



SECTION I

DESCRIPTION

The AG-440C Tape Recorder/Reproducer is available mounted in an Ampex console, 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.

The AG-440C Recorder/Reproducer can be configured for use with 1/4-inch or 1/2-inch width magnetic tape. Available head assemblies permit one, two, or four channel recording or reproduction.

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 matching transformer (600-ohm impedance), and a remote control unit are available as optional equipment.

TAPE TRANSPORT

All components of the tape transport (Figure 1-1) are mounted on a rigid-casting base. Mechanical features allow changing from one tape width to the other in a few minutes.

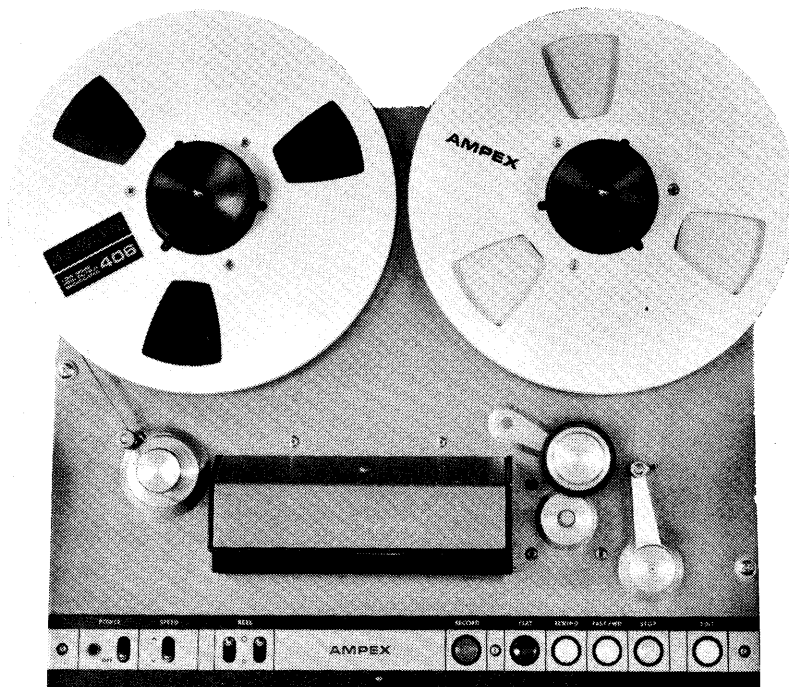


Figure 1-1. Tape Transport

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The tape transport consists mainly of sub-assemblies which may be removed without unsoldering connections. The heads plug into receptacles inside the head housing for easy removal and installation. Most relays and electronic circuits are the plug-in type.

Three standard tape speed pairs are available: 3-3/4 or 7-1/2 in/s (inches per second), 7-1/2 or 15 in/s, and 15 or 30 in/s. 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 a large NAB hub and small EIA hub may be used by setting the REEL (tension) switches accordingly. Also, the turntables can be easily repositioned for use with an 11-1/2 inch IEC reel.

Tape scrape-flutter is minimized by a scrape-flutter idler that is mounted on jeweled bearings and located between the record and reproduce head stacks. An optional second idler may be installed 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 regulator and master bias and erase oscillator is mounted in a power supply box on the underside of the tape transport.

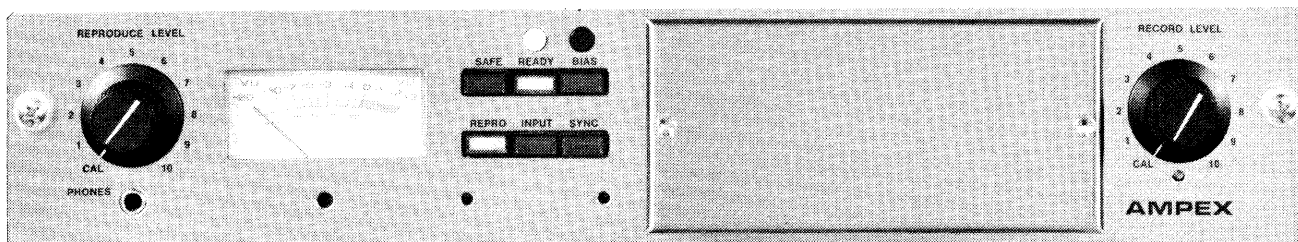
Pushbutton controls at the transport lower right edge select operation modes: RECORD, PLAY, REWIND, FAST FWD, STOP, and EDIT. These switches are on the front of the tape transport control box. The control box has externally-mounted main fuses, cable receptacles for transport sub-assemblies, and plug-in relays for the play, rewind, fast forward, and edit functions.

