

AMPEX

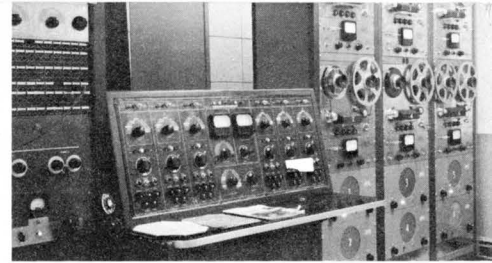
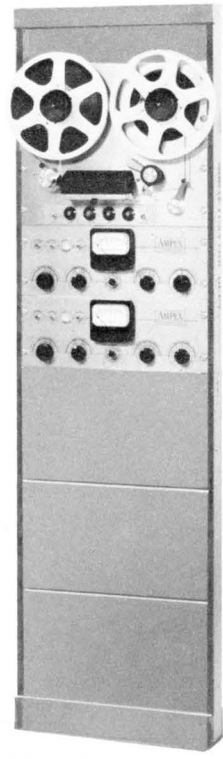
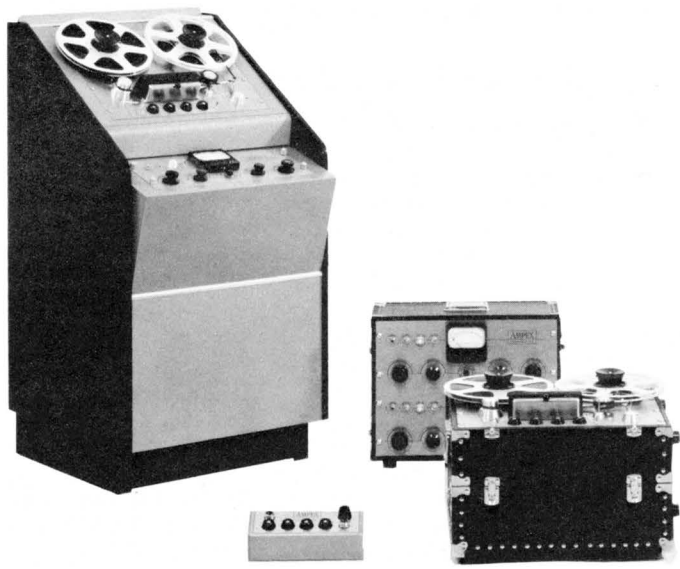
**PRODUCT DATA
BULLETIN**

SERIES 351

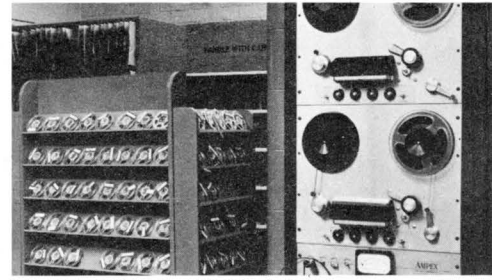
Specifications and Operating Features

AMPEX 351

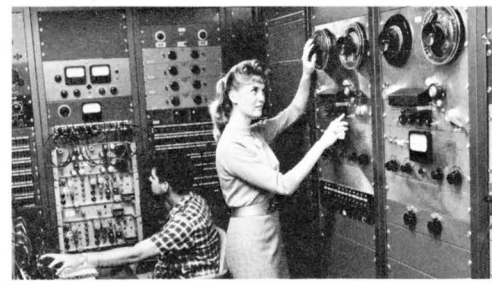
STEREOPHONIC/MONOPHONIC



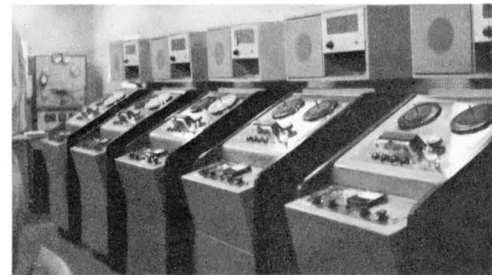
NETWORK: KGO, AM/FM (ABC)



INDEPENDENT: KMAK, AM (News, music and spot)



EDUCATION: San Diego State College



OVERSEAS: Tokyo Radio Service

THE EXPERIENCE BEHIND THE 351

The acknowledged leader in magnetic tape technology is Ampex Corporation, the only company whose research, engineering and production facilities are devoted exclusively to magnetic recording and related techniques in audio, video and instrumentation fields. This specialization accounts, in part, for the technical excellence which has become synonymous with the name Ampex. Each model Ampex recorder is exactly designed for a particular professional application. The Ampex 351, for the broadcast industry, is a classic example.

