GOTHAM

1978

GOTHAM

HISTORY

It was the 29th of August 1957 when Stephen F. Temmer, founder and president of GOTHAM, was introduced to the NEUMANN Company in Berlin on the occasion of an official visit on behalf of the Voice of America. They amazed him with the very first stereophonic records cut with their equipment, and the rest is history. There followed GOTHAM's appointment as the exclusive U.S. representative for all of NEUMANN's disk cutting equipment, and soon after, this was expanded to include their world-famous condenser microphone line as well.

As time went on, GOTHAM obtained the U.S. and Canadian representations for the products manufactured by ALBRECHT, BEYER, DANNER, EMT, EUROPAFILM PLATING, KLEIN + HUMMEL, LYREC, NTP, PYRAL, STUDER, TELEFUNKEN, and WOELKE, most of which GOTHAM still represents to this day.

A West Coast Office, at the corner of Hollywood & LaBrea, was established in 1960 and serves the needs of the enormous recording industry complex in Southern California.

1969 saw a further expansion of GOTHAM into the leasing business with the founding of TELDEN LEASING which has provided venture capital for many of today's most successful disk mastering and plating facilities. Without TELDEN's support, most of them would never have been able to enter these sophisticated technology areas, since the usual financing channels have little understanding for a $150,000 set-up that cuts master lacquers and which is run by someone in his early twenties. GOTHAM EXPORT CORPORATION was founded in 1972 to take advantage of our world-wide family of representatives, most of whom carry the same lines of professional products. Export has flourished on an unprecedented scale representing such companies as ALLISON, AMBER, LEXICON, MRL, SWITCHCRAFT, UREI, and WESTON.

In 1973 GOTHAM moved into its own two-story building in the West Village where its staff has available the most modern communications, lab and demonstration facilities.

PHILOSOPHY

Ever since its founding in 1957, Gotham has tried to be "all things to *some* people," while most other suppliers of our industry try to adhere to the time-worn slogan of "all things to *all* people." In a highly profit-motivated world filled with manufacturers attempting to attract a mass market by watering down good engineering with inferior materials and workmanship, it is good to know that there are still companies of the Old World tradition, owned by people devoted to their craft, who find personal satisfaction in the excellence of equipment made in limited quantity for a discriminating world-wide clientele painfully aware of the *true* cost of inexpensive merchandise.

Many of these manufacturers bear the name of their single owner. Gotham Audio, also a one-man ownership company, devotes itself to engineering advice and the dignified distribution and service of their products. Not price but excellence, craftsmanship and serviceability are the criteria on which Gotham bases its choice of companies to represent.

LEASING

Gotham's TELDEN LEASING DIV. provides financing for all equipment sold by Gotham and permits packaging of related equipment from other sources under a single financing arrangement. The usual financing and leasing organizations have little understanding for the workings of the recording industry and do not provide venture capital at all. TELDEN is able to evaluate the business acumen of potential clients, and on the basis of this, may make available leasing terms where such might not be possible from other sources. A brochure is available which fully explains TELDEN's leasing program.

GOTHAM
AUDIO CORPORATION

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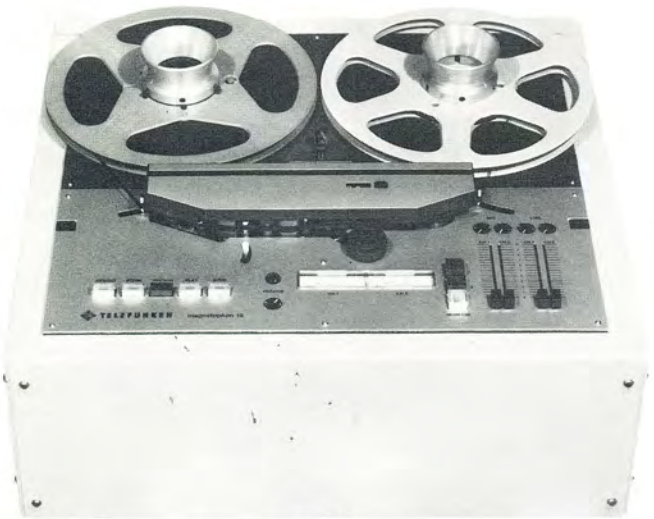
TELEFUNKEN



M 12A "Magnetophon" Tape Recorder

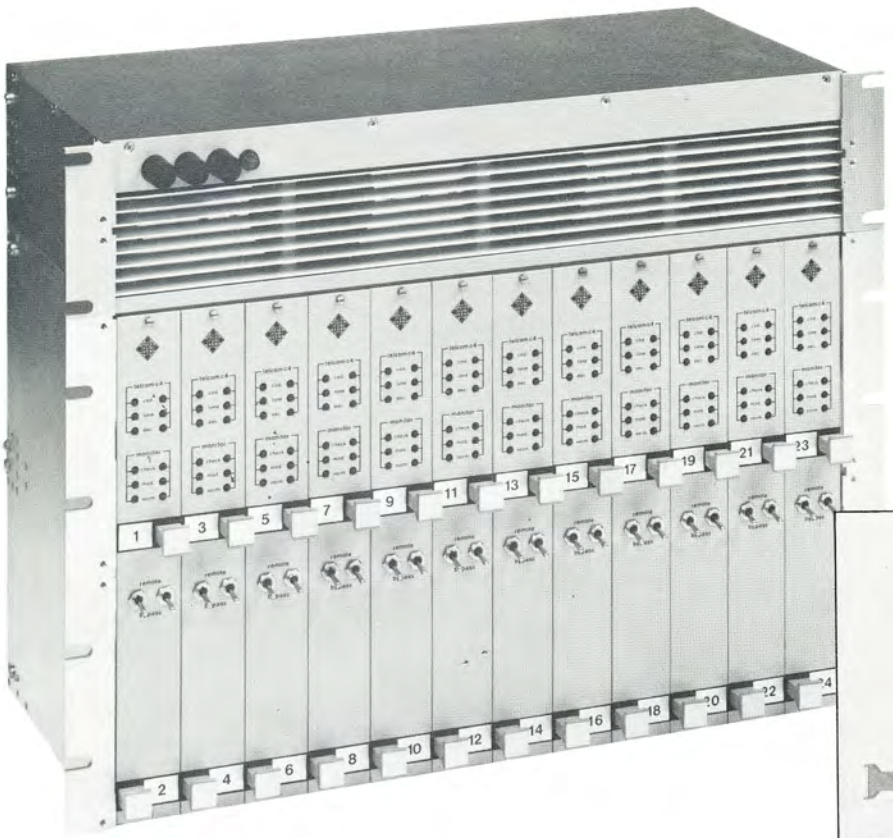
At last a professional tape machine designed solely for ¼" tape, without the compromises necessary to "adapt" to ½" widths, and with newly designed motion logic. Fully self-contained in a single 19" rack mountable unit built on a heavy die cast frame usually found only in much more expensive recorders. Traditional belt driven, large diameter capstan with fly-wheel result in the lowest weighted peak flutter of any machine on the market today (typically ±0.03%). 3.75/7.5 and 7.5/15 ips models all with the same large capstan diameter. Built-in four-input phantom powered mixer with full metering is an option also retrofittable later. Heads and sintered ruby tape guides are guaranteed for 15 years! Console, portable and rack mounted versions available.

M 15A (¼") "Magnetophon Tape Recorder

The world's most advanced Master Recorder featuring C-MOS technology throughout. Crystal controlled 131 kHz erase/bias oscillator also locks in the Hall-effect capstan motor to perfect speed. Digitally timed record/bias/erase functions provide space and click-free drop-in ability. Not a single switch contact in the entire unit—even the control buttons use sensors! 7.5/15 or 15/30 speeds with 100 meter spool capacity (12" DIA.). Digital timer. Full auto-locator and capstan servo remote accessories.

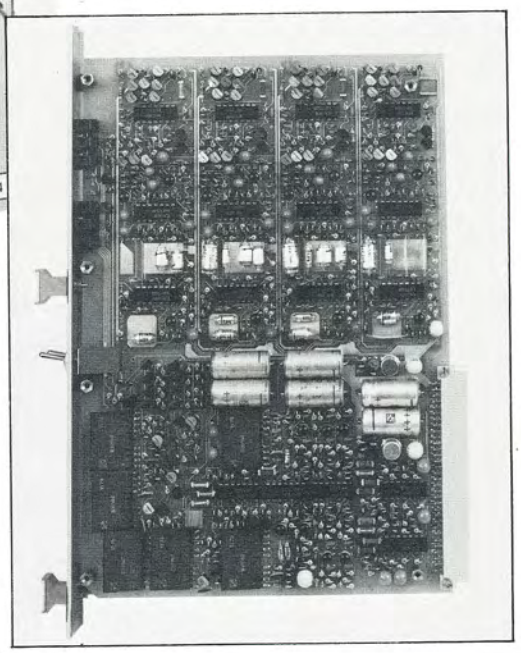
M15A MULTI-TRACK
"Magnetophon" Tape Recorder

January 1978 marks the premiere of a totally new multi-track Master Recorder: the M15A MULTI-TRACK equipped for up to 32 tracks on 2" tape. The integral Telefunken "telcom c4" Noise Reduction System gives an unprecedented 92 dB S/N ratio at 15 ips (rel. 510 nWb/m) and 90 dB for 32 tracks at 30 ips. The M15A is a model of compactness and simplicity of alignment, all in two lockable file drawers. All inputs and outputs on 30-pin rear connectors. Meter panel tilts up to horizontal. 12½" NAB reel capacity!



telcom c4

More than ten years after noise reduction companding became an indispensable component of studio technology, AEG-TELEFUNKEN achieved a break through in this field. 30 dB of dynamic range expansion without pre-emphasis or the need for aligning expander to compressor, have made the **telcom c4** system uniquely applicable to satellite, micro-wave, telephone line and studio technology.



TELEFUNKEN

A

B

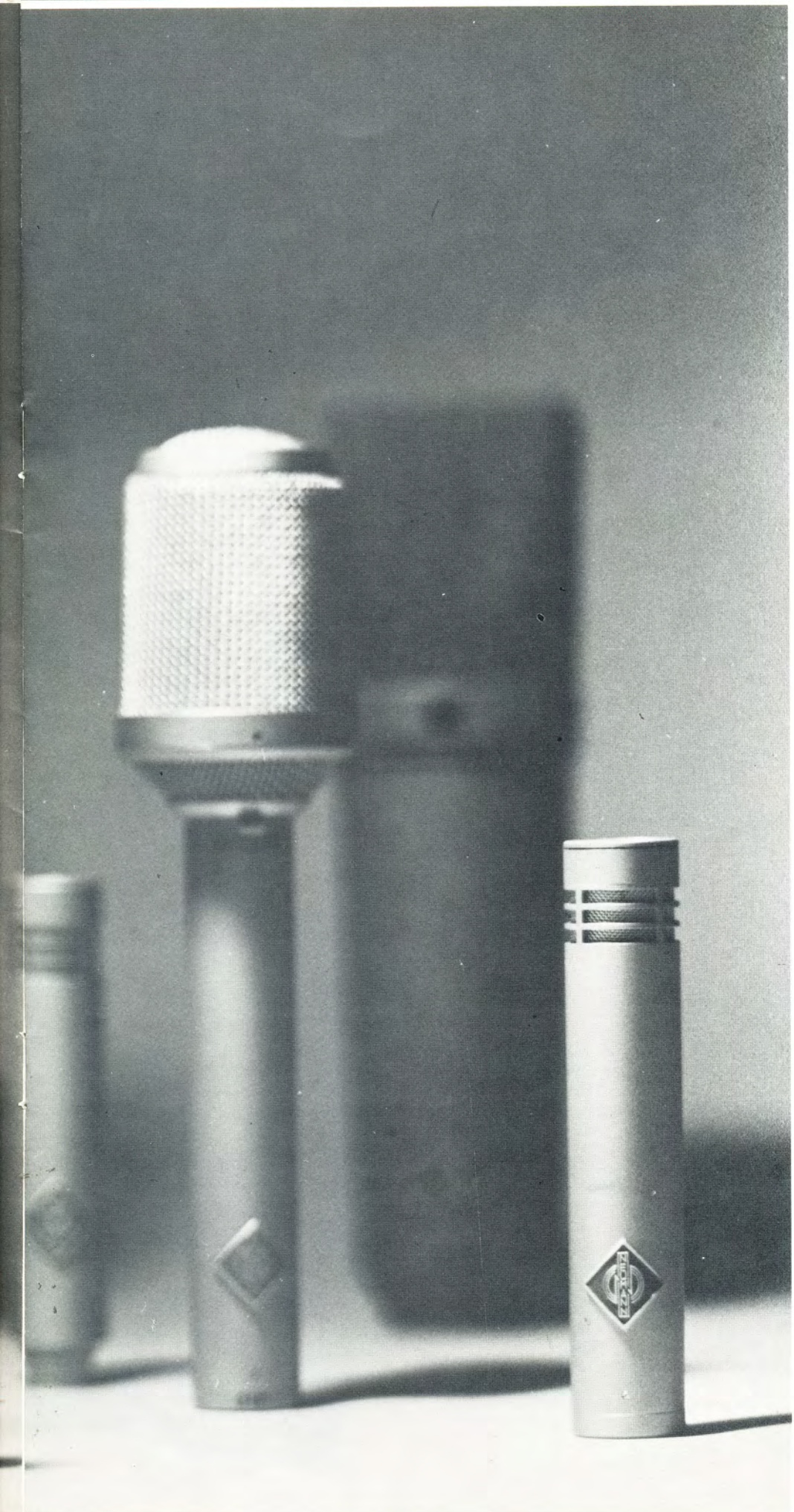
C

(A) **AL 15A Autolocator**—microprocessor based cue locating computer including 9 position memories, shuttle mode, digital stop timer without losing position control and all remote control functions.

(B) **FS 15A Remote Control Module**—provides all deck functions with true lamp indication of machine action, not of button pushed. Additionally provides low/high tape speed and mono/stereo or NAB/CCIR selection.

(C) **SZ 15A Vari-speed Module**—permits the capstan speed to be varied between 50 - 150% of nominal speed. Digital percent read-out and accurate musical half-tone vs. speed percentage table on the front panel.


