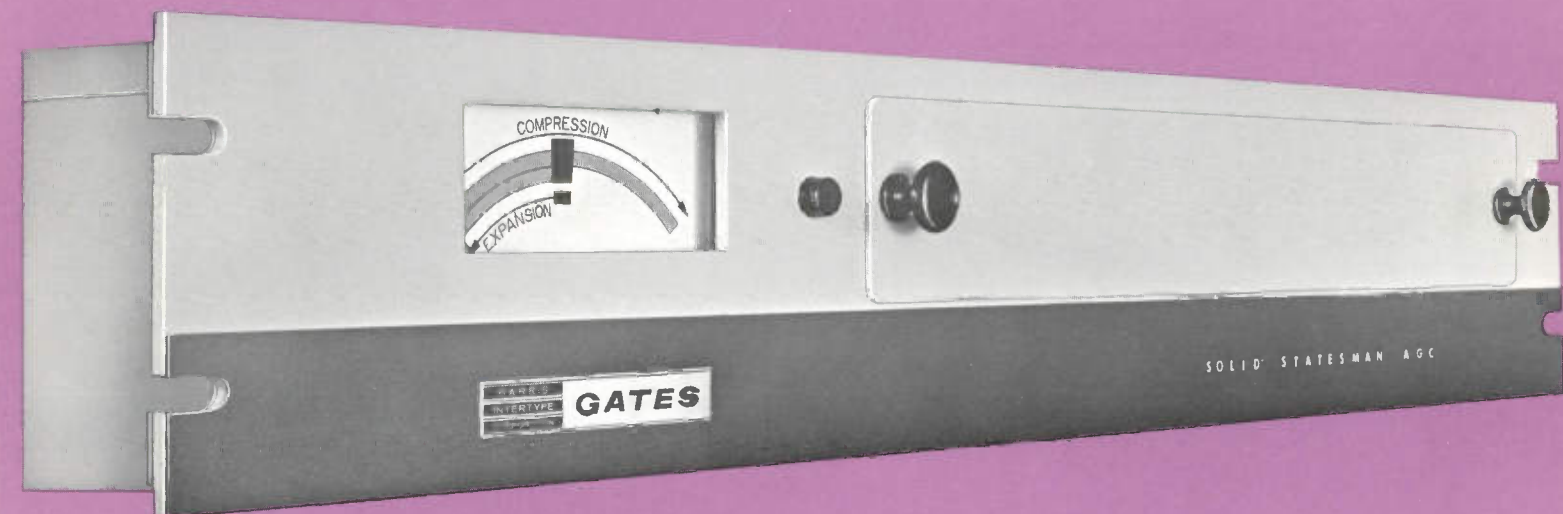
Solid Statesman Automatic Gain Control Amplifier

994-6629

*725
Stereo #1,430*



GATES RADIO COMPANY • QUINCY, ILLINOIS • 62301 • U.S.A.
A Division of Harris-Intertype Corporation



SOLID STATESMAN AUTOMATIC GAIN CONTROL AMPLIFIER

- Selectable Attack/Recovery Times
Fast — Medium — Slow
- Separate expansion and compression disable switches
- Separate input and output attenuators
- All silicon solid state circuitry
- Differential amplifier gain controlling circuit
- Fully RF protected
- Excellent frequency response
- Low distortion
- Extended control range (30 dB)
- Two AGC's easily synced for stereo operation
- Fully field tested

Gates Solid Statesman AGC Amplifier (M-6629) is the most versatile automatic gain control system available today. A wide range of control on the amplifier, and an adjustable attack/recovery time feature, insure programming flexibility. The high compression ratio and rapid attack time generate consistently high modulation levels, while the slow attack/recovery mode will maintain control over average program material and extend dynamic range.

SELECTABLE ATTACK RECOVERY TIMES

The wider control range, lower distortion and rapid attack time are made possible by the use of a "differential amplifier" as the gain controlling device. Extremely close balance of this amplifier provides the desirable characteristics of the M-6629. Another feature is the selectable attack/recovery time which allows each station to select the control time best suited to its program format.

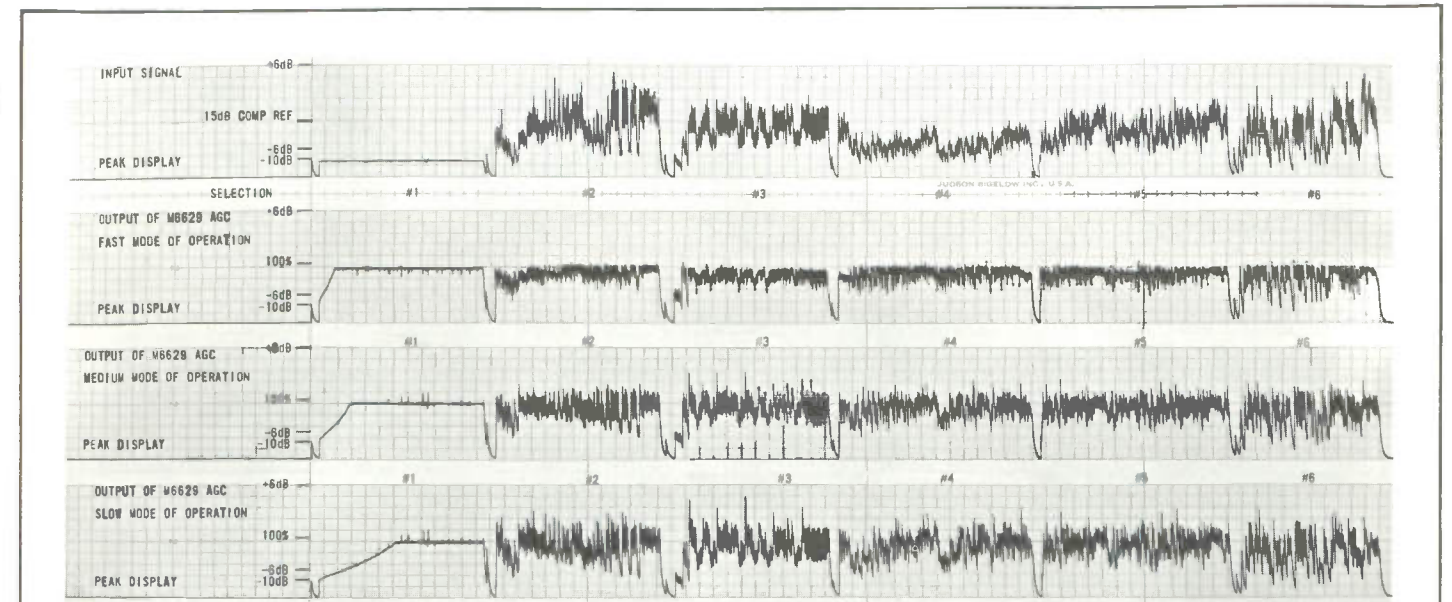
In the FAST mode, the reaction time is similar to that of other limiters now on the market. This operating mode is most desirable for those stations wanting the highest possible modulation levels.

In the MEDIUM and SLOW modes, reaction times are considerably slower. These operating modes are available to those stations which desire a lesser amount of control action than that found in the FAST mode.

Two Solid Statesman AGC Amplifiers may be synced together for stereo operation. A small jumper cable is all that is required.

CENTRALIZED OPERATING CONTROLS

Front panel controls permit the user to disable both the expansion and compression functions



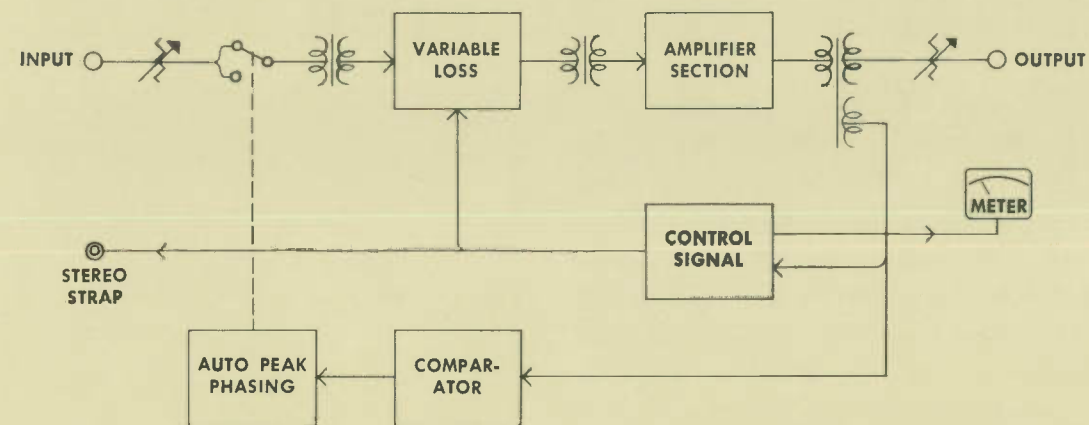
OPERATIONAL CURVES

separately for proof of performance tests. Under these conditions the unit has the same gain as when 15 dB of compression, the ideal operating point, is being used. This provides a test position and at the same time maintains system calibration.

Only 3 1/2" of standard rack space is required

for the M-6629. All operating controls are located behind the easily removable access panel. Circuit components are readily accessible by removal of the top cover. Input and output connections are provided on a barrier terminal block on the rear of the unit, along with the stereo sync jack and AC power and fuse.





BLOCK DIAGRAM

SPECIFICATIONS

GAIN:

50 dB, ± 2 dB max. @ 1 kHz. (May be reduced by built-in input and/or output attenuators).

FREQUENCY RESPONSE:

± 1.0 dB max., 30 to 16,000 Hz (with or without limiting).

HARMONIC DISTORTION:

Less than 1.0% from 30 to 16,000 Hz, from 0 to 10 dB of limiting, except with fast recovery on low frequencies where there is partial recovery on each $\frac{1}{2}$ cycle.

NOISE:

70 dB below threshold of limiting, 30 to 16,000 Hz.

ATTACK TIME:

Less than 10 microseconds (typical 3 to 5 microsec.)

RECOVERY OR RELEASE TIME:

Gated to program content, with 3 positions for individual preferences.

