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AEG
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magnetophon

TECHNICAL INFORMATION

magnetophon 20

The Professional Tape Recorder with Timecode Version

AEG

Purpose

AEG has been producing magnetic tape recorders for 50 years now. The inventor carried this product to higher performance and most of the professional radio, TV, and industrial studios are relying on AEG's high standard of quality.

AEG presents to the electronic media the machines and equipment suited best for their particular purposes. These are future-oriented, long life, advanced systems which are, due to decades of customer/producer dialog, up to date, particularly in the human engineering aspect.

The M 20 is completing this product family on it's high end for universal and flexible requirements in production studios for music and sound post production for film and video.

This product family of compact and solid studio machines starts with the M 21 R editorial machine, the M 21 standard professional machine, the digitally adjustable M 20, and the M 20 TC timecode machine.

The M 20 with its electronically adjustable amplifiers assures maximum quality of audio recording and playback. Its amplifiers can be adjusted for all four speeds to the standard equalizations and for any type of tape (3 of them storable).

The digital adjustment and the storage of the alignment data into the internal memory makes the M 20 universal and highly adaptable to the many demands of today's studio operations.

The M 20 TC is conceived for sound post-editing in video production and has a separate timecode channel for recording the 80 bit SMPTE timecode on the 2 mm separation track according to IEC 461 in the EBU (PAL, 25 Hz) or the NTSC (30 Hz or 29.97 Hz) version. The timecode may be recorded via a delay unit either modulation-coincident or M 15A-TC compatible - e.g. with an 2 frames offset.

The M 20 TC can be connected to video and audio editing systems via a synchronizer.

Optionally the M 20 TC can also follow single frame stepping ("frame by frame") and position from a master's parking position in both directions.

The machine is built for A-wind (oxide coating inside) or B-wind (oxide coating outside) mono, stereo, or two-track recording and, optionally, for timecode recording.

Replay either via the playback or the recording head (SYNC mode).

The control panel is designed to meet all logical and ergonomic operating requirements. Particular attention has been given to fast and safe handling of locator functions.

The machine may be used with all types of reel mounts, such as hubs with turntable for self-supporting tape packs, NAB reels or cine-type reels.

NAB reels up to 12 1/2" diameter or 300 mm diameter self-supporting tape packs may be used. According to DIN 45 514 the minimum center diameter of cine-type reels is 45 mm and does not require alteration of the tape tension.

And this is of particular importance for mobile operation: At -5° C the M 20 is ready for operation after 5 minutes warm-up.

For international operation all tape equalizations are available: IEC1 (CCIR), IEC2 (NAB or AES), or NAB (3.75 ips).

The playback and recording heads are available with a 0.75 mm or 2.0 mm track separation between the two audio tracks. The 2.0 mm wide separation track is used for SMPTE timecode (80bit timecode) recording and playback in the EBU (PAL, 25 Hz) or NTSC (30 Hz or 29.97 Hz) versions (refer to Fig. 1).

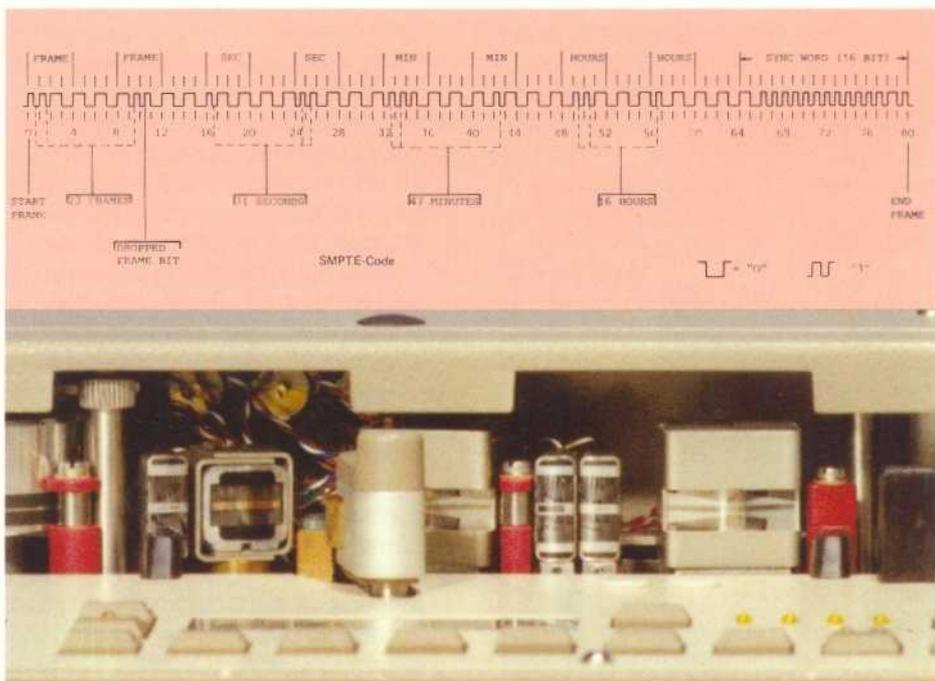


Fig. 1 magnetophon 20: Timecode Head Assembly of highest precision for coincident timecode recording



