



## MM-1000 Series Recorder/Reproducer

### CAPSTAN SERVO KIT

**AMPEX**

- Tape Speed Consistent to 0.05% (Tape Sync Accessory)
- Protection from Power Line Fluctuations
- Long Life
- High Reliability

#### and these options:

- Variable Speed
- Recorded Control Track for Perfect Playback
- Synchronization with Videotape

**TO ENHANCE YOUR INVESTMENT.** All phases of the MM-1000's design—including design of accessory packages—are based on the Ampex "Building Block Principle." In the case of the Capstan Servo Kit, this means that the basic kit can be added to an MM-1000 quickly and simply. More—it means that the three options to the basic kit—tape lock, variable speed, videotape sync lock—build on it easily to offer other important control refinements. The servo operates at the three normal tape speeds available for the MM-1000: 7.5/15 or 15/30 ips.

**FOR CONSTANT TAPE SPEED.** Ampex's new Capstan Servo Kit protects the quality of the sound that you record by isolating the capstan motor from fluctuations in electrical power. And additional protection is available in the form of one of its options.

By adding the Tape Lock option to the kit, you can depend on tape speed to be consistent to 0.05% during both record and playback. Even extremes of temperature and humidity, both of which can

affect tape, are compensated for by the Tape Lock option. This high level of precision lets you stop worrying about either timing accuracy or pitch—retains the original sound faithfully.

Add to these safeguards precise, variable control over tape speed during recording or playback, and you begin to see how this new kit not only raises sound quality levels but adds new creative possibilities for the engineer or mixer.

#### **CAPSTAN SERVO KIT: The Basic Accessory.**

The MM-1000 Capstan Servo Kit completely eliminates one source of drive speed error: line frequency fluctuations. It supplies its own precise drive power to the capstan motor, making it completely independent of normal changes in external line frequency. An important benefit for many users outside the United States is the ability to operate on both 50 Hz and 60 Hz input power. To achieve precise control of tape speed, a crystal oscillator, accurate to within  $\pm 0.01\%$ , provides a reference frequency for the capstan servo. In operation, this frequency is divided down and compared in phase with a tachometer signal from the motor drive amplifier. This generates an error voltage that corrects the angular velocity of the motor to maintain the selected speed with an accuracy of  $\pm 0.05\%$ .

A second source of error—the flutter introduced by the belts, pulleys, and other drive train elements of many transports—is also eliminated by the Servo Kit's direct drive system. Its capstan is actually the motor shaft, so that intermediate drive train components are eliminated. Flutter at all speeds (7.5, 15 and 30 ips) is reduced to below 0.07%\* with the addition of the Servo Kit.

\*(Refer to overleaf.)



A printed circuit dc motor was chosen for the drive because it offers high instantaneous torque, low torque perturbations, high response (low inertia) and long-term reliability.

The capstan servo operates at either 7.5/15 ips or 15/30 ips in the MM-1000. Your Ampex Service Engineer can make the speed change quickly.

#### 4010155-01 Capstan Servo Kit

#### TAPE LOCK ACCESSORY: Precise Playback.

The MM-1000 Tape Lock Accessory eliminates timing and pitch errors during playback. For example, at 15 ips, it closes the servo loop by comparing a recorded control track with the 2400-Hz internal reference frequency. During recording, a reference frequency is laid down as a 2400-Hz

\*Percentage of total flutter is measured by the methods of the ASA 257.1-1-1954, in a band 0.5-200 Hz, while reproducing an Ampex flutter test tape (flutter on test tape less than 0.03%).

control track on any desired channel of the MM-1000. On playback, the servo locks to the control track so that playback speed is identical to record speed. Even if the original recording contained a speed variation, the reproduced wave lengths will be identical to those originally recorded within the  $\pm 0.01\%$  accuracy of the reference oscillator. This process also reduces flutter components within the pass band of the servo.

#### 4010165-01 Tape Sync Accessory

**VARIABLE SPEED ACCESSORY: Extended Control.** The Variable Speed Accessory adds a range of speed selection to the basic capstan servo system. In addition to normal speeds (7.5, 15 and 30 ips), it provides button-selectable speeds 6% faster than normal (one half-tone higher), 6% slower than normal (one half-tone lower) and a rotary variable speed control with a range of +50% to -25% of nominal. All of these functions, includ-

ing variable speed, may be remotely controlled. This accessory includes a pushbutton control for selecting an external frequency reference, so that the internal crystal oscillator of one MM-1000 can be used as a common reference for other MM-1000 Recorder/Reproducers.

#### 4010167-01 Variable Speed Accessory

#### SYNC LOCK ACCESSORY: Video/Audio

**Synchronization.** You can synchronize the MM-1000 with a taped video picture by adding the Capstan Servo Kit, the Tape Sync Accessory, and Sync Lock Accessory to the MM-1000. The Sync Lock unit derives a signal from composite station sync used to synchronize video equipment and records it on tape as a control track. Thus, the MM-1000's playback speed is continuously controlled after the audio is manually brought into lip sync with the videotape reproduction.

#### 4010163-01 Sync Lock Accessory

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