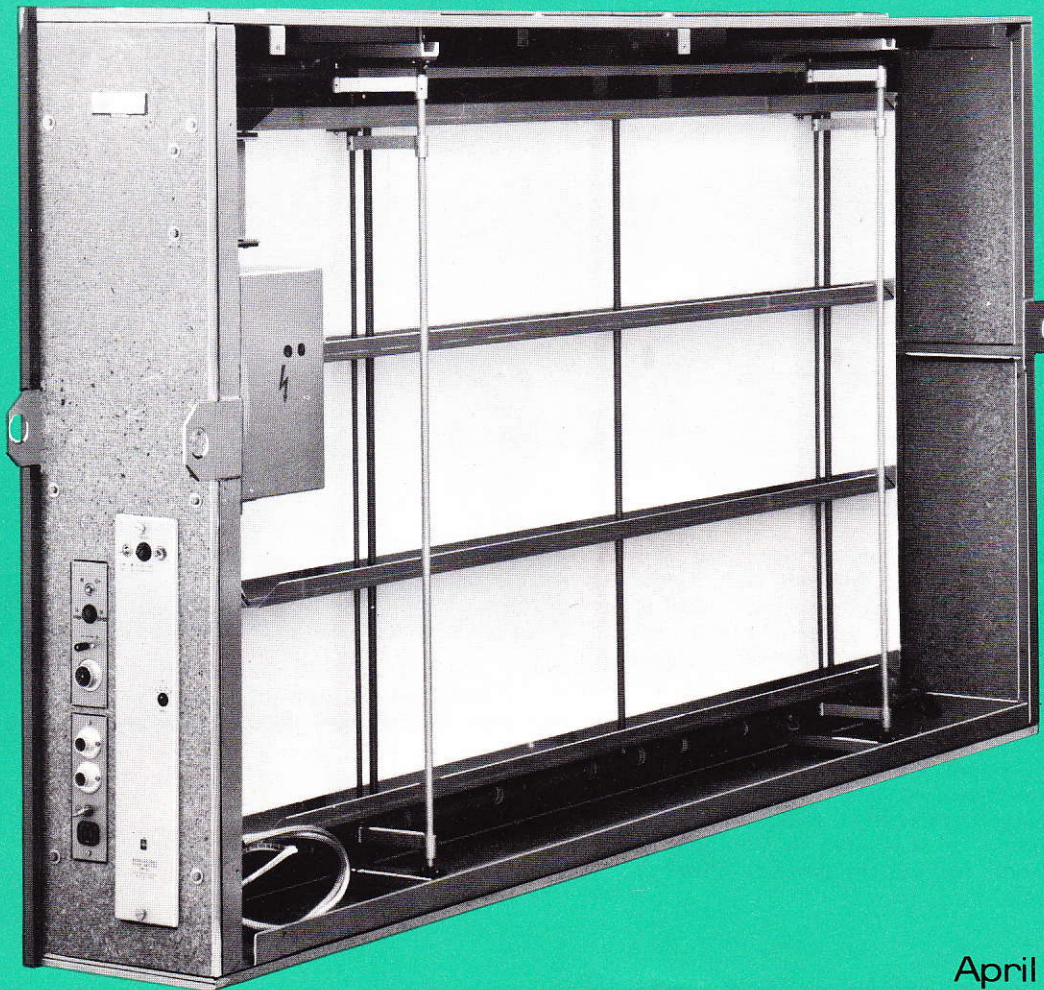




# REVERBERATION UNIT EMT 140 TS



April 1971



# Realistic Reverberation

The use of simulated reverberation for recording, broadcasting and TV dates back many years. It has found many applications both for creating special effects and for optimizing the room acoustical impression in musical recordings. It has also found application in the creation of three-dimensional effects in stereo recording and for reconstituting mono recordings for stereo release.

The EMT 140 Reverberation Unit is the standard device used throughout the entire world.

The new improved version of the EMT 140, equipped with solid state electronics carries the designation EMT 140 TS and with built-in remote control EMT 140 FB-TS. Besides its ability to acoustically reproduce rooms of various sizes, it is also able to increase the apparent distance between sound source and microphone. For this reason it is possible to use the Reverberation Unit with maximum success in any of the following situations:

For dramatic presentations on radio and television as well as for film sound stages for imparting the impression of large halls, factories, churches, bathrooms, cellars and many others.