EXACTING REQUIREMENTS OF THE BROADCAST INDUSTRY

As a professional broadcaster you give special consideration to long life and reliability of any tape recording/reproducing equipment. Your recorder is one of your most important "tools." Performance of a tape recorder must meet your exacting needs or you sacrifice program quality which means possible loss of revenue. Top performance is strictly an economic factor for your business — an investment which must pay off!

You require **LASTING ECONOMY** from your tape recorder. As a professional, your recording equipment must operate to give you a profitable return on your investment. You can't afford down-time.

You require **CONTINUITY OF SERVICE**. Not only is long life important, but long periods of *continuous* use — days, weeks or months.

You require **DEPENDABILITY**. Your recorder must be ready to go at all times over periods of long continuous use and also after long stretches of non-use. You can't risk delays or failures in performance. You must be "on the air" with your recorders always in perfect working order.

You require **STABILITY**. Mechanical specifications and recording/playback characteristics must remain identical from one use to the next — sometimes over long periods of time.

You require **RUGGEDNESS**, for your work is often unreasonable in its demands upon tape recorder performance (field use, remotes, etc.).

You require **FLEXIBILITY** for your broadcast day. Your equipment must do "everything" well — recording, reproducing, editing, commercials, interviews, sound effects, cueing, delay broadcasts, stereophonic work, etc.

You require **SIMPLICITY** in operation. You must have handling ease to save your valuable time and allow even non-technical personnel to operate your tape recorders with confidence.

You require **PROFESSIONAL SPECIFICATIONS** for your exacting broadcast needs, both mechanical and electrical. (These must consistently meet NAB standards.)

QUICK-RELEASE HOLD-DOWN KNOBS
are self-locking for fast loading and provide firm grip.

HEAD ASSEMBLY HOUSING
mu-metal shielded, covers Ampex precision heads — erase, record and playback (triple shielded with mu-metal), all specially mounted for easy alignment. Multi-channel erase head provides separate erase for each track. Provides space to mount professional splicer.

IDLER PULLEY
and its heavy-mass flywheel provides essential damping. This, along with the precision capstan assembly and the hysteresis synchronous motor, holds the wow and flutter to an absolute minimum.

FAST FORWARD BUTTON
(recessed in safety-well) gives same quick action, professional feel and speed as Rewind. These buttons can be used to "rock" tape back and forth for fast editing and cueing.

REWIND BUTTON
(recessed in raised safety-well) gives smooth instantaneous response: 2400' reel (10½") rewinds in just 52 seconds. Gentle tape handling without stretching tape even at fast wind/rewind speeds (recessed in raised safety-well). Switch from Rewind to Fast Forward with tape in motion without throwing or spilling tape. All controls interlocked to prevent jamming.

REEL SIZE SWITCH
selects correct electro-dynamic tension for small reels as well as 10½-inch reels.

CORK PADDED 4" TURNTABLE
with locating pins and holes for positive grip of all reel sizes, 10½-inch and smaller.

RIGID TOP PLATE
of high tensile strength aluminum alloy means perfect, permanent alignment of all mechanical components even after years of heavy use.

EXCLUSIVE HEAD GATE ASSEMBLY
with non-wearing glass tape lifters, releases tape for fast tape travel and for time saving "touch cueing" to locate spots in Fast Forward or Rewind.

CAPSTAN IDLER
with solenoid control for accurate traction pressure, will disengage when power is shut off at end of reel and in case of power failure, to avoid flat spots on idler pulley.

DIRECT DRIVE
by hysteresis synchronous motor. Capstan spindle, machined to tolerance of 100 microinches, provides accurate tape speeds and further reduces wow and flutter.

STOP BUTTON
(recessed in raised safety-well) instantaneously stops tape travel in 0.13 seconds for cueing, editing and other program requirements.

TAKE-UP TENSION ARM
with safety shut-off switch gives even wrap on take-up reel and eliminates tape "bounce" in fast starts.