RECORD/REPRODUCE ELECTRONIC UNIT

One record/reproduce electronic unit (Figure 1-2) is required for each recorder/reproducer channel. The record/reproduce unit consists of an electronic chassis with three plug-in modules (Figure 1-3). The modules, removable through a front panel cut-out, are guided to printed circuit board receptacles when inserted in the chassis.

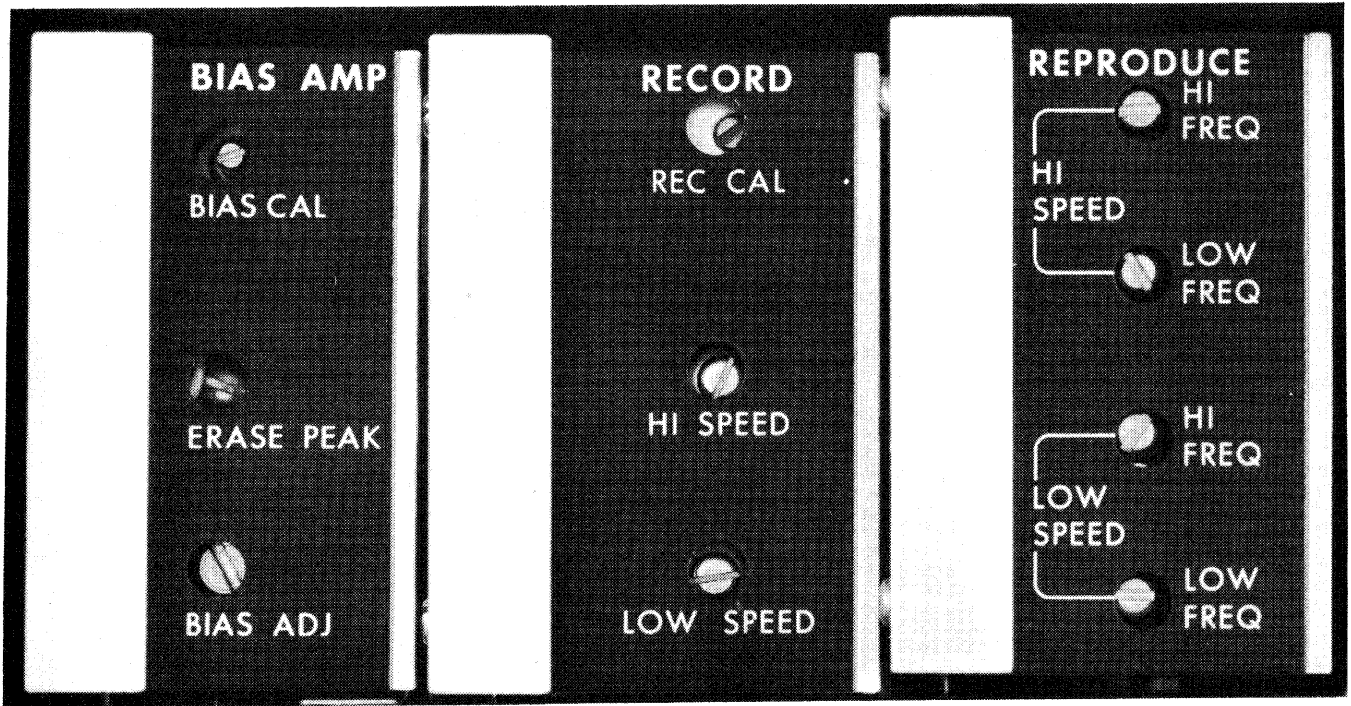
The three removable modules provide amplification for record, reproduce, and bias. The record and reproduce modules each contain plug-in equalization circuitry mounted at right angles to the main boards, so electronic alignment controls are accessible through the front panel cutout. Equalization is automatically switched (according to the tape speed selected) by solid-state switching circuits.