For recording of popular dance music and jazz in which a vocalist or individual sections are to be recorded with an echo quality.

To improve on the special effect in symphonic or church music, especially when it is written for performance in large halls but must, of necessity, be recorded in absorptive rooms.

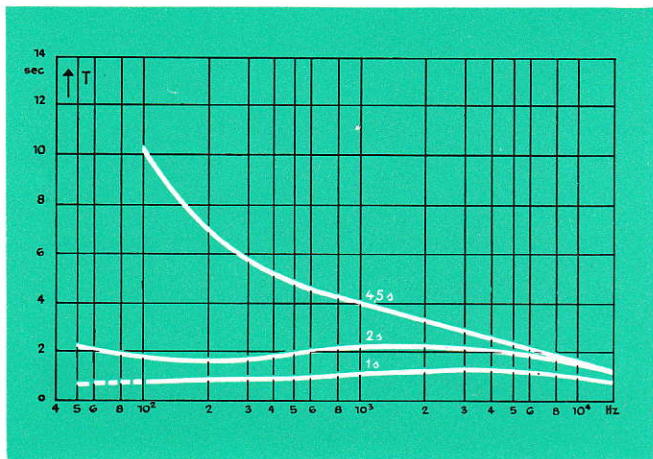
For adding echo to stereophonic music. For this purpose a stereo reverberation unit was constructed and is available under the designation EMT 140 TS. Its use provides additional accentuation of the stereophonic effect by emphasizing the three-dimensional characteristics of the recording room.

Besides these there are numerous other applications in theaters, opera houses, and concert halls. In situations such as these, artificial reverberation can be effectively employed to amplify the desired illusion in stage presentations, or can serve to increase the existing reverberation for certain musical offerings such as organ music.

The frequency response of the reverberation time, without additional damping, corresponds approximately to that of an empty stone walled hall or church; i. e. about 5 seconds at 500 cps. Towards the low frequency end

there is a rise and towards the high frequency end a decline (to about 1.5 seconds at 10 kHz), just as is the case in actual rooms as a result of the sound absorption of the air.