PLAY BUTTON
(recessed in raised safety-well) accelerates tape to full speed in play or record modes in just 0.1 seconds. Essential to special effects and tight programming.

TAPE SPEED SWITCH
selects fast or slow tape speed (3¾ and 7½ or 7½ and 15) with dual-speed motor.

AMPEX 351 PRECISION

CONTROL CIRCUIT BOX centralizes all operating controls, relays, switching circuits in a single *plug-in* unit. All switches and relays are oversize for sure, long-life operation. There is no open wiring on underside of tape deck to create shock hazard. All wires are color-coded and clearly labeled.

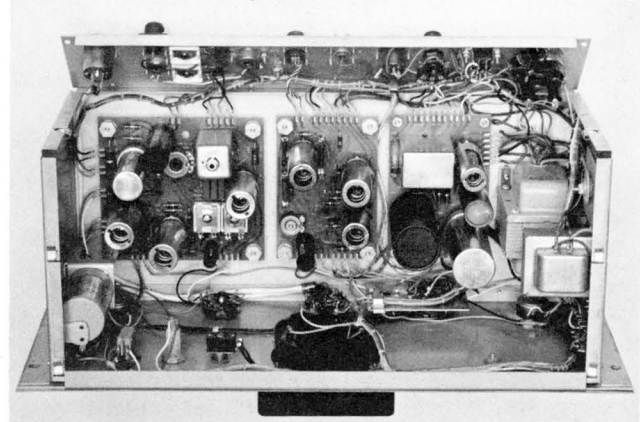
ELECTRONICS

A complete chassis and electronic control panel is provided for each channel. For the stereophonic model, two chassis are direct-coupled for high flexibility but have complete individual controls for half-track recording (separate erase for each channel) and playback. You can easily utilize newer techniques of making master monaural tapes from multi-channel originals. Controls are smooth and positive in their action and easy to read. Stainless steel panel mounts on standard rack, in Ampex 351 Console cabinet, or in portable cases. Each chassis is fused for equipment protection. Stable circuitry eliminates problems with critical tubes, assures higher performance over a very long life. Chassis are tropic-treated to protect components from effects of excessive heat and humidity.

ETCHED CIRCUIT BOARDS of high-impact epoxy and glass fiber for record amplifier with bias and erase oscillator, reproduce amplifier and power supply, give new performance characteristics not possible with previous wired circuits. This provides temperature, moisture and shock resistance, solid dip-solder strength, better electrical conductivity and more stable operation. Edge-on harness connectors make each sub-chassis quickly removable from main chassis. All components are oversize to provide a safety factor for surges beyond the normal power requirements.

FRONT PANEL CONTROLS are large and spaced for convenient handling. Figures are deep-etched, clear and easy-to-read. They allow independent control of channels for stereo or half-track recording work.

REAR CHASSIS CONNECTIONS are power (117 volt) socket, fuses, transport interconnecting plug, line termination switch, line output socket, monitor jack, bias coupling socket, playback head socket, bias calibration adjustment, erase adjustment, bias adjustment, erase hand socket, record hand socket and line input socket. Professional, locked-in connectors for all cables provide positive contacts and safety against accidental uncoupling. Oscillators are locked together for stereo operation. Easy identification of all connections for quick, easy set-up. Grilled cover protects tubes and parts from damage.



RECORD AMPLIFIER is four stage, high gain, resistance coupled with two dual triode tubes. Transformer coupling is used for microphone or balanced bridge inputs. Plate voltage is only supplied to final stage in record mode to lengthen tube life.

REPRODUCE AMPLIFIER uses three dual triodes for three stages, is resistance coupled with phase inversion and push-pull output for maximum fidelity.

BIAS AND ERASE OSCILLATOR uses a dual triode as a push-pull oscillator to provide high frequency bias and erase signals (approximately 100 k.c.) with a clean, harmonic-free wave form.

POWER SUPPLY uses vacuum tube, full wave rectifier, gives smooth dc. Selenium rectifier provides sufficient dc for filament voltage where needed.