MICROPHONE



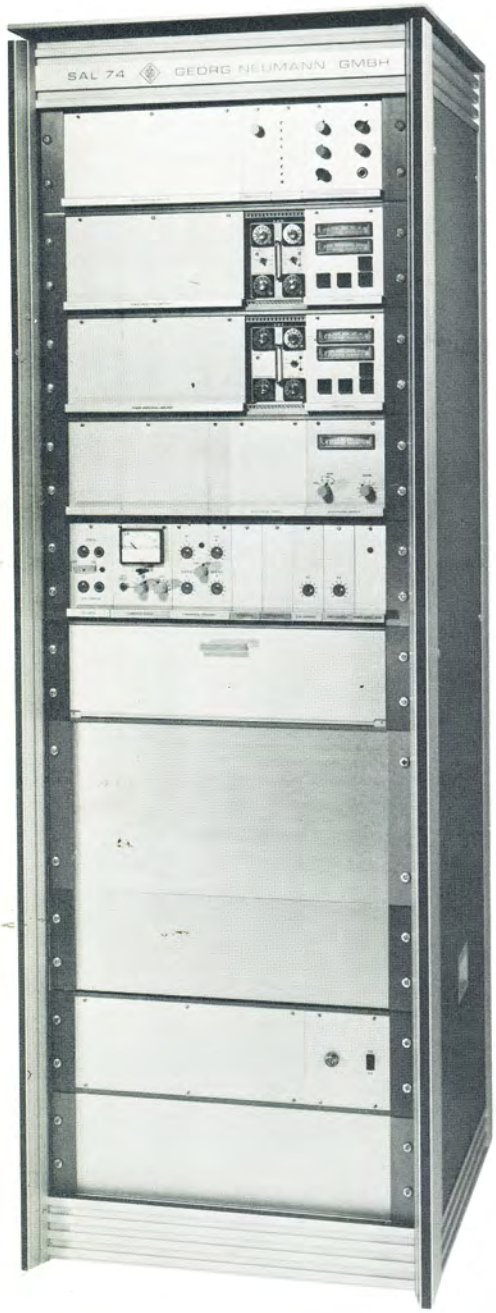
NEUMANN MICROPHONES

This marks the 50th year of NEUMANN condenser microphones. The fet 80 series of phantom powered studio condenser microphones have long been the microphone standard of the world. A simple central powering system has all but eliminated the need for supply boxes on the floor, while utilizing only the standard 3-pin audio connectors which are common to all microphones. The "KM" series of miniature units and the "U" series of large-size studio microphones is augmented by the SM 69 stereo and QM 69 quad microphones, while the KMA lavalier and KU 80 Dummy Head binaural system round out the program.

NEUMANN DISK SYSTEM

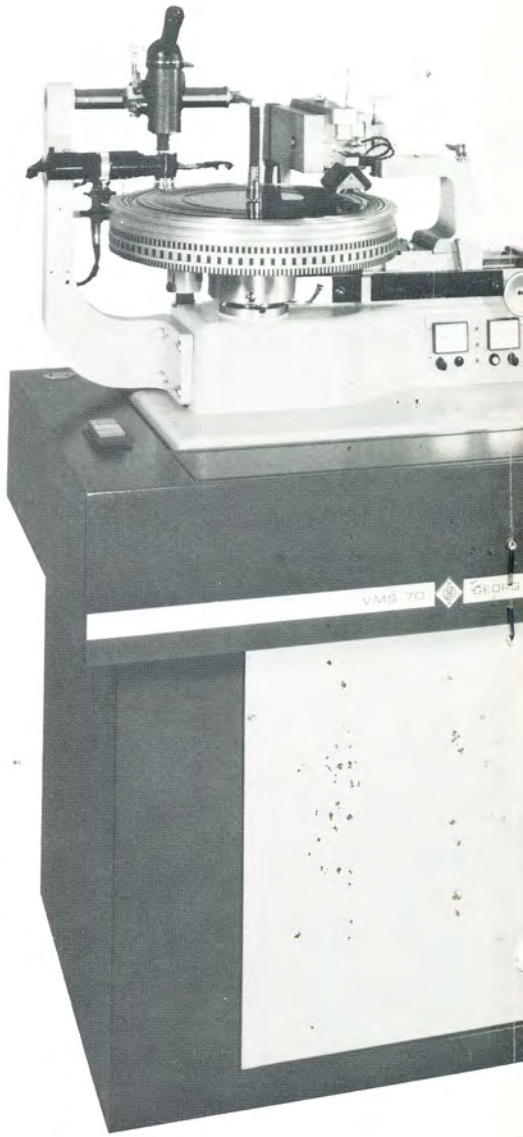
SP 77
DISK CUTTING PROGRAM CONTROL CONSOLE

The latest in a long tradition of tape-to-disk control consoles. New dual tracking equalizers coupled with automatic A/B switching or segue permit the operator to leisurely prepare the upcoming cut's equalization and level. Totally electronic switching logic, reverb send/receive, second tape machine control for making dubs, peak and vu level meters, scope and correlation meter, noise reduction, compressor/limiters, and all lathe and cutting system function remote controls are logically laid out. A large amount of 19" rack space to add to your own choice of accessories.



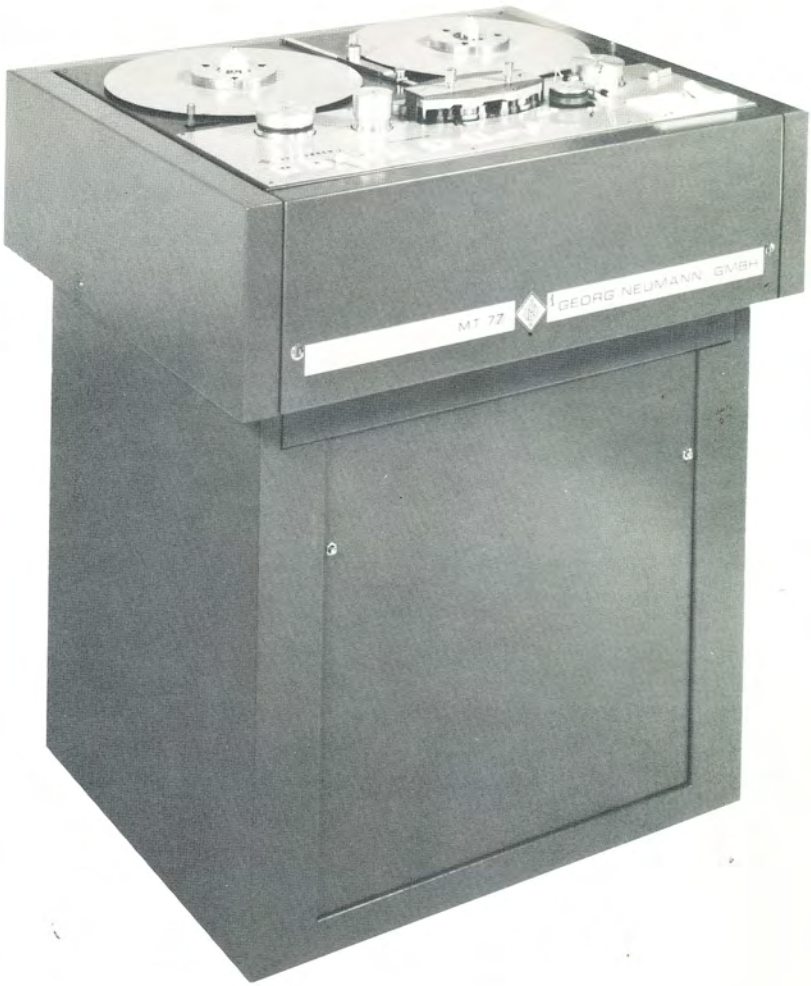
SAL 74 Cutter Drive Logic

This is the Cutterhead Drive Logic and cutterhead combination that put such well-known companies as Sterling Sound, Artisan, Nimbus 9, Acme Recording, United Sound, Masterfonics, JVC, Woodland Sound, Allen Zentz, RCA, Kendun Recorders, Atlantic Records, MCA Records, etc., etc. into the forefront of the world's mastering studios. The 600-watt per channel opamp system with its acceleration limiters, computer brain circuit breaker and distortion compensating Tracing Simulator, combines perfectly with the SX 74 Stereo Feedback Cutterhead to provide the sharpest transient response without exposing the cutterhead to danger of destruction. A system that records with ease, levels that cannot be played back with any pick-up.



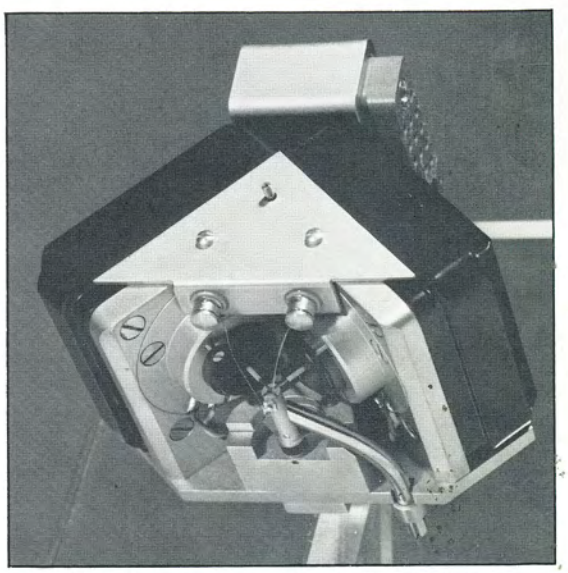
MT 77 Preview/Playback Tape Machine

This special preview model of the TELEFUNKEN M 15A Master Recorder is the perfect source for tape-to-disk transfer. Its continuously variable preview distance provides the exact distance for any combination of tape speed and disk rpm. Its four extremely low noise-level playback amplifiers are switched to either IEC or NAB equalization from a single push button. A light barrier provides leader sensing for the automatic banding unit in the SP Program Console. Full tape tension servo, contactless tape deck push buttons, Hall-effect capstan motor, 3300 ft. reel capacity: all these features and more make the NEUMANN/TELEFUNKEN MT 77 the ultimate playback device.



VMS 70 Disk Mastering Lathe System

The VMS 70 is a solid state design for variable pitch and depth control without advance ball. Synchronous turntable for any of the prime turntable speeds or half speeds. Completely relayless logic circuitry avoids clicks. Self-contained vacuum pump. Plug-in 90-pin programmers provide for all possible combinations of rpm, start diameter, end diameter, cutter lift delay, etc., etc. Now supplied with a working lamp over the turntable.



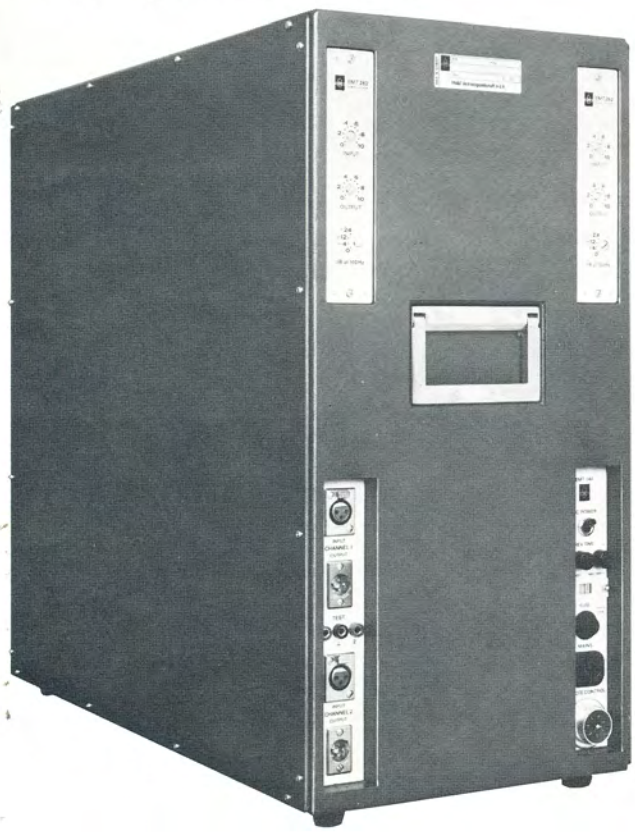
SX 74 Dynamic Feedback Stereo Cutterhead

Ever since the model ZS 90/45 ushered in the era of stereo disks in 1957, the NEUMANN Company has kept the faith by spending enormous sums of money on research and development in the field of dynamic feedback cutterheads. The SX 74 is the latest result of their efforts. With a temperature tolerance of 200 degrees C and an improved sensitivity compared to its predecessor of 1.4dB, the SX 74 clearly permits the cutting of velocities which are beyond the ability of any pick-up to reproduce. It performs best with the SAL 74 Cutter Drive Logic, but may be driven by any of the electronics ever built by NEUMANN.

EMT

EMT 240 Reverberation Gold Foil

The successor to the world renown EMT 140 steel plate Reverberation Unit. One fifth its size, virtually impervious to both mechanical and acoustic interference from the outside, self-contained reverberation time controller, and built-in input signal compressor. Dual inputs and dual outputs produce the only proper three-dimensional reverberation effect for stereo mix-downs.



EMT 250—Digital Reverberation Unit

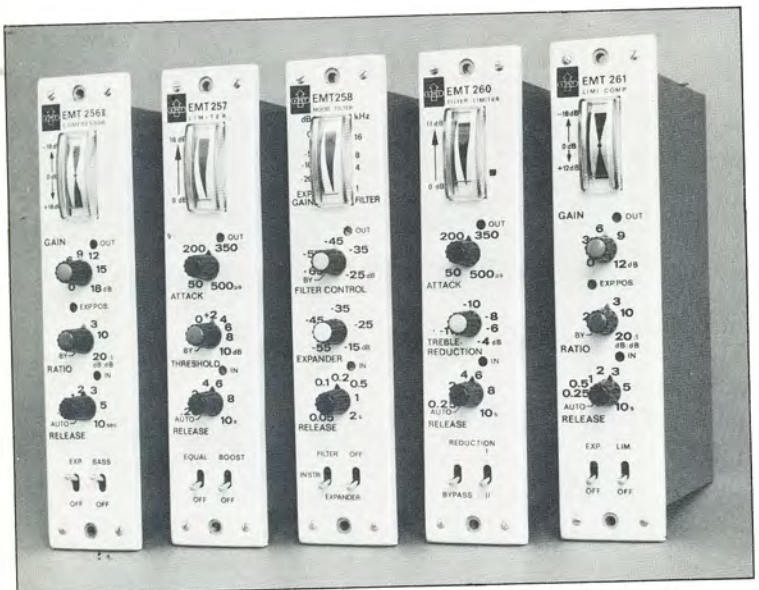
A dream come true: Fully Electronic Reverberation by means of a highly sophisticated real time computer made in U.S.A. and programmed by EMT. For the first time it is possible to change reverb time separately at the high and low frequency ends of the spectrum: a mind blowing effect which is sure to establish new standards in the industry. Other available effects include 10 second space thriller reverb, chorus, phasing, variable speed repeat echo, and pure delay, on all four outputs.

