

## Section 1

**DESCRIPTION****1.1 GENERAL**

Ampex Model AG-440B and AG-445B Magnetic Tape Recorders and Reproducers (frontispiece) have a very-quiet tape transport usable with 1/4-inch or 1/2-inch tape, and have solid-state plug-in electronic modules. Up to two channels can be used with 1/4-inch tape, and up to four with 1/2-inch tape. The AG-440B is a record/reproduce machine, and the AG-445B is a reproduce (only) machine. Part numbers and details of the different configurations of the AG-440B and AG-445B are given in the first tables in Section 6.

The tape transport, designed for very quiet mechanical action, consists mostly of sub-assemblies which may be removed without unsoldering connections. Heads plug into receptacles inside the head housing for easy removal and installation. Most relays and electronic circuits are also the plug-in type.

The AG-440B tape recorder/reproducer is available either mounted in an Ampex console (frontispiece), mounted in portable cases, or unmounted for vertical or horizontal installation in

a rack or custom console. The basic system consists of a tape transport, a head assembly, and one record/reproduce electronic unit for each channel. Each record/reproduce unit contains a built-in Sel-Sync\* circuit for recording added channels in perfect synchronization with previously recorded channels. Plug-in accessories, such as a microphone preamplifier, a balanced line-input transformer, and a remote control unit are available as optional equipment.

The AG-445B reproducer is available either in a console or unmounted for installation in a rack or custom console. Up to four reproduce electronic modules will fit in the supplied mounting tray.

**1.2 TAPE TRANSPORT (Figure 1-1)**

A rigid-casting base is used to mount all components of the tape transport to assure precision machine-handling of the tape. Mechanical features allow the changing from one tape width to the other in a few minutes.

Two standard tape speed pairs are available: 3-3/4 or 7-1/2 inches per second (ips)

\* TM Ampex Corp.

and 7-1/2 or 15 ips. Speed selection is made by a toggle switch, and electronic equalization is automatically switched according to the speed selected.

The transport, as delivered, will accommodate tape reels 10-1/2 inches, 8 inches, 7 inches, and 5 inches in diameter. Any combination of large NAB reel and small EIA reel may be used by setting the REEL (takeup tension) switches accordingly. Also, the turntables can be easily repositioned for use with a 11-1/2-inch CCIR reel.

Tape scrape-flutter is minimized by a scrape-flutter idler mounted (on jeweled bearings) between the record and reproduce head stacks. An optional second idler may be mounted to the left of the record head.

Two solenoid-actuated arms automatically move the tape from contact with the heads during the fast forward or rewind modes. For editing and cueing operations, electronic override of the tape lifter is provided by pressing the EDIT pushbutton.

A plug-in printed circuit card, containing the power supply and master-bias-and-erase oscillator, is mounted in a power supply box on the back of the tape transport. On the AG-455 reproducer, the bias oscillator is omitted.

Pushbutton controls at the transport lower right edge, select operation modes: RECORD, PLAY, REWIND, FAST FWD, STOP, and EDIT. These switches are on the front of the tape transport control box. The control box has externally-mounted main fuses, cable receptacles for transport sub-assemblies, and plug-in relays for the play, rewind, fast forward, and edit functions. One control box receptacle must have the dummy plug installed when the remote control unit is not connected to it.

### 1.3 RECORD/REPRODUCE ELECTRONIC UNIT (Figure 1-2 and 1-3)

One record/reproduce electronic unit is required for each recorder/reproducer channel. The record/reproduce unit consists of an electronic chassis with three plug-in printed-circuit-board modules.

Front panel controls are: RECORD and REPRODUCE LEVEL, RECORD SELECTOR, and OUTPUT SELECTOR. Pilot lamps light to indicate that the associated channel is ready to record or is recording. A large VU meter monitors levels of the record, reproduce, and bias plug-in modules. The modules, removable through a front panel cutout, are guided to printed-circuit-board receptacles when inserted in the chassis.

The three removable modules provide amplification for record, reproduce, and bias. The record and reproduce modules each contain an equalization printed-circuit-board receptacle that is mounted at right angles to the mainboards, so the board alignment controls are accessible at the module face. Equalization is automatically switched (according to the tape speed selected) by a solid-state switching circuit.