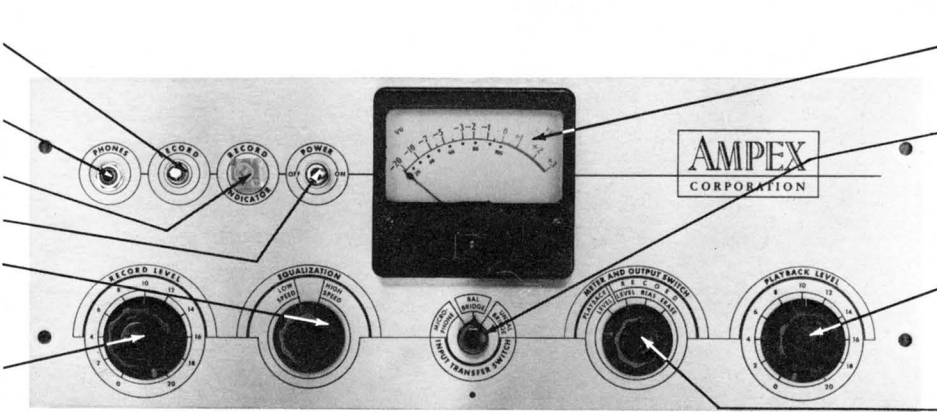
Record Mode Push Button, for safety, operates only with play button.

Phone Monitor Jack
Record Mode Indicator Light. Large neon, can readily be seen from a distance.

Line Power Off-On Switch

Quick-change of electrical equalization for low or high tape speed. 2" knob.

Large 2" professional Record Level Knob gives precise, smooth, linear control.



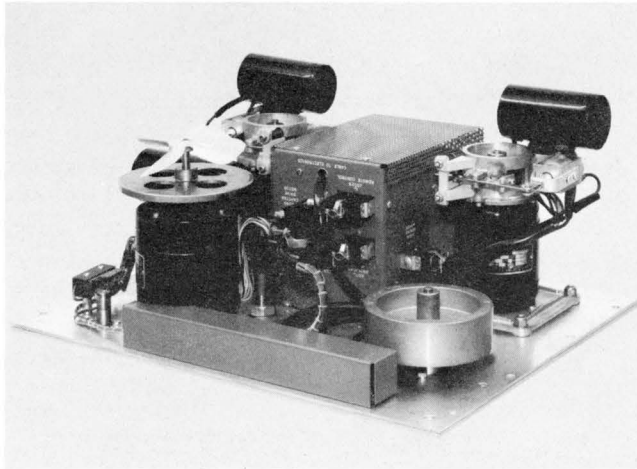
Large illuminated professional 4" V-U Meter can be seen across room.

Input Switch: low impedance microphone, balanced or unbalanced bridge.

Playback Level. 2" knob. All control markings are deep-etched for permanence. They are large—can be easily seen from a distance.

Meter and Output Switch: playback level, record level, bias, erase. 2" knob.

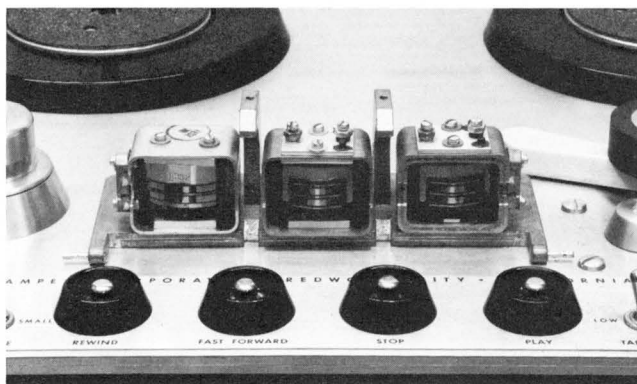
MECHANICAL



All components are oriented on top plate in a basically simple pattern for foolproof operation, ease of access and minimum maintenance effort. For example, all 351 transport mechanism components (motors, switches, control box, etc.) are designed and mounted so that entire mechanism can be completely disassembled in less than 20 minutes. Straight-line tape path provides complete safety at maximum speeds (2400' in 52 seconds), while at the same time it allows quick and simple loading and threading.

PUSH BUTTON CONTROLS, logically and sequentially placed, add to ease of editing and cueing. Push-button safety-wells guard against accidental tripping. All controls, including recording, are also available as a separate, compact remote control unit for added flexibility and convenience.