EMT 422—Flutter Analyzer

The latest in the EMT line of sophisticated flutter meters. Self calibrating and usable over a wide range of input levels without level setting need. An accessory plug-in module allows its use in production line testing with GO/NO-GO light indications for pre-selected thresholds.

EMT 424 Flutter Analyzer

The king of the flutter analyzers! Ideally suited to production checking as well as the most advanced research laboratory. The EMT 424 is unique in many different ways: built-in wave analyzer with automatic filter sweep (pen recordable, of course), timed test interval with meter pointer hold for absolutely objective readability and reproduceability of readings. Gaussian weighting is used for timed measurements. The EMT 424 additionally contains a separate start-up time test section which accurately measures the start-up time of turntables, tape machines and other reproducers.



Five console component cassettes providing high performance processing in compact form:

EMT 256 Compact Compressor/Expander little brother to the EMT 156 based on four quadrant multiplier principle.

EMT 257 Compact Limiter based on the limiter function of the EMT 156.

EMT 258 Dynamic Noise Filter for improving signal-to-noise ratio on circuits, old recordings and other sources.

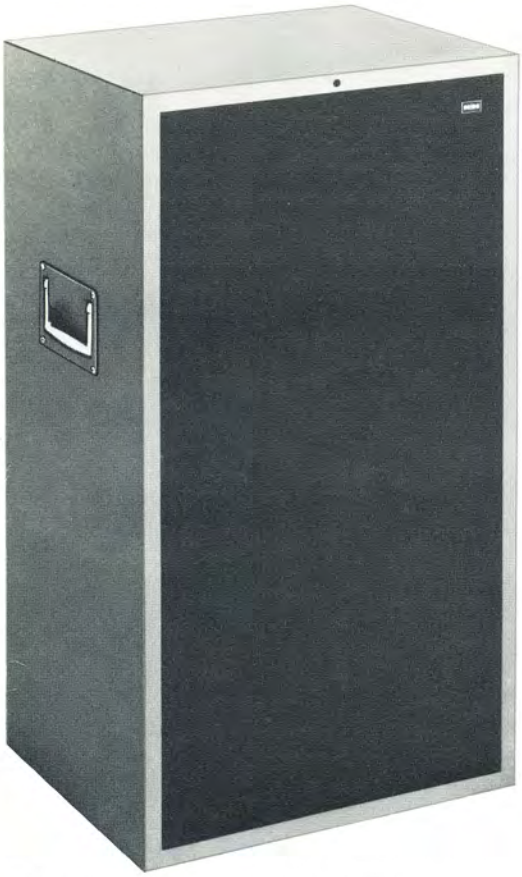
EMT 259 Accessories such as 19" rack mounting frames and power supplies for operation of all of the cassette units.

EMT 260 Filter/Limiter (de-esser) prevents splattering of high frequencies such as sibilants in tape, disk and film recording and broadcasting.

EMT 261 Combination of the EMT 256 Compact Compressor/Expander and the EMT 257 Compact Limiter in a single unit.

EMT 950—Direct Drive Turntable System

A totally new concept in broadcast studio turntable systems incorporates every electronically switched convenience required in rapid cuing of disks. Automatic back-cuing, rapid pick-up, audio muting, cue speaker and much more.



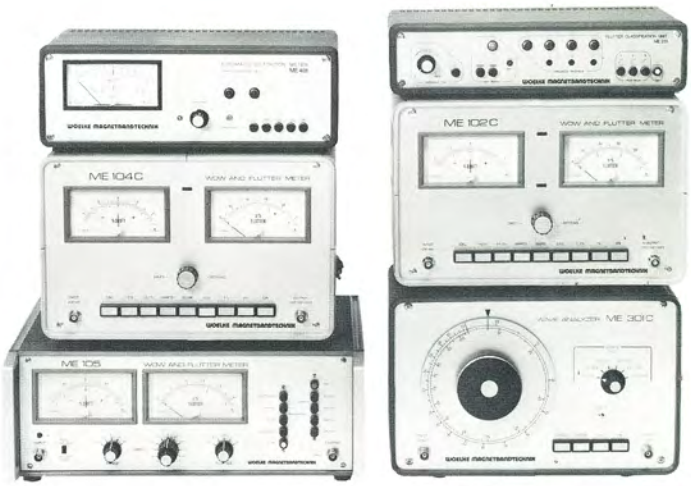
K+H—Model 0-92 Super Monitor System

The ultimate tri-amped (240W) loudspeaker system capable of highest sound pressure levels with minimal distortion. Great attention has been paid to accuracy of the distribution pattern at all frequencies. Special plug-in equalizers permit physical location in the middle of a room, at one of its boundary surfaces or in corners.

K+H—Model 0Y Monitor Speaker System

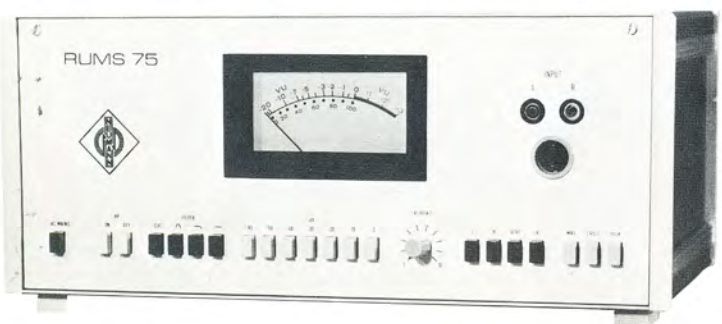
A compact bi-amped (2 X 30 W), equalized, three-way speaker system with balanced bridging line level input. Convenient wall hanger or floor stand available.

K+H



NEUMANN—RUMS 75 Rumble Meter

The world's only meter for the measurement of IEC turntables and record rumble. Direct cartridge input, IEC/RIAA playback weighting and proper vu meter indications of left, right, vertical and lateral rumble components. A must for service labs and manufacturers of turntables and records.



FLUTTER METERS

Woelke—Flutter Meters and Analyzers

Long a leader in the manufacture of production and service oriented flutter meters, Woelke continues to augment its program with updated models and accessories. ME-104C: the hi-fi service shop model; ME-102C: the broadcast and recording studio model; ME-105: the model for the development lab featuring crystal accuracy. All flutter meters have both flutter and drift meters and IEC/DIN/ANSI standard filters. No level alignment is ever needed for any input level above 30 mV. ME-301C: An all-important frequency analyzer to determine the exact component causing the flutter. Continuous tuning from 1 Hz to 1000 Hz.

LYREC—TIM 4B High Speed Precision Tape Timer

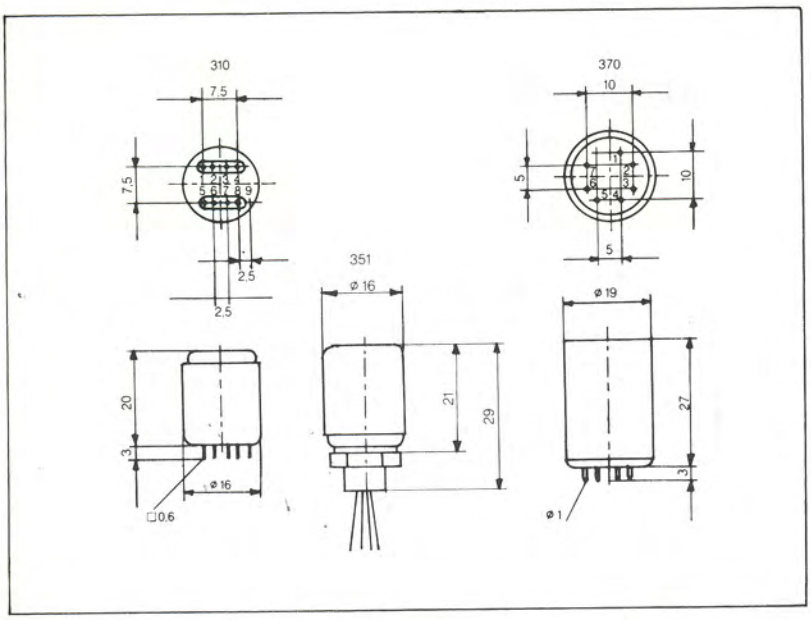
This unique instrument will time any tape in only the time it takes to rewind it, and this with an accuracy of under 3 seconds out of 30 minutes. Manufactured by LYREC in Denmark, it comes in several models suitable for mounting on Ampex or Scully professional decks. The TIM 4B reads directly in minutes and seconds and is mounted on tape decks without drilling. The timer adds absolutely no flutter or tape motion impedance. They are available in ½" and 1", the ½" also covering ¼" tape width. You may order the timer to read directly at either 7½ or 15 ips.

PYRAL—Recording Disk Blanks

PYRAL is the inventor of the lacquer recording blank (1931); and the company which licensed Audio Devices (now Capital Magnetics) and EMI. As a member of the giant French Rhone-Poulenc chemical complex, PYRAL has access to the most advanced techniques in both chemistry and metallurgy. The PYRAL disks are delivered packed 20 masters to a steel case, ideal for later master shipping to the plating plant. Aside from the MASTEREO master disks in 12" and 14" diameters, PYRAL also produces reference lacquer blanks in all popular sizes.

EFP—Phonograph Record Plating Plant

The latest in GOTHAM equipment is the complete record plating equipment made by EFP (Europafilm AB) of Sweden. This system has revolutionized the videodisk field in Europe and because of its reliability, cleanliness, degree of automation, and above all plating speed, has become the standard of excellence throughout the world. Each disk is plated in its separate tank, as opposed to huge vat systems still in use in many plants. This assures absence of impurities on the one hand, and exceptional plating speed on the other. The 400A system is capable of producing a part in under 30 minutes! The system is complete in every detail ready to install in a matter of hours. No multiple sources of supply; no divided responsibility. Ask Europadisk Plating in New York what they think of theirs.

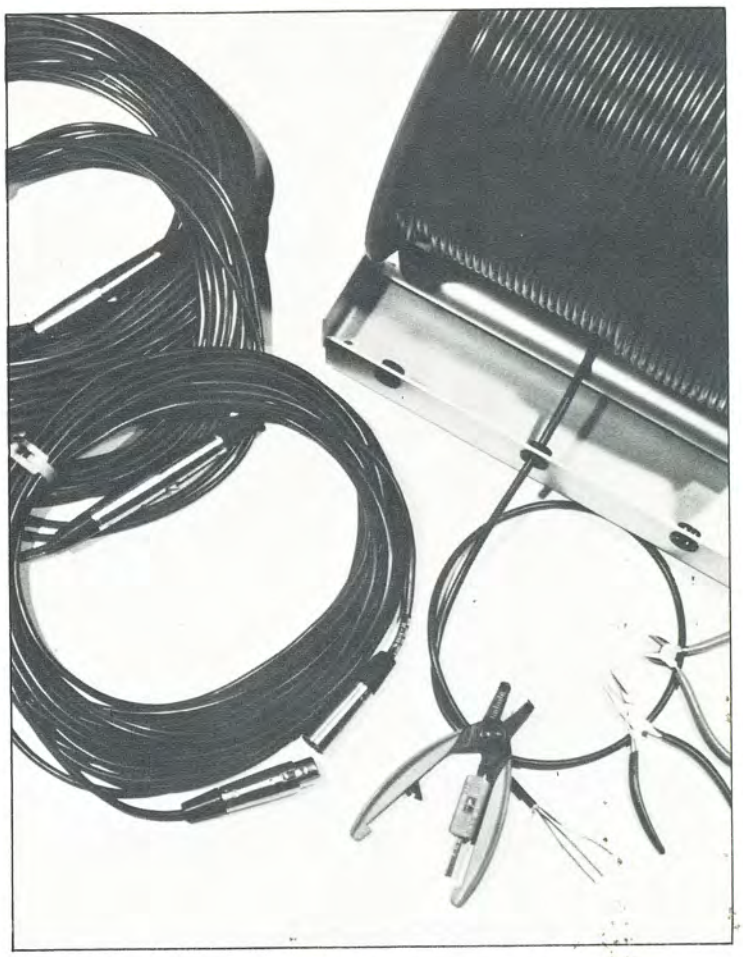


BEYER—Miniature Transformers

BEYER is the undisputed leader in the very specialized field of miniature transformers. For the past 15 years, GOTHAM has supplied the needs of such companies as Ampex, 3M, MCI, Barcus-Berry, Ampro, Inovonics, Studer, Collins, and many more. BEYER makes no output transformers, no chokes and no power transformers. The entire research facilities are directed at the perfection of only one type of transformer: the miniature microphone or tape head input transformer.

EMT—Specialized Audio Cables

These highly specialized audio cables have found wide acceptance in critical applications where double Reusen layer shielding is required in multi-pair cables of two, five and ten individually and jointly shielded pairs, ultra-thin audio cable, shielded heavy-duty power cable and low capacity coaxial audio wire. Manufactured in Switzerland by one of the world's leading cable makers and distributed by EMT.

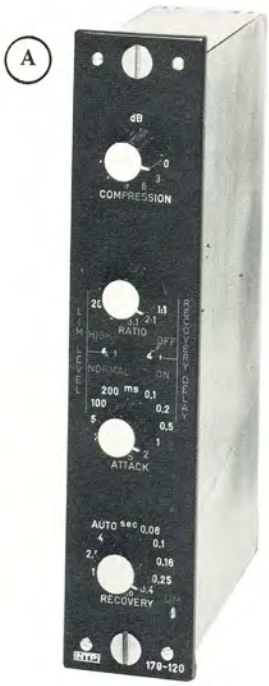


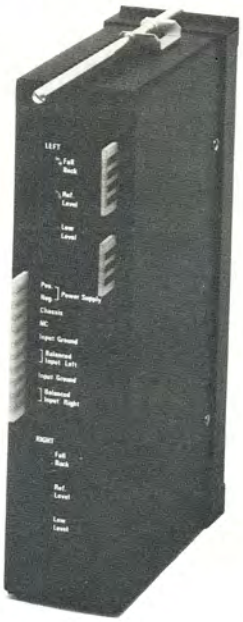
GOTHAM—Microphone Cable and Extension Cables

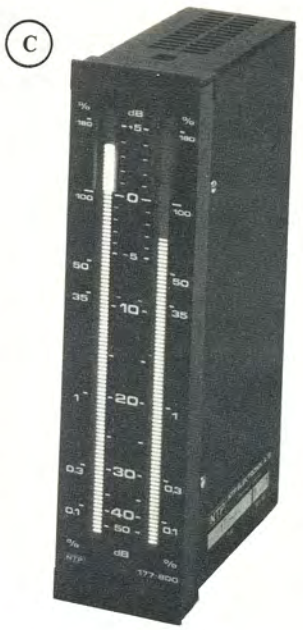
Recent increases in EMI and RFI (Electro-magnetic and Radio Frequency Interference) have focused attention on the effectiveness of shielding in audio cables. GOTHAM imports from Germany and Austria double Reusen layer cable made to its specifications. Three-conductors assure phantom powering integrity even if the shield should part. Available in super-flexible gray, white, red, blue, yellow and green to match our Neumann wind screen colors for easy identification in P.A. applications. Model BV-2461 on 1,000 ft. spools and made-up extensions using Switchcraft Q-G audio connectors in 10, 25, 50 and 100 ft. lengths or made to order in any length.

