

# MagLink<sup>®</sup>

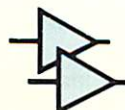
## SYNCHRONIZER

An indispensable tool in multi-track audio production; video mixing, editing and "sweetening"; film sound track production, and foreign language overdubbing.



MagLink is a completely new approach to fast, efficient tape synchronizing, position logging and editing. Through the use of a unique timing code system, videotape, multi-track audio, and magnetic film machines may now be locked in synchronism, offset, or stopped and

started at preset positions with an accuracy not formerly attainable. A master and any number and any type of slave machines may be controlled by MagLink and will remain synchronized even in REWIND and FAST FORWARD modes.



**AUTOMATED PROCESSES, INC.**  
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**MagLink** acts as a precise "electronic sprocket" coupled to an accurate programmable footage counter which links and controls any number and any type of tape machines. This is accomplished by means of the **MagLink** position code which can be recorded on one track of each tape during the original session or applied later during the mixing or editing process. A **MagLink** code converter is available to accommodate SMPTE coded tapes. A separate code generator can be used for recording at remote locations. The various modes of operation and their functions are discussed below.

## SYNCHRONIZATION

Synchronization can occur between a master tape machine and up to six slave machines per Model 200 assembly.

When the AUTO/MANUAL switch is set to AUTO, all slaves will automatically assume the same stationary position as the master, regardless of where they were, and will remain stationary until the master tape machine is set in motion.

When this happens, all slaves stay locked to the master, whether it is in the PLAY or RECORD mode, or in the FAST FORWARD or REWIND mode.

In the latter two modes, synchronization will be maintained regardless of the speed of the machines, and in the case of most machines available today, regardless of whether or not the tape is lifted away from the heads. Bear in mind that no modifications to the tape machines are required. However, connections to the remote motion controls are necessary. This is a simple process and data is provided. These connections are required for the master and the slaves. Additionally, connections are made to the drive motor of each slave.

## OFFSET

The term **OFFSET** denotes the constant difference in position maintained between two machines in motion. For example, one slave may always be .5 second behind the master. Offset can be created in either of two ways:

A. The **CONTROL ASSIGNMENT** switch is used to select the appropriate machine. Then, using the keyboard, any desired offset (up to 31 hours) may be entered and the **OFFSET** key depressed. As soon as the **OFFSET** key has been depressed, the slave will assume the offset. The actual offset is indicated by the lower half of the **POSITION READOUT** in units determined by the **READOUT CONVERSION SELECTOR**.

If a negative offset is required, i.e., if a machine is to fall behind the others, the number entered on the keyboard is preceded by the minus sign (—).

B. Pushing the **ADVANCE** or **RETARD** button will cause the selected machine to increase or decrease its speed at the rate of 2 frames (.07 second) per second with respect to the others, thus causing an offset. When the button is released, this offset will be retained, even if the machines are stopped, started, and run in fast forward or rewind.

Regardless of which way offset is achieved, zero offset can be restored automatically by simply pressing the **OFFSET** key. Offset mode operation is verified by the **OFFSET INDICATOR**.

## SEARCH

The search functions can be used to find any position on any or all of the machines in the group.

When the **CONTROL ASSIGNMENT** switch has selected a slave, entering a 1 to 8 digit position on the keyboard followed by depressing the **SEARCH** button will cause the selected machine to find and assume that position. When the **CONTROL ASSIGNMENT** switch is in the **MASTER POSITION**, the master as well as all slaves will find and assume the selected position. If the **AUTOSEARCH** button is pressed at the start of a take, the tape will return to that starting point each time the **SEARCH** key is pressed.

## PRE-PROGRAMMING

Using the pre-programming function will allow the master machine to be synchronized to slaves containing portions of material located at random throughout the length of their tapes.

For example, assume the master is a VTR, and one of the audio slaves contains a number of sound effects which have to be synchronized with various portions of the master tape. The requirement may be that, at 10 min., 15 sec., 12 frames on the master a sound effect located at 1 min., 5 sec., 10 frames on the slave should be in sync with the master until 10 min., 20 sec., 20 frames of the latter (cue 1). Also, from 15 min., 10 sec., 10 frames, to 18 min., 0 sec., 0 frames, the master is to be synced to material located on the slave at 20 min., 10 sec., 10 frames (cue 2); and from 20 min., 20 sec., 0 frames, to 20 min., 40 sec., 18 frames on the master, material located at 8 min., 8 sec., 8 frames on the slave (cue 3).