AMOUNT OF LIMITING:

30 dB with a 30:1 compression ratio, an increase of 30 dB input level will increase output level 1 dB.

INPUT LEVEL:

Adjustable -22 to $+18$ dBm for 5 dB of limiting.

OUTPUT LEVEL:

Adjustable to $+23$ dBm maximum.

INPUT AND OUTPUT IMPEDANCE:

600 ohms, balanced or unbalanced.

DIMENSIONS:

$3\frac{1}{2}$ " H x 12" D x 19" W (standard rack).

WEIGHT:

13 lbs. net; 22 lbs. shipping.

TEMPERATURE RANGE:

-20°C to $+55^{\circ}\text{C}$.

INPUT POWER:

115/230 volts, 50/60 Hz.

ORDERING INFORMATION

Solid Statesman Peak Limiting Amplifier 994-6543



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GATES

SOLID STATESMAN PEAK LIMITING AMPLIFIER



SOLID STATESMAN PEAK LIMITING AMPLIFIER

PERFORMANCE FEATURES

- True Peak Limiting without Clipping.
- Choice of Asymmetrical (AM) or Symmetrical (FM and TV) Limiting.
- Automatic Phase Reversal, with asymmetrical limiting.
- Permits Higher Average AM Modulation Levels.
- All silicon solid state circuitry.
- Fast Attack Time in microseconds —Variable Release Time.
- No Distortion Introduced by clipping action.
- Excellent Frequency Response.
- Fully Field Tested.
- Two Limiters Operate Together for Stereo.

True limiting without peak clipping is achieved in the M-6543 Solid Statesman Limiter with an average 3 to 5 microsecond attack time. This eliminates several milliseconds of clipping found in most limiters while the limiting action catches up; it also eliminates associated distortion. Thus in the M-6543 even the most critical ear cannot detect audible distortions that are apparent with hard clipping.

Very low distortion is typically 0.2% at 30 Hz and 0.3% at 16 kHz with 10 dB of limiting, and it

is less than 1.0% with up to 30 dB of limiting. Frequency response remains uniform with or without limiting.

HIGHER MODULATION LEVELS

Fast attack time (in microseconds) and variable release time provide complete freedom from "thumping" with limiting of 15 to 20 dB on most program content. A 30:1 compression ratio allows 99.5% negative modulation without overmodulation. For AM stations asymmetrical limiting permits positive peak modulation levels of 110 or 120%. This produces a louder sounding signal.

AUTOMATIC PHASE REVERSAL

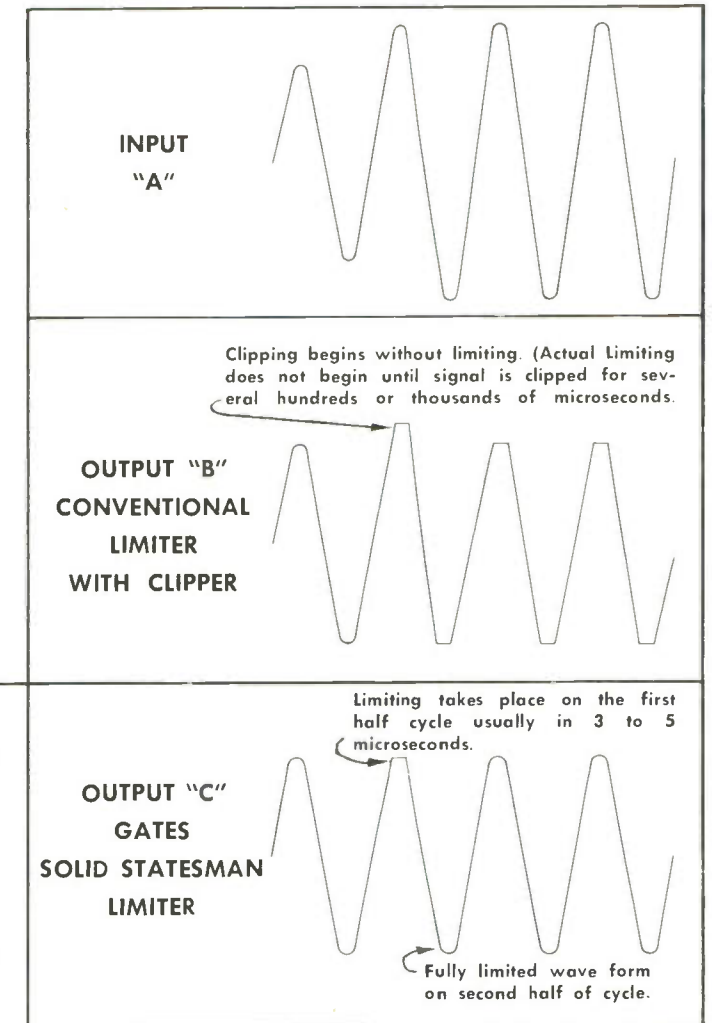
The highest peak of the audio signal is made positive to produce the highest AM modulation level in the transmitter. This asymmetrical limiting causes no base line shift in the limiter, and does not artificially alter the balance of the program content. It does permit greater modulation of the natural positive peaks with the resultant increase in transmitter power.

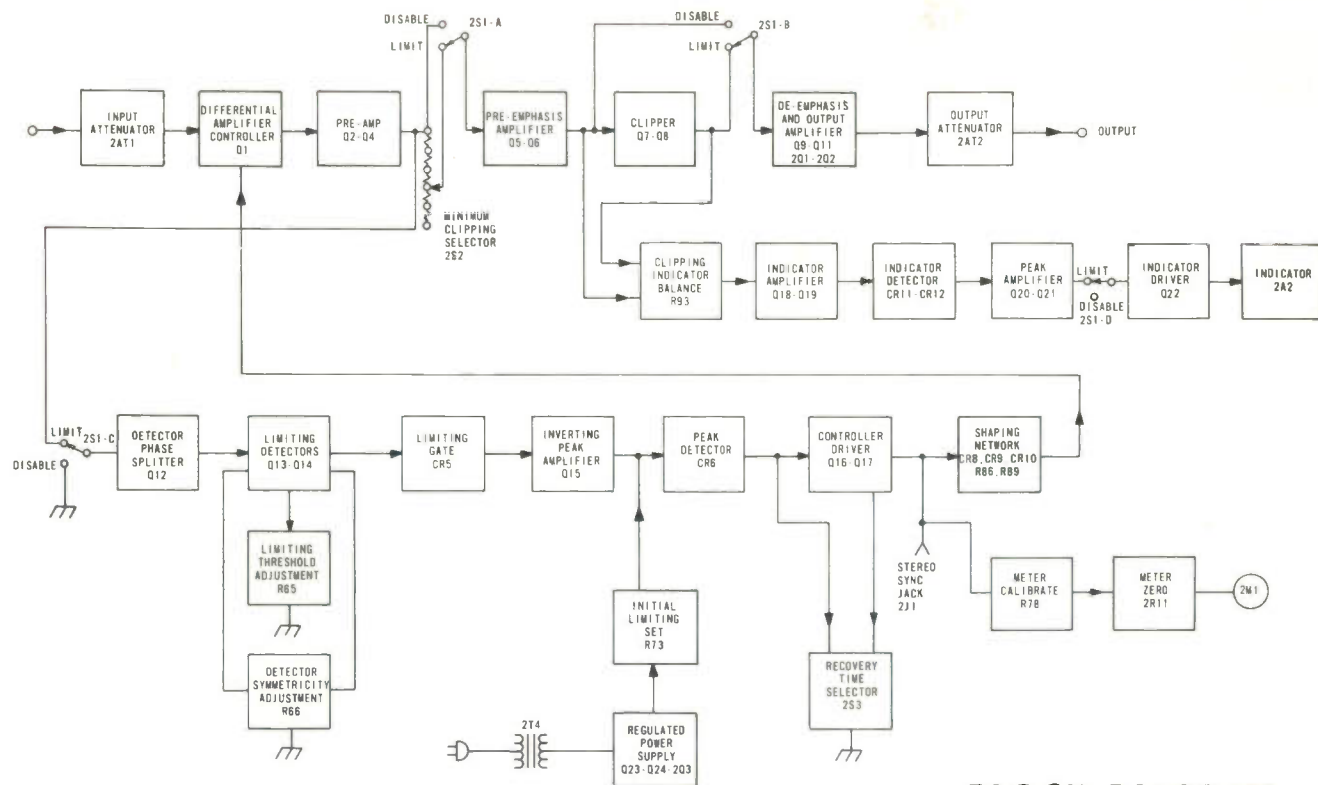
Symmetrical limiting is also available for oper-

ation where peaking and phasing of the signal are not desired such as FM or TV. Two Solid State Limiters may be operated together with a jumper for FM Stereo operation. A front panel control also permits the limiter to be disabled for proof of performance tests. The limiter will then operate without limiting with levels up to 6 dB higher than normal to permit full modulation without losing calibration of the system.

Only 3½" of standard rack space is required for the M-6543 limiter. All operating controls are located behind the front access panel. Circuit components are all accessible through a removable dust cover panel. Input and output connections are provided on a barrier terminal block on the rear of the unit along with the AC power.

The signal at "A" applied to a conventional limiter with a clipper produces output "B". Here the signal is first clipped introducing distortion, and then several milliseconds later the true limiting is accomplished. Gates Solid Statesman Limiter completes the limiting action during the first half cycle of the pulse (output "C"). Any distortion produced would be during the first half cycle, and after that the signal would be truly limited without distortion.





BLOCK DIAGRAM

GATES

SOLID STATESMAN FM LIMITER

SPECIFICATIONS

GAIN: 50 dB, ± 2 dB max. @ 1 kHz. (May be reduced by built-in input and/or output attenuators).

FREQUENCY RESPONSE: ± 1.0 dB, 30 Hz to 16 kHz, below threshold of instantaneous limiter.

HARMONIC DISTORTION: 1% Max. 30 Hz to 16 kHz, below limiting, or at 10 dB of limiting in any recovery made.

NOISE: 70 dB below the threshold of limiting. (Limiting Threshold 30 Hz to 16 kHz.)

