PREPRINT NO. 583

MASTER RECORDING ON TWO INCH WIDE TAPE

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PRESENTED AT THE

34th CONVENTION

APRIL 29 – MAY 2, 1968

AN AUDIO ENGINEERING SOCIETY PREPRINT

Convention Price . . . . . $.25
By Mail to Members . . . . $.50
By Mail to Non-Members . $.85

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The use of multitrack master recording has been with us for some time now. Three and four tracks on half inch tape is commonplace. More recently, eight and twelve tracks have been employed on one inch wide tape. This article deals with sixteen and twenty-four track master recording on two inch wide tape. Such a system with its large number of separate channels has become necessary due to the modern recording techniques employing many special effects, i.e. echo, reverberation, sound on sound, etc. Older four track and even eight track systems do not offer the flexibility required by many of the present day artists.

Console

The master recorder itself is not much larger than a modern four track console type master maker, measuring only 42"w x 36"h x 28"d. All electronics and controls are mounted beneath the transport. A photograph of the Ampex AG-1000-24 appears as figure 1.

Transport

The transport is similar to those used on video recorders. It is both extremely rugged and precision in construction, thus tape handling is excellent and guiding precise. Flutter and speed tolerance compare favorably with the finest existing master makers. The unit is capable of two speed operation, 7-1/2 and 15 ips, selectable on the front control panel. An accessory motor drive amplifier is available for continuous speed control over a range of -25% to +10% of the nominal speed selected. For ease of maintenance, the transport tilts up as shown in figure 2. It is capable of operation in this position to facilitate adjustments which require the transport to be running. The takeup and supply tensions are adjusted in a separate, easy to reach, control unit rather than on the transport itself. All transport logic is also, either in the aforementioned control unit, or the front control panel, leaving the transport proper with only the bare essentials. An accurate tape time counter is provided, calibrated in hours, minutes, and seconds. It is easily visible in figure 3.

Control Panel

The front control panel is equipped with the following controls. A back lighted pushbutton for speed change. A back lighted switch for local or remote control. (In the remote position, all transport controls on the control panel are locked out.) A rotary selector switch is provided for selection of any channel for monitoring by the built in accessory monitor amplifier. A set of five back lighted push buttons control transport operation. The logic of the control is such that the record button and play button must be depressed simultaneously to enter the record mode. Play may not be entered directly from the fast forward or rewind modes. A remote control accessory unit is available with smaller versions of the same back lighted switches arranged in the same format. Two rows of 3 positions multicolor illuminated lever switches, one for each channel, select the mode of operation for that channel. The mode chosen is indicated by the position and color of illumination of the switch. The modes are "Ready" which allows that channel to enter the record mode if the transport is in this mode, "Safe" which prevents that channel from entering the record mode regardless of transport mode, and "Sel-Sync"* which allows recording on any other channel in synchronization with material previously recorded on the channel in the "Sel-Sync" mode. This mode will be explained more completely later in the article.

Electronics

The electronics consist of 3-1/2 inch wide trays with plug-in cards for the amplifiers. Each reproduce tray contains 4 channels of reproduce amplifiers. The amplifiers themselves are plug-in cards with "piggyback" plug-in equalizers. The remainder of the tray contains connectors, switching circuits and a VU meter for each channel. The VU meter together with the output of the reproduce amplifiers is individually switch selectable at the front of the reproduce tray for either reproduce out or E-E (electronics to electronics). A reproduce level control is also provided near the VU meter for each channel. Equalization is for two speed and is automatically switched, (employing solid state techniques), with transport speed. Equalizers on the reproduce amplifiers have sufficient range to allow setting to either NAB or CCIR reproduce curves.

* TM Ampex Corporation

The record trays also, 3-1/2 inches wide, contain four channels of plug in record amplifiers with plug-in "piggyback" equalizers and four plug-in bias driver units. There are individual record level controls on the front of each tray. The record equalizers, like the reproduce are two speed, employ solid state switching and automatically switch with transport speed selector. Both NAB and CCIR record curve equalization are available. The bias driver serves as a bias and erase amplifier for the 150 KHz bias oscillator. The use of the single oscillator and multiple drivers serves to isolate each channel with regard to signal and adjustment while eliminating any possibility of bias beat, often encountered with multiple oscillators. The driver has sufficient power to bias the record head and drive the erase head for each channel.