The synchronizer will be programmed as follows (before or while the machines are in motion):

Set the **CONTROL ASSIGNMENT** switch to **MASTER**, the **START/FINISH** switch to **START**, and enter 10 15 12, and depress the **ENTER** key; then set the **CONTROL ASSIGNMENT** to the first slave and enter 1 5 10, and depress the **ENTER** key, return the **CONTROL ASSIGNMENT** switch to **MASTER**, set the **START/FINISH** switch to **FINISH**, and enter 10 20 20, depress the **ENTER** key. Finally, enter the cue number ("1") and depress the **ENTER** key.

The same procedure is repeated to enter the remaining data, and can be written in a shorter form thus:

```
MASTER START/10 15 12/ENTER
SLAVE START/1 5 10/ENTER
MASTER FINISH/10 20 20/ENTER, 1/ENTER
```

```
MASTER START/15 10 10/ENTER
SLAVE START/20 10 10/ENTER
MASTER FINISH/18 0 0/ENTER, 2/ENTER
etc.
```

When the master tape machine is set in motion, the slave will go to position 1 5 10 and wait. Then, when the master reaches 10 15 12, the slave will go into synchronization until 10 20 20, at which time it will unlock, and go to position 20 10 10 to wait for the master to reach 15 10 10, whereupon it will be in sync as shown above.

The slave will always assume a waiting position which is located sufficiently ahead of the entered position, to be completely in sync with the master when it reaches that position.

To change any individual cue, enter the new data along with the cue number of the cue to be changed. The old data



will then be erased from the memory and the new data inserted in the correct sequence. In order to erase the entire memory prior to pre-programming a new show, set the CONTROL ASSIGNMENT SELECTOR to CANCEL and press the ENTER key. An accessory memory unit makes it possible to permanently store and retrieve pre-programmed data.

#### TIMING CODE CLOCK

The code clock can be set to "zero", or to any point in time through the use of the keyboard and the RESET key. There is an internal switch in the rack equipment for use with color sync (NTSC).

A "Jam Sync" feature allows the clock to synchronize with a pre-existing time code and continue consecutive time. This is useful when doing insert recording ("drop ins") or add-ons. It eliminates the necessity of re-recording the entire time code in order to achieve a consecutive count. To synchronize the clock with a pre-recorded time code on the tape simply press the RESET key, then put the code track in Record to cause the time code to be recorded beyond that point. In synchronization, a consecutive count is not required, but may be a convenience for editing point computations. On the other hand, a "time of day" clock may be preferred when "take" identification is of prime importance.

#### SELECTABLE CONVERSION DISPLAY

The MagLink control panel will display the machine positions in units that are commonly used in different applications, as indicated by the 5-position READOUT CONVERSION SELECTOR. Additional readout displays may be re-moted if required.

In the first three positions of the CONVERSION SELECTOR, the first six digits display hours (0-23), minutes (0-59) and seconds (0-59). The last two digits display frames (0-29), frames (0-24), or tenths of seconds.

In the last two positions the first digits display feet (0-9999), and the last two, 16mm frames or 35mm frames (0-39 and 0-15 respectively).

Since all position codes are derived from the same basic code format, the CONVERSION SELECTOR can be moved to any position at any time during recording or playback.