ATTACK TIME: 40 microseconds, maximum (no "thumping").

RECOVERY TIME:—Selectable:
FAST: Dynamically Gated for 200 milliseconds
MEDIUM: 2 seconds
SLOW: 10 seconds

AMOUNT OF LIMITING: 30 dB.

LIMITING SLOPE: Better than 30:1. (A 30 dB increase in the input signal will produce less than a 1 dB rise in the output level.)

INPUT LEVEL: -17 dBm to $+23$ dBm for 10 dB of limiting.

OUTPUT LEVEL: Adjustable to $+23$ dBm maximum with limiting, $+30$ dBm amplifier maximum.

INPUT AND OUTPUT IMPEDANCE: 600 ohms, balanced or unbalanced.

DIMENSIONS: $3\frac{1}{2}$ " H x $13\frac{5}{8}$ " D x 19" W (standard rack).

WEIGHT: 14 lbs. net; 23 lbs. shipping.

TEMPERATURE RANGE: -20°C to $+55^{\circ}\text{C}$. -4°F to $+130^{\circ}\text{F}$.

INPUT POWER: 115/230 volts, 50/60 Hz, 5 watts.

ORDERING INFORMATION

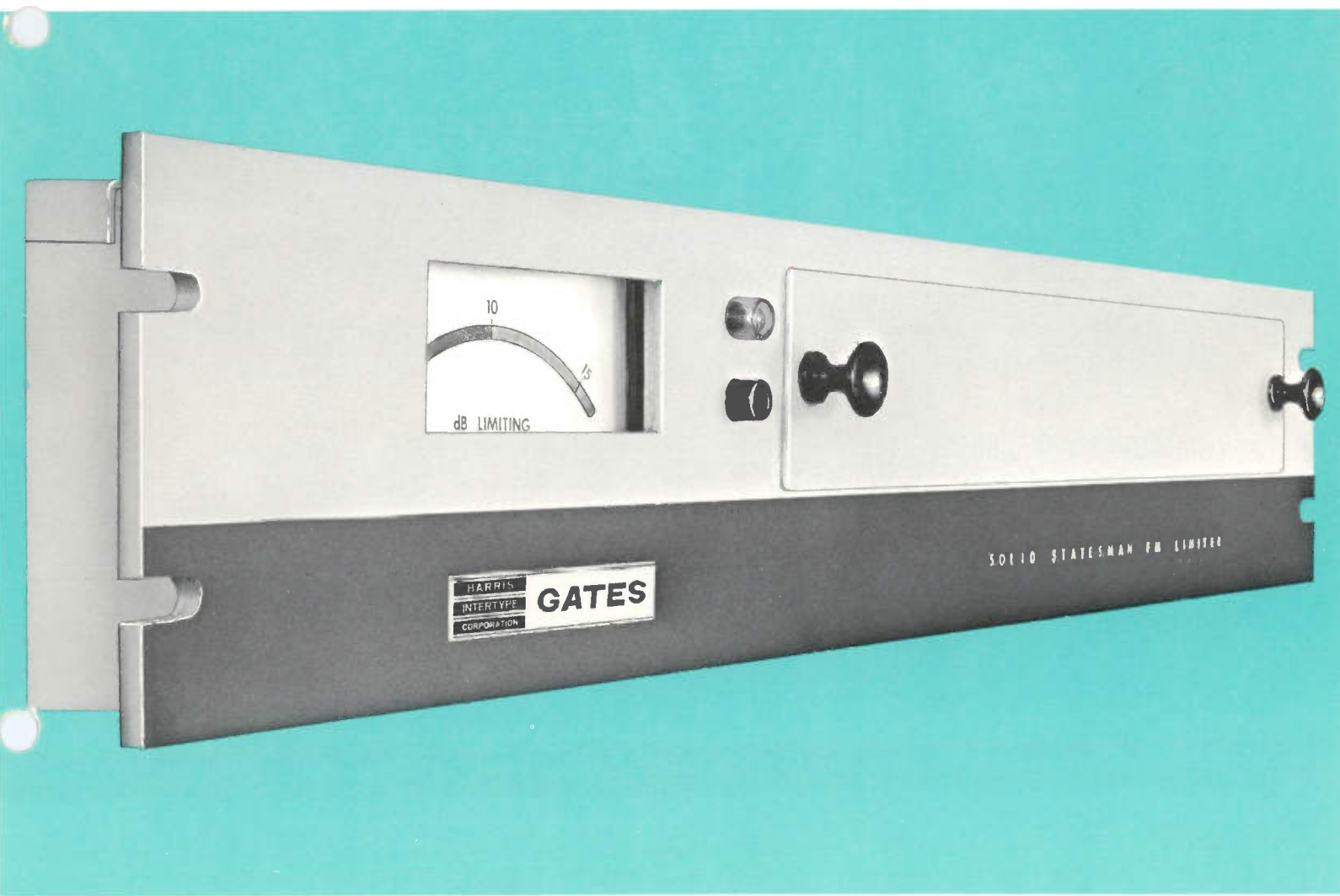
Solid Statesman FM Limiter

994-6631 \$750
pair 1,500

HARRIS
INTERTYPE
CORPORATION
GATES

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A division of Harris-Intertype Corporation

ADV. 258A



SOLID STATESMAN FM LIMITER

IMPORTANT FEATURES

- Selectable recovery times
FAST • MEDIUM • SLOW
- Selectable frequency threshold for instantaneous peak controlling
- High compression ratio—greater than 30:1
- High output modulation due to unique dynamic recovery circuit
- Separate input and output attenuators
- Extended control range (30 dB)
- Low distortion
- Fully field tested

Gates' new Solid Statesman FM Limiter (M-6631) is designed to prevent FM over-modulation, while retaining the original fidelity of the program material. This is accomplished through a combination of limiting, pre-emphasis, instantaneous peak controlling and de-emphasis.

A wide control range, low distortion and rapid attack time are outstanding features of the M-6631—made possible by the extremely close

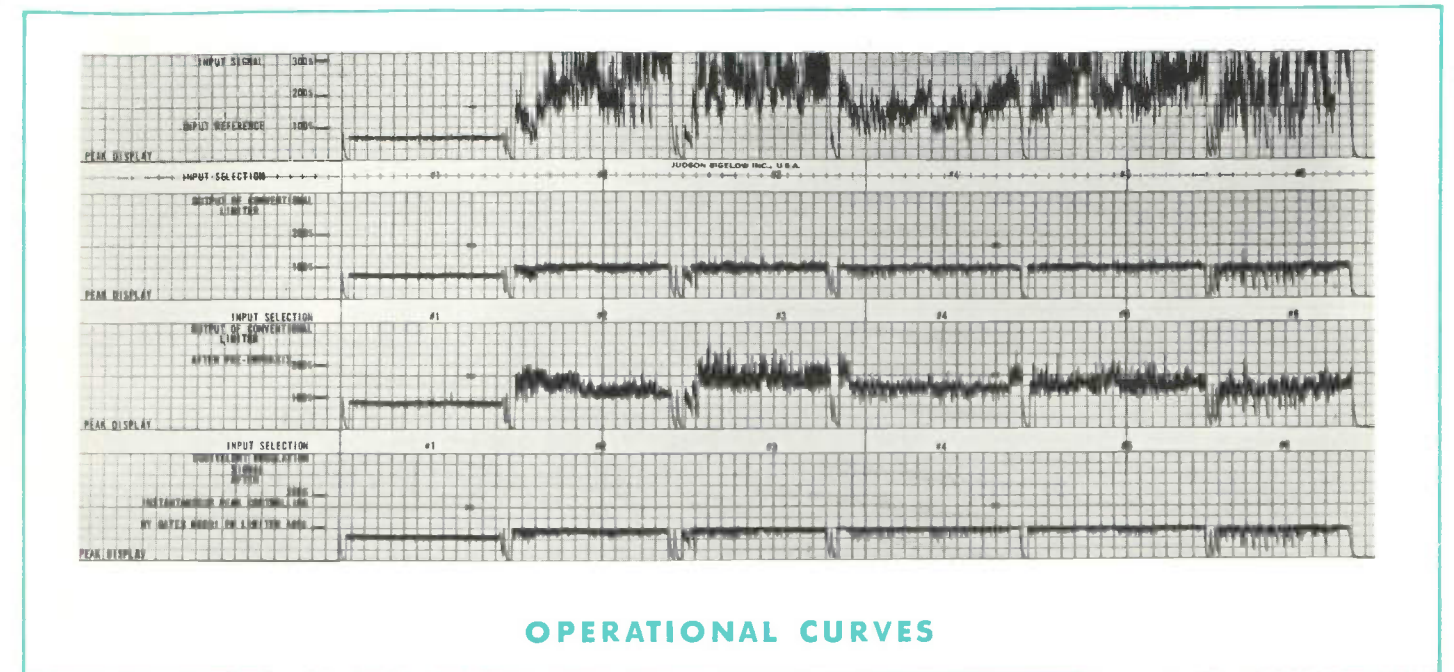
balance of the "Differential Amplifier" used as the gain control device.

Another important feature is the selectable recovery time, which allows each station to choose the best recovery time (FAST, MEDIUM, SLOW) for its type of programming.

In the FAST mode of operation the FM Limiter has dynamic gated recovery. This permits very fast (200 millisecond) recovery times for the highest possible modulation levels, while distortion figures are almost as low at 30 Hz operation as at 1000 Hz.

The MEDIUM and SLOW positions are conventional and offer slower recovery times for stations desiring protection from over-modulation, but more subtle operation.