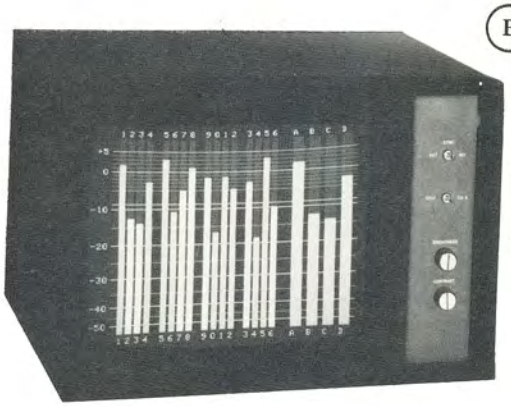
NTP

NTP, a Danish company, specializes in the manufacture of program level meters featuring either peak or "vu" ballistics, and with LED, gas discharge, light beam or video monitor projecting read-outs, while their compressor/limiters are used on the NEUMANN SP 77 Disk Mastering Program Consoles









(A) **NTP 179-120** Compressor/Limiter in cassette form is unique in its recovery delay feature and its versatile adjustable attack and recovery times.

(B) **NTP 177-520** Stereo Monitor Oscilloscope; another component used on the NEUMANN SP 77. Provides a clear presentation of the phase and amplitude relationship of two program channels, while completely filling the scope screen regardless of program level. Lateral/vertical/left/right information display follows the actual stylus motion in the groove.

(C) **NTP 177-800** Dual bar graph Peak Program Meter (PPM) in a miniature format (40 X 165 mm).
NTP 177-900 Dual bar graph vu Meter; otherwise as above.
NTP 177-950 Dual bar graph as above but one PPM and one vu Meter side by side.
NTP 177-400 Dual bar graph in standard cassette size (40 X 190 mm) with additional memory to store highest level read, recall same at any time, and to reset for new memory accumulation. (vertical or horizontal mounting).

(D) **NTP 377-500** Video Projecting PPM—permits a single audio channel level to be displayed on any black & white or color television monitor. Unique scale generator and contrasting projected pointer provides clear level indication regardless of background. Inserts into video input line of monitors.

(E) **NTP 377-100** Color multi-channel PPM display generator for up to 36 channels. Alpha-numeric display of dB scale, track numbers and channel letters. 625-line standard (PAL color).

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AUDIO CORPORATION

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NEUMANN CONDENSER MICROPHONES

The latest addition to the NEUMANN line of Studio Microphones is the U-67 Universal Condenser Microphone — designed for utmost flexibility — ideal in any application. Among its features are: all three directional characteristics; "Voice-Music" bass cut-off switch; overload protection switch for extremely close pickups; standard EF-86 tube; instantly accessible amplifier; MYLAR double-membrane capsule; printed circuits used throughout.

Non-linear distortion:	**less than 0.3% entire range**
Output level:	**— 53 dBm re 10 dyne/cm²**
Microphone Dimension:	**7⅞" x 2¼"**
Weight:	**1 lb.**

Output impedance:	**50/200 ohms switchable**
Field pattern:	**non-directional, figure-8, cardioid**
Front-to-back rejection (cardioid):	**23 dB**
Front-to-side rejection (Figure-8):	**greater than 30 dB**

GOTHAM AUDIO CORPORATION
2 WEST 46 STREET, NEW YORK 36, N.Y. · · · COLUMBUS 5-4111

Gen. Cat.

NEUMANN
U-47a and U-48a
Microphone Systems

These microphones have become the standard of the American Recording, Broadcasting, and Film industries, and are the only condenser microphones in their price range featuring a switchable directional characteristic.

Frequency Range:	**30-20,000 cps**
Output Impedance:	**50/200 ohms switchable**
Field Pattern:	**Switchable non-directional or cardioid**
Non-linear distortion:	**Less than 0.9% entire range to 110 dB absolute**
Effective Output Level:	**— 52 dBm Minimum**
Dimensions:	**Microphone: 2½" dia.; 8" length. Power supply: 8½" x 4" x 4¾"**
Weight:	**Microphone: 1½ lbs. Power supply: 4 lbs.**

Complete microphone systems consist of microphone, power supply (type NG) inter-connect cable (type UC-3), Z-37 full elastic suspension, AC power cable. U. S. fuse holder, pilot light, power connector and XLR output receptacle with mating cable connector. See price schedule for system makeups available.

U-48a System Same as above but Field Pattern selectable either **bi-directional** or cardioid.

NEUMANN
M-49b
Remote Control Directional-Pattern Microphone System

Fast becoming a favorite in international broadcasting, this microphone permits remote control of the directional characteristic. A smooth, continuous fader-control selects any of the basic directional patterns (non-directional, bi-directional, and cardioid) and any intermediate pattern. Wide frequency response with extremely low distortion, a slight roll-off of frequencies below 40 cycles to prevent shock-noise interference, and extreme ruggedness, make the M-49b the ideal "work-horse" for studio and remote recording, as well as single-mike pick ups from concert halls.

Frequency range:	**30-20,000 cps**
Output impedance:	**50/200 switchable**
Field pattern:	**Continuously variable through all characteristics — omni-directional, cardioid and figure-eight and all intermediate pattern configurations**
Non-linear distortion:	**less than 0.3% entire range to 110 dB absolute.**
Effective Output Level:	**— 46 dBm**
Dimensions:	**Microphone: 3" dia.; 6¼" length. Power supply: 8½" x 4" x 4¾"**
Weight:	**Microphone: 1¾ lbs. Power supply: 5½ lbs.**

Complete microphone system consists of microphone, power supply (type NN-48), interconnect cable (type C-26), AC power cable, XLR output connector, and MZ-49 swivel mounting harness.

NEUMANN
KM-54a & KM-56
Miniature Condenser Microphone System
(KM-56—shown at left)

This miniature condenser microphone is one of the latest to join the precision Neumann line. Its quality is in every way similar to the U-47 series, but its dimensions are amazingly miniaturized.

Frequency Range:	**30-20,000 cps**
Output Impedance:	**50/200 ohms (must be**
Field Pattern:	**Switchable on microphone: non-directional, bi-directional, and cardioid**
Non-linear distortion:	**Less than 0.4% entire range to 110 db absolute**
Effective Output Level:	**— 45 dBm Minimum**
Dimensions:	**Microphone: 7/8" dia. 6" length. Power supply: 8½" x 4" x 4¾"**
Weight:	**Microphone: 4 oz. Power supply: 5 lbs.**

Complete microphone system consists of microphone, power supply (type NKM), interconnect cable (type KC-1), SG-5 Microphone Stand Coupling, AC power cable. U. S. fuse holder, pilot light, power connector, and XLR output receptacle, with mating cable connector.

KM-54a Miniature Condenser Microphone System (shown at right) Same as above but ultra cardioid directional pattern only. Length: 4¾".

NEUMANN
Type SM-2 Miniature
Stereo Double Microphone System

This latest addition to the condenser microphone field comprises two separate and complete condenser microphones and their respective preamplifiers in the same miniature housing. The two condenser capsules are mounted one above the other, the top one being rotatable to achieve the M-S Stereo Recording Technique (also known as **intensity stereo).** Each of the two microphone systems can be separately switched to any pattern (non-directional, bi-directional, and cardioid) or any one of six intermediate patterns. Specifications identical to KM-56 microphone with addition of extreme balance between systems, and numerous intermediate directional patterns.

Dimensions:	**Microphone: 1⅛" dia.; 8" length. Power supply: 8½" x 4" x 4¾"**	**Both Sections:**	
Weight:	**Microphone: 9½ oz. Power supply: 5 lbs.**	**Frequency range:**	**30-20,000 cps**
		Output Impedance:	**50/200**
		Directional pattern:	**Remote control switchable to omni-directional, cardioid, and figure-8 as well as six intermediate patterns**
		Harmonic Distortion:	**less than 0.4% entire range to 110 dB absolute.**
		Effective Output Level:	**— 43 dBm**

Complete microphone system consists of microphone, power supply (type NSM), inter-connect cable (type SC-1) with Z-42 full elastic suspension, AC power cable, XLR Cannon output connectors. U. S. standard pilot light, fuse holder, AC receptacle.

MICROPHONE ACCESSORIES

FOR U-67 MICROPHONE:

UC-5	Interconnect extension cables in 25, 50, and 100 ft. lengths or to special order.
EF-86	Microphone amplifier tube.
NUK	Plug-in power supply for permanent control room installation.

FOR U-47 or U-48 MICROPHONES:

UC-3	Interconnect extension cables in 25, 50, and 100 ft. lengths or to order.
Z-37	Full elastic suspension for elimination of mechanical interference.
Z-18a	Wind and close talking screen.
VF-14M	Microphone amplifier tube (specially selected for low noise).
NG-2	Double power supply for (2) U-47 or U-48 microphones.
NGK	Plug-in power supply for permanent control room installation.

FOR KM54a and KM-56 MICROPHONES:

KC-1	Interconnect extension cables in 25, 50, and 100 ft. lengths or to order.
Z-38	Full elastic suspension for elimination of mechanical interference.
Z-118	Wind and close talking screen.
M-31b	Extendable floor stand with internal shock mounting and goose neck.
Z-29	High intensity overload protection switch for KM-54a.
Z-64	Humidity-proof jeweler's case for KM-series microphones for tropical use.
AC-701k	Microphone amplifier tube (specially selected for low noise).
SG-5	Swivel stand adapter with 5/8-27 thread.
Z-19	Flexible goose-neck extension (wired).

FOR M-49b and M-50b MICROPHONES:

C-26	Interconnect extension cables in 25, 50, and 100 ft. lengths or to order.
AC-701k	Microphone amplifier tube (specially selected for low noise).
N-52a	Plug-in power supply for permanent control room installation. Also usable for KM-series microphones.

FOR SM-2 STEREO MICROPHONE:

SC-1a	Interconnect extension cables in 33 ft. length or to special order.
Z-42	Full elastic suspension for elimination of mechanical interference.
Z-43	Wind and close talking screen.
Z-140	Sum and difference (matrixing) transformers for converting "M-S" to "A-B" or "X-Y" or vice versa.
SG-6	Swivel stand adapter with 5/8-27 thread.
NSK	Plug-in power supply for permanent control room installation.

GENERAL ACCESSORIES:

Z-30	Portable power supply protective enclosure for field use.
CF-3	Studio "Stand-by" and "Go-ahead" signal; attaches to microphone stand.
BB-9k	Battery operated power supply for KM-series, M-49b, and M-50b microphones complete with rechargeable nickel-cadmium batteries and charger.

Other accessories and replacement parts quoted on request. All accessories stocked in New York, N. Y. Price lists published on October 1 and April 1 of each year.

For further information, contact Gotham Audio Corporation or your Neumann dealer!

PRINTED IN U.S.A.

GOTHAM AUDIO CORPORATION
2 WEST 46 STREET, NEW YORK, N. Y. 10036 - (212) COLUMBUS 5-4111

PRICE LIST

NOTE: Arrows (>) indicate price changes or additions

U-67 & M-269 UNIVERSAL STUDIO MICROPHONES:

>U-67	Universal studio system	$ 435.00 ***
>U-67	With Z-48 suspension	449.00 ***
>UC-5/25	Extension - 25 feet	20.00 ***
>UC-5/50	Extension - 50 feet	26.50 ***
>UC-5/100	Extension - 100 feet	39.50 ***
>UC-6/25	Extension w/swivel - 25 ft.	40.00 ***
>M-269	Universal studio system	495.00 ***
>M-269	With Z-48 suspension	509.00 ***
>KC-5/25	Extension - 25 feet	20.00 ***
>KC-5/50	Extension - 50 feet	26.50 ***
>KC-5/100	Extension - 100 feet	39.50 ***
>KC-6/25	Extension w/swivel - 25 ft.	40.00 ***
>Z-48	Elastic susp. (U67/M269)	32.50 ***
>Z-67	Wind screen (U67/M269)	32.50 ***
>NUK	Plug-in (Rack) supply (U67)	210.00 ***
EF-86	Tube (U-67)	avail. local
AC-701k	Tube (M-269) (selected)	26.50 ***

KM-54a, KM-55 & KM-56 MINIATURE MICROPHONES:

KM-54a	Super cardioid system	435.00 ***
KM-55	KM-54a w/low freq. roll-off	435.00 ***
KM-56	3-pattern switchable	435.00 ***
KC-1/25	Extension - 25 feet	15.00 ***
KC-1/50	Extension - 50 feet	21.00 ***
KC-1/100	Extension - 100 feet	33.00 ***
Z-38	Elastic suspension	24.00 ***
Z-118	Wind screen	17.50 ***
BB-12	Battery supply for KM's	150.00 ***
BL-12	BB-12 charger for NiCd cells	24.00 ***
Z-29	Overload protector (KM54a/55)	39.00 ***
>Z-29/56	Overload protector (KM56)	45.00 ***
Z-64	Humidity proof case	12.90 ***
SG-5	Swivel stand adapter	6.60 ***
Z-19	Gooseneck extension (wired)	18.00 ***
>N-52t	Plug-in (Rack) supply	227.00 ***
Z-74	M-S suspension (KM56)	52.00 ***
AC-701k	Tube (selected)	26.50 ***

NOTE: BB-12 battery supply and charger can substitute for NKMu normally furnished at same price.