Receptacles for interconnect cables, accessories, and input/output-signal cables are on the back panel of the chassis. The panel also has a line-termination switch (to select correct termination during maintenance procedures), two alignment adjustments for the Sel-Sync electronics, a plug-in record relay, and a power fuse. A supplied dummy plug is inserted in the INPUT ACCESS(ory) socket (on the back panel) during shipment and when an unbalanced-line input is used. A supplied bridging transformer is inserted in the socket for a balanced-line input (input impedance with the transformer is 20,000 ohms).

Internal strapping provides either a +8 dBm, or +4 dBm, nominal output level into a 600-ohm line. The equipment is strapped for a +8 dBm output, which can easily be changed when desired.

### 1.4 REPRODUCE ELECTRONIC MODULE (Figure 1-4)

The AG-445 reproducer chassis can hold up to four reproduce electronic modules in its 3 1/2-inch high tray. The tray can be mounted in a 19-inch rack, or in a console.

The plug-in reproduce-and-equalizer printed circuit board in the reproduce module is the same as the one in the record/reproduce unit. Each module contains the complete circuitry for one reproduce channel. Any additional components must be mounted on a separate chassis.



Fig. 1-1 Tape Transport

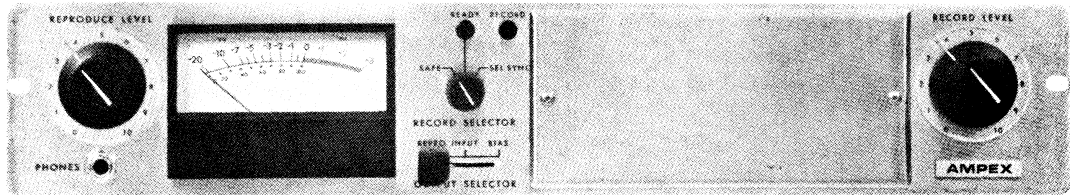


Fig. 1-2. Record/Reproduce Unit

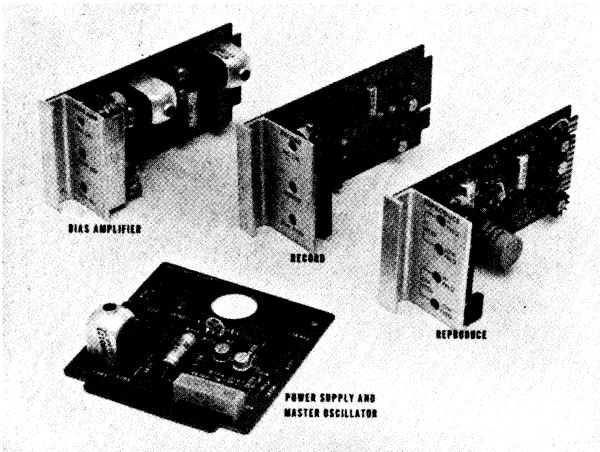


Fig. 1-3. Printed Circuit Boards

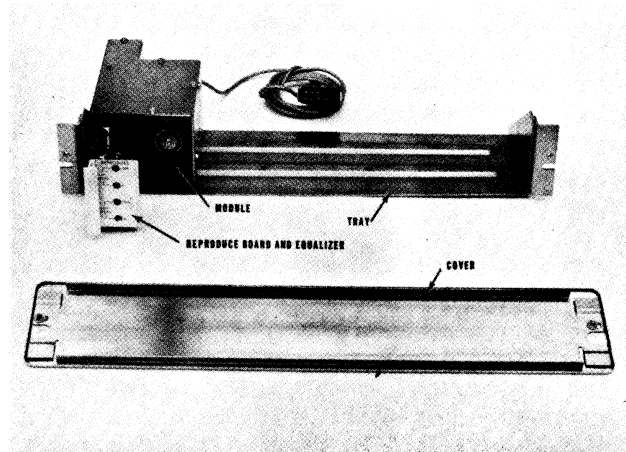


Fig. 1-4. Reproduce Electronic Module

A screwdriver-slot reproduce-level control is on the front panel of each module. The back panel contains the reproduce-head input receptacle, the line-output receptacle, a monitor jack, a line-termination switch (for use during maintenance), and a captive power-cable for connection to the transport power supply box.