The selectable frequency threshold for instantaneous peak controlling permits the local station to select the frequency at which the instantaneous peak controller starts operating. This control function is related to the FCC 75 microsecond pre-emphasis curve, and is intended to offer stations



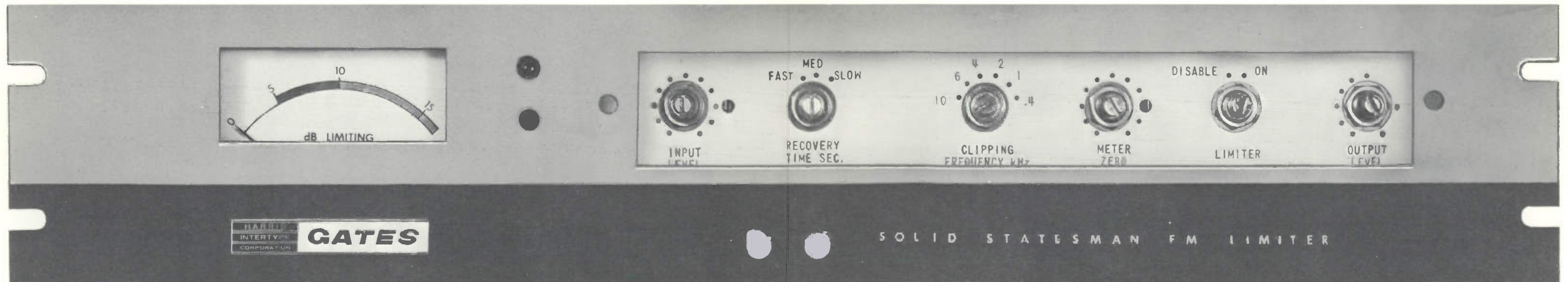
OPERATIONAL CURVES

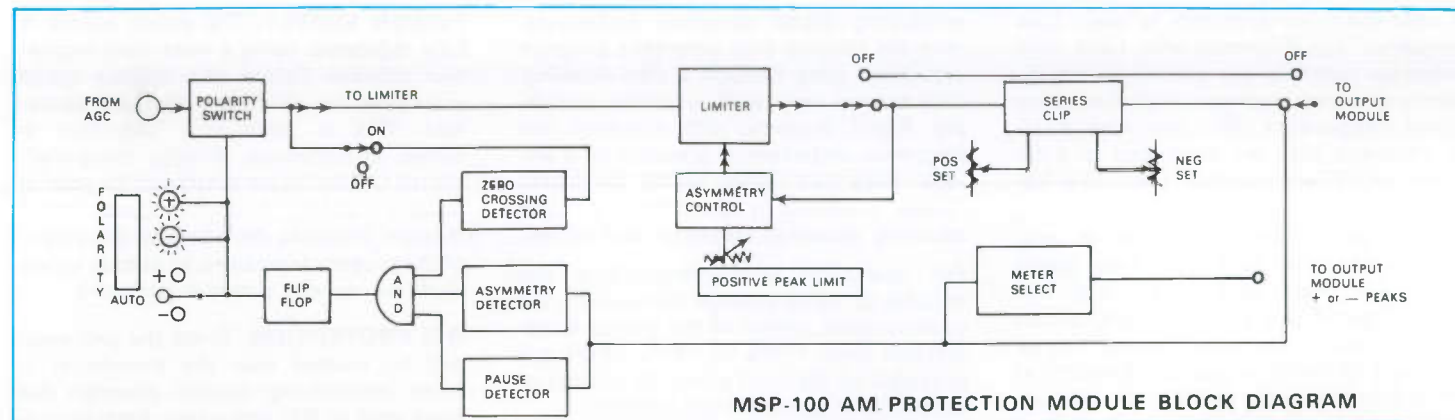
positive protection, but lesser amounts of control action if desired.

Two FM Limiters may be synced together for stereo operation with a small phone jumper.

A front panel control permits the user to disable the unit for proof of performance tests.

Only 3 1/2" of standard rack space is required for the M-6631 FM Limiter. All operating controls are located behind the easily removed front access panel. Circuit components are readily accessible by removing the top cover. Input and output connections are provided on a barrier terminal block on the rear of the unit along with the stereo sync jack and AC power and fuse.





MSP-100 AM PROTECTION MODULE BLOCK DIAGRAM

MSP-100 SPECIFICATIONS

PERFORMANCE SPECIFICATIONS

FREQUENCY RESPONSE: 30 Hz to 15 kHz, ± 1 dB of 1 kHz value at +10 dBm output, control functions disabled.

HARMONIC DISTORTION (TOTAL): 0.25% or less, 20 Hz to 15 kHz at +10 dBm output with control functions disabled.

INTERMODULATION DISTORTION: 0.5% or less, 60 Hz and 7 kHz mixed 4:1 at +10 dBm output with control functions disabled.

NOISE: 65 dB below +10 dBm output over 30 Hz to 15 kHz bandwidth for 0 dBm input with control functions disabled.

GAIN: Switch selected, 23 dB or 43 dB, ± 2 dB (input and output controls allow finer adjustment).

MAXIMUM OUTPUT LEVEL: +18 dBm.

GENERAL

SOURCE LOAD IMPEDANCE: 600 ohms, balanced or unbalanced.

AC INPUT POWER: 115/230 volts, 50/60 Hz, single phase, 40 watts.

TEMPERATURE RANGE: Operating, 0° to +55° C; storage, -40° to +85° C.

HUMIDITY RANGE: Non-condensing, 5% to 95% relative.

ALTITUDE RANGE: To 10,000 feet A.M.S.L.

DIMENSIONS: 17.6" (44.8 cm) W x 14" (35.5 cm) H x 15.1" (38.4 cm) D.

OPERATIONAL SPECIFICATIONS

AGC Section

CROSSOVER FREQUENCIES: Switch selectable, $\pm 10\%$:
Low: 75, 95, 105, 135, 160, 230, 320 Hz.
High: 1.7, 2.2, 2.5, 3.1, 3.7, 5.3, 7.2 kHz.

ATTACK TIME (Applicable to each of 3 bands): Compression or expansion, switch selected .25, .8, 2.5, 8, 25 milliseconds.

RECOVERY TIME (Applicable to each of 3 bands): Compression or expansion, switch selected 0.4 to 6 seconds; dual recovery mode (when used) dynamically increases period recovery time up to 11 times selected.

COMPRESSION RATIO (Applicable to each of 3 bands): Switch selected, 12:4; 12:2; 12:1, 12:0.5 (dB/dB) at center of range.

EXPANSION RATIO (Applicable to each of 3 bands): Fixed, 12:24 dB/dB.

COMPRESSION THRESHOLD (Applicable to each of 3 bands): Adjustable over 12 dB range.

EXPANSION THRESHOLD (Applicable to each of 3 bands): -30 dB relative, adjustable ± 12 dB.

EXPANSION RANGE (Applicable to each of 3 bands): 12 dB.

COMPRESSION RANGE (Applicable to each of 3 bands): 24 dB.

Limiter Section

ATTACK TIME: Automatic mode, 25 microseconds to 3.6 milliseconds determined by program signal; manual mode, 0.04 to 3.6 milliseconds.

RECOVERY TIME: Automatic mode, 40 milliseconds to 10 seconds determined by program signal; manual mode, 0.4 to 6.5 seconds. Dual recovery mode (when used) dynamically increases recovery time up to 11 times selected period in either mode.

LIMITING RATIO: 12:0.5 (dB/dB), minimum.

LIMITING RANGE: 12 dB

FM Protection Section

COMPENSATION CURVES: Flat, 25, 50 and 75 microsecond.

ATTACK TIME, H.F. LIMITER: 100 microseconds.

RECOVERY TIME, H.F. LIMITER: 100 milliseconds.

OPERATIONAL MODE: Parallel split-band with H.F. control only. Crossover frequency: 450 Hz. High frequency control: infinitely variable from full clamp to full gain-reduction limiting.

AM Protection Section

ASYMMETRICAL LIMITING: 100% to 133%, continuously variable.

LIMITER ATTACK TIME: Automatic mode, 25 microseconds to 3.6 milliseconds, determined by program signal; manual mode, 0.04 to 3.6 milliseconds.

LIMITER RECOVERY TIME: Automatic mode, 40 milliseconds to 10 seconds, determined by program signal; manual mode, 0.4 to 6.5 seconds. Dual recovery mode (when used) dynamically increases recovery time up to 11 times selected period in either mode.

ASYMMETRICAL SENSITIVITY: 5%.

SWITCHING TIME: Less than 1 microsecond.

SWITCHING ACTIVATOR: Pause detector and zero crossing detector.

PAUSE DETECTOR SENSITIVITY: 10 dB, 20 dB, 30 dB below limiting threshold (switch selectable).

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

ORDERING INFORMATION

MSP-100 FM/TV Audio Processor (stereo)	994-7967-001
MSP-100 FM/TV Audio Processor (mono)	994-7968-001
MSP-100 AM Audio Processor (mono)	994-8148-001

HARRIS CORPORATION Broadcast Products Division
P. O. Box 290, Quincy, Illinois 62301 U.S.A.



HARRIS
COMMUNICATIONS AND
INFORMATION HANDLING

MSP-100

Audio Processor for AM/FM/TV

- Insures maximum signal power with minimum distortion
- Replaces six to eight separate processors
- Automatic audio processing
- Asymmetrical limiting to achieve 125% positive peak modulation for AM
- Switch selection of all operating parameters for tailoring sound to station format
- Expandable to FM stereo by adding plug-in modules





MSP-100, SHOWING METER MODULE CONTROLS.

The Harris MSP-100 Audio Processor is an extremely flexible audio control package offering new control concepts and unequalled versatility. It is designed to allow the highest possible modulation levels, with minimum distortion. This single unit incorporates a tri-band AGC and broadband peak limiter with pre-emphasis compensation to permit unparalleled "tailoring" of sound to station format.

The modular construction assures flexibility in initial installation and in future additions. An FM monaural unit is converted to stereo operation simply by plugging in "right channel" modules. No critical calibration adjustments are required.

All audio circuitry employs linear integrated circuit amplifiers with no discrete transistors, reflecting the state-of-the-art approach to circuit design.

INPUT SELECTION. An active instrumentation-type input circuit permits balanced or unbalanced input without modification. Problems normally associated with transformer inputs relative to frequency response, low-frequency distortion and transients are eliminated.

An input sensitivity switch (20 dB) and a further fine adjustment range of 20 dB allow control of input level to the AGC section over a 40 dB range.