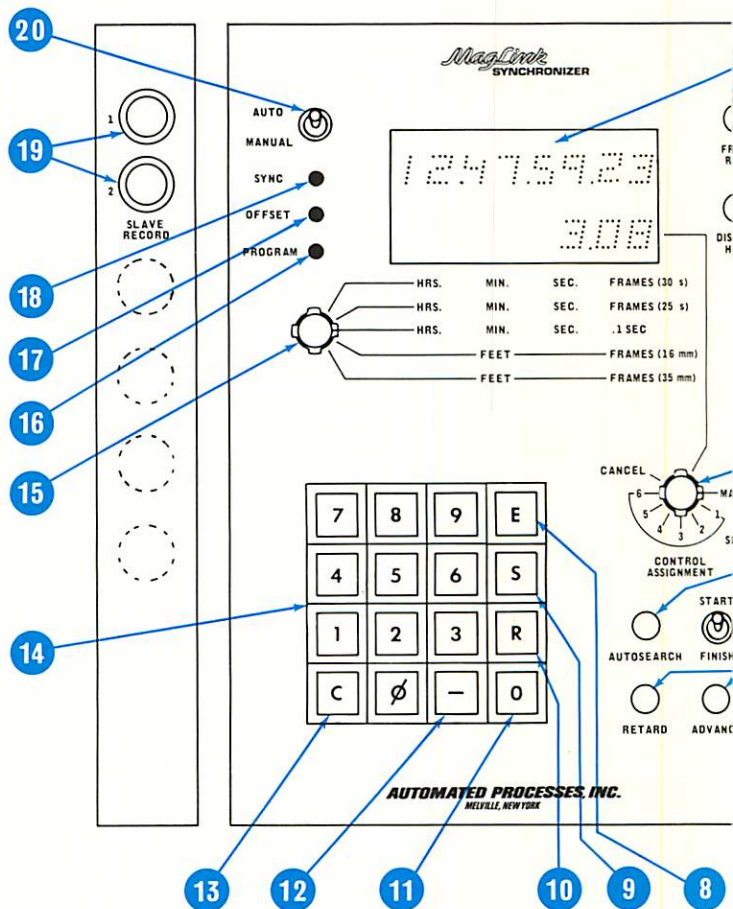
The DISPLAY HOLD and FRAME READ switches are for ease in reading the display while the tape machines are in motion. Pressing the DISPLAY HOLD button "freezes" the display instantly, permitting the accurate readout of a cue location. The FRAME READ switch unblanks the last two digits on the right of the display. The count or identity of these rapidly changing digits is constantly known by the system even though the display normally will not show them. With this switch they can be recalled at will, typically when the display is frozen or when the machines are at rest.

In the AUTO mode, the slave portion of the readout (concerning the particular slave selected by the CONTROL ASSIGNMENT SELECTOR) reads the offset of that slave from the master. It will show 00 if there is no offset, and master and slave are in sync.

When achieving a particular offset, or returning to "dead" sync, the readout will show progress toward or away from the 00 point. Whenever a keyboard entry is made, that entry will be displayed on the readout, temporarily displacing the pre-existing display until the action is called for; and then the progress toward that action will occupy the display.

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## SYNCHRONIZER FRONT PANEL



In the PRE-PROGRAM mode, the true positions of master and selected slave are displayed. True positions are also displayed in the MANUAL mode in which the machines operate as conventional independent tape drives.

In addition to the synchronizer controls, the only other controls required to operate the tape machines are those normally needed to run the master machine, and an optional RECORD button for each slave. These RECORD buttons, are provided since it is possible to RECORD as well as PLAY BACK from a tape in sync.

Through the correct interface module, the MagLink output can be made compatible with any type of machine. The unit will control synchronous motors as well as servo or other voltage controlled motors. Contact closures are provided for audio mute, etc. during search or slewing.



## 1 POSITION READOUT

Upper half displays the position of the master tape; lower half displays the position, or offset, of any slave as determined by the CONTROL ASSIGNMENT SELECTOR (4).

## 2 FRAME READ CONTROL

This "press to activate—twist to lock" switch permits reading the FRAMES or .1 SEC portion of the POSITION READOUT which is normally blanked for ease of operation.

## 3 DISPLAY HOLD CONTROL

Press to "freeze" the display while tape is in motion; twist button to hold display while logging.

## 4 CONTROL ASSIGNMENT SELECTOR

Determines which machine will be affected by the operation of controls (6) thru (14). It will also determine which slave is monitored on the POSITION READOUT. The CANCEL position permits the entire pre-program memory to be erased when the ENTER key (8) is pressed.

## 5 AUTOSEARCH BUTTON

Used for repeated automatic return to start of take, etc. Used in conjunction with SEARCH key (8). Present position may be entered by pressing the AUTOSEARCH button. Later, pressing the SEARCH key will cause the machine to return to that point.

## 6 START/FINISH SWITCH

Used in conjunction with the ENTER key (8) and the CONTROL ASSIGNMENT SELECTOR (4) to pre-program a sequence of operations. In the START position, the switch permits entry of the position of the MASTER at which a slave is to start in sync. An entry made with the switch in the FINISH position determines the point at which the slave will "unlock" out of sync and either stop or search for the next start point.

## 7 ADVANCE AND RETARD BUTTONS

Depressing the ADVANCE or RETARD button will speed up or slow down the selected machine, thus creating an offset which will be displayed on the POSITION READOUT, and which will be maintained when the button is released.

## 8 ENTER KEY

Used in conjunction with START/STOP switch (6).