TOP PLATE is high tensile strength aluminum alloy and stainless steel reinforced by electro-welded lamination to provide maximum rigidity. This eliminates stresses, strains and vibration so all elements, bearings and shafts remain in perfect alignment for years of use. This is basic to absolute accuracy of the tape path.



AMPEX TAPE HEADS are basic to the quality performance of the Ampex 351. Ampex research in instrumentation recorders for missiles has developed

heads with extreme requirements far beyond audio needs. (Response up to 4,000,000 cps.) The experience thus gained has resulted in heads for the 351 unit which are more precise and reliable than any other audio heads available today. Exclusive Ampex design holds exact gap tolerance regardless of wear (heads with 18,000 hours use have shown no change in published performance specifications). Reflected light-waves must be used to check heads during manufacture, since they are polished to an accuracy beyond mechanical measurement. The 351 has a separate multi-channel erase head which permits separate recording of either channel for narration, sound on sound, etc.

SUPPLY AND TAKE-UP TURNTABLE have heavy duty induction torque motors with sturdy mounting frames. Positive electro-dynamic drive holds tape in perfect tension at all times, responds evenly to instantaneous push button control, and eliminates problems inherent in mechanical wind/rewind systems.

BRAKES are large "Raybestos" band-type, actuated by solenoids for smooth, quick, positive action. Brake wheel is machined and cannot "freeze" or "bite" as softer metals may. Special brake-drum housings protect against dirt. Entire brake mechanism is coupled directly to motor for perfect brake alignment, needs little or no adjustment, ever.



BEARINGS manufactured to high Ampex specifications, are disassembled at Ampex and are degreased, carefully inspected, reassembled and relubricated—all in atmospheric controlled rooms. In this way you are assured mechanical accuracy.

CAPSTAN ASSEMBLY uses positive, direct drive from a heavy duty hysteresis synchronous motor. Spindle is balanced and machined concentric to a tolerance of 100 microinches, eliminating a major potential source of wow and flutter. Capstan idler is solenoid-operated for quick engage and disengage.



STANDARD OF THE BROADCAST INDUSTRY

THE AMPEX 351 — DESIGNED TO YOUR REQUIREMENTS

LASTING ECONOMY is one of the important advantages of the Ampex 351. It costs only a few cents per operating hour because of its long life. It requires fewer adjustments and little or no down-time through years of use. Ampex recorders have very low depreciation since their trade-in value is consistently high no matter what their age.

LONG LIFE and stability is a matter of history with all Ampex recorders. Stations are still using Ampex units which they installed 5, 10 or 12 years ago — *and still obtaining the same quality of performance.* Nearly all original professional units delivered in 1948 are still in operation, some of them with over 36,000 logged hours. **DEPENDABILITY** and **CONTINUITY OF SERVICE** are built-in. Close tolerances, precision machining and rugged oversize motors and parts assure top performance when you need it — any time for any length of time.

STABILITY for broadcast applications has been achieved in the Ampex 351 by scaling-down the basic mechanism of proven master-recording instruments. Improved electronics design gives a high degree of stabilization in all specifications and parallels the quality of the mechanism. Not only will the Ampex 351 meet or surpass published specifications, but, more important than this, it will maintain them for years to come.

RUGGEDNESS of the Ampex 351 can easily be seen in the thickness of the top plate, size of motor, solenoids, brakes and other parts. The electronics utilize only high-rated components. In addition to the obvious ruggedness is the amount of performance testing that goes into the 351 — life tests, vibration tests, field tests, etc. Thousands in everyday use have verified the outstanding ruggedness of the Ampex 351.

FLEXIBILITY is also a part of the basic design of the Ampex 351. Available in console, portable or rack mounting, single track, double track or stereo versions, 351 can be mounted horizontally, vertically, or at any angle. It takes reels from 3" to 10½"; is available with speeds of 3¾ and 7½, or 7½ and 15 ips; can be used for recording, playback, editing or any other broadcast requirement. Because of its flexibility this machine has also found widespread acceptance in fields, outside

broadcasting (education, recording, industrial, research, religious and advanced audiophile).

SIMPLICITY is quickly apparent in the Ampex 351 recorder. Logical location of parts and simple tape transport path means easy handling and trouble-free operation. The same simplicity of design is carried out below the top plate and in the electronics as well.