MAY 1, 1964

SM-2 COMPATIBLE M-S STEREO MICROPHONE:

SM-2	Stereo microphone system	$ 795.00 ***
SC-1a/33	Extension - 33 feet	38.50 ***
SC-1a/66	Extension - 66 feet	58.00 ***
SC-1a/100	Extension - 100 feet	76.00 ***
Z-42	Elastic suspension	24.00 ***
Z-43	Wind screen	48.00 ***
Z-140	Matrixing transformers (pr.)	87.00 ***
SG-5b	Swivel stand adapter	7.90 ***
NSK	Plug-in (Rack) supply	305.00 ***
AC-701k	Tube (selected)	26.50 ***

U-47a & U-48a MICROPHONE SYSTEM ACCESSORIES:

(Microphone systems as such discontinued)

UC-3/25	Extension - 25 feet	20.00 ***
UC-3/50	Extension - 50 feet	25.00 ***
UC-3/100	Extension - 100 feet	35.00 ***
>UC-4/25	Extension w/swivel - 25 feet	37.50 ***
Z-37	Elastic suspension	28.50 ***
Z-18a	Wind screen	69.00 ***
Z-33	Stand coupling connector	18.50 ***
NGK	Plug-in (Rack) supply	183.00 ***
VF-14M	Tube (selected)	11.85 ***

M-49b & M-50b CONCERT HALL MICROPHONES:

M-49b	Variable pattern (remote)	495.00 ***
>M-50b	Special purpose system	455.00 ***
MZ-49	Suspension harness	18.50 ***
>N-52t	Plug-in (Rack) supply	227.00 ***

NOTE: Microphones with screw type connectors, see KC-5 extension cables under M-269. Microphones with twist type connectors, see cables below:

C-26/25	Extension - 25 feet	30.00 ***
C-26/50	Extension - 50 feet	36.50 ***
C-26/100	Extension - 100 feet	49.50 ***
AC-701k	Tube (selected)	26.50 ***

GENERAL ACCESSORIES FOR ALL SYSTEMS:

CF-3	"Stand-By" "Go-Ahead" signal	49.50 ***
Z-30	Supply protective case	28.50 ***
Z-68	Auditorium cable hanger	11.50 ***

EMT PROFESSIONAL EQUIPMENT:

EMT-140	MONO reverb. unit	$ 2450.00 ****
>EMT-140st	STEREO reverb. unit	2540.00 ****
EMT-140FB	MONO remote control unit	3250.00 ****
>EMT-140FBst	STEREO rem. cont. unit	3340.00 ****
EMT-140F	Remote control drive	775.00 ****
EMT-140B	Remote control panel	65.00 ****
	EMT-140 shock mounts (4)	27.00 ****
EMT-420a	Wow & flutter analyzer	1585.00 ****
EMT-421a	Filter set for above	560.00 ****
EMT-930	12" MONO auto turntable	1165.00 ****
EMT-930st	12" STEREO auto turntable	1295.00 ****
EMT-940	12" 4-speed manual TT	595.00 ***
C-37	STUDER MONO tape recorder	3495.00
C-37st	STUDER STEREO tape rec.	3995.00
	Console for above	265.00
J-37	STUDER 4-track 1/2" or 1"	9995.00

Quotation on other EMT equipment on request!

NEUMANN & GOTHAM DISK CUTTING EQUIPMENT:

AM-131	NEUMANN lathe	5250.00 ****
G/G	GOTHAM/GRAMPIAN system	1370.00 ****
MS-52H	NEUMANN magnetic cutter	450.00 ****
EQ-52H	RIAA equalizer for above	70.00 ****
DST-62a	NEUMANN STEREO cartridge	79.50 ***
DST-62b	Above w/square contacts	79.50 ***
STA-12	Matched arm for DST-62a	79.50 ***
>KTR-147C	DST-62 cable xfmr (2 req.)	14.95 ***

TUCHEL CONNECTORS FOR NEUMANN MICROPHONES:

T-2045	U-47 base insert (M)	1.50 ***
T-2046	U-47 insert (F)	1.50 ***
T-3037	U-47/48 cable (M)	3.90 ***
T-3038	U-47/48 cable (F)	3.90 ***
T-3040	NGU chassis mount	3.25 ***
T-3400	KM cable (M)	2.55 ***
T-3401	KM cable (F)	3.35 ***
T-3403	NKM chassis mount	2.55 ***
T-3460/10	U-67 cable (M)	4.50 ***
T-3461/10	U-67 cable (F)	4.65 ***
T-3471/10	NU-67 chassis mount	6.00 ***
T-3460/2	M249/M269 cable (M)	4.50 ***
T-3461/2	M249/M269 cable (F)	4.65 ***
T-3471/2	NN48hu chassis mount	6.00 ***
T-3050	M-49b twist, cable (M)	9.50 ***
T-3051	M-49b twist, cable (F)	10.30 ***
T-3053	NN48bu tw. chassis mount	5.40 ***
>T-3615/2	SM-2 cable (M)	5.50 ***
>T-3616/2	SM-2 cable (F)	5.50 ***
>T-3618/2	NSM chassis mount	3.45 ***

NEUMANN SOLID STATE CONSOLE MODULES:

TMV-60	Input amplifier system	$ 495.00
TV-60	60 dB switchable amplifier	295.00
TV	30 dB ampl. cube	58.50
>TV-34	34 dB amplifier card	95.00
TRV	Linear atten./ampl.	197.50
TEV	Equalizer/ampl.	320.00
TLTV	Line amplifier	385.00
TSVT	Push button junction ampl.	310.00
TSVR	Potentiometer junct. ampl.	295.00
>TPG-6	6-freq. oscillator	245.00
TTMV	Peak ind. log. ampl.	350.00
KBV-2	Isolation amplifier module	15.50
TNG	12V DC supply (double)	225.00
TNGL	Lamp power supply	195.00
	Blank cover panel	5.50

NEUMANN ACOUSTICAL PRODUCTS:

DK-2A	Pistonphone	750.00

GOTHAM PRODUCTS AND ACCESSORIES:

EQ-1000	Universal equalizer	1650.00 ****
>KW 600/1	Linear motion ladder att.	59.00 ***
>KW 600/2	2-Channel ganged att.	135.00 ***
>KW 600/4	4-Channel ganged att.	238.00 ***
>K 600	Rotary ladder attenuator	25.50 ***
>T 600	Rotary "T" attenuator	25.50 ***
>UE 600	Rotary "pan pot"	25.50 ***
M-35	18' collapsible mike stand	160.00 ***
G-35	9' boom for above	125.00 ***
>LBV	VU meter (light beam)	145.00 ***
US-1050	Pilot-tone sync. head	29.00 ***
>PREH	Lin. motion pot. (single)	4.95 *
>PREH	Lin. motion pot. (dual)	6.80 *
PFB-D	150 Watt power amplifier	615.00
TIM-4a	Tape timer (high speed)	295.00

EMT SPECIAL RF SHIELDED AUDIO CABLES:

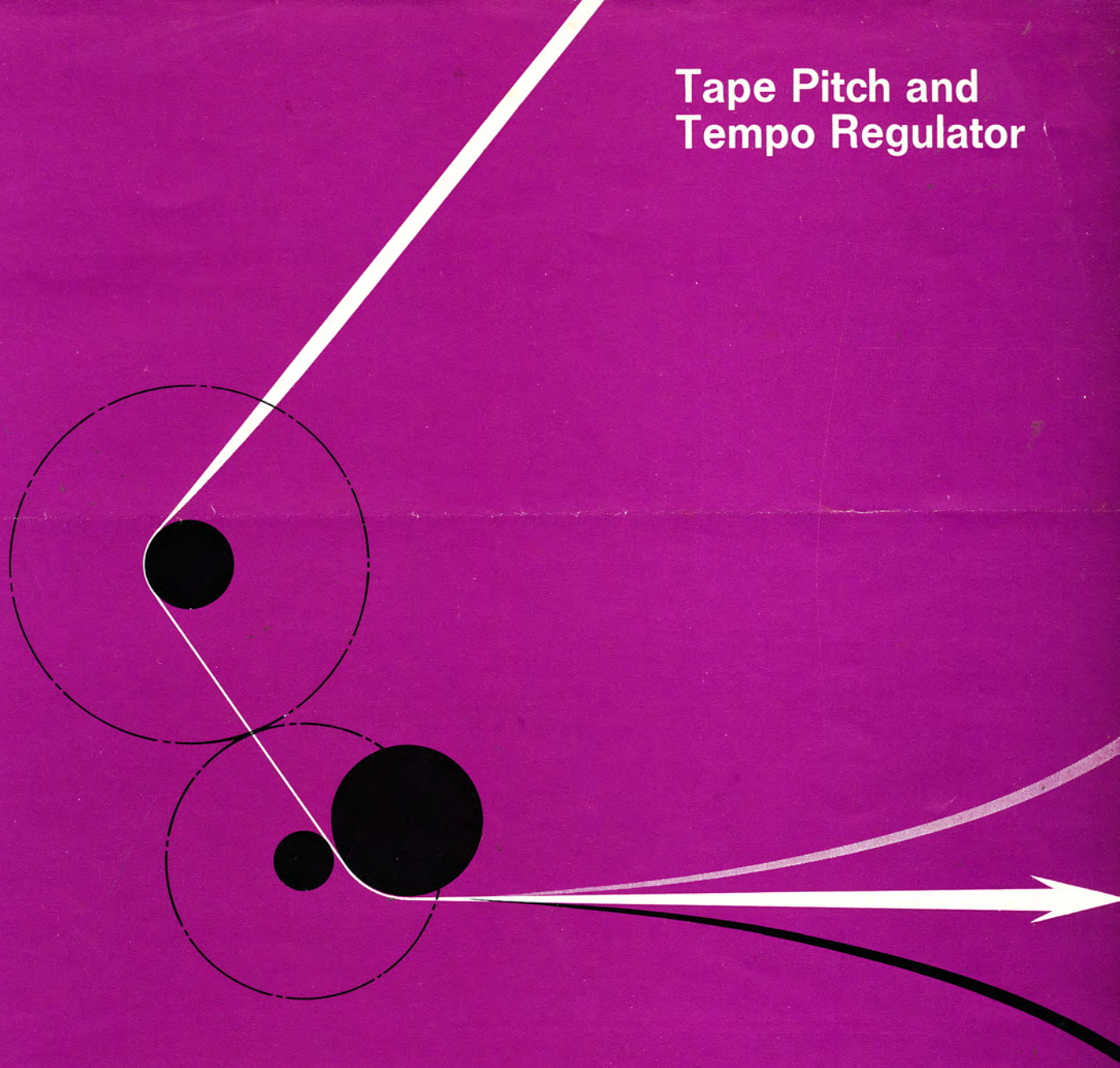
		PER 100'
EMT-2111	1 pr. double shielded	19.50 ***
EMT-2112	1 pr. hi flex extra thin	17.85 ***
EMT-4113	2 pr. individually shielded	32.00 ***
EMT-9622	5 pr. individually shielded	86.00 ***
EMT-9623	10 pr. individually shielded	158.00 ***

Other EMT cables available on special request. Prices quoted are per 100 ft. lengths. For over 1,000 ft., ask for special quotation; less than 100 ft., add 15% to prices listed above.

NOTE: Prices subject to change without notice. This Price List supersedes that dated December 1, 1963

0564236

Tape Pitch and Tempo Regulator



To change program length without changing pitch

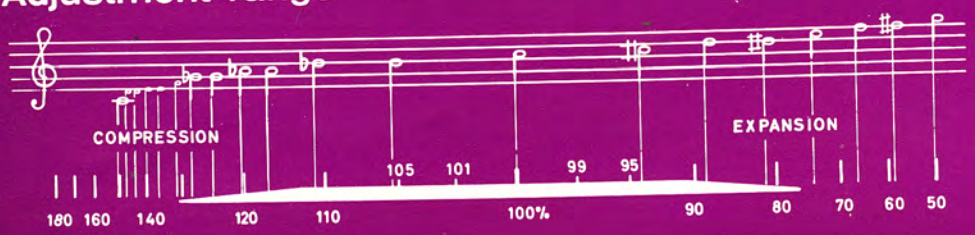
To change pitch without changing program length

Eltro

Acoustic Tempo and Pitch Regulator Model MLR 38/15

Function

Adjustment range



Pitch
or
Tempo

Application

The acoustic Tempo and Pitch Regulator serves for varying the speed or the pitch during the playback of a sound recording. It is a supplementary device for studio tape recorders of different makes. When playing back a sound recording which has been recorded at a speed of 15 ips, this regulator allows a continuous tape speed variation from half the speed (approx. 7.5 ips) to double the speed (approx. 27.5 ips) without involving an alteration of the pitch, the level or the fidelity of the recording.

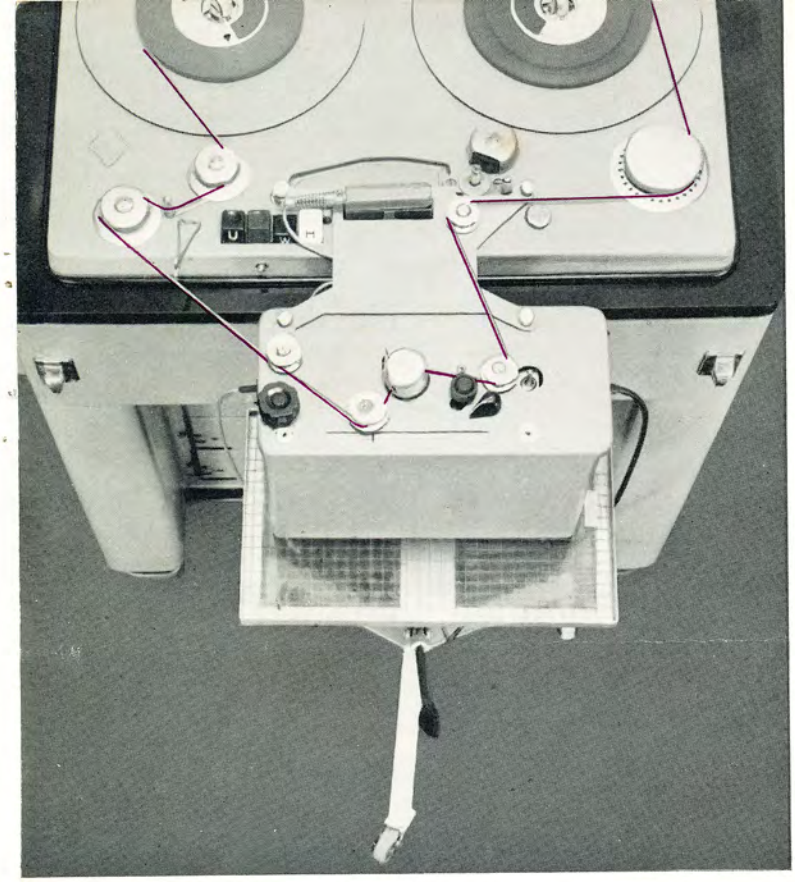
Moreover, during the playback of a sound recording, its pitch may be continuously varied without altering its speed, i. e., up to seven half tone steps higher or several octaves lower than the recording pitch.