### 1.5 HEAD ASSEMBLY

Although the erase, record, and reproduce head stacks are usually mounted in head-mounting positions 1, 3, and 4, respectively, many other combinations are possible.

For operation with 1/4-inch magnetic tape, a full-track head or a two-track head (for single-channel half-track operation) is available. A special four-stack head is also available which provides two-track erase, two-track record, quarter-track reproduce, and two-track reproduce, with a switch to select either the quarter-track or two-track reproduce head.

For 1/2-inch magnetic tape, three-track or four-track heads are available and are mounted in the normal head positions (1, 3, and 4).

Complete head assemblies can easily be changed to convert from a three or four-channel recorder using 1/2-inch tape, to a one or two-channel recorder using 1/4-inch tape.

Since the AG-445 reproducers contain only reproduce heads, a post is substituted in the erase-head position to maintain correct tape alignment. One or two-track heads are available for 1/4-inch tape. The two-track assembly has the normal two-track head and a 1/4-track head, with a switch for selecting the head desired. Three or four-track heads are available for 1/2-inch tape operation.

### 1.6 OPTIONAL EQUIPMENT

Available optional equipment is listed in Table 1-1. If a balanced-line or microphone input is to be used, the dummy plug (in the INPUT ACCESS socket) must be replaced with one of these accessories: 1) bridging-input transformer (providing unity gain with an input of 20,000 ohms), 2) matching input transformer (providing a gain of approximately 14 dB) and 3) microphone pre-

amplifier (for recording with a microphone). The preamplifier is a two-stage solid-state unit that is wired so the RECORD LEVEL control is connected between the two stages, making it a variable-gain device usable with a wide range of microphones.

### 1.7 SPECIFICATIONS

Specifications for significant parameters and features of the AG-440B Recorder/Reproducer and AG-445B Recorder are given in Table 1-2.

**TABLE 1-1  
ACCESSORIES\***

DESCRIPTION	Ampex Part No.
Microphone Preamplifier	4010066
Remote Control Unit	4010080
Matching Transformer (600 ohms input impedance)	4580200-02
Console Rear Cover	4040982
Electronics Assembly Cover	4040984
Console Rear Cover Set	4010076-01 (contains 4040982 and 4040984)
	4010076-02 (contains 4040982 and two 4040984)
	4010076-03 (contains 4040982 and three 4040984)
	4010076-04 (contains 4040982 and four 4040984)
Scrape-Flutter Idler (not interchangeable with furnished idler)	4010069
<b>Extender Boards for Circuit Boards:</b>	
Reproduce	4020151
Record	4020152
Bias Amplifier	4020153
Power Supply	4020154
CCIR Record-Equalizer Module (For Conversion to CCIR recording)	4020269-03
Portable Case (for two electronic units) (for 3-4 electronic units)	4150330-02 4150331
Blank Panel (for unused case spaces)	4290620-01
Support, Electronic Unit (used in pairs)	4260404
Reel, 10 1/2", 1/4" Tape (identical to reel supplied)	4690003-10
Reel, 10 1/2", 1/2" Tape	4690003-20
* Supplied with all required installation hardware.	