## 9 SEARCH KEY

Entering a position on the keyboard, followed by depressing the SEARCH key, will command a selected tape machine to search for and then wait at this position. See AUTOSEARCH (5).

## 10 RESET KEY

Used to reset the code generator when starting a time code recording. Set the desired starting point with the keyboard and enter by depressing the RESET key.

## 11 OFFSET KEY

Entering a number, followed by depressing the OFFSET key, will immediately create an offset between one selected machine and all other machines in the system.

## 12 — (MINUS) KEY

Provides the selected machine with a negative offset or "retard".

## 13 CLEAR KEY

Used to clear incorrect data entry.

## 14 KEYBOARD

Used to enter offsets and tape positions in conjunction with switches (8) thru (13). Any number entered on the keyboard will be shown on the POSITION READOUT, and will temporarily replace the machine position otherwise displayed.

## 15 READOUT CONVERSION SELECTOR

Converts the position display to the format selected by the switch.

## 16 PROGRAM INDICATOR

Lights when in the PRE-PROGRAM mode.

## 17 OFFSET INDICATOR

Lights when the selected slave is commanded to be displaced with respect to the MASTER.

## 18 SYNC INDICATOR

Lights when machines are locked in synchronism, with or without offset.

## 19 RECORD BUTTONS

Control the RECORD functions of each of the slave machines.

## 20 AUTO/MANUAL SWITCH

In the AUTO mode, **MagLink** controls machines connected to it. In the MANUAL mode, the positions of the machines are monitored, but they are not controlled by **MagLink**.



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### BASIC SYSTEM AND ACCESSORIES

**Model 200** Basic **MagLink** System for 1 Master, 1 Slave. Includes Code Generator and 1 No. 241 Memory Card.

**Part No. 205** Interface Equipment for each additional slave—  
Consists of: Relay Interface Card\*  
Capstan Control Card\*  
Logic Card  
Set of two Filter Cards

\*Specify manufacturer and model number of master and each slave to be connected to **MagLink** to assure correct interface.

**Model 250** Motor Drive Amplifier for Slave (required for synchronous motors)

**Model 210** Separate Self-powered Code Generator

**Model 211** Code Generator with Precision Crystal Clock

**Model 220** SMPTE to **MagLink** Code Converter

**Model 230** Additional Readout Display in Cabinet

**Part No. 241** Additional Memory Card for One Hundred Cues

**Part No. 244** Additional Memory Card for Four Hundred Cues

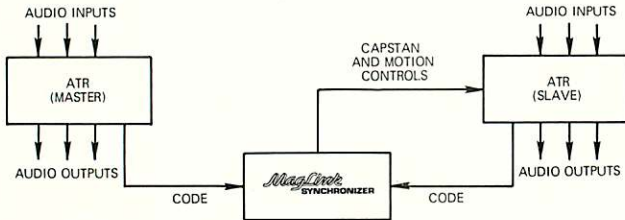
**Model 260** Memory Unit for Permanent Pre-Program Storage



# MagLink<sup>®</sup> SYNCHRONIZER

## TYPICAL APPLICATIONS

### 1 SYNCHRONIZING AUDIO TAPE RECORDERS

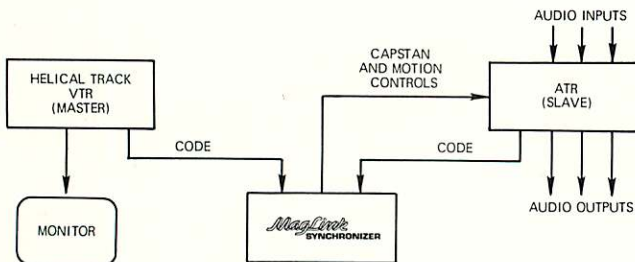


MagLink will keep two or more ATR's in sync. For example, two 16 track ATR's can be connected to function as a single 30 channel ATR by means of the edit code recorded on one track of each tape.

AUTOSEARCH simplifies repeated shuttling back to the beginning of a take or cue point.

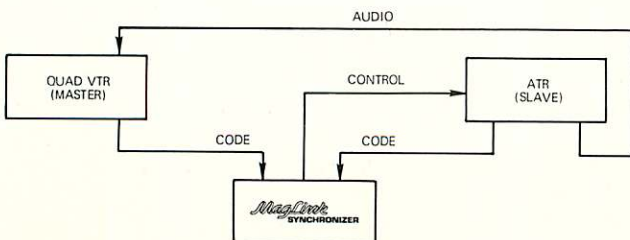
OFFSET sync provides continuously variable or fixed tape delay effects.