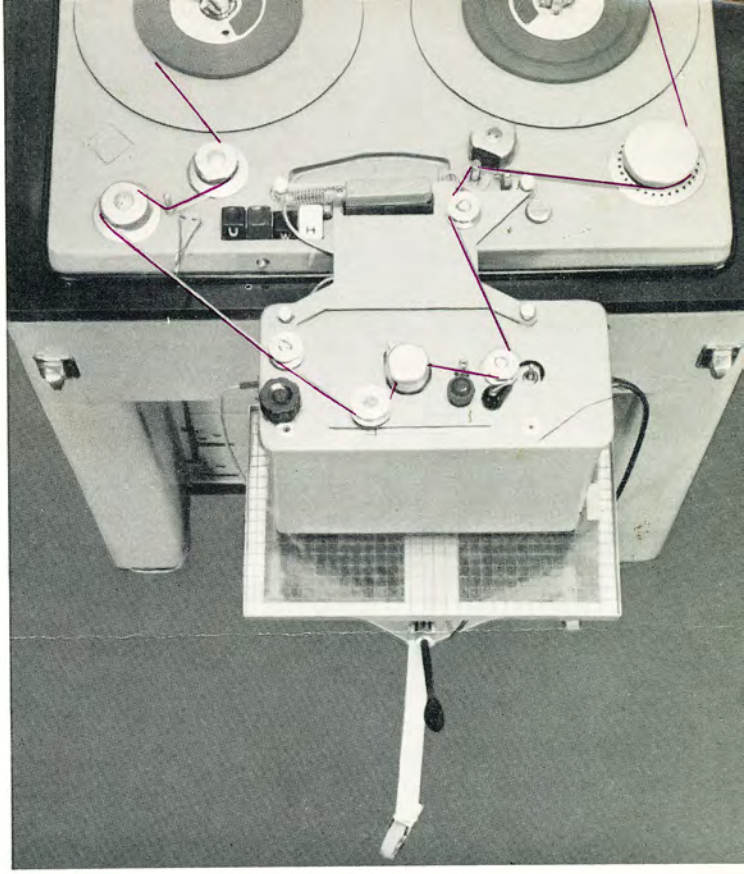
When playing back a sound recording this regulator permits a variation of the duration of a program and, therefore, adjustment of the running time during broadcasting.

In the television and film studio this regulator is suitable for a motion synchronized playback of sound films and/or of silent films where the sound is to be added synchronously, or which have to be played back motion synchronized as is done in films produced in foreign languages. A special cutting of the sound track is not necessary in any case.

For any piece of music, the desired and/or required speed may be selected with this regulator.

Speech may be slowed down during playback and yet the speaker always remains recognizable since the characteristic of his voice is maintained. Under conditions of simple speed variation not using this device, even a 10 % change in speed will so alter the speaker's voice quality as to make it difficult, if not impossible, for the listener to recognize the speaker by his voice.





Tempo Regulation

The recording pitch depends on the relative speed between the pick-up head and the tape during playback. If the pitch is to remain constant at a changed speed, i. e. if the relative speed is to remain the same, minute sections of modulation have to be skipped for a reduction in overall playback time while minute sections of modulation have to be repeated when the playback time is to be extended.

The length of these modulation sections is about 30 ms. To guarantee uninterrupted playback, the tape is fed to a quadruple pick-up head with a wrap angle of approx. 90 degrees. These repeated and/or deleted sections (30 ms) are always shorter than the shortest sound of speech or music.

Pitch Regulation

A speed regulation between 80 and 120 % is distortion-free. Depending on the quality of the sound recording, certain phenomena may in some cases become audible with higher degrees of expansion and/or reduction. The phenomena are due to the technical principles involved. Simultaneously with the degree of expansion and/or reduction, reverberation is extended and/or reduced.

Pitch regulation at an unchanged playback duration, however, entails practically no noticeable reduction in quality.

Tempo Regulation

When changing the playback speed, the tape (as indicated) is guided from the supply reel of the studio recorder via the tempo regulator to the take-up reel. By pushing the playback button provided at the studio recorder (for actuating the reel motors) and closing the rubber pressure roller lever provided at the tempo regulator, the tape is driven by the capstan of the tempo regulator. For this the tempo regulator scale from 50 % to 180 % applies. 100 % means that the quadruple head is stationary, i. e. at normal playback speed.

Pitch Regulation

For a pitch variation, the tape is inserted in the same way as in the case of tempo regulation. However, the tape is inserted between the capstan and the rubber pressure roller of the studio recorder. After pushing the playback button of the studio recorder, however, the rubber pressure roller lever of the pitch regulator must remain open. The drive of the tape is effected by the capstan of the studio recorder. A pitch variation is brought about by rotating the quadruple head (alteration of the relative speed). For this, the pitch scale applies, which indicates deviation from 440 cps (a) in musical terms.

Some of the various adapter plates available to mechanically attach the MLR 38/15 to tape recorder models such as the Ampex, Studer, Telefunken, etc. This mechanical linkage is important only for pitch regulation.

For properly positioning the Tempo and Pitch Regulator in front of any tape recorder, the pictured mobile pedestal is available as an accessory. This is adjustable in infinite increments to bring the tape guides of the regulator to any height between 31" and 40". Weight of the pedestal is 16 lbs.

Attaching the Regulator to the Studio Recorder

The acoustic Tempo and Pitch Regulator must be adjusted to the exact height of the studio recorder tape guide. An adapter is available with which the regulator is fastened to different types of studio recorders.

The rotary quadruple pick-up head of the regulator is connected to the playback amplifier of the studio recorder in lieu of the studio recorder pick-up head. The regulator does not incorporate any amplifier nor electronic components.

The quadruple head is adapted to the impedance of the playback amplifier. High or low impedance is to be specified when ordering.

Manufacturer:

ELTRO GmbH & Co.
Gesellschaft für Strahlungstechnik
Heidelberg/West Germany

Data for the MLR 38/15 Tempo and Pitch Regulator

Frequency range:	30–15,000 cps.
Tempo adjustment range:	50 %–180 % of 15 ips tape speed
Pitch adjustment range:	3 octaves lower to seven half tones higher than original pitch.
Rotating head specifications:	Standard mono unit equipped with halftrack head. Standard impedances for Ampex, Studer or Telefunken tape recorders. Other impedances on request.
Special head configurations:	The MLR 38/15 is deliverable for 1/4", 1/2" and 1" tape widths and from 1 to 4 tracks on special order.
Power requirements:	117 Volts, 60 cps, 110 Watts (including built-in ventilator)
Length:	13.5 inches
Width:	6.3 inches
Height from the lower edge of the tape:	10.0 inches
Weight:	34 lbs.

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Printed in Germany

GOTHAM AUDIO CORPORATION
2 WEST 46 STREET, NEW YORK 36, N.Y. · · · COLUMBUS 5-4111

ACOUSTICAL PRODUCTS PRICE LIST

STUDER Master Tape Recorders	
C-37 1/4" Mono	$ 3,495.00
C-37 1/4" Stereo	3,995.00
Console	265.00
J-37 1" 4 Track	9.995.00
GOTHAM MLR 38/15 Pitch & Tempo Regulator	3,950.00
Pedestal	100.00
EMT 420A Wow and Flutter Meter	1,585.00
EMT 421A Octave Band Filter Set	560.00
EMT 117A Concert Pitch Generator	595.00
NEUMANN DK-2A Pistonphone	750.00
NEUMANN Measurement Microphones	
MM-3	600.00
MM-3u (High Intensity)	635.00
MM-5	650.00
MM-5u (High Intensity)	685.00
NEUMANN BB-12 Battery Supply	150.00
NEUMANN SM-2 Stereo Microphone	795.00
(NOTE: With either NSM AC power supply or battery supply at same price)	

See standard price list for other products represented by Gotham Audio Corporation

Effective May 1, 1964

0564233

Reverberation Unit
EMT 140
for stereo EMT 140 st

The Reverberation Unit

A device for the creation of artificial reverberation has been developed which replaces the traditional acoustic echo chambers used heretofore in broadcasting, television, film and recording studios. This device is the EMT-140 Reverberation Unit which, besides its ability to acoustically reproduce rooms of various sizes, 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 special stereo reverberation unit was constructed and is available under the designation EMT-140 st. Its use provides additional accentuation of the stereophonic effect by emphasising 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.

An ideal device for natural echo addition

The Reverberation Unit EMT 140

Artificial reverberation is nothing new

Artificial reverberation or echo has been used for years. In dramatic performances it serves to create the effect of voices from another world or large halls while the field of popular recording has made the echo effect one of its most effective tools for separating instrumental sections from each other or for placing vocalists distinctly in front of the orchestra. Prior to stereophonic recording, echo helped immeasurably in presenting the illusion of three dimensional sound. The creation of a true echo with an infinite number of steadily decreasing reflections has, until recently, never been successfully achieved. The most difficult task of all, however, has been the adding of reverberation to stereophonic music recording.

Echo chambers are expensive:

Mostly because of limited space which can be assigned to echo chambers and the relating high rental costs for such space, most echo chambers to date have been of the fairly small size of up to 3000 cuft. Assuming that the loudspeaker employed in an echo chamber of such dimensions showed only a minor sensitivity loss towards the high frequency end, and the chamber itself were so well constructed acoustically as to have a decay time linear with respect to frequency, then the resulting mid and high frequency reverberation would be quite acceptable. For sound with predominant low frequency components, however, the density of the resonances in such a small chamber would become unpleasantly obvious. The result is usually an unnatural and metallic sound.

Adjustment of the decay time in acoustical echo chambers is practically impossible, or achievable only with considerable difficulty, and is hardly ever used. The illusion of changing decay time is sometimes created by varying the ratio of direct to reverberated sound.

In addition to all this, acoustical echo chambers are rather uneconomical to construct since their sound isolation characteristics have to be as good as that of the studio itself, while the electronics, the loudspeakers and microphones all have to be of highest quality and therefore expensive.

In search of a solution:

Numerous ways have been sought to arrive at a method for generating artificial reverberation in a more favorable and economical way. The best known of these attempts is the use of a tape loop device using several record and/or playback heads and employing positive feedback. They all, however, have the distinct disadvantage of producing discrete echoes which, quite contrary to echoes in a three dimensional room, follow in nearly constant intervals, while real echoes get ever denser with increasing time. The well-known "slap echo" results which is used oftimes as an electronic effect in popular music but falls short of the true reverberation mark. A further qualitative problem with such tape loop devices is the noise introduced by the tape itself, the necessity for changing tape loops and the often metallic coloration of the sound caused in part by the insufficient density of the resonant points in such a system.

Stereo reverberation - special problem:

As has been shown, the creation of usable artificial reverberation brings with it numerous difficulties. The extension of such reverberation, in an aurally correct manner, to the field of stereophonic music, presents even more vexing problems. The answer which lies close at hand is the use of two reverberation units; one in each of the two recording channels. This solution, however, brings with it a considerable increase in equipment and space requirement, and furthermore produces reverberation effects in which the two distinct reverberant signals can be clearly heard.