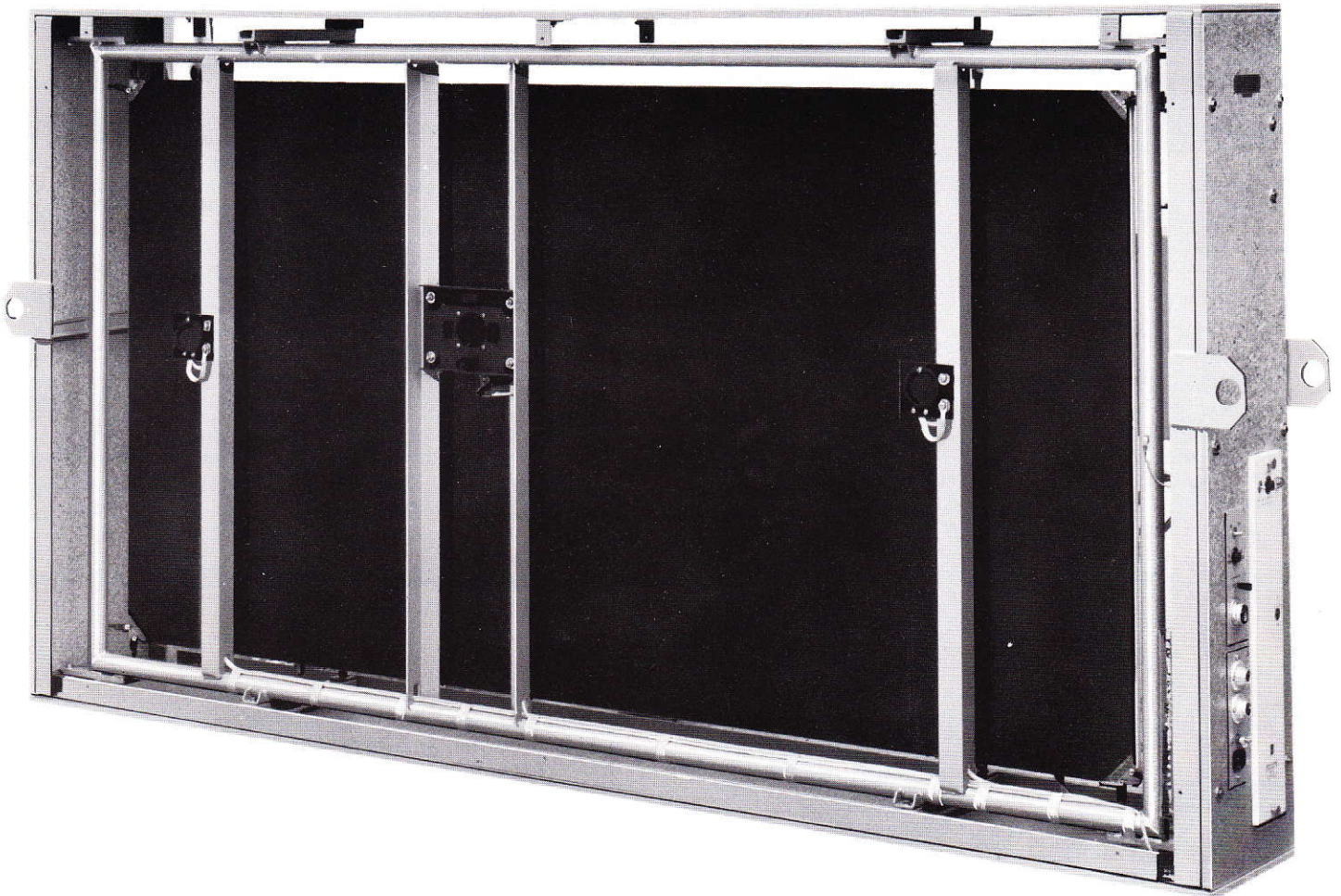
When testing the overall frequency response using a slowly gliding pure tone, one gets the same pronounced intensity fluctuations as are obtained from a three dimensional room. According to the theory of Dr. Schröder, the statistical mean value of the difference between "peaks" (maxima) and "valleys" (minima) of the response curve is 10 dB. Measurements of the reverberation unit confirm the veracity of this theory, both with respect to the number of maxima and minima within a defined frequency interval as a function of the reverberation time, and the wavering of the frequency response curve.



Reverberation times as a function of frequencies for various distances between reverberation and damping plates.



# with the EMT 140 TS



Front view of the Stereo Reverberation Unit EMT 140 TS. The steel reverberation plate is suspended in a welded tubular frame which in turn is shock mounted inside the wooden outer case. The two ceramic pickups are visible at different distances on either side of the driver Unit. The picture shows the wooden case without its side and top panels.



# True Room Tone

## The principle

The EMT 140 TS Reverberation Unit utilizes the physical torsional properties of metals to achieve its effect. It is a fact that a steel sheet which has been excited by an impulse setting up within it bending oscillations, will deliver reflections which increase in density as a function of time. Reflections in a three-dimensional room, on the other

hand, become more dense as a function of the square of the time. The human ear is unable to recognize the difference between these two operating modes.

Through the use of appropriate steel and critically chosen dimensions, it is possible to produce a plate which possesses an adequate number of self-resonances. The length and frequency response of the decay time produce an artificial reverberation effect, which is not possible to differentiate from that obtained from a three-dimensional room.

It was according to this principle that the EMT 140 TS Reverberation Unit was developed.

Its main component is a steel plate which is suspended in a tubular steel frame. Parallel to this plate, another made of highly porous material is suspended in such a way as to permit it to be swung towards or away from the steel plate with an extreme distance ratio of about 1 : 30.

This motion is controlled by means of a hand wheel, or it may be remote-controlled from the studio console itself and the particular reverberation time remotely indicated by an appropriate meter.

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## The construction of the reverberation unit

The steel tube frame which carries the steel plate has three transverse bridges, of which one mounts the magnet for the moving coil excitation system, while the other two are used for the two contact microphones and their connecting wires. The frame furthermore has the bearings for the damping plate arms mounting at the top and bottom, and is suspended by means of rubber shock mounts from the outside frame. Should the reverberation unit be exposed in its location to extreme mechanical noise interference, it can be further isolated by additional elastic suspension of the unit itself.