Fig. 2
Professional Tape Recorder magnetophon 20 with Timecode (option) – B-wind shown

For video and audio production, recording head monitoring without time offset (Selsync) allows manual electronic editing and, with timecode-controlled editing systems, electronic editing via the synchronizer interface. An accessory VU-meter and monitoring unit (with headphone jack) is also available.

Special Features

- Coincident and optional non-coincident timecode recording possible
- Suitably timed amplifier control for electronic editing
- SYNC playback equivalent to playback mode
- Amplifiers electronically adjustable via internal adjusting panel or externally via optional serial interface
- Each of the 4 tape speeds may be combined with any arbitrary equalization; all 4 speeds selectable on control panel
- Good low frequency response due to asymmetric head poles
- Good timecode-signal-into-modulation crosstalk rejection
- Inputs and outputs electronically balanced, optional floating
- Integration of a Telcom c4E compander into record/playback amplifiers optional:
 - one telcom per channel automatically switched between record and playback
 - two telcoms per channel, one for record, the other for playback
- Ergonomically designed control panel
- CUE/ZERO-Locator and REPEAT function; automatic cue memory for any starting point; up to 4 cue marks may be stored additionally
- Electronic tape timer, presetable
- Direct drive with quartz-referenced, electronically controlled brushless DC-motor
- Varispeed range $\pm 50\%$ via interface by external frequency (nominal 9.6 kHz)
Varispeed range $\pm 20\%$ via potentiometer on control panel (range restricted for good adjust)
- Very short starting time
- Short tape-speed change-over times
- Rewind function with WIND button and lever (14 speeds in either direction) or alternative fast wind with REWIND and WIND buttons
- Constant tape tension at all tape speeds and regardless of reel diameter
- Edit operation without touching the erase and recording heads
- Dump mode
- Edit point search with constant reverse monitoring speed (using REWIND AT SEARCH button); when releasing the button the ma-

chine automatically reverts to the playback mode

- Compact professional tape recorder in the 19" design for 1/4" magnetic tape
- A-wind (oxide coating inside) and B-wind (oxide coating outside)
- Takes up to 12 1/2" reels (1,200 m = 3,960 ft standard tape, 50µm)
- Studio and mobile operation
- Any operating position between horizontal and vertical
- Interfaces:
 - remote control
 - synchronizer
 - optional serial interface

Operating Function

The M 20 is an easily transportable, compact machine. It uses 1/4" tape with either A-wind or B-wind for mono, stereo, or two-track recording, optional for timecode recording with function keys for mono, stereo (tracks 1 and 2), track 1, track 2, and timecode; and this for recording preselect (READY), input-output monitoring select (INPUT), and playback -sync select (SYNC).

The M 20 allows the use of all commercial professional 50 and 35µm tapes either in self-supporting tape packs, cine-type reels (minimum hub diameter 45 mm) or NAB reels (max. reel diameter 12 1/2" = 3,600 ft = 1,200 m standard tape).

The rewind, fast forward, record, playback, and stop functions may be operated either directly or by remote control (remote control unit optional).

An internal programming switch allows setting the type of record function.

Click-free record punch-in and punch-out due to properly timed ramp control signals.

Recording may be inhibited by the programming switch (playback only).

Apart from these basic functions the M20 has the following standard functions for increased operating comfort:

- Zero Locator: For returning the tape to counter "Zero" position
- Cue Locator: For positioning the tape at a desired counter position stored in memory at the previous PLAY or record command.

A PLAY command during the positioning period results in automatic playback when the memorized point is reached.