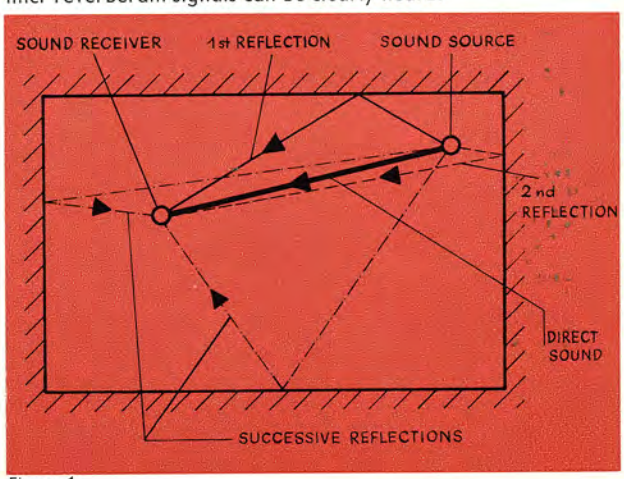

Figure 1

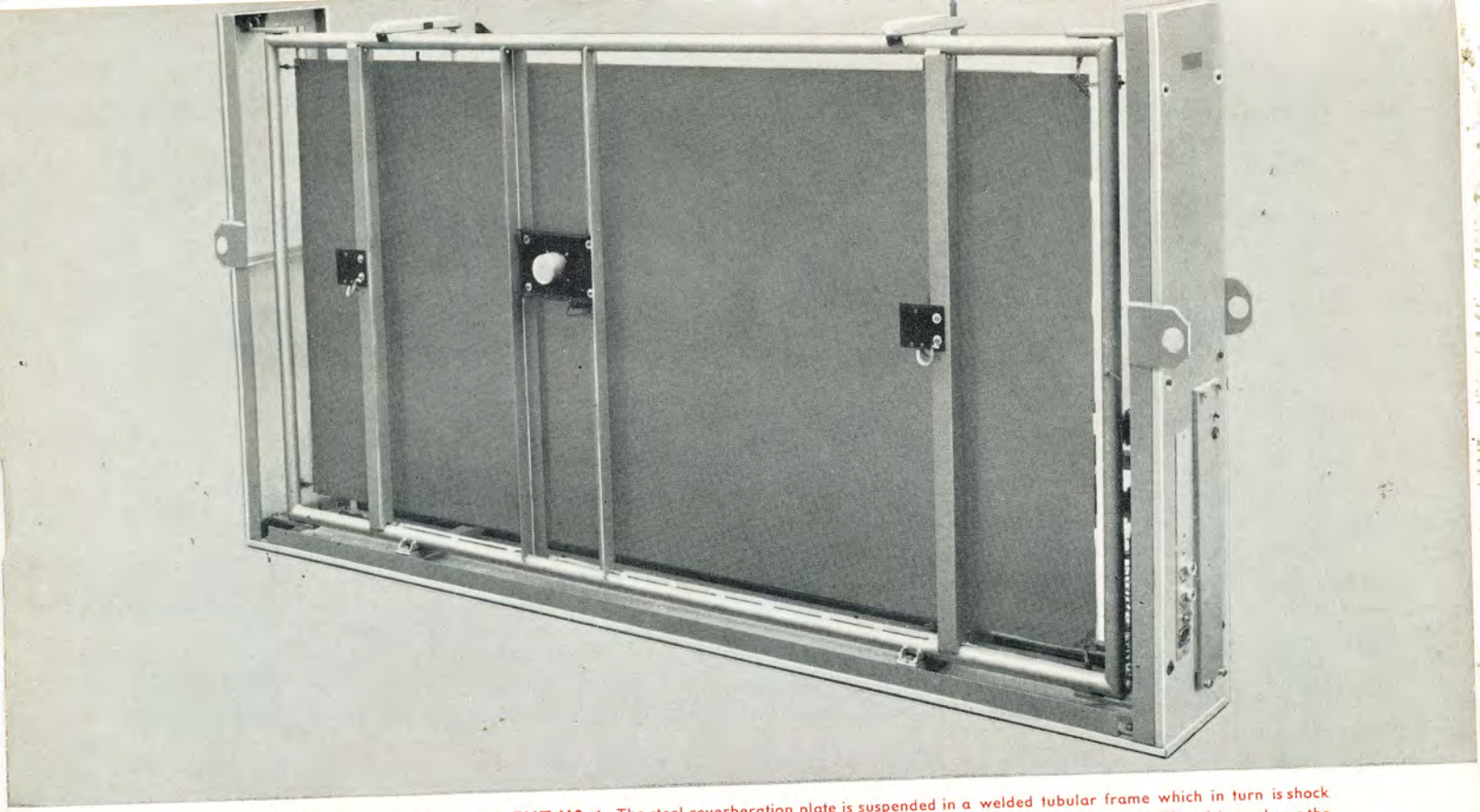

Figure 2 **Front view of the Stereo Reverberation Unit EMT 140 st.** The steel reverberation plate is suspended in a welded tubular frame which in turn is shock mounted inside the wooden outer case. The two ceramic pickups are visible at different distances on either side of the driver Unit. The picture shows the wooden case without its side and top panels.

How does reverberation come about?

A sound source located within a room generates sound waves which reach the ears of an observer within the room in several different ways:

a) directly; along the straightest, shortest way, and

b) indirectly; after one or more reflections from the existing walls, with commensurately longer running times and lesser intensity.

All of the reflected sound waves taken together are referred to as "echo". It depends primarily on the shape of the room, and the relative positions of sound source and observer. The length of time required for the intensity of the echo to diminish by 60 db; i. e. to 1/1 000th of the sound pressure, is referred to as the decay time. Localization of the sound source is only possible by means of the direct sound. The echo, however, reaches the observer from a multitude of directions, in rapid succession, and in ever decreasing intensity. This makes determination of the directions from which these reflections come, impossible. The echo is, of course, made up of the same sound frequencies as the direct sound. The directional information, however, is statistically distributed.

A better way

The EMT-140 Reverberation Unit utilises the physical 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 with 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 prosesses 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 at the Broadcast Technical Institute at Nurenberg, and later at the Institute for Broadcast Engineering in Hamburg, W. Germany, that the first reverberation plate using these principles 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. The choice of plate material requires great care and takes into consideration its internal damping characteristics and the resulting reverberation time. The steel plate's losses are additively formed by the non-frequency dependent and frequency dependent parts which are caused by the heat conductivity loss of the bending modes. For high frequencies it is the former and for mid and low frequencies the latter effect which predominates. Since the phase velocity of the bending mode of the plate in the entire frequency range is smaller than the velocity of sound in air, the damping of the plate through the greatly reduced radiation of air borne sound may be neglected when compared to all of the other damping causes. Damping through heat conductivity is, through practically the entire audible frequency range, directly proportional to the frequency, and inversely proportional to the plate thickness.

Because of the need for great density of bending mode self-resonances and the sound qualities caused by it, the plate must of necessity be very thin. This requires a compromise between sound quality and decay time. As an optimum, a plate of cold drawn high quality steel approximately 3 ft. by 6 ft. × 1/64" thick, has been chosen. This produces a decay time at 500 cps of about 5 seconds dependent upon material properties and thickness.

The plate used must not only be completely undamped, but must also be extremely flat. Since the normal cold drawn steel sheets only live up to these demands in rare cases, the plates to be used must be chosen from a large number of rolling mill products, and must be tested by suspending them in their frames. Their final acceptability for this purpose can only be determined after extended suspension time.

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 Construction of the Reverberation Unit

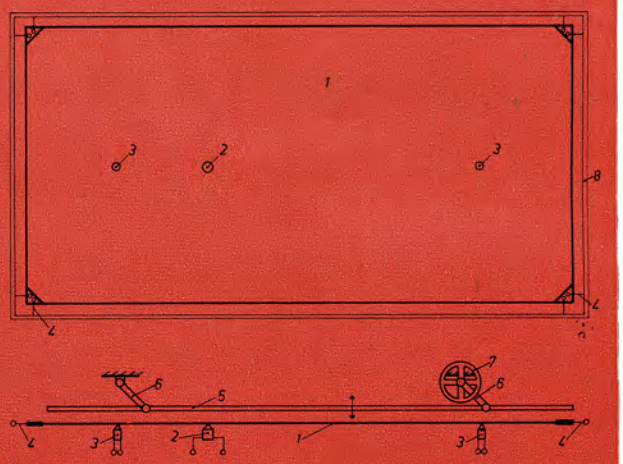

Figure 3

Schematic illustration of the Reverberation Unit.
1. Steel plate; 2. Dynamic driver unit; 3. Ceramic pickups; 4. Steel wire suspension clips; 5. Damping plate made of acoustically absorbent material; 6. Pivoting arms for purpose of varying distance between damping and steel plates (change of reverberation time); 7. Handwheel for reverberation time adjustment; 8. Welded tubular frame.

Operation of the driving system and microphone pick-offs

The steel plate is excited by means of a moving coil system. The sensing of the vibrations is accomplished by means of two contact microphones. Since these piezoelectric microphones are accelleration sensitive, their output rises for low frequencies up to 250 cps, stays constant to 900 cps and then falls at a rate inversely proportional to the frequency. The resonant frequency of these microphones lies beyond 20 kc and their capacitance is approximately 500 pf.

Reverberation without coloration of the original sound

At 1000 cps the running time from drive coil to microphone is about 6×10^{-3} seconds, which equals the running time of a sound in air over a distance of only 6 feet. Because of the short running time of the flexing waves, the successive repetitions follow in rapid sequence. Their number grows as a function of time, and as a result one obtains, as with an acoustically pleasing three-dimensional room, none of the flutter and slap echoes of other artificial reverberation devices. This is true even for the shortest sound impulses!

The number of self-resonances per cycle is independent of frequency. In contrast to actual echo chambers, the reverberation plate has many more self-resonant points, which brings with it great adventages for reverberation at these frequencies

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. The material which has proven most effective in this application is a stiff pressed fiberglass plate only 1/32" thick. 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 cps.

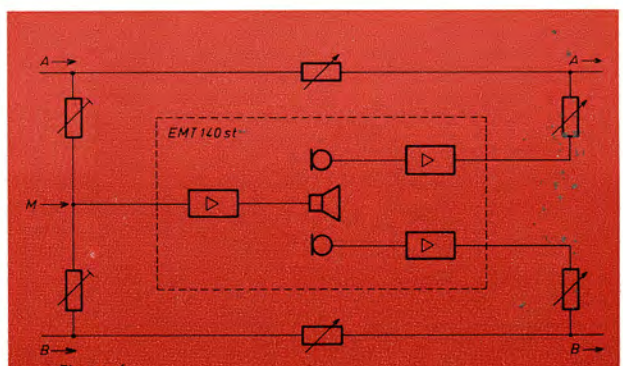

Figure 4

Block schematic of the operational components of the Stereo Reverberation Unit EMT 140st

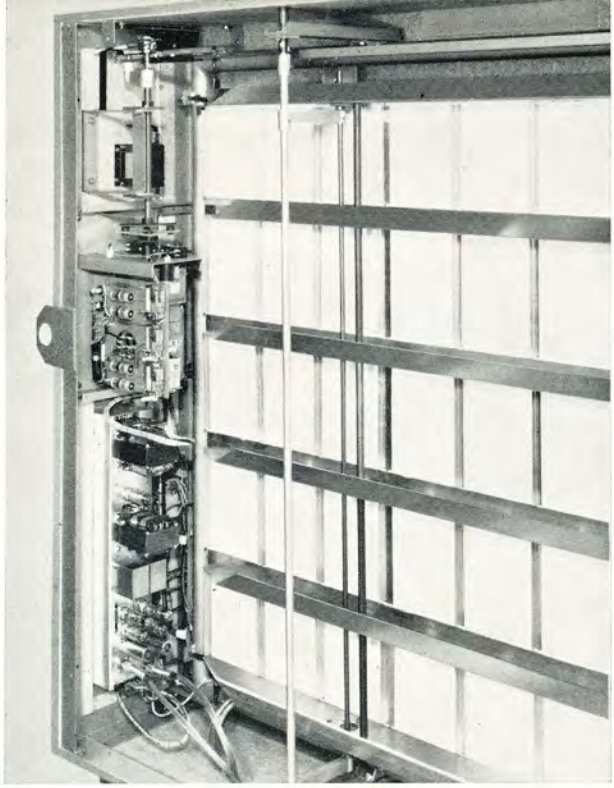

Figure 5

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

The two signals obtained from the two contact microphones which are mounted at unequal distances from the driving coil are entirely incoherent; 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 between them 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 sine wave tone of any frequency, one can obtain at the two microphones an infinite variety of phase relationships, of which four are of particular interest:

	Microphone 1	Microphone 2	Directional Impression
Phase	90°	0°	Echo seems to come from the right
Phase	0°	90°	Echo seems to come from the left
Phase	90°	90°	Echo seems to come from the center
Phase	90°	—90°	Echo seems to come from the sides.

Under the heading "Directional Impression" in the foregoing table, are given those directional impressions which would be created if the two microphones were standing in a room and the sound source would be moved. There are of course, besides the phase relationships given, an infinite further number which are entirely frequency dependent. If musical modulation is fed to the reverberation unit, therefore, all of the imaginable phase relationships will appear between the two microphones and the result is a statistical distribution and a resulting impression of echo coming from every possible direction within the room.

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.

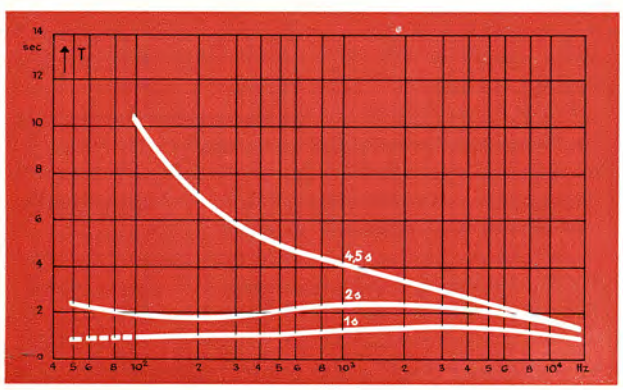

Figure 6

Reverberation times as a function of requency for various distances between reverberation and damping plate.

This is done by feeding part of the unreverberated output signal of channels A and B through isolation networks to a common buss. 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.

Frequency response of the reverberation system:

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 kc), 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

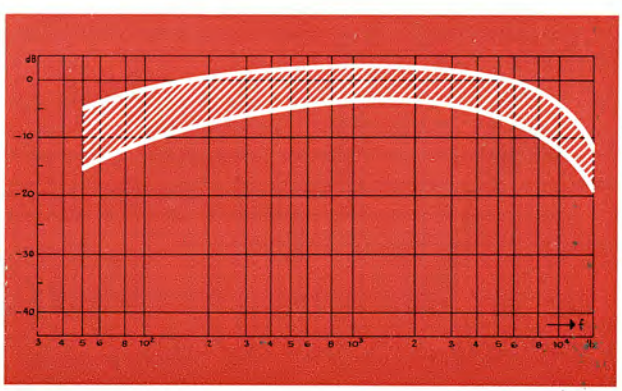

Figure 7

Tolerance range of the frequency response for the Reverberation Unit measured using a white noise generator with third octave filter or 25 cps warble tone generator for an adjusted 2 second reverberation time.

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.

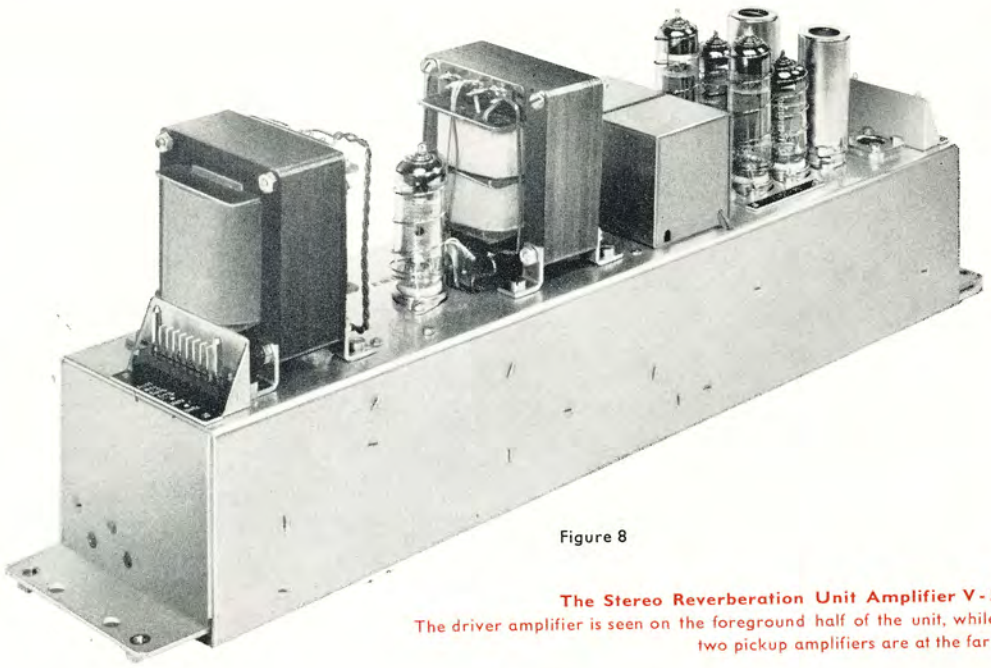

Figure 8

The Stereo Reverberation Unit Amplifier V-54st.
The driver amplifier is seen on the foreground half of the unit, while the two pickup amplifiers are at the far end.