The reverberation plate together with its drive and reproduce amplifiers is built into a massive wood case. The standard version has a hand wheel for the adjustment

of reverberation time. The remote control components may be obtained and installed at a later time. The installation time required is, however, considerable and it is therefore recommended that the choice of remote control or manual control be made prior to the ordering of the unit.

## The damping plate for reverberation time variation

When the damping plate, which is constructed of absorptive material, is brought closer to the steel plate, its bending oscillations are increasingly damped and a shortening of the reverberation time results. This damping plate is so constructed as to be perfectly flat in spite of its great surface area and can therefore be brought to a distance of about 1/8" from the steel plate without touching the same. The minimum reverberation time reached at this distance is approximately 1 second at 500 Hz.

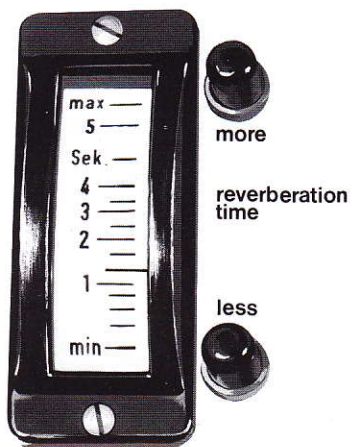


# with EMT 140 TS

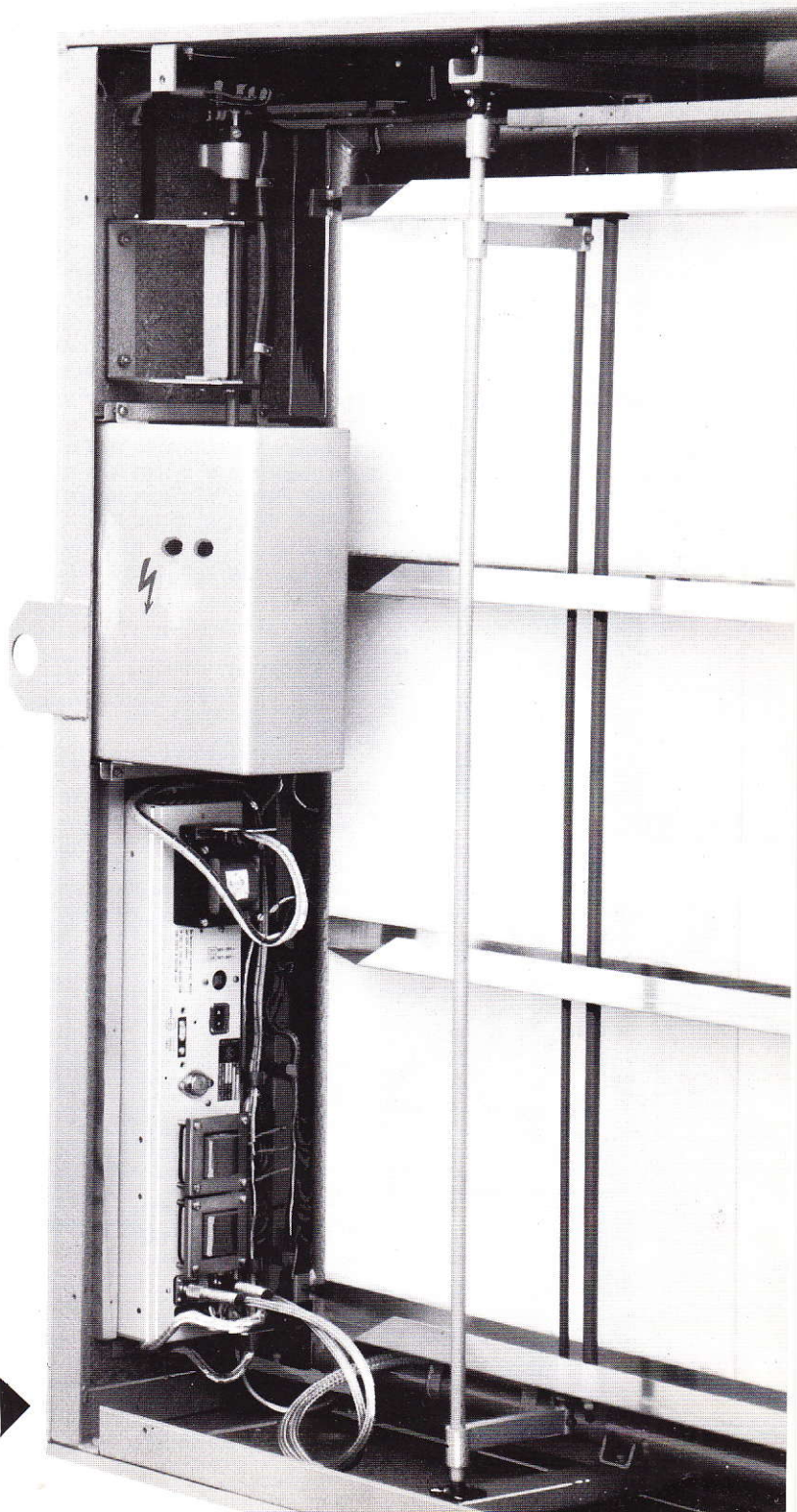
## Remote control of reverberation time from the studio console