- Loop Operation (Repeat): Monitoring between two marked tape positions with automatic repetition. The first tape position is marked by the PLAY command, the second by pressing the PLAY and LOC buttons.
- Four further Locate positions can be stored via LOC1 thru LOC4. They are positioned by ENABLE/LOC and LOC1 thru LOC4.
- Rewind at monitoring speed: The machine rewinds at monitoring speed as long as this button is depressed; releasing the button starts playback.
- Vari-Speed: This button switches the machine from fixed to variable tape speed allowing the tape speed to be adjusted continuously by ± 20%. Display of vari-speed.
- Lever for adjusting speed and direction of wind, or, in conjunction with the REWIND and FAST FWD buttons, fast rewind.
- Edit operation
- Spot erase
Erasing of short tape sections or spots (interferences) by moving the tape manually.
- Input: Click-free switch-over between input and output monitoring
- Start position for short start-up time by pushing the STOP button after turning the machine on (Load)
- Unload:
Tape lifts off the heads.

The M 20 has the following indicators facilitating fast and precise status control:

- Electronic 5-digit illuminated LCD tape timer, starting at zero and when reversing incrementing with negative sign. Indicator may be set to Vari-Speed (optional)
- Automatic switch-over to error code indication
- Automatic switch-over to adjustment data (test operation)
- VU-meter and monitoring unit (with headphone jack) optional.

Full provisions for cut-and-splice editing:

- Tape marker (optional)
- Tape cutter with splicer (optional)
- Tape cutter in front of playback head with splicer (optional)

- Dump mode to the right and left
- Monitoring facility during wind and stop by pressing the EDIT button and advancing the tape lifter automatically or manually for appropriate adjustment of monitor volume when winding
- Easy manual location of edit points
- High wind speed
- Lever control
- Constant search speed
- Automatic locking of tape tension sensor levers in the STOP position (optional)
- Spot erase.

Construction

The M 20 is a compact recorder which can be fitted into desks, carrying cases, consoles and 19" racks. It can be fitted into a Vario stand which allows the working position of the recorder to be adjusted ergonomically for ease of operation in a sitting or standing position.

The entire unit is mounted on a heavily ribbed, rigid die-cast aluminium frame which gives a very sturdy base. This means that even under rough conditions there is no distortion of the chassis.

The precise head assembly support points assure proper tape path. The head assembly is interchangeable without the need for any height or bias / erase adjustment.

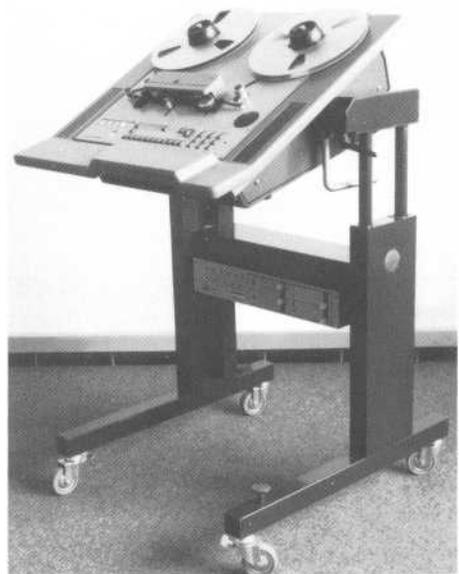


Fig. 3
magnetophon 20 built into a Vario stand with
Telcom c4 Compander (19" rack installation)

Control Panel

Push-button function

Rewind
Fast Forward
Wind
Record
Playback
Stop
Locate:
with the functions
Search Play
Locate Zero
Repeat
Simultaneous ▲
operating ▼

Unloading tape from heads

Editing

Rewind at search

Function enabling button:
Memory LOC1 to LOC4, tape speed/
equalization switch-over, varispeed,
input, mono and remote

Memorizing up to 4 cue positions
or positioning of the stored values

Tape speed switch-over

Equalization switch-over

Input-monitoring switch-over
(INPUT-Master-button)

Mono-Stereo switch-over

Variable tape speed release

Setting the tape timer to zero

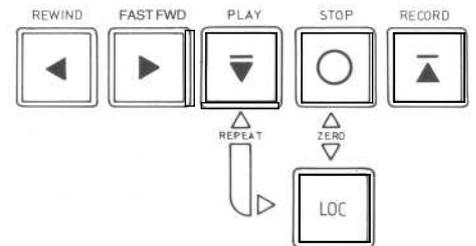
Remote control switch-over
and synchronizer interface release

Recording preselection track 1, 2 or TC

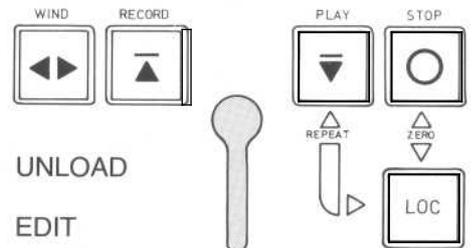
Input switch-over track 1, 2 or timecode
Sync track 1, 2 or timecode