APPLICATIONS IN OTHER FIELDS

The Ampex 351 was designed for the most varied uses of the broadcaster. Because of this versatility, the Ampex 351 is ideal for educators' use — language courses, remedial reading training and for music and speech class-work; for recording companies — remote sessions where professional quality is required; for research laboratories — acoustics and sound propagation experiments; for industry use — product testing and general recording requirements; and for business use — background music. Religious organizations use the Ampex 351 for recording radio programs, sermons and lectures (some duplicated for distribution in the field), as well as many local and national organizations, service clubs and groups where the need to record with professional quality exists.

Serious musicians own their own Ampex 351's to assist them with their careers. Advanced audiophiles, in large numbers, have added the 351 to their high fidelity systems where finest sound reproduction is important.

In meeting the varied requirements of the professional so completely, the Ampex 351 has become the STANDARD of the Broadcast Industry as well as many other fields.

With a four-year history of dependable operation by more than 9,000 units in use throughout the world, the Ampex 351 has aptly proved its ability to perform as it was designed.

THE AMPEX 351 PROVES ITS WORTH

The description and specification breakdown on the following pages details why the Ampex 351 gives you the lowest cost per operating hour. You are assured of profitable recorder operation with dependable performance, minimum maintenance or down-time and professional sound reproduction.

WORLDWIDE INSTALLATIONS . . . (partial list)

United States . . .

the Domestic **STANDARD**

ABC, CBS, NBC AND OTHER NETWORKS
THOUSANDS OF BROADCASTING STATIONS
HUNDREDS OF COLLEGES, HIGH SCHOOLS
AND GRADE SCHOOLS
INDUSTRIAL USERS
RESEARCH LABORATORIES
GOVERNMENT AGENCIES
ADVANCED AUDIOPHILES
RELIGIOUS ORGANIZATIONS
PROFESSIONAL RECORDING COMPANIES

Other Countries . . . the International **STANDARD**

AUSTRALIA
BRITISH BROADCASTING CORPORATION
CANADIAN BROADCASTING CORPORATION
INDIA
ITALY, RADIOTELEVISIONE ITALIANA
JAPAN, TOKYO RADIO SERVICE
KOREA BROADCASTING CORPORATION
MALAYA, DEPARTMENT OF BROADCASTING.

SINGAPORE
MEXICO, RADIO PROGRAMAS DE MEXICO.
RADIO CADENA NACIONAL
NEW ZEALAND
PORTUGAL, EMISSORA NACIONAL DE
RADIOIFUSAO
SOUTH AFRICAN BROADCASTING CORPORATION
SWEDISH BROADCASTING CORPORATION

SWISS BROADCASTING CORPORATION
TURKISH BROADCASTING COMPANY
URUGUAY, RADIO IMPARCIAL
PERU, RADIO NACIONAL, LIMA
ARMED FORCES RADIO
RADIO FREE EUROPE
UNITED NATIONS
VOICE OF AMERICA

MODEL
351

IMPORTANT: AS PROFESSIONAL EQUIPMENT, THE AMPEX 351 SPECIFICATIONS LISTED ARE ACCURATE MEASUREMENTS REQUIRED BY PROFESSIONAL STANDARDS AND DO NOT INCORPORATE ANY EXAGGERATED SALES CLAIMS. THESE ARE THE GUARANTEED MINIMUM PERFORMANCE SPECIFICATIONS THE CUSTOMER CAN EXPECT IN LONG-RANGE OPERATION.

GENERAL PERFORMANCE CHARACTERISTICS AND SPECIFICATIONS

**TAPE SPEEDS
FREQUENCY RESPONSE**

7½ and 15 ips. or 3¾ and 7½ ips.
All versions: 15 ips. ±2 db 30 to 15,000 cps.
7½ ips. ±2 db to 10,000 cps down not more than 4 db at 30 cps and 15 kc.
3¾ ips. ±2 db 40 to 7,500 cps.

**SIGNAL-TO-NOISE
RATIO**

Speed	Peak Record Level to Unweighted Noise
15"	Full track 60 db Half track 55 db 2 Channel stereo 55 db
7½"	Full track 60 db Half track 55 db 2 Channel stereo 55 db
3¾"	Full track 50 db

The peak record level is defined as that level at which the overall (input to output) total RMS harmonic distortion is 3% when measured on a 400 cycle tone. Noise is measured when erasing a signal of peak recording level and in absence of new signal. Thus, bias and erase noise are included as well as playback amplifier noise. All components between 30 and 15,000 cycles are measured.