Besides the standard model, the EMT 140 TS Reverberation Unit is also available with remote control facilities. This is done by means of a motor built into the unit itself by means of which the damping plate distance from the steel plate may be continuously varied. A potentiometer coupled to the motor itself delivers a voltage for indication of the reverberation time on an indicating meter mounted on the console. The operating elements; i. e. the indicating meter and the two push buttons may be located at any distance from the unit, and these in turn operate the motor relays via a 24 Volt supply. By using the remote control possibility, the unit may be located in the most desirable locations such as a dry cellar, or quiet anteroom. It is furthermore possible to control the reverberation time of a single unit from many locations.

Operating group for the remote control feature. Shown installed in the studio console.



Rear view of the Reverberation Unit EMT 140 FB-TS. Mounted against the unit's narrow vertical side are the amplifier chassis at the bottom and the remote control section above.





# respected world wide

## Reverberation for stereo as well

For the addition of reverberation to stereophonic recordings, the reverberation unit must satisfy two separate conditions: For one, it must extract from the stereo signal its directional component, and secondly it may not, as a result, adversely affect the significant information content.

In order to achieve this end, use is made of the so-called "M" channel which is formed by the addition of the two signals according to the formula  $A + B = M$ .

This is done by feeding part of the unreverberated output signal of channels A and B through isolation networks to a common bus. For compatibly recorded signals this addition of A and B into an "M" channel produces a proper monophonic signal containing all of the informational content of the stereo signals. This self same "M"

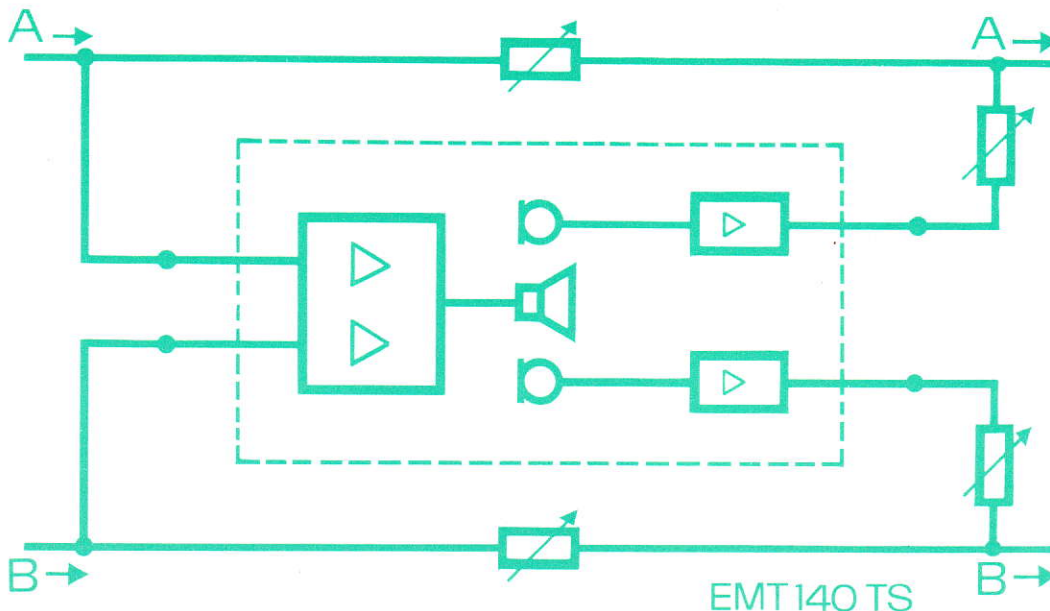
signal can also be obtained by placing a single microphone in the recording studio center and feeding its output to the reverberation unit.