Receptacles for interconnect cables, accessories, and input/output-signal cables are on the back panel of the chassis (Figure 1-4). Also accessible from the rear of the unit are: a line-termination switch (to select correct termination resistance



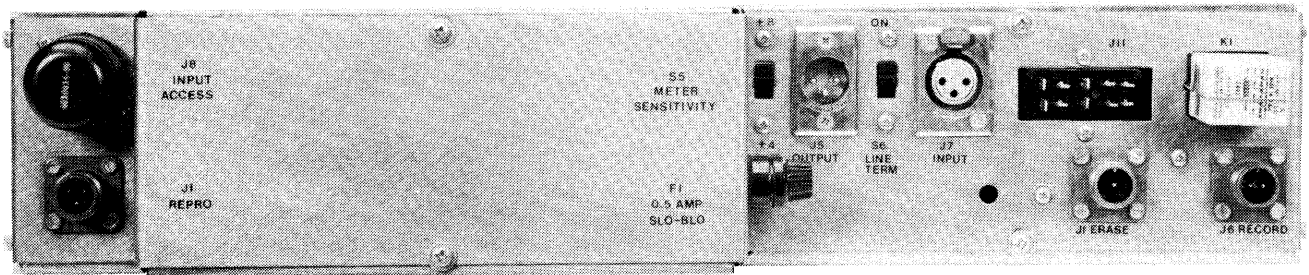
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Figure 1-2. Record/Reproduce Unit (Front Panel)



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Figure 1-3. Removable Modules



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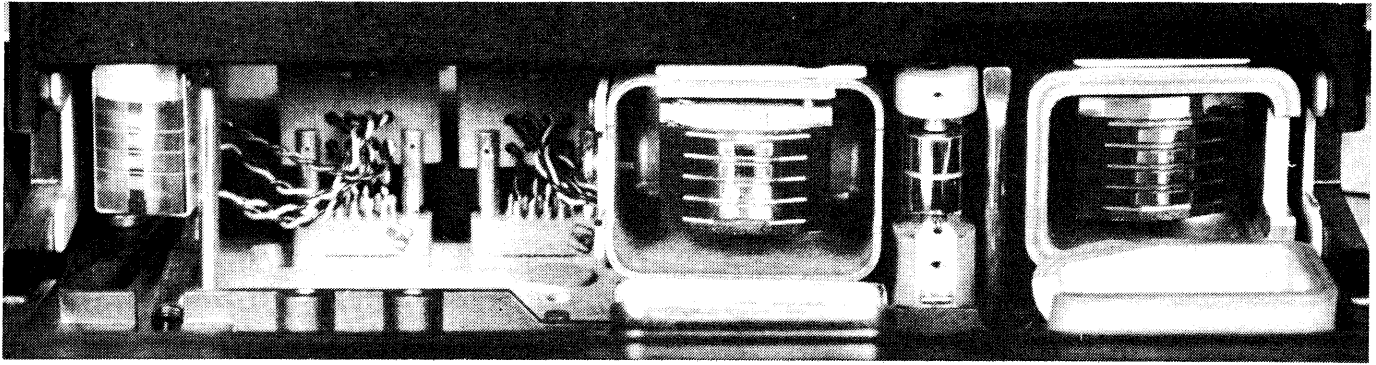
Figure 1-4. Record/Reproduce Unit (Rear View)

during maintenance procedures), a meter sensitivity switch (to permit selecting +8 dBm or +4 dBm output level), a switch for selecting output impedance (150 ohm or 600 ohm), a plug-in record relay, and a power fuse. The recorder/reproducer is shipped from the factory with a dummy plug inserted in the INPUT ACCESSory socket. With the dummy plug installed, an unbalanced-line input is provided (input impedance is 100,000 ohms). A supplied bridging transformer is inserted in the INPUT ACCESSory socket when a balanced-line

input is desired. Input impedance with the bridging transformer installed is 20,000 ohms.

HEAD ASSEMBLY

The erase, record, and reproduce head stacks are usually mounted in head mounting positions 1, 3, and 4, respectively (Figure 1-5) but other combinations are possible.



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Figure 1-5. Head Assembly

EQUIPMENT CONFIGURATIONS

Many configurations of the AG-440C Recorder/Reproducer are possible. Either one-channel, two-channel, or four-channel versions can be console, portable, or rack mounted. Two console mounted versions are illustrated (Figures 1-6 and 1-7).

motor, any two of the four tape speeds listed in Table 1-1 are possible.