AGC SECTION. Three AGC circuits process separate segments of the audio spectrum independently. Operational parameters, including frequency bandwidths, thresholds and shapes, and attack/recovery times, are variable to user tastes in each band. Variation of parameters directly affects the output spectral distribution—the characteristic "sound" of the processed signal. The AGC module may be quickly set for use as a gentle AGC, spectral equalizer, fast parallel split-band compressor, or anything in between.

Confusion in operational adjustment is minimized by the extensive use of selector switches rather than potentiometers. High and low crossover frequencies are adjustable to any one of seven frequencies each. Attack and recovery times of expansion and compression have five different periods each per band. The dual recovery mode expands the range of recovery times to ten per band. Expansion and compression thresholds may be adjusted in-

dependently in each band. Exclusive crossover compensation assures frequency response free from sharp peaks or dips under both dynamic and static conditions.

The gain controlling element is a monolithic four-quadrant multiplier operating in the two-quadrant mode, assuring optimum noise and distortion performance. Exact tracking between bands and between left and right stereo channels is inherent in the circuits used.

Metering modules are located above the main signal card frame and contain most operating parameter adjustment switches. One module is used per band. Meter circuitry can be switched to monitor left or right band control signal or the greater of the two. In stereo operation, the greater of left or right controls the gain of both sections.

LIMITER SECTION. A broadband fast limiter controls transient peaks and summation errors present in the output of the tri-band AGC. The unit analyzes program content and automatically selects optimum attack and recovery time constants. Automatic attack time selection minimizes transient intermodulation of restricted-bandwidth signals during limiting. Automatic recovery time selection optimizes the degree of dynamic range reduction to the nature of the program signal.

A two-quadrant multiplication technique similar to that employed in the AGC section is used to control limiter gain. Automatic attack circuitry analyzes the signal density in six separate frequency bands and selects faster attack times when significant high frequency energy is present. Automatic recovery is based on the detection of syllabic rate. Pulsing signals, such as voice, have a waveform envelope containing many more pulses per second than smooth signals, such as certain musical selections. Recovery time is selected by a limited bandwidth pulse counter to eliminate extreme recovery selection errors on very rapid pulses such as drum rolls.

Attack and recovery times are monitored by LED status indicators. Manual selection of attack and recovery times is available over a range of five values for each, with dual recovery available in both manual and automatic modes. Stereo strapping of limiters is easily connected and disconnected. An expanded scale meter indicates limiting over a 12 dB range; it can be switched to monitor left limiting, right limiting, or the greater of the two.

FM PROTECTION SYSTEM. High frequency energy can cause significant overdrive conditions in pre-emphasized systems such as FM, TV and SCA broadcasting, and tape recording. Modification of the signal is required to eliminate instantaneous overdrive when high frequencies are present.

A split-spectrum approach is used. Low frequency signal components have little overdrive potential but contribute significantly to signal loudness. High frequency signal components affect overdrive greatly, therefore they are controlled to a far more significant degree than low-frequency signals.

Input signal from the limiter is pre-emphasized and split into two bands above and below 400 Hz. The high frequency band feeds a parallel clamp circuit and fast limiter. The output signal may be adjusted to combine any combination of limited or clamped signal with the unprocessed low-frequency signal. A final broadband clamp circuit controls transient peaks and summation errors. De-emphasis after the clamping sections minimizes audible harmonic distortion. LED's are used to indicate operation of the high frequency limiting and clamping.

AM PROTECTION SYSTEM. To convert from FM to AM, simply replace the FM Protection Module with an AM Protection Module—this is the only change that is needed.

The AM Protection Module works in conjunction with the broadband peak limiter featuring low distortion and low noise. Asymmetrical limiting of the signal is achieved through the use of innovative circuitry to allow 125% positive peak modulation. A polarity reversal circuit,

employing digital detection techniques, reverses polarity only when the program waveform goes through a zero crossing. This assures very rapid, inaudible, switching. Rapid recovery, with minimum low frequency distortion, is provided by a unique integrated circuit which eliminates "holes" produced by conventional delayed recovery distortion reduction techniques.

For operation with transmitters not capable of 125% positive modulation, the positive peak ceiling of the limiter is adjustable from 100% to 133%. LED's are provided on the front panel for readout of polarity and asymmetrical limiting.

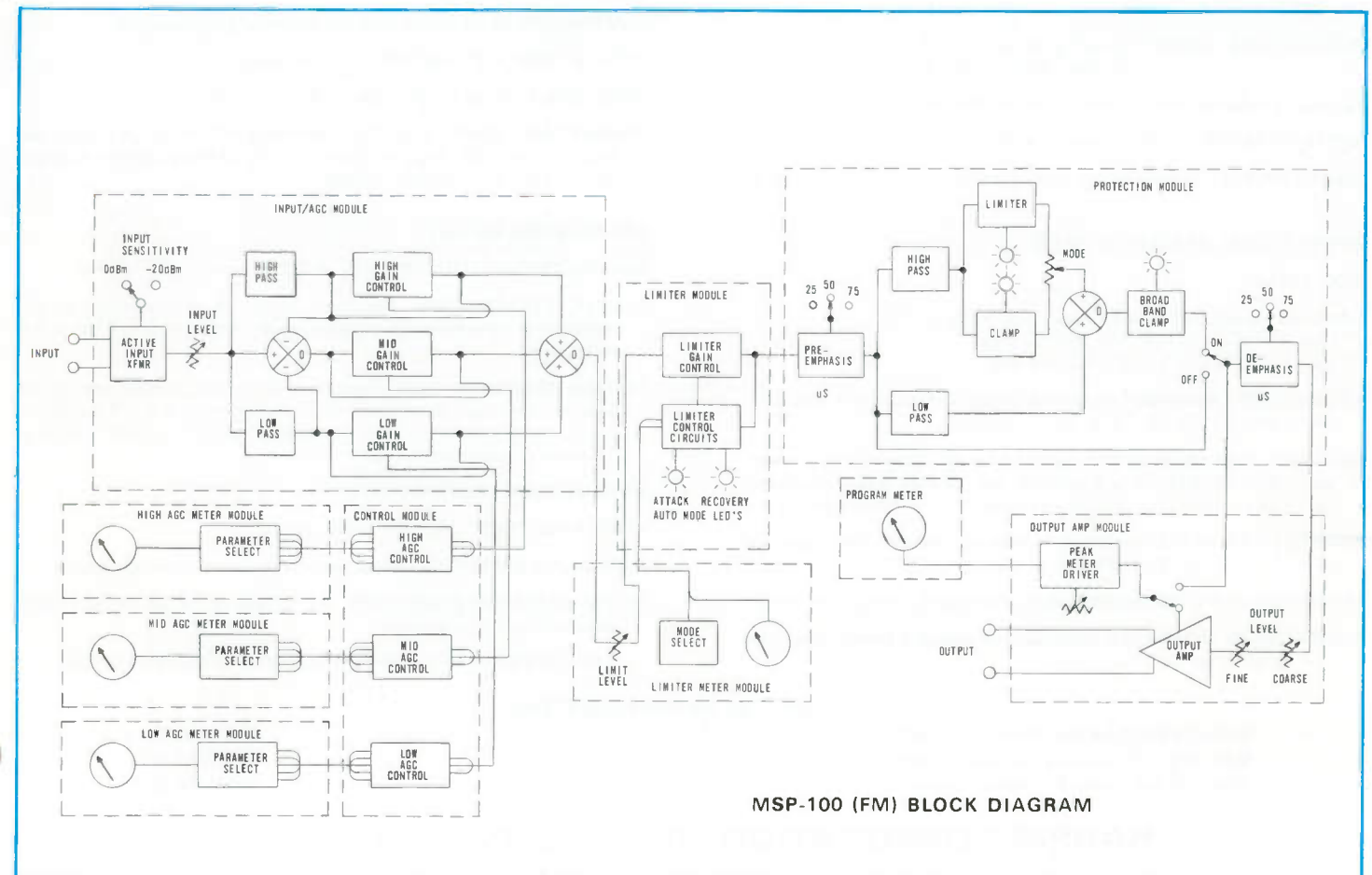
OUTPUT AMPLIFIER. State-of-the-art circuitry insures best transient response without the distortion or ringing limitations of transformers. The output amplifier does not use any transformers or transistors whatsoever in providing a 600 ohm balanced output capable of delivering +18 dBm. Integrated circuits are used exclusively. Both coarse and fine output level adjustments are provided.

Output metering circuitry permits observation of peak signal levels both with and without pre-emphasis. Meter sensitivity can easily be changed in precise 2 dB increments. As in the AGC metering modules, left output, right output, or the greater of the two can be switched into the meter.

POWER SUPPLY. The power supply is fully regulated, using a redundant regulation scheme. Failure of a module would not cause the entire unit to cease operation. This is particularly important in stereo broadcasting. Simple integrated-circuit regulators are employed for ease in trouble-shooting. A unique power status monitor indicates deviations in the output of the primary regulators, to quickly locate faults or identify potential problems.

RFI PROTECTION. Since the processor will be located near the transmitter in most installations, special attention has been paid to RFI protection. Each plug-in module has been shielded, grounding of circuitry has been given special attention, extensive use of ground planes on PC boards has been made and filters have been used at critical points.

MECHANICAL. Modular construction allows easy access to all circuit elements. All plug-in modules are easily serviced through the use of an extender card. Metering modules lift out for accessibility and the power supply is easily accessed by removing the top cover. Ease of maintenance and an extremely clean appearance have been achieved through the use of a mother board and plug-in card concept. Most maintenance and service is easily performed without removing the unit from its rack.



MSP-100 (FM) BLOCK DIAGRAM

MSP-95 SPECIFICATIONS

AC INPUT POWER:

117/234 volts, $\pm 10\%$, 50/60 Hz, 50 watts

DC VOLTAGES:

dual series regulation at ± 20 VDC and ± 15 VDC, ± 6 VDC

HUMIDITY RANGE:

non-condensing to 90% relative

ALTITUDE:

to 10,000 feet A.M.S.L. (3048 meters)

TEMPERATURE RANGE:

0°C to +50°C. Storage -40°C to +85°C.