Push-button designation

Version 1



Version 2



UNLOAD

EDIT



ENABLE/LOC

LOC 1 ... LOC 4

SPEED

CCIR/NAB resp. IEC1/IEC2

INPUT

MONO

VARI-SPEED

RESET

REMOTE

READY

INPUT
SYNC

Specifications

Tape transport

Motor

3-motor tape transport:
1 electronically controlled brushless
crystal oscillator reference dc motor
for direct capstan drive
2 electronically controlled
dc reel motors

Tape speed

30/15/7.5/3.75 ips
all 4 tape speeds selectable
on the operating panel



Fig. 4
magnetophon 20: Operating panel with internal adjusting panel for the audio channels (accessible after turning up the track selection panel)

Tape transport (continued)

Varispeed	all tape speeds are continuously adjustable within a range of $\pm 50\%$ via interface by external frequency (nominal 9.6 kHz) or a range of $\pm 20\%$ via potentiometer on control panel (range restricted for good adjust)
Deviation of average speed from nominal speed	max. 0.2%
Wow and flutter	peak weighted (DIN 45507, IEC Publ. 368, ANSI) measured using EMT 424 with 3.300 ft (1000 m) standard tape on European tape hub per DIN 45515 at 30 and 15 ips max. $\pm 0.04\%$ at 7.5 ips max. $\pm 0.06\%$ at 3.75 ips max. $\pm 0.1\%$
Tape slip	max. 0.1%
Tape width	6.3 mm (1/4 inch)
Hub diameter	max. 12 1/2" \triangleq 3,960 ft (1200 m) standard tape (50 μ m) \triangleq 5,940 ft (1800 m) long play tape (35 μ m), min. 45 mm
Tape coating	inside (A-wind) or outside (B-wind) (alternative models)
Applicable hubs and reels	European type hub per DIN 45515 3 7/8" (100 mm) diameter (with turntable for self-supporting tape packs) or Cine-type reels per DIN 45514, min. 1 3/4" (45 mm) center diameter (with reel locking mechanism) or NAB reels, 4 1/2" (114 mm) center diameter (with adapter)

Starting time at 15 ips and 3,300 ft (1000 m) tape	to attainment of nominal speed: 0.2 sec to attainment of $\pm 1\%$ wow and flutter: 0.5 sec
Fast wind time	max. 100 sec for 3300 ft (1000 m) tape (variable wind speed)
Stopping time (out of fast wind with full 3300 ft (1000 m) spool	stop max. 3 sec end of tape max. 3 sec
Spooling tape tension	1 N (3.6 ozs force)
Electronic tape timer	5-digit illuminated LCD indicator in hours, minutes and seconds for all tape speeds, with negative sign below zero
Tape timer error	max. 0.3%
Timer overshoot after tape end run-off	max. 1 sec
Tape transport and amplifier control	microcomputer with 8085 microprocessor
Remote control interface	rewind, fast forward, record, playback, stop, locate fader contact, enable fader contact tape timer pulses direction of travel nominal tape speed ready status remote status light barrier signal (option) tape lifter (option)
Synchronizer interface	capstan control (external reference frequency 9.6 kHz) tape timer pulses wind control track selection edit control FBAS-Sync (option)
Serial interface	RS 232 type, 9 pin (option 1) RS 422 type, 9 pin (option 2)

Record and playback electronics

Audio channels	Equalization at 30 ips at 15 ips at 7.5 ips at 3.75 ips All equalizations combined, switchable All speeds selectable at the operating panel	17.5 μ s (prop. IEC2) or 35 μ s (IEC1) 35 μ s (IEC1) or 50 + 3180 μ s (IEC2) 70 μ s (IEC1) or 50 + 3180 μ s (IEC2) 90 + 3180 μ s (NAB) or 50 + 3180 μ s (NAB-EE)
Input	electronically balanced (differential input circuit) (optional floating with input transformer)	
Input level	+ 6 dBm (nominal value) adjustable from 0 dBm to + 15 dBm (max. 24 dBm)	
Input impedance	min. 10 k Ω between 20 Hz and 20 kHz (min. 5 k Ω between 30 Hz and 16 kHz with input transformer)	