Six different types of head assemblies are available (Table 1-2). Two types of head assemblies are available for one-channel machines, two types for two-channel machines, and two types for four-channel machines.

Tape transports may be equipped with either a two-speed AC capstan drive motor or a servo controlled DC motor. With the servo capstan

Record and reproduce equalizers (Figure 1-3) required for different tape speeds are listed in Table 1-3.

Table 1-1. Tape Transports

CAPSTAN MOTOR	TAPE SPEED (IN/S)				TRANSPORT ASSEMBLY PART NUMBER
	3-3/4	7-1/2	15	30	
AC (60 Hz)	X	X			4020271-32
AC (60 Hz)		X	X		4020271-30
AC (50 Hz)	X	X			4020271-33
AC (50 Hz)		X	X		4020271-31
DC Servo	X	X	X	X	4020271-34



Figure 1-6. One-Channel (1/4-Inch Tape Width) Recorder/Reproducer



Figure 1-7. Four-Channel (1/2-Inch Tape Width) Recorder/Reproducer

Table 1-2. Head Assemblies

CHANNELS	TYPE	TAPE WIDTH (INCHES)	PART NO.
1	Full Track	1/4	4020355-01
1	Half Track	1/4	4020355-02
2	Two Track	1/4	4020355-02
2	Two Track Playback and Two-Channel Four-Track Playback*	1/4	4020355-03
4	Four Track	1/4	4020282-01
4	Four Track	1/2	4020356-01

*This head assembly contains four head stacks in head positions as follows: two-track erase (position 1), two-track record (position 2), two-channel four-track reproduce (position 3), and a two-track reproduce (position 4). A switch on the head assembly permits selection of either the two-channel four-track (2-Ch 4-Tr) or the two-track reproduce head.

Table 1-3. Standard Equalizers

FUNCTION	TAPE SPEED (IN/S)	PART NO.
Record	7-1/2 NAB – 15 NAB	4020269-01
Record	3-3/4 NAB – 7-1/2 NAB	4020269-02
Record	15 NAB – 30 AES	4020269-07
Reproduce	3-3/4, 7-1/2, 15 NAB (or IEC)	4020270-01
Reproduce	15 NAB (or IEC) – 30 AES	4020270-02

OPTIONAL EQUIPMENT

Available optional equipment is listed in Table 1-4. 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 the following:

1. A bridging-input transformer (providing unity gain with an input impedance of 20,000 ohms). This transformer (Catalog No. 4580200-01) is supplied with the AG-440C Recorder/Reproducer.
2. A 600-ohm input impedance matching transformer (providing a gain of approximately 14 dB).

3. A microphone preamplifier (for recording with a microphone).

This preamplifier is a two-stage solid-state unit with the RECORD LEVEL control located after the input stage; making the preamplifier a low-noise variable-gain device that is usable with a wide range of microphones.

SPECIFICATIONS

Specifications for significant parameters and features of the AG-440C Recorder/Reproducer are given in Table 1-5.

Table 1-4. Accessories

DESCRIPTION	AMPEX PART NO.
Microphone Preamplifier	4010066
Remote Control Unit	4010080
Matching Transformer (600 ohms input impedance)	4580200-02
Pickup Recording Kit	4850180
Erase Head Kit	
Mounting 1/4-inch heads in position 2	4850178-01
Mounting 1/2-inch heads in position 2	4850178-02
Multivolt Transformer (permits operation from 220-Vac line voltage)	4010186
Console Rear Cover	4040984
Electronics Assembly Cover	4040982
Console Rear Cover Set	
Contains 4040982 and 4040984	4010076-01
Contains 4040982 and two 4040984	4010076-02
Contains 4040982 and three 4040984	4010076-03
Contains 4040982 and four 4040984	4010076-04
Scrape-Flutter Idler (not interchangeable with furnished idler)	4010069
Extender Boards for Circuit Boards:	
Reproduce	4020151
Record	4020152
Bias Amplifier	4020153
Power Supply	4020154
Capstan Servo	4050695-02
IEC (CCIR) Record Equalizer	
7-1/2 in/s (70 μ s) – 15 in/s (35 μ s)	4020269-03
3-3/4 in/s (90 μ s) – 7-1/2 in/s (70 μ s)	4020269-04
15 in/s (35 μ s) – 30 in/s (17.5 μ s)	4020269-06
Portable Case (for two electronic units)	4150330
Portable Case (for three or four electronic units)	4150331
Blank Panel (for unused case spaces)	4290620
Support, Electronic Unit (used in pairs)	4260404
Reel, 10-1/2 Inch Diameter	
1/4-inch tape (identical to reel supplied)	4690003-10
1/2-inch tape	4690003-20