DIMENSIONS:

19" W x 5.25" H x 15.5" D (48.3 cm W x 13.3 cm H x 39.4 cm D)

WEIGHT:

24 pounds (10.9 kg)

CONNECTIONS:

barrier strips and BNC jacks

INPUT:

600 ohms terminating. Adaptable to other impedances. Input Level: 0 ± 1 dBm for 100% modulation. Switch selectable for +10 dBm, -10 dBm, -20 dBm, or -30 dBm.

EXTERNAL INPUT FOR SCA:

10K resistive, unbalanced. Amplitude response ± 0.25 dB, 30-75,000 Hz.

OUTPUT:

150 ohms unbalanced, resistive (BNC connector). Adjustable from less than 1V RMS to greater than 4.5V RMS for 100% modulation

AUDIO FREQUENCY RESPONSE:

(Left and Right) standard 75 microsecond FCC pre-emphasis curve ± 0.5

dB, 30-15,000 Hz; selectable; flat; 25; or 50 microsecond pre-emphasis

TYPE OF MODULATION:

Digitally Synthesized Modulation (DSM)

INPUT FILTERING:

15 kHz LPF, 50 dB minimum rejection at 19 kHz and above

OVERSHOOT PROTECTION:

Dynamic Transient Response (DTR) filter

AUDIO TRANSIENT RESPONSE:

2% maximum overshoot beyond steady state

HARMONIC DISTORTION:

1V RMS output, 0.25% maximum, 30-15,000 Hz, limiter disabled; 1% maximum, 30-15,000 Hz, 10 dB limiting. Slow recovery. THD of stereo generator typically less than 0.1%

INTERMODULATION DISTORTION:

SMPTE 4:1 at 1V RMS output (P.EQ) 0.25% maximum, limiter disabled. Stereo generator typically less than 0.1% IMD

NOISE:

Left or right 70 dB minimum below 100% modulation. Reference: (400 Hz, 75 microsecond de-emphasis, 1V RMS output, measured 30-15,000 Hz.

CROSSTALK:

(main to stereo sub-channel or stereo sub-to-main channel; test mode) greater than 40 dB below 90% modulation. Typically greater than 40 dB with limiters enabled

PILOT OSCILLATOR:

crystal controlled

PILOT STABILITY:

19 kHz ± 1 Hz, 0°C to 50°C

PILOT PHASE:

automatically controlled

STEREO SEPARATION:

45 dB minimum, 30-15,000 Hz

DYNAMIC STEREO SEPARATION:

40 dB minimum under normal programming

SUBCARRIER SUPPRESSION:

60 dB minimum below 100% modulation

76 kHz SUPPRESSION:

60 dB minimum below 100% modulation

MODES:

stereo (L+R), mono (L), mono (R), remote

LIMITING RANGE:

15 dB

LIMITING SLOPE:

30:1

LIMITING ATTACK TIME:

less than 40 microseconds

LIMITING RECOVERY TIME:

switch selectable from 1.3 seconds to 7.5 seconds

FM PROTECTION:

split band - dual mode



HARRIS
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MSP-95 FM AUDIO CPU

(Composite Processing Unit)

83895

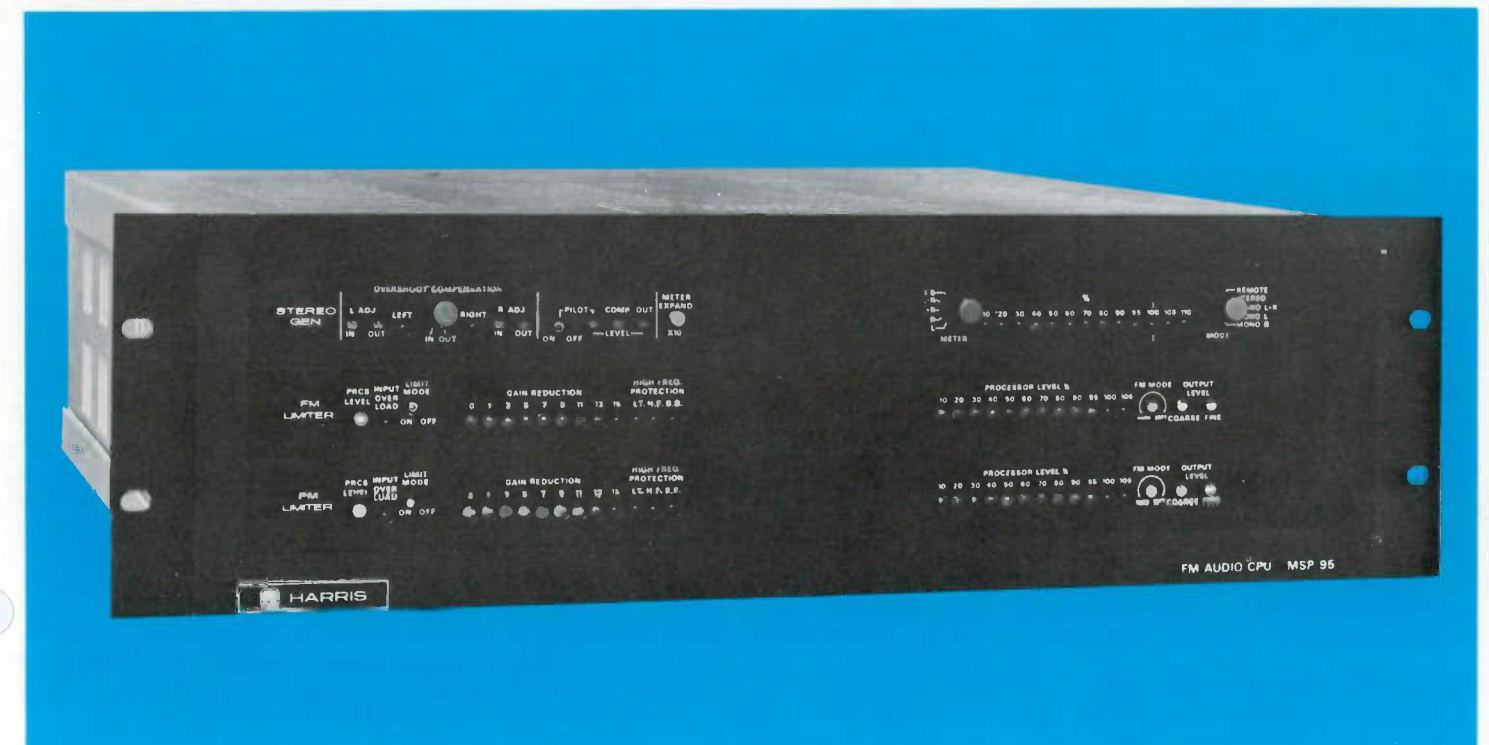
- Local/Remote Stereo Generator
- Drives composite STL or wideband FM exciter input
- Digitally Synthesized Modulation
- Dynamic Transient Response
- Low output impedance
- Remotely selectable operational mode
- Active transformerless inputs
- Selectable pre-emphasis
- Split-band dual-function FM protection
- Unique "soft syncing" recovery system
- Extensive LED metering
- RFI protected
- Modular construction

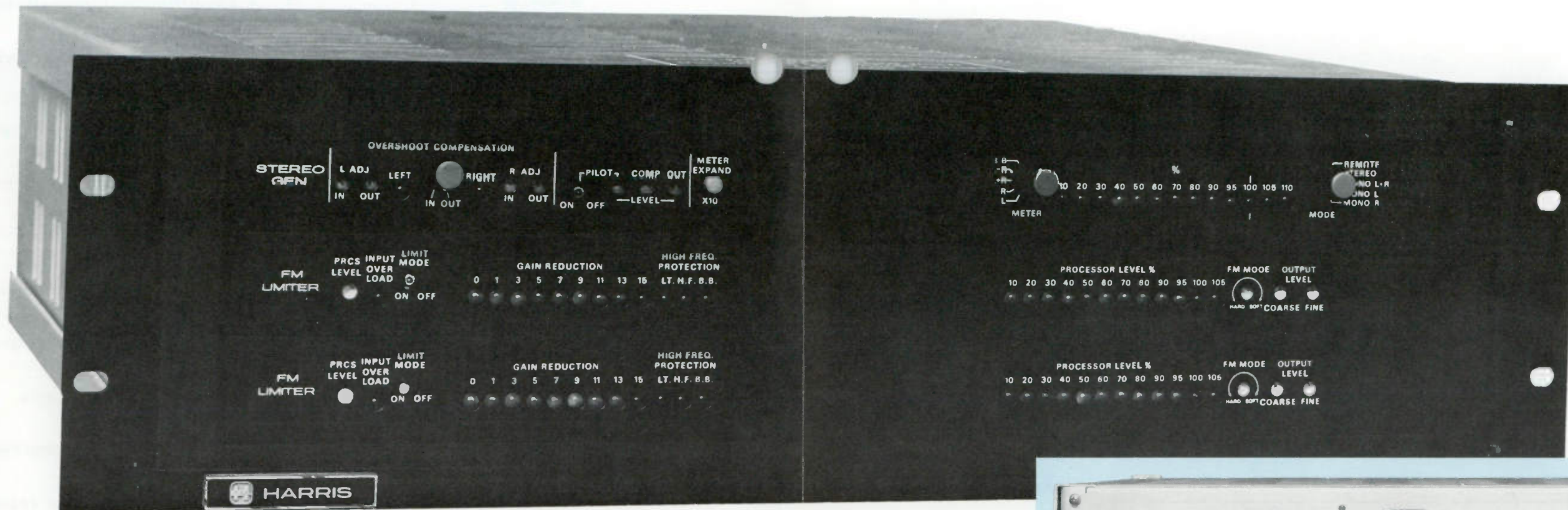
SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

ORDERING INFORMATION

MSP-95 FM Audio Composite Processing Unit994-8441-001

HARRIS CORPORATION Broadcast Products Division
P. O. Box 4290, Quincy, Illinois 62301 U.S.A. 217/222-8200





The MSP-95 FM Audio Composite Processing Unit features an integrated designed Stereo Limiter/Generator specifically suited for FM stations using an STL link. It drives composite Studio/Transmitter Links or wideband input of any FM exciter. The carefully engineered MSP-95 is a precision modular product that delivers studio program fidelity to remote FM transmitters and matches high performance studio equipment to an STL link. The MSP-95 FM Audio CPU is an exclusive Harris development, featuring Digitally Synthesized Modulation (DSM) and patented Dynamic Transient Response (DTR). The DTR filter, developed by Harris for FM stereo, holds overshoot on any program material to 2% or less. Mono mode switching allows front panel or remote selection of L+R, L, or R. A unique recovery system, "Soft Syncing", maintains stereo imagery while increasing loudness. Additional features of the MSP-95 include low output impedance for driving various lengths of coaxial cable; extensive LED metering; wide use of multturn pots; and socketed ICs for easy troubleshooting and serviceability.