The two signals obtained from the two contact microphones which are mounted at unequal distances from the driving coil are entirely uncorrelated; i. e. they have no relationship to each other. This fact is an all important prerequisite, for the two resulting stereo channels with echo must have a statistically distributed directional as well as informational content.

Since the reverberation plate contains a great number of resonant points, there is created on the plate an almost infinitely dense resonance spectrum, resulting in a frequency dependent phase displacement between the two pickup microphones. If, as an example, one feeds to the plate a complex signal such as music, all conceivable phase relationships will appear between the two pickups. As a result the reverberations directional information is distributed statistically to all directions of the room.

The EMT 140 TS Reverberation Unit may of course also be used for the reverberation of mono signals.

Block schematic for the operation of the stereo Reverberation Unit EMT 140 TS.



# EMT 140 TS

## The amplifier

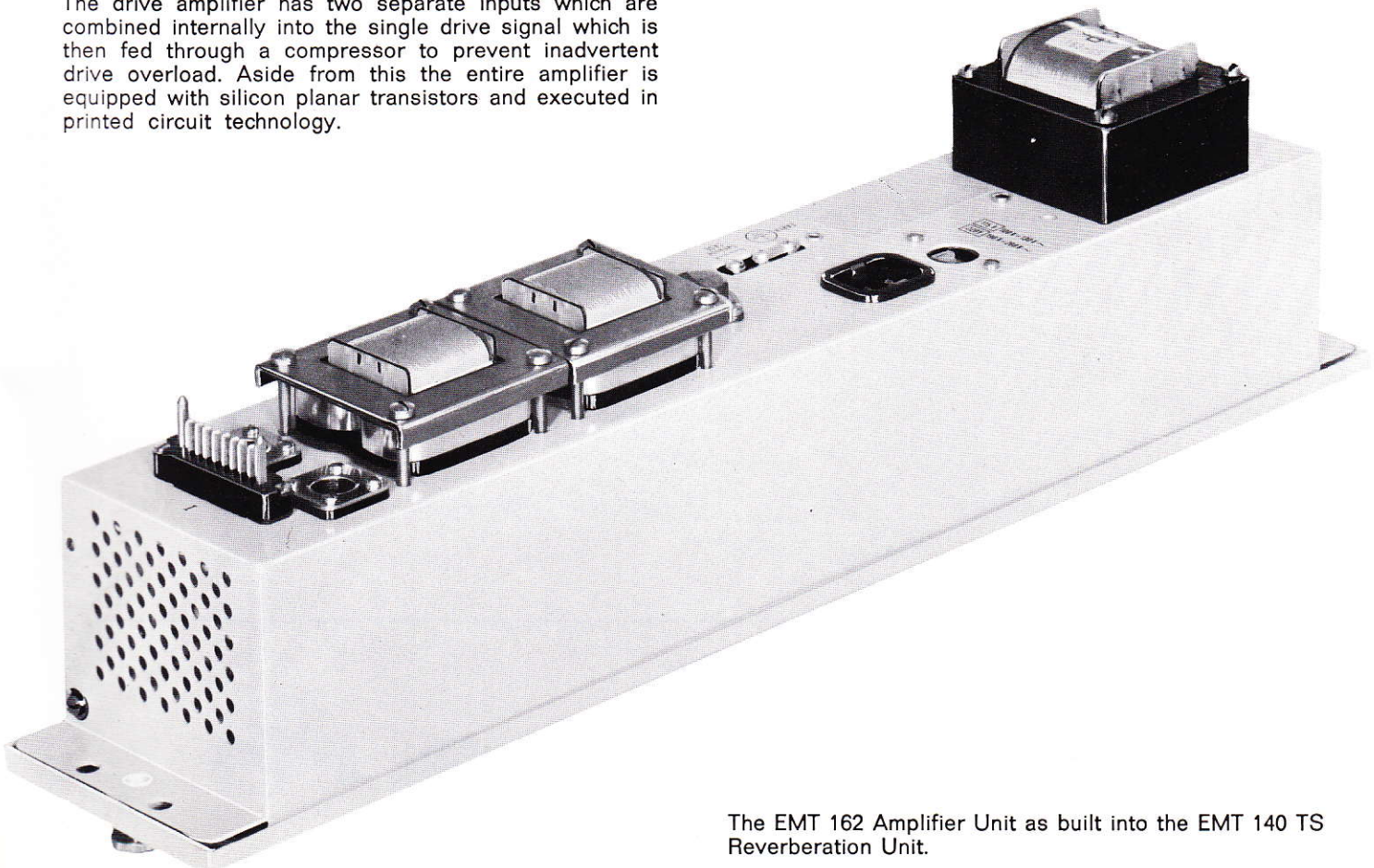
The drive and reproduce amplifier EMT 162 is a new development. It has two completely separate playback amplifier channels each connected to one of the pickup systems. The two inputs are balanced and floating. The high input impedance of over 5 kohm presents practically no load to a low impedance source. The input level may be chosen to correspond to any of the standard line levels prevalent throughout the world such as +4, +6, +8 dBm etc. The drive coil signal may be checked by means of a test jack located behind the amplifier's front panel. The pickup microphones' relatively low output signal is amplified by the reproduce sections of the amplifier to any line level desired. Their outputs are low impedance, balanced and likewise floating.