The "Sel-Sync" feature mentioned earlier is a switching circuit in which the record or reproduce heads are switchable to the reproduce amplifier input. When the record head is switched to the reproduce amplifier input, it functions as a reproduce head but is physically located in the record head position. This allows recording of material on one channel that is in exact time synchronization with the material previously recorded on the channel which is using the record head as a reproducer. Switching of the heads is accomplished through special relays controlled, either remotely, or on the front control panel by the illuminated lever switches. The relays and other associated components are in 3-1/2 inch wide trays with eight channels included per tray. A screwdriver adjusted "Sel-Sync" level control is provided for each channel.

A regulated dual ±39 volt power supply is provided for each 8 channels of record/reproduce electronics. The master, or primary power supply also contains the 150 KHz bias oscillator. Each power supply is divided into 2 smaller identical units hence in effect every four channels has its own power supply. Each power supply pair is contained in one 3-1/2 inch wide rack space and is individually fused.

The head assembly utilizes fixed Aximuth heads. The record and reproduce heads are low inductance mu metal heads with all channels in a single stack for each function. The erase heads are low inductance, dual gap, ferrite types. Two stacks are employed, one for even channels and one for odd. The entire assembly consisting of four stacks is enclosed in a small mu metal head assembly shield (visible in figure 2) which is then enclosed by a much larger aluminum head and guide enclosure as seen in figure 1. The head assembly with its mu metal shield is fastened by two screws and is plugged in for easy changing of heads for different configurations.

Flexibility

One of the beauties of this machine is its flexibility. It can be easily adapted for one inch operation with the proper accessories, i.e. heads and guides, one truly has a universal master maker capable of eight track one inch, and 16 or 24 track two inch operation.

Accessories

Some of the accessories available will be the motor drive amplifier (explained earlier) permitting continuous speed control. A twenty watt monitor amplifier is available which will monitor any channel selected by the front control panel selector switch. A two inch wide, full track erase head and driver is available to permit selected but full width (all channel) erase of any portion of the tape. This head is used in conjunction with, not in place of the individual channel erase heads. A remote control unit for transport control or one for transport and record/"Sel-Sync" control is available and can easily be plugged into the rear of the master maker unit. One inch/two inch convertibility will also be available as an accessory item.

Illustrations

Figure 1 shows the front view of the Ampex AG-1000-24. Such features as the speed selector and remote local switches (left end of control panel), monitor selector switch, transport control cluster (center) and illuminated mode selection switches (left), are easily visible on the control panel. The full track erase head (left of head cover) and tape time counter (right of head cover) are visible on the top plate.

Figure 2 shows the first Ampex AG-1000-16 with the transport in its raised position. The external head cover is removed for clarity. This was the first 16 channel recorder built hence, some items (i.e. erase head, monitor selector switch, mode selector switches and electronics) are not exactly as described in the text.

Figure 3 shows the top view of the same AG-1000-16 pictured in figure 2 but with tape threaded to show tape path.

Figure 4 shows the electronics of the first AG-1000-16. As mentioned earlier, this is not exactly the configuration now used or described in the text.

Conclusion

The future of wide tape master making seems to be excellent. A 16 channel unit operating for several months in a recording studio in New York has met with considerable success among the recording artists of the area. This machine has also proved extremely reliable since its delivery last fall. Due to its greatly increased flexibility over older master makers, recording studios can demand higher rates from the artists for its use, hence raise profits.