MAINFRAME

The MSP-95 mainframe is a compact assembly designed to fit in a standard 19-inch rack, and occupies just 5 1/4 inches of vertical rack space. Double Power Supply regulation is incorporated to assure brownout protection. For further reliability, all connections are easily made via terminal strips or

BNC connectors. The MSP-95 rear panel offers quick access to power supply, line fuses, input and output connections, and I/O board. Audio inputs are filtered for RFI protection. Card guides are utilized for precise alignment of modules to the motherboard, and highly reliable ribbon cable is used on internal connections.

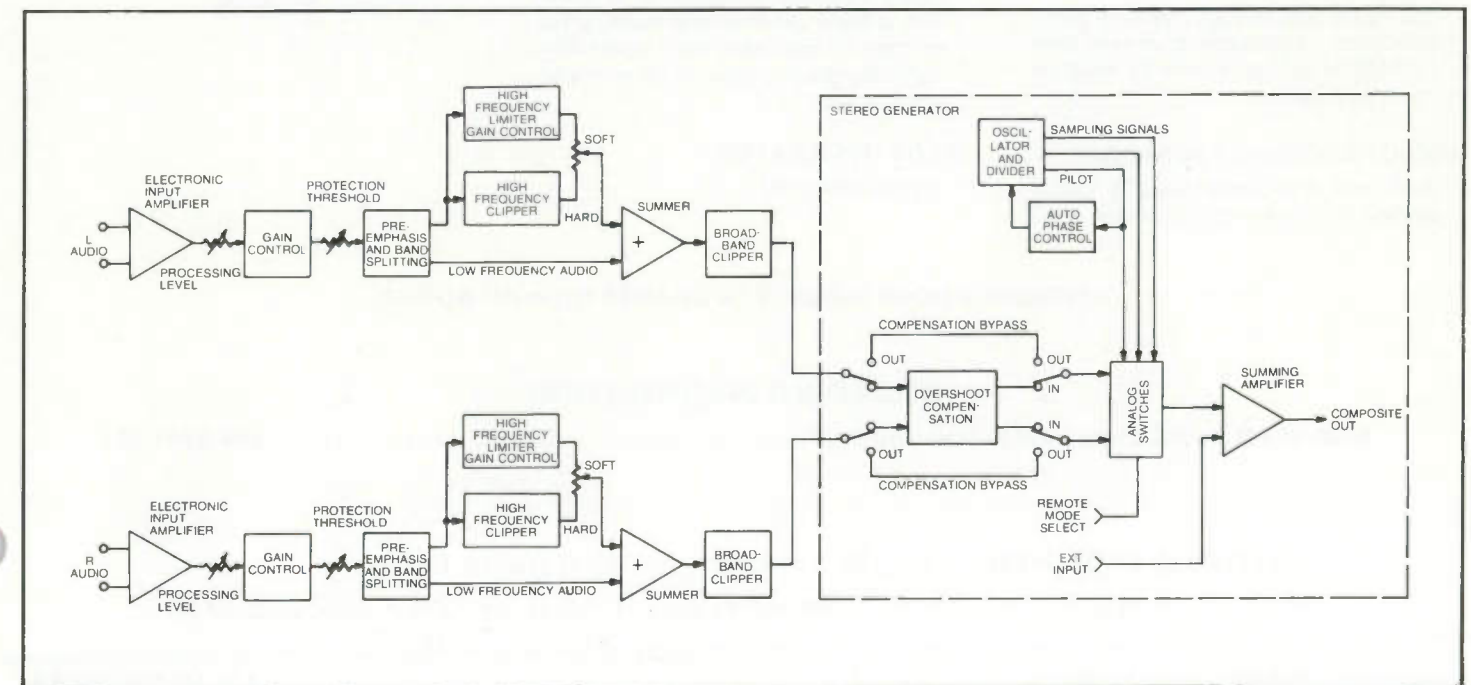
FM LIMITER

Harris' superb FM limiter gives the MSP-95 FM Audio CPU true instrumentation amplifier input for low distortion. The limiter also delivers excellent transient response and high common mode rejection. The input amplifier includes switch selectable gain over a 40 dB range, and a 600 ohm input impedance which can be easily changed. An input overload indicator is provided. Four quadrant multipliers are used for all limiting functions for low THD and IMD. Harris' split dual function processing provides the utmost in user flexibility. Tailoring the limiter to individual station formats is a simple exercise. Adjustments of recovery time, high frequency protection threshold, high frequency limiting or clipping can be accomplished in minutes. Switch selectable precision pre-emphasis gives access to 25, 50 and 75 microseconds curves. Dual recovery limiting allows the limiter to rapidly recover on short musical bursts while maintaining a slower recovery time on the majority of program audio. The resulting sound is less self modulated by peaks and more dynamic. Harris' high performance LED metering dis-

plays monitor all major functions of the MSP-95 limiter, including broadband gain reduction, high frequency protection and output. The broadband and high frequency limiters are strapped to eliminate image shifting.

STEREO GENERATOR

Unlike earlier types of stereo generators, the MSP-95 does not suffer from lower separation at the frequency extremes, thanks to Digitally Synthesized Modulation (DSM). Minimum separation is 45 dB from 30 to 15,000 Hz, typically exceeding 50 dB. This generator provides a clean baseband signal which promotes minimal interaction between stereo and SCA operation. What's more, the high performance characteristics of the DSM generator are easily maintained year after year. All digital signals, including the pilot, are generated from a crystal controlled master clock. An automatic pilot phase control makes misadjustment virtually impossible. Overshoot compensation is accomplished by a Harris patented Dynamic Transient Response (DTR) filter. Overshoot on any program material is held to 2% or less with no degradation in audio quality. As a result, a 2 to 6 dB increase in loudness can be achieved from the stereo generator alone. Controlled transient response, high stereo separation, low crosstalk and low intermodulation distortion are maintained with the increased loudness. Fast LED metering replaces analog meters.



SPECIFICATIONS

INPUT

INPUT GAIN: -10, -5, 0, 5, 10, 15 dB, switch selectable
INPUT IMPEDANCE: 20K Ohms, active balanced
CMRR: More than 40 dB @ 120 Hz
INPUT OVERLOAD: +30, +25, +20, +15, +10, +5 dBv, depending on input gain switch setting
INPUT INDICATOR: LED illuminates RED around 1.5 dB before input amplifier overloads, GREEN for normal operation (30 dB range below 0-L), no illumination below normal range (more than 30 dB below 0-L)

INPUT FILTERS

LOW PASS: 2nd order Butterworth, 17 kHz turnover frequency, switch defeatable
HIGH PASS: 2nd order Butterworth, 30 Hz turnover frequency, switch defeatable

BANDSPLITTING FILTERS

SLOPE: 6 dB/octave on low pass, bandpass and high pass
TURNOVER FREQUENCIES, switch selectable:
Low pass/bandpass: 100, 150, 200, 250, 300, 400 Hz
Bandpass/high pass: 1.5, 2, 2.5, 3, 4, 8 kHz

MULTIBAND COMPRESSION SECTION

THRESHOLD: Adjustable with COMPRESSION control from -20 dBv to +10 dBv in 0 dB input gain switch position. Threshold window dependent on input gain: +20 to -10 dB (-10 dB input gain), -5 to -35 dB (15 dB input gain position).
SLOPE: 10:1 nominal with soft knee
LF THRESHOLD: Adjustable +10 dB from midband
HF THRESHOLD: Adjustable +10 dB from midband
LF OUTPUT LEVEL: Adjustable +6 dB from midband
HF OUTPUT LEVEL: Adjustable +6 dB from midband
GATE THRESHOLD: Referenced to average compression level. Switch selectable: 0, 6, 12, 18, 24, INF dB positions below average compression level with 30 dB gain reduction, also defeatable.
COMPRESSION RANGE: 10 dB to 40 dB, depending on COMPRESSION control setting
GAIN REDUCTION METERING: 3 dB per step in 10 element bar graph

display, 30 dB total range, one meter each for LF, MF and HF bands of compressor.

COUPLING CONTROLS: Compression control in LF and HF bands may be slaved to midband compressor control. Continuously adjustable from fully strapped to fully independent control.
RECOVERY RATE: dB-linear, constant throughout control range. Multiple recovery time constant: Fast for first 6 dB, user adjustable from 60 dB to 0.3 dB/second for next 20 dB, slow for balance of range.