The EMT 162 Amplifier compared to its predecessor has considerably higher input and output level capabilities. The drive amplifier has two separate inputs which are combined internally into the single drive signal which is then fed through a compressor to prevent inadvertent drive overload. Aside from this the entire amplifier is equipped with silicon planar transistors and executed in printed circuit technology.

## Installation

The Reverberation Unit is to be set up in a fairly quiet spot. For an ambient noise level of 50 dB SPL, the interference noise produces at the output of the unit a level approximately equal to the self noise level of the unit. It would be most expedient to select a special room in which, however, more than one such Reverberation Unit may be operated simultaneously. This sort of room is also to be recommended to prevent inadvertent mechanical noise interference from external bumping or other mechanical contact. Reverberation Units placed next to each other do not interfere with each other since practically no sound is radiated to the outside of the unit.

They are also relatively impervious to mechanical shock interference. For areas which are particularly prone to rumble, special shock mounts are available.



The EMT 162 Amplifier Unit as built into the EMT 140 TS Reverberation Unit.



# EMT 140 TS

## Technical data

Reverberation time (re 500 Hz)	1 to 4 seconds
Time scale accuracy (re 500 Hz)	± 8 %
Weighted and unweighted noise levels measured at	T = 2 seconds
Unweighted noise level (with remote control running)	≤ - 50 dB
Peak weighted noise level	≤ - 60 dB
Input level for full drive	+ 1 dBm min.
Input impedance	≥ 5 kΩ
Output level for full drive	max. +12 dBm
Output of amplifier	max. +24 dBm
Output source impedance	≤ 25 Ω
Load impedance	≥ 200 Ω
AC Power Requirement	110/220 V 50 Hz 117 V 60 Hz max. 60 VA

Remote control for Model EMT 140 FB-TS with built-in servo motor, relay control and reverb time instrument.	
External power required	24 V/0.25 A
Weight without remote control	374 lbs (170 kg)
with remote control	418 lbs (190 kg)
Dimensions	Length 8' 1/2" width 1' 1 1/2" height 4' 4"
Ordering Information	
Stereo Reverberation Unit manual control	EMT 140 TS
remote control	EMT 140 FB-TS
Remote control panel alone	EMT 140 B
Amplifier alone	EMT 162 TS

## World wide patent protection

The EMT 140 TS Reverberation System is protected in many countries of the world under one or more of the following patents:

Germany	1 001 011
Denmark	91 041
Great Britain	827 302
France	1 159 692
Netherlands	105 890
Austria	196 145
Switzerland	347 016
USA	2 923 369

Subject to change without notice

Further patents applied for.

# GOTHAM

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