Table 1-5. Specifications

Track Width:

1/4-inch (6.3 mm) tape:

- Full-track: 0.234 inch (5.94 mm)
- Half-track 2 channel: 0.075 inch (1.9 mm)
- 4 channel: 0.040 inch (1.0 mm)

1/2-inch (12.6 mm) tape:

- 4 channel: 0.070 inch (1.8 mm)

Tape Speeds:

With AC capstan motor:

TRANSPORT PART NO.	LINE POWER FREQUENCY	SPEED	
		(LOW)	(HIGH)
4020271-32	60 Hz	3-3/4 in/s	7-1/2 in/s
4020271-33	50 Hz	(9.5 cm/sec)	(19 cm/sec)
4020271-30	60 Hz	7-1/2 in/s	15 in/s
4020271-31	50 Hz	(19 cm/sec)	(38 cm/sec)

With DC servo capstan motor:

Choice of three low/high speed combinations, depending upon pin strapping of servo printed wiring assembly:

- a. 3-3/4 in/s and 7-1/2 in/s
- b. 7-1/2 in/s and 15 in/s
- c. 15 in/s and 30 in/s

Variable speed operation is also possible.

Reel Size:

5-inch, 7-inch, 8-inch, 10-1/2-inch, EIA or NAB. Can accept 11-1/2-inch (29 cm) IEC (CCIR) reel with adaptors. Reel switches provide correct tension for large or small reel hubs.

Line Input:

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. Record amplifier mid-frequency clip level 28 dB or more above operating level.

Line Output:

Balanced or unbalanced.

Nominal Impedance: 600 ohms or 150 ohms (selected by switch)

Internal Impedance: 130 ohms or 33 ohms respectively.

Clip Level: +28 dBm or 10 Vrms respectively.

Output Level: Meter sensitivity is selectable by switch for +4 dBm or +8 dBm.

Table 1-5. Specifications (Continued)

Equalization:

NAB standard for 3-3/4, 7-1/2, and 15 in/s; AES standard for 30 in/s; IEC (CCIR) available for 3-3/4, 7-1/2, and 15 in/s.

Equalization automatically switched by transport speed selector.

Overall Frequency Response:

Specification referred to a 700-Hz zero reference when recording with Ampex 406 tape or equivalent high-output, low-noise tape. Zero reference is operating level for 15 in/s and 30 in/s, at least 14 dB below operating level for 3-3/4 in/s and 7-1/2 in/s.

3-3/4 in/s NAB:	+1, -2 dB	30 Hz to 7,500 Hz
7-1/2 in/s NAB:	±1 dB	50 Hz to 10,000 Hz
	+1, -2 dB	30 Hz to 15,000 Hz
15 in/s NAB:	±1 dB	100 Hz to 15,000 Hz
	±2 dB	30 Hz to 25,000 Hz
30 in/s AES:	±2 dB	50 Hz to 20,000 Hz

SEL-SYNC Response:

Specification referred to a 700-Hz zero reference in the SEL-SYNC mode of operation where the record head is used for reproducing. The specification does not apply to full-track recorders.

15 in/s:	±2 dB	30 to 12,000 Hz
30 in/s AES:	±2 dB	50 to 12,000 Hz

Signal-to-Noise Ratio:

Measured with respect to a record level of 520 nWb/m to biased-tape noise when using Ampex 406 or equivalent high-output, low-noise tape.