	Output	electronically balanced (differential output circuit) (optional floating with output transformer)
	Output level	+ 6 dBm (nominal value) adjustable from 0 dBm to + 15 dBm (at 514 nWb/m) max. output level + 24 dBm
	Output impedance	max. 45Ω between 20 Hz and 20 kHz (max. 40Ω between 30 Hz and 16 kHz with output transformer) min. load impedance: 150Ω up to + 18 dBm 200Ω up to + 24 dBm
	Erase/bias frequency	205 kHz (crystal reference)
Timecode channel	Timecode signal	SMPTE-Timecode (80 bit timecode) in EBU (PAL, 25 Hz) version or NTSC (30 Hz or 29.97 Hz) version
	Input	electronically balanced (optional floating with input transformer)
	Input level	1 Vpp - 4 Vpp rectangle
	Input impedance	min. 5 kΩ
	Output	electronically balanced (differential output circuit) (optional floating with output transformer)
	Output impedance	max. 40Ω
	Playback range of timecode	0.1 to 50 times of nominal speed (7.5 ips)
	Cross talk rejection	timecode channel (729 nWb/m; peak-peak) - audio channels (514 nWb/m; RMS, Sinus) timecode in audio channel min. 80 dB

Overall characteristics

These data refer to modern tapes such as 3M226, Ampex 456, BASF LGR50, Agfa PEM 468 or equivalent

Frequency response (without input and output transformers)		Record-Playback
at 30 ips:	With high or low speed head assembly	30 Hz ... 20 kHz ± 1.5 dB 40 Hz ... 18 kHz ± 1 dB
at 15 ips		20 Hz ... 20 kHz ± 1.5 dB 30 Hz ... 18 kHz ± 1 dB
at 7.5 ips		20 Hz ... 16 kHz ± 1.5 dB 20 Hz ... 14 kHz ± 1 dB
at 3.75 ips	With high speed head assembly	20 Hz ... 10 kHz ± 1.5 dB 20 Hz ... 8 kHz ± 1 dB
at 3.75 ips	With low speed head assembly	20 Hz ... 16 kHz ± 1.5 dB 20 Hz ... 14 kHz ± 1 dB
		Record-Sync
at 30 ips		30 Hz ... 18 kHz ± 2 dB
at 15 ips		20 Hz ... 16 kHz ± 2 dB
at 7.5 ips		20 Hz ... 12 kHz ± 2 dB
at 3.75 ips		20 Hz ... 6 kHz ± 2 dB

Signal-to-noise ratio RMS, A-weighted according to DIN 45633 (IEC Publ. 179),

referred to 1020 nWb/m and NAB equalization	30	15	7.5	3.75	ips (510 nWb/m)
full track stereo (30 mil \triangleq 0.75 mm track separation)	79	77	75	66	dB
two-track (80 mil \triangleq 2 mm track separation)	75	73	71	62	dB
	74	72	70	61	dB

Quasi-peak, weighted according to CCIR 462-2, referred to CCIR equaliz. full track (320 nWb/m)	30	15	7.5	3.75	ips
stereo (510 nWb/m)	56	55	54	51	dB
two-track (510 nWb/m)	56	55	54	51	dB
	55	54	53	50	dB

Total harmonic distortion referred to 400 nWb/m (i.e. 6 dB above vu operating level)	full track max. 0.3% stereo and two-track max. 0.6%				
Crosstalk rejection measured at 1 kHz in accordance with DIN 45521	stereo version min. 55 dB (30 mil \triangleq 0.75 mm track separation) two-track version min. 65 dB (80 mil \triangleq 2 mm track separation)				
Erase attenuation	min. 85 dB at 1 kHz (1020 nWb/m)				
AC mains	100, 110, 120, 200, 220 or 240 V (+ 5%/- 10%) (by changing solder connections), 50 or 60 Hz				
Power consumption at nominal voltage	~ 160 VA max. 250 VA				
Ambient temperature	+ 5° C to + 45° C cold start (-5° C) ready for operation after 5 minutes				
Operating positions	any horizontal to vertical				
Dimensions, weights	Height x	Width x	Depth (mm)	Weight (kg)	
Chassis	277+50 (11"+2") (262.5*)	483 (19")	525 (20.6")	45 (100 lbs)	
Carrying case	405 (16")	510 (20.1")	600 (23.6")	14.8 (33 lbs)	
Console 700	920 (36.2")	730 (28.7")	605 (23.8")	42 (92.4 lbs)	
Vario stand (max. dimensions)	1320 (52")	664 (26")	800 (31.5")	32 (70.4 lbs)	

* when installed in console 700 the height is the same as that of the M15A, namely 252.2 mm (10")

We are easy to reach.

One of our representatives is certainly in your vicinity, too. Please contact the representatives abroad or our central address below. One of them will respond at once.

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