FIGURE 1

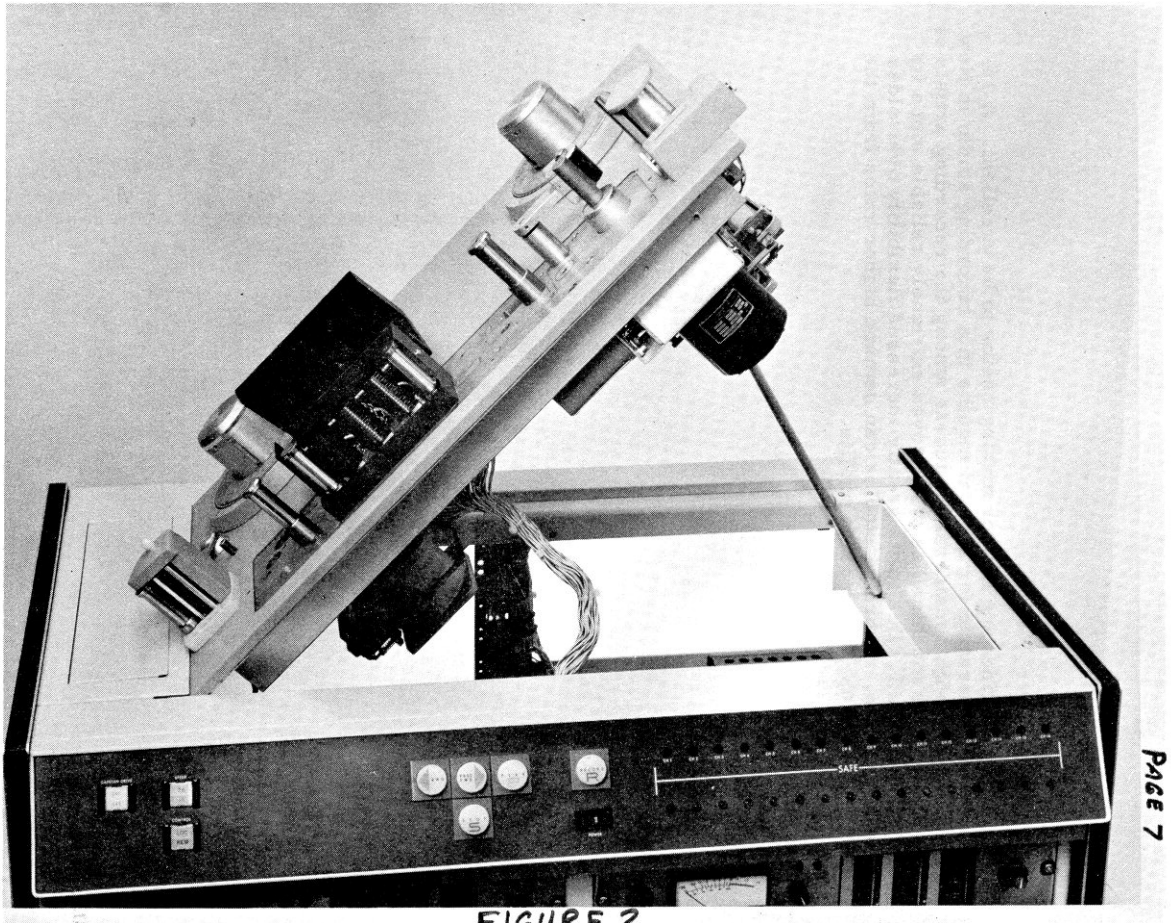

FIGURE 2