FLUTTER AND WOW

15 ips.	Well below 0.15% RMS.
7½ ips.	Well below 0.2% RMS.
3¾ ips.	Well below 0.25% RMS.

Flutter and Wow measurements include all components between 0 and 300 cps using an RMS value of constant amplitude sine wave flutter.

PLAYING TIMES

	Speed	Half Track	Full Track
With NAB 10½" reels (2400 feet of tape)	15 ips. 7½ ips. 3¾ ips.	64 min. 2 hrs. 8 min. 4 hrs. 16 min.	32 min. 64 min. 2 hrs. 8 min.

STARTING TIME

Instantaneous (tape accelerates to full speed in less than 1/10 second).

STOPPING TIME

At 15 ips. speed, tape moves less than two inches after pressing "Stop" button.

PLAYBACK TIMING ACCURACY

±0.2% (±3.6 seconds in a thirty minute recording).

REWIND TIME

Approximately one minute for 2400-foot NAB reel; 30 seconds for 1200-foot EIA reel. Rewind times for thin base tapes proportionately longer.

CONTROLS

Tape motion controlled by four pushbuttons; Start, Stop, Fast Forward and Rewind. Separate Record button energizes record circuits, which drop out when machine is stopped. Individual Record button control for each channel in 2 Channel stereo machines. Motor speed and electronic equalization for various tape speeds are controlled by separate switches. Reel Size Switch provides proper tape tensions for NAB 10½" reels or EIA 5" and 7" reels.

RECORD INPUT

A switch allows recorder to accommodate either microphone level low impedance input or to bridge a 600 ohm line, balanced or unbalanced. Minimum input signal for recommended record level is — 10 dbm balanced bridge, or — 13 dbm unbalanced bridge. Levels as low as 150 microvolts at the microphone input will produce the recommended record level.

PLAYBACK OUTPUT

Plus 8 dbm output into 600 ohms, balanced or unbalanced. Will feed a high input impedance amplifier directly with approximately two volts. Can be connected for +4 dbm by restrapping.

AMPLIFIERS

Separate record and playback amplifiers are used. Amplifier distortion at any operating level is negligible compared to tape distortion, even when using new high-output tapes.

PLUG-IN HEAD HOUSING

Erase, record and playback heads are contained in a single plug-in head housing.

MONITORING

Independent record and playback systems allow tape to be monitored while recording. A phone jack is provided to monitor either the record input signal before or during recording, or the output signal from the playback head while recording or during playback. An A-B switch is incorporated in order that direct comparison can be made between the original program and the recorded program. The same switch transfers a 4-inch VU meter for level comparison and monitoring. The VU meter is also used to read bias and erase current.

POWER REQUIREMENTS

Either half or full-track machines require 2.0 amperes at 117 volts AC., 2 Channel stereo requires 2.5 amperes. Machines are available for either 50 or 60 cycle operation.

RACK SPACE

Standard 19 inch wide panel with commercial notching.
Tape Transport, 15¾ inches of rack space, weight . . . 58 lbs.
Electronic Assembly, 7 inches of rack space, weight . . . 18 lbs.
(Two required for 2 Channel stereo.)

CONSOLE DIMENSIONS

48 inches high x 24½ inches wide x 28½ inches deep; weight: 168 lbs.

**OPTIONS TO SPECIFY
WHEN ORDERING**

Mouthing Style — Console, rack-mount or two case portable for Full or Half Track; rack, or portable for 2 Channel stereo.

Tape Speed — 7½ and 15 ips. or 3¾ and 7½ ips.

Track Configuration — Full track, or half track, or 2 track stereo.

Power Line Frequency — 60 or 50 cps. (117 V. only).

ACCESSORIES

Remote Control: Controls Start, Stop, Fast Forward, Rewind and Record from a remote location.

MX-35 STEREOGRAPHIC AND MONOPHONIC MIXER: Compact, professional, 4-position mixer. For complete listing see General Accessories and Accessories for Broadcast Recorders Price Schedules.



AMPEX CORPORATION
AUDIO DIVISION
934 CHARTER STREET
REDWOOD CITY, CALIFORNIA