BROADBAND LIMITER

LEVEL: 0 dB to 10 dB, user adjustable
SLOPE: 50:1 or greater
LIMITER METERING: 1 dB per step in 10 element bar graph display, 10 dB total range
RECOVERY RATE: 2 dB to 300 dB/second, user adjustable

OUTPUT AMPLIFIER

NOMINAL LEVEL: 0 dBv to +20 dBv when in limiting, infinite resolution, user adjustable
CLIPPING LEVEL: Not less than +24 dBm
OUTPUT INDICATOR: LED illuminates RED with amplifier overload, GREEN for normal range of 20 dB below overload
OUTPUT IMPEDANCE: 60 ohms resistive, active balanced
LOAD IMPEDANCE: 150/600 ohms, balanced

OVERALL SYSTEM

FREQ RESPONSE: +0.0, -0.25 dB, 20 Hz to 20 kHz, below threshold. +1.0 dB, 100 Hz to 20 kHz, above threshold with pink noise generator input.
HARMONIC DISTORTION: 0.05% @ 1 kHz, 0 dB to 40 dB gain reduction 1.0% max., 20 Hz to 20 kHz, 0 dB to 40 dB gain reduction with slow recovery time 0.1% max., 20 Hz to 20 kHz, below threshold
IM DISTORTION: 0.05% max., 60 Hz/7 kHz, 4:1 ratio, nominal levels, below threshold
POWER REQUIREMENTS: 115/230 VAC, +10%, 15 watts
SIZE: 45mm (1.75") high, 483mm (19") wide, 305mm (12") deep (less XLR mating connectors)
NET WEIGHT: 4kg (9 lbs)

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

ORDERING INFORMATION

Ulti-Mate 91 Tri-Band AGC Compressor/Limiter 994-8871-001
Stereo Pair of Ulti-Mate 91 AGC/LIM Amplifiers 994-8975-001

HARRIS CORPORATION BROADCAST GROUP
P. O. BOX 4290, QUINCY, ILLINOIS 62305-4290 U.S.A. 217/222-8200



HARRIS

Ulti-Mate 91™ Tri Band AGC Compressor/Limiter



For AM, FM, or TV

- Improves Performance Of Leading Audio Processors
- True Linear VCA Gain Control For Consistent Sound
- 110 dB Dynamic Range For Ultra Quiet Operation
- Adjustable To Optimize Sound To Station Format
- Phase Coherent Filtering For Accurate Transient Response
- Pull Out Drawer For Easy Adjustment and Security

ULTI-MATE 91™

Tri Band AGC Compressor/Limiter

More Signal Shaping Flexibility — Surprisingly Low Cost!

Good sound is the currency of radio; it buys audience. Now, with the new Ulti-Mate 91 by Harris, you can sound better instantly! The Ulti-Mate 91 AGC amplifier comes with all the creative flexibility you'll need to make *your* airsound unique and more competitive in the marketplace.

Improve any audio source. Use Ulti-Mate as your final broadband limiter or put it in front of your audio processing system for a remarkable improvement in sound. The Ulti-Mate's linear VCA gain control allows extraordinary processing capability, sure to enhance even the purest system. Considering a transition to stereo? The Ulti-Mate 91 is totally compatible with all broadcast stereo systems, AM, FM, or TV. And, Ulti-Mate 91 can drive your STL too!

LOUD, CLEAR AND CLEAN

The Ulti-Mate 91 uses feed-forward gain control for lowest distortion and noise. Instead of looking at the output level to control gain, it looks at the actual input level in each band, eliminating the need for feedback. The result is an AGC amplifier with unprecedented dynamic range—110 dB! You set the operating point best for your operation. If you need a "crunch proof" processor, set the control range at 40 dB and get 70 dB signal to noise ratio. If you want ultra-low noise, set the control range at 10 dB and get 100 dB signal to noise ratio!

Bandsplitting is performed by a phase coherent, first order, three way dividing network. The low frequency and high frequency inflection points (turn-over frequencies) are switch selectable over several octaves, allowing control of static and dynamic frequency response.

The recovery rate of all three bands is identical and adjusted with one control, which simplifies setup. The recovery rate remains constant throughout the gain control range, providing consistent sound, independent of compression level. A triple time constant recovery profile with dB-1 linear characteristics assures smooth operation over widely varying program levels. A program controlled gating circuit sets a gate threshold reference to peak program. This gating circuit allows adjustment of the amount of fast gain control action available, limiting source noise buildup and unnatural reverberation effects.

A full complement of equalization controls allow static and dynamic response shaping. High and low frequency bands have threshold controls for dynamic response shaping and output level controls for static response shaping.

In order to prevent unnatural gain control action on high quality source material, the high and low frequency band compressors may be controlled by the mid-band control signal. Coupling controls allow continuous adjustment of the degree of control exercised by the mid-band compressor, from fully inde-

pendent (Tri-Band) to fully dependent (Wide-Band). In the fully dependent mode, excessive level in the HF or LF bands will still be reduced, providing excellent consistency with an insignificant amount of spectral shaping.

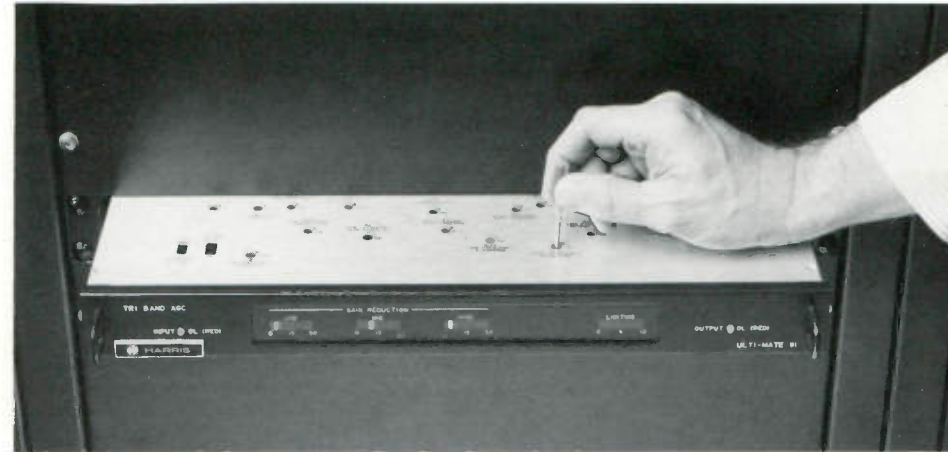
The Ulti-Mate 91's front panel contains only gain reduction and overload indicators. All the primary calibrating controls are concealed in an easily accessed slide out drawer. However, if tampering is a concern, unauthorized adjustments can be discouraged by the installation of a lock plate assembly.

Input audio is applied to the unit via a back panel XLR type connector. An effective Pi network RFI filter eliminates troublesome interference from strong AM and FM fields. An electronically balanced, overload protected, differential input amplifier removes unwanted common mode hum and interference. A two color indicator illuminates (RED) during input overloads and (GREEN) during normal operation.

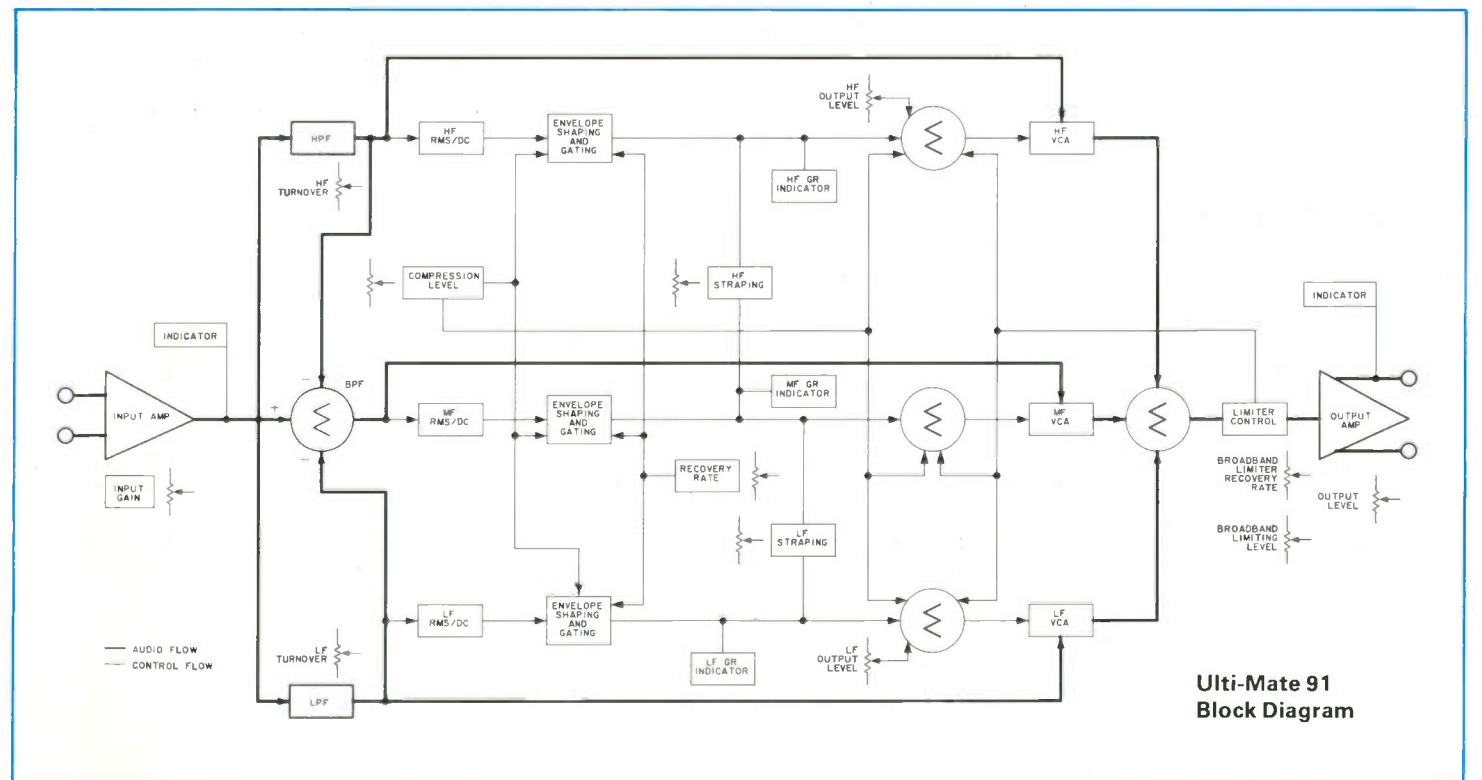
NO ROOM IN THE RACK?

Space is no problem with the Ulti-Mate 91 as it is accommodated in only 1 3/4" of vertical rack space! Two units for stereo requirements need only 3 1/2" of rack space.

More signal shaping flexibility, markedly improved signal transmission, pleasingly low cost. The Harris Ulti-Mate 91 will give your station the competitive edge only a consistent air sound can bring!



The Ulti-Mate 91's primary calibrating controls are concealed in an easily accessed slide out drawer. Unauthorized adjustments can be discouraged by the installation of a lock plate assembly.



Ulti-Mate 91 Block Diagram

Take a closer look . . .