UNWEIGHTED

(Using a 30-Hz to 18-kHz RC filter to attenuate noise outside the audio spectrum)

TAPE SPEED	FULL TRACK	HALF TRACK OR 2 TRACK	4 TRACK 1/2 INCH	4 TRACK 1/4 INCH
3-3/4 in/s NAB	67 dB	62 dB	—	59 dB
7-1/2 in/s NAB	69 dB	64 dB	64 dB	61 dB
15 in/s NAB	68 dB	63 dB	63 dB	60 dB
30 in/s AES	70 dB	65 dB	65 dB	—

Table 1-5. Specifications (Continued)

Signal-to-Noise Ratio (continued):

WEIGHTED

(Using an NAB or ASA "A" weighting filter and a 1,000-Hz reference)

TAPE SPEED	FULL TRACK	HALF TRACK OR 2 TRACK	4 TRACK 1/2 INCH	4 TRACK 1/4 INCH
3-3/4 in/s NAB	71 dB	66 dB	—	63 dB
7-1/2 in/s NAB	73 dB	68 dB	68 dB	65 dB
15 in/s NAB	71 dB	66 dB	66 dB	63 dB
30 in/s AES	74 dB	69 dB	69 dB	—

Bias and Erase Frequency:

150 kHz

Erase Efficiency:

75 dB or greater at 1 kHz

Crosstalk:

Measured by recording a 1,000-Hz signal on a track of an erased tape and reproducing from an adjacent channel.

Two-track, 1/4-inch tape, and four-track 1/2-inch tape: Better than 65 dB

Four-track, 1/4-inch tape: Better than 60 dB

Even-Order Distortion:

Second-harmonic distortion of a 500-Hz signal recorder at 520 nWb/m (6 dB above high output tape operating level) is less than 0.4%.

Flutter and Wow:

Measured per ANSI S4.3 or DIN 45507 using a prerecorded flutter tape.

TAPE SPEED	SERVO MOTOR			7-1/2-15 AC MOTOR			3-3/4 – 7-1/2 AC MOTOR		
	PEAK WTD	PEAK UNWTD	RMS UNWTD	PEAK WTD	PEAK UNWTD	RMS UNWTD	PEAK WTD	PEAK UNWTD	RMS UNWTD
3-3/4 in/s	0.10%	0.18%	0.12	—	—	—	0.12%	0.22%	0.15
7-1/2 in/s	0.06%	0.12%	0.08	0.10%	0.14%	0.1	0.10%	0.16%	0.1
15 in/s	0.06%	0.10%	0.06	0.07%	0.12%	0.08	—	—	—
30 in/s	0.04%	0.08%	0.05	—	—	—	—	—	—

Table 1-5. Specifications (Continued)

Speed Accuracy:

Speed measured per NAB Standard on Magnetic Tape Recording and Reproduction 1965 Section 2.02.01 with the pulley tachometer located between the capstan and the reel idler.

Absolute Speed:

Measured in the beginning portion of a reel using a tape whose thickness is 0.0019 inch \pm 0.00005 inch (1.5 mil tape).

Servo Motor: Nominal \pm 0.08%

AC Motor: Nominal \pm 0.20%

Speed Variation Beginning to End of Reel: Using 10-1/2-inch NAB or 7-inch EIA.

Servo Motor: Less than 0.08%

AC Motor: 15 in/s Less than 0.10%
7-1/2 in/s Less than 0.14%

Start Time:

At 3-3/4, 7-1/2, and 15 in/s, the average speed is typically* within \pm 1/2% of the nominal speed in 300 milliseconds throughout a reel of tape. This specification does not apply to 3-3/4 – 7-1/2 in/s recorders equipped with AC capstan motors if the supply tape pack is less than 1 inch from the reel hub. At 30 in/s, \pm 1/2% of nominal speed is reached in 3 seconds.

With capstan servo motors, the flutter components below 20 Hz will be less than \pm 0.3% peak in 1 second. At 30 in/s, in 3 seconds. With AC capstan motors, the flutter components below 20 Hz will be less than \pm 0.3% peak in 3-1/2 seconds.

Stop Time:

At 15 in/s, the tape moves less than 3 inches after pressing the stop button.

Rewind Time:

Approximately 1 minute for a 2,400-foot NAB reel.

Power Requirement:

105 to 125 Vac, 60 Hz.

SYSTEM	AMPS (APPROXIMATELY)
1 Channel	2.3
2 Channel	2.5
3 Channel	2.7
4 Channel	2.9

Recorders with capstan servo motors operate at either 60 Hz or 50 Hz. Recorders with an AC capstan motor are available for 50 Hz operation.

*Varies with tape.