Minimal distortion:

The level handling capabilities of the reverberation plate and amplifier were so chosen, that the third order harmonic distortion, to which the human ear is far more sensitive than the even order harmonics, would not exceed 0.6% for a peak input level of 1.55 Volts measured using white noise through a third octave band pass filter. This takes into consideration the statistical power distribution of sound modulation which drops normally towards the high frequency end of the spectrum.

The actual distortion produced by the plate itself at mid and high frequencies and moderately long reverberation time settings, is lower than that of the amplifier. At low frequencies, where the human ear is less sensitive, the distortion of the plate increases somewhat. When the maximum input level referred to above is not exceeded, no disturbing distortion is audible.

Installation in quiet surroundings prevents interference:

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. The actuating arms of the damping plate are not isolated from the tubular frame and yet adjustment of the reverberation time either by hand or remote control, even during modulation pauses, is not audible.

The signal to noise ratio:

The signal to noise ratio at the output terminals of the microphone amplifier as measured with a frequency of 300 cps and a reverberation time of 2 seconds and with the remote control motor not running, is greater than 60 db, when the direct sound channel level is mixed in at a level of –8 db. With the remote control motor running, this is reduced to about 45 db.

The amplifier as a single unit:

The excitation amplifier and pickup amplifier are a special development carrying the broadcast type designation V-54. The stereo model is designated V-54st and has two entirely separate pickup amplifiers; one for each contact microphone. Both amplifier types have identical dimensions. The input to the driver amplifier is balanced and floating with an impedance of 1000 Ohms.

The input level requirement follows the broadcasting standard of 1.55 Volts, equal to +6 dB referred to 0 = 0.775 Volts. The input transformer is fed to the first stage via a three position low frequency attenuating network. This stage (E 81 L/6686 tube) then feeds directly to the output transformer which in turn is connected to the driving coil. It is possible to check the coil driving voltage on a terminal strip directly behind the amplifier's cover panel.

The relatively low signal voltage delivered by the contact microphones is amplified by the pickup amplifier to the already mentioned standard line level. This is done through a four stage RC-coupled amplifier with parallel fed output transformer, using 2 EF 804 S and 1 E 80 CC 6085 tube. The output impedance is low, balanced and floating.

Figure 9
Operating group for the remote control feature.
Shown installed in the studio console.

Remote control of Reverberation time from the studio console

Besides the normal construction, the EMT-140 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 antiroom. It is furthermore possible to control the reverberation time of a single unit from many locations.

How is the reverberation unit delivered?

The reverberation plate and its associated amplifier system are built into a massive wooden case. For the manually operated unit, a hand wheel is provided for adjustment of the reverberation time. While it is possible to deliver and install the remote control components at a later date, this is connected with no small amount of installation work and it is therefore highly recommended that the choice of manual or remote control be made before the unit is purchased.

Special care during shipment:

Because of the large dimensions of the reverberation unit and the necessarily delicate suspension of the steel plate and damping plate, it is imperative that great care be exercised during shipment. On the part of the factory the greatest diligence is exercised with respect to packing and plain labelling of the proper lifting and carrying methods. After unpacking, the unit can be carried comfortably by four men. Four carrying rings at the ends of the unit permit insertion of carrying rods.

Connection of the Reverberation Unit

The full modulation level should be applied to the input of the reverberation unit's amplifier, and echo faders, level controls, and filters, if used, should all follow in the circuit. The reverberated signal from the unit is mixed with that of the direct channel transmission and the ratio of these two signals determines the illusion of distance between the sound source and microphone. Through use of a mixing control it is possible to maintain a constant overall level while changing the reverberation to direct sound ratio.

By proper connections it is possible to use the stereo reverberation unit for adding echo to both A-B as well as M-S stereo recordings. The stereo unit may, of course, also be used for adding echo to monophonic recordings.

Technical data

Reverberation Time (measured at 500 cps): Adjustable between	1 and 4 seconds.
Accuracy of time scale division (re 500 cps)	±8%
Frequency response at 2 seconds reverb. time	see curve, figure 7
Signal-to-noise ratio at output of unit referred to full output level, at 300 cps, 2 sec. reverb. time and —8 db of direct channel addition:	
remote control not running	> 60 db
remote control running	> 40 db
Input level for full modulation:	1.55 Volts (+6 dbm)
Input impedance:	> 1000 Ohms
Output level:	
(a) 300 cps	max. 1.55 Volts (+6 dbm)
(a) 1000 cps	max. 1.1 Volts (+3 dbm)
Usual direct channel mix-in level:	—6 to —10 db
Output impedance:	< 25 Ohms
Load impedance:	> 200 Ohms
Moving coil impedance of drive system	12.5 Ohms
Tube complement of V-54 Amplifier:	(1) E81L/6686; (2) EF804S; (1) E80CC/6085
Tube complement of V-54st Amplifier:	(1) E81L/6686; (2) EF804S; (2) E80CC/6085
Power Supply requirement:	110/220 Volts 50 cps; or 117 Volts 60 cps
Remote Control: (Available at additional cost); built-in servo motor with relay control; indicating instrument External voltage required:	24 Volts DC, 250 ma
Weight:	
Without remote control	374 lbs. (170 kg)
With remote control	418 lbs. (190 kg)
Dimensions:	7.5 ft. (2.4 m) long 1 ft. (0.34m) wide 4 ft. (1.32 m) high

Ordering Information:

Reverberation Unit; MONO; hand operated	EMT-140
Reverberation Unit; MONO; remote controlled	EMT-140FB
Reverberation Unit; STEREO; hand operated:	EMT-140st
Reverberation Unit; STEREO; remote controlled	EMT-140FBst
Remote Control for subsequent installation	EMT-140F
Operating panel alone	EMT-140B
Amplifier; MONO	V-54
Amplifier; STEREO	V-54st

World-wide patent protection:

The construction of the EMT-140 Reverberation Unit is already protected by many international patents:

Western Germany	1001011
Denmark	91041
England	827302
France	1159692
Netherlands	applied for
Austria	196145
Switzerland	347016
USA	2923369

Further patents have been applied for.

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U-67 SOUND OF TOMORROW!

NEUMANN U-67 MICROPHONE

Sets NEW Standards for the Next Decade!

Neumann proudly introduces the U-67 Microphone — which represents a culmination of over 30 years of electronic leadership. The U-67 contains many advance features that not only meet the needs of today . . . but anticipate the requirements of the future!

Check these outstanding features — see for yourself why the U-67 Microphone is truly the New Microphone Standard of the World.

ACTUAL SIZE

1. Electronically switched directional characteristics: Cardioid, Omni-directional, Figure-8.

2. Frequency response perfectly linear ± 1 dB to 15 KC with respect to a direct incident sound field; virtually no peak at the high end. Makes possible close miking without the usually sharp sound common to previous condenser microphones.

3. A newly developed and patent applied for input circuit permits flat response to 40 cps with sharp roll-off below. This makes possible full-fidelity pickup without necessity of elastic suspensions, wind-screens, or "popping" filters. Previous attempts at filtering out low frequency response AFTER the microphone's preamplifier were useless since grid "blocking" already occurred from tremendous low-frequency output of condenser capsule. Now for the first time such "blocking" has been stopped AHEAD of the amplifier, making the U-67 virtually "pop"-proof. (This circuit readily disabled for flat low-end response to below 10 cps.)

4. Separate "Voice-Music" switch raises the roll-off starting point from 40 cps to 100 cps. Especially advantageous for speech in TV and film applications.

5. A third switch on the microphone itself permits reduction of the capsule's sensitivity by approximately 14 dB BEFORE the amplifier section. Prevents overload of amplifier from extremely close placement of the microphone. This is the first time that such overload protection is available in a studio microphone, again at the INPUT to the amplifier.

6. Current regulated filament supply permits wide variation in interconnecting cable lengths without necessity for filament voltage adjustment.

7. "Calibrating input" connection on power supply permits direct testing of microphone preamplifier with oscillator. Signal is fed directly to INPUT of amplifier section. Instantaneous response, distortion, noise, and IM measurements possible without opening microphone.

8. Regular EF-86 tube readily replaceable.

9. Zehner diode use in power supply prevents damage if accidentally operated without microphone connected.

10. Complete protection against radio frequency interference due to a number of structural innovations in both power supply and microphone. Use of RF proof connectors. Feed-through capacitors used on all leads reaching the microphone connector.

11. Built-in pad for U.S. nominal input impedances and levels; fully compatible with all domestic microphones.

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NEUMAN U-67 MICROPHONE

DISASSEMBLED PARTS OF THE REVOLUTIONARY NEW U-67 MICROPHONE

The service free operation of the U-67 is further enhanced by the following innovations.

1. Diaphragm made of gold sputtered polyester foil, which, compared to previously used materials is far more impervious to heat, moisture and aging.
2. Printed circuits used throughout produce better stability and guard against mechanical shock damage.
3. Greater security against humidity by complete encapsulating of all grid input components in high resistance silicone potting compound. Use of Teflon tube socket.
4. Simple removable threaded fastening ring at the bottom of the microphone permits ready disassembly into its component parts without the necessity of using even a screwdriver. Tube change is a matter of seconds.

TECHNICAL DATA:

Acoustical Function: Combination of two pressure-gradient elements – electrically switchable to cardioid, omni-directional and figure 8.

Frequency Range 20—16,000 cps

Nominal Output Impedances: Switchable 30/50 ohms—150/250 ohms.

Effective Output Levels: (Referred to 10 dyne/cm² S.P.L.)

Characteristic	30/50 ohms output	150/250 ohms output.
Omni, Figure 8	–59 dBm	–52 dBm
Cardioid	–55 dBm	–48 dBm

RMS Total Harmonic Distortion: Less than 0.5% at 40, 1000, and 5000 cps to 115 dB SPL referred to 2×10^{-4} μb. (With overload protection 129 dB.)

Self-Noise Level: (Weighted according to CCIR 1949.)
Less than 17 dB in Cardioid.
Less than 20 dB in Omni-directional and Figure 8.

Switchable Sensitivity Reduction: (Overload protection) 12-16 dB depending on directional pattern.

Calibrating Input Impedance: 600 ohms unbalanced.

Power Requirements: NU-67 Power Supply: 110/127/220 volts 50-60 cps – 9 watts.

Cable Lengths: Normal length – 25 ft. (Permissible 250 ft.)

Dimensions and Weight. U-67 Microphone: 7⅞" x 2¼": 1 lb.
NU-67 Power Supply: 4" x 4" 8½": 4 lbs.

Finish: U-67: Matte Satin Chrome. NU-67: Grey Hammertone.

The U-67 Microphone system consists of the following components:

U-67 Condenser Microphone

NU-67 Power Supply (U.S. std. fuse, pilot, XL output, AC plug).

UC-6 – 25 ft. microphone interconnect cable and suspension: 6 ft. AC power cord; mating XLR-3-11 output connector.

FREQUENCY RESPONSE

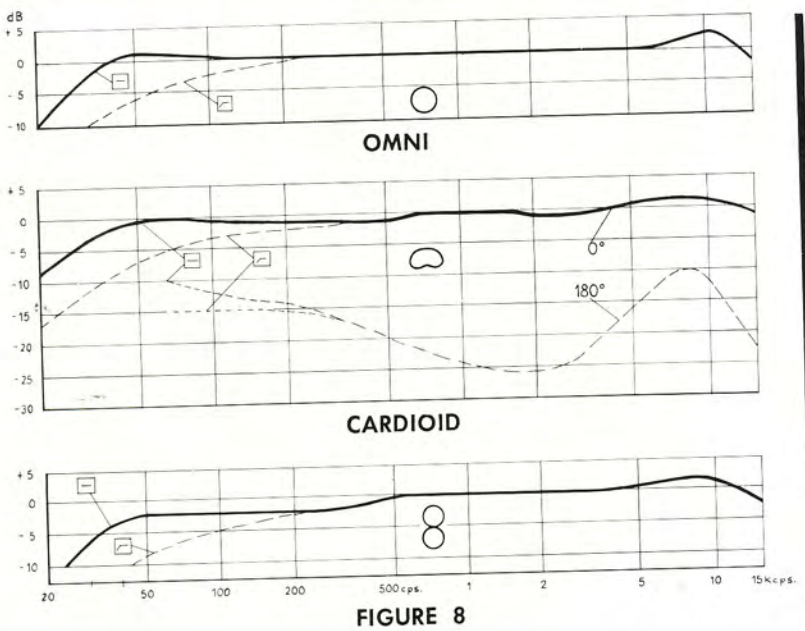

FIGURE 8

POLAR PATTERNS

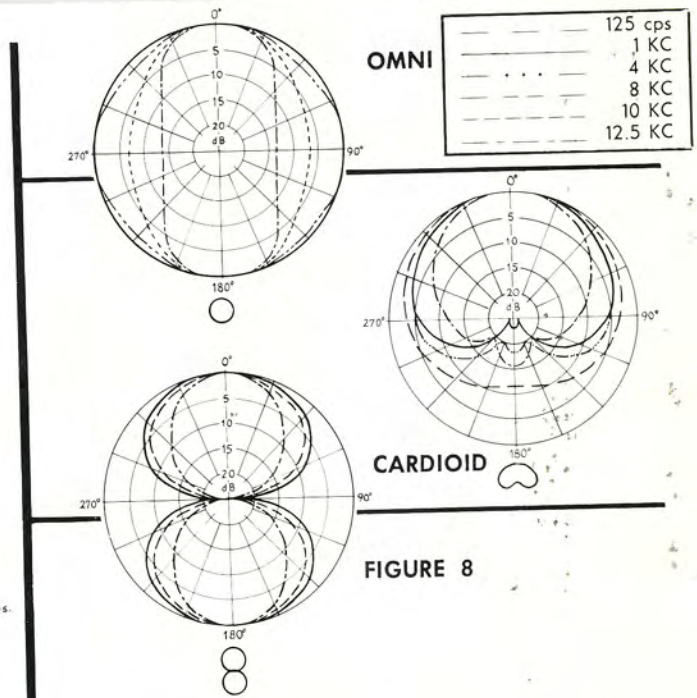

FIGURE 8

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