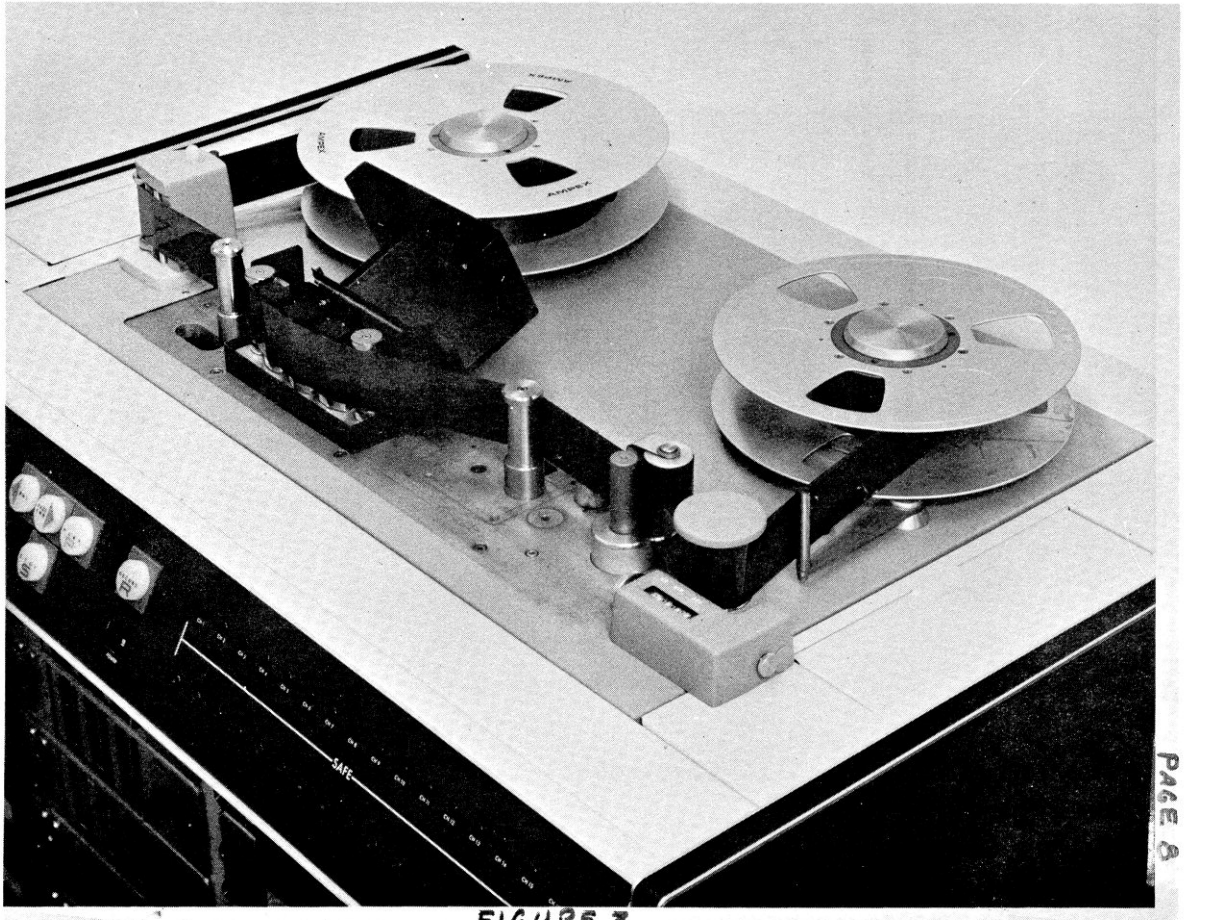

FIGURE 3

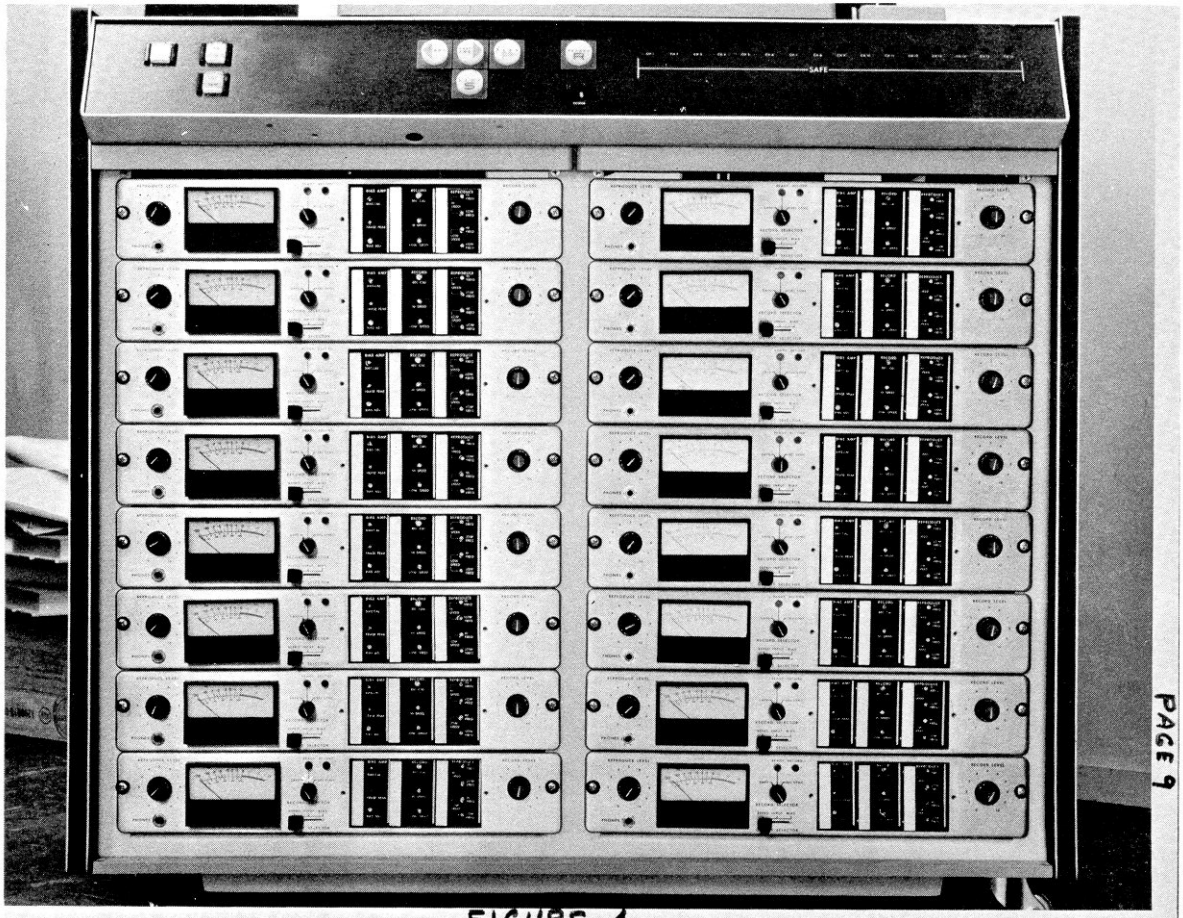

FIGURE 4