TABLE 1-2  
SPECIFICATIONS

<u>PARAMETER/FEATURE</u>	<u>DESCRIPTION</u>
<u>Tape Width and Channels</u>	1/4-inch Tape -- 2 Channels max. 1/2-inch Tape -- 4 Channels max.
<u>Tape Speeds</u>	3-3/4 and 7-1/2 ips; or 7-1/2 and 15 ips
<u>Reel Size</u>	5-inch, 7-inch, 10-1/2-inch, EIA or NAB. Can accept 11-1/2-inch CCIR reel with adaptors. (Turntable reel switches provide correct tension for large or small reel hubs.)
<u>Input</u>	100,000 ohms unbalanced; convertible to 20,000 ohms balanced, with supplied bridging transformer. Accepts line levels from -17 dBm, to produce recommended operating level.
<u>Output</u>	600 ohms balanced or unbalanced, with nominal output levels of +4 dBm or +8 dBm.
<u>Equalization</u>	Automatically switched by transport speed selector.
<u>Electronics</u>	All Solid-state. Plug-in printed circuit boards for record, reproduce, and bias amplifiers. Built-in Sel Sync <b>**</b> (selective synchronization) circuit. Power supply-and-bias oscillator for AG-440B; power supply, only, for AG445B (on separate plug-in printed circuit board in tape transport power supply box).
<u>Overall Frequency Response</u> *	15 ips NAB: ±2 dB, 30 Hz to 18,000 Hz 7-1/2 ips NAB: ±2 dB, 40 Hz to 15,000 Hz  3-3/4 ips: ±2 dB, 50 Hz to 7,500 Hz
<u>Signal-to-Noise Ratio*</u>	Measured from peak record level (6 dB above Ampex operating level) to unweighted noise; while erasing a 500 Hz signal recorded at peak record level, with a filter to attenuate noise outside the audio spectrum.

<u>Tape Speed</u>	<u>Full-Track</u>	<u>Half-Track, or 2-Track</u>	<u>3-Track</u>	<u>4-Track</u>
15 ips NAB	66 dB	60 dB	62 dB	60 dB
7-1/2 ips NAB	66 dB	60 dB	62 dB	60 dB
3-3/4 ips	63 dB	56 dB	-----	-----

\* Using Series 404 low-noise tape, biased for maximum sensitivity at 15 mil wavelength.

\*\* TM Ampex Corp.

Signal-to-Noise Ratio\*

Measured on an ASA "A" weighted curve

<u>Tape Speed</u>	<u>Full-Track</u>	<u>Half-Track, or 2-Track</u>	<u>3-Track</u>	<u>4-Track</u>
15 ips NAB	70 dB	64 dB	65 dB	64 dB
7-1/2 ips NAB	70 dB	64 dB	65 dB	64 dB
3-3/4 ips (120 micro secs.)	65 dB	58 dB	-----	-----

Bias Oscillator-and-Power Supply

(In tape transport power supply box)

Nominal bias/erase frequency 150,000 Hz.

Tape Lifting

Tape automatically lifts from heads in fast forward or rewind modes. (Manual or electronic override available during local control; electronic override on remote control.)

Even-Order Distortion

Second harmonic distortion of a 500 Hz signal, recorded at peak level, is less than 0.2%.

Flutter and Wow

Measuring all wavelengths from 0.5 Hz to 200 Hz according to ASA Z57.1-1954.

At 15 ips:	Maximum 0.08% rms
7-1/2 ips:	Maximum 0.1% rms
3-3/4 ips:	Maximum 0.15% rms

Start Time

Attains speed in 0.1 second; stable tape motion within 3.5 seconds (motion within Flutter and Wow specification).

Tape Recommended

Specifications are based on use of Ampex Series 404, Low-Noise Tape (or equivalent).

Speed AccuracyWithin  $\pm 0.2\%$ .Rewind Time

1 minute (approx.) for 2400-foot NAB reel.

Electronic Overload Margin

Record Amplifier: record level (before clipping) is 28 dB or more above normal operating level. Distortion is less than 1%, up to the clip level.

Reproduce Amplifier: output level (before clipping) is +28 dBm, which is  $\pm 20$  dB above normal operating level.

\* Using Series 404 low-noise tape, biased for maximum sensitivity at 15 mil wavelength.

Operating Controls

Input and output-level rotary controls.

Record selector: "Safe", "Ready", and "Sel-Sync" positions.

Output and Meter Selector: "Reproduce", "Input", and "Bias" positions.

Toggle switches: Power, Tape Speed, and Reel (2).

Mode Control Pushbuttons: Play, Fast Forward, Rewind, Record, Stop, and Edit. (Edit modes available are Stop/Edit, Play/Edit, and Fastwinding/Edit. All modes except Stop/Edit and Play/Edit can be remotely controlled.)

Power Requirement

105-125 vac, 60 Hz (50 Hz system available).

Power Consumption

Systems:	Amps (Approx.);
1 channel:	2.3
2 channel:	2.5
3 channel:	2.7
4 channel:	2.9