### 2 SYNCHRONIZING AUDIO AND VIDEO TAPE RECORDERS

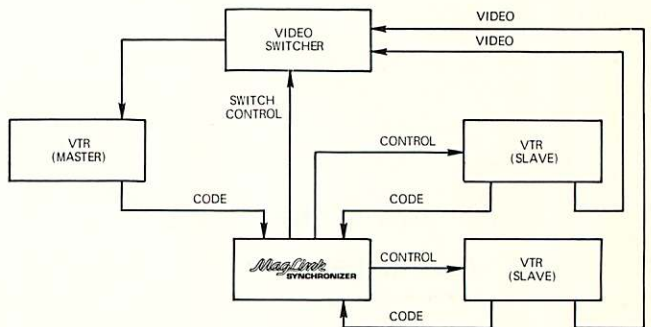


MagLink will keep one or more ATR's synchronized with a VTR while recording for audio "sweetening." The edit code is recorded on both the ATR and VTR while a helical video dub is made from the quadruplex master.

After completion of the audio mix the "sweetened" audio is recorded on the audio track of the Quadruplex VTR master tape from the ATR. Perfect synchronization is maintained throughout the entire sweetening process (including offsets where necessary for lip sync.) by means of the edit code.

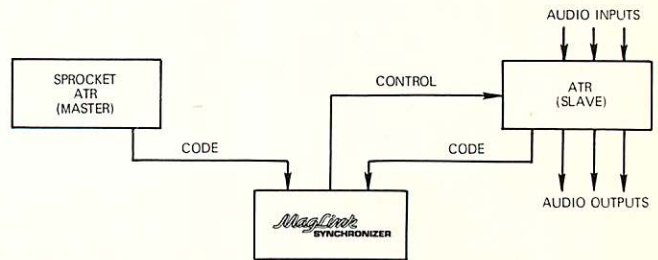


### 3 SYNCHRONIZING VIDEO TAPE RECORDERS



MagLink will operate two or more VTR's in sync, in accordance with predetermined cues entered in the pre-programming mode. This permits spliceless editing and previewing with inexpensive slant track tape. Editing of the original quad tapes may then be automatically accomplished, using the previously programmed edit code format. The pre-programming function may also be used for audio tape editing.

### 4 SYNCHRONIZING SPROCKETED MAGNETIC TAPE RECORDERS WITH CONVENTIONAL AUDIO RECORDERS



MagLink will keep one or more audio tape recorders in perfect synchronism with a sprocketed multi-track magnetic film master by means of the edit code previously recorded on one track of each tape. After the recording of additional tracks on the ATR, the final mix is recorded on the sprocketed master. In the manner described in (2), one or more multi-track magnetic film machines may be synchronized with a VTR master.

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## ENGINEERING SPECIFICATIONS

- Code Generator Output:** .....—6 to +4 dBm
- Code Crosstalk into PGM Tracks:** ..... Does not degrade normal program crosstalk specifications of machine.
- Nature of Code:** ..... Unique format. Converter module available to interface with SMPTE Synch code.
- Required Bandwidth:** ..... 30 Hz to 4 kHz ( $\pm 6$  dB)
- Required Signal to Noise Ratio:** ..... 24 dB
- Minimum Data Recognition Speed:** ..... Approx. .02 normal speed\*
- Maximum Data Recognition Speed (Play Mode):** .. 4 times normal speed\*
- Maximum Data Recognition Speed (Slewing Mode):** ..... 400 times normal speed\*
- Sync Resolution (Accuracy):** .....  $\pm 1/300$  sec.
- Search Accuracy:** ..... Determined by stopping time of machine. Typically 0.2 sec. at 15 i.p.s.
- Size:** ..... Controls: 8" x 10" panel in sloping front cabinet. 4" high (max.).
- ..... Electronics: 10½" x 19" rack mount card frame, 11" deep.
- ..... Power Supply: 5¼" x 19" rack mount, 16" deep.
- Power Required:** ..... 115/230 Volts 50-60 Hz, 6 Amperes.
- Maximum Number of Slaves:** ..... Six per Assembly.
- Maximum Pre-program Capacity:** ..... 1,200 Cues

\*Although not all tape machine drives will produce these extremes, hand slewing within the specified limits is permissible.

*All specifications subject to change without notice.*

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