PROGRAM

The PROGRAM function enables the user to save frequently used effect setups. All the front panel controls with the exception of INPUT LEVEL are programmable. Additionally, the DIGITAL DELAY pushbutton settings have the capability of overriding the programmed DIGITAL DELAY settings.

- SAVING THE PROGRAM: Simply press the red WRITE button and before the READY light goes out, depress the program channel button that you wish to store your setting into.

- RECALLING THE PROGRAM: Simply depress the PROGRAM button to recall stored settings of interest.

- OVERRIDING DELAYS: Depress any delay button to override the program delay setting. By returning all delay buttons to the OUT position, the originally programmed delay setting will be restored.

FEEDBACK

- FEEDBACK: The FEEDBACK control varies the amplitude of the signal that is fed back and regenerated. Close to 100% feedback, just short of oscillation is possible at either of the extreme settings. The regeneration signal passes through a 12 kHz low pass filter to minimize noise buildup as it is being fed back.

- At this setting, the signal is fed back out of phase (negative feedback).

- The maximum setting is full counterclockwise; various amounts of negative feedback are possible starting from zero through the maximum position.

- At this setting, the signal is fed back in phase (positive feedback).

- The maximum setting is full clockwise; various amounts of positive feedback are possible starting from zero through the maximum position.

- At the zero (click) center position, there is no feedback — hence no regeneration.

LFO

The LFO output of a precision internal VCO (Voltage Controlled Oscillator) which is controlled by an LFO (Low Frequency Oscillator). The LFO controls are the WIDTH and SPEED located on the front panel. These controls interact with the DELAY FACTOR front panel control and are enabled by the (0 to +5V) CONTROL input located on the rear panel.

- WIDTH: The WIDTH control varies the sweep of the internal oscillator. In the MAX position, the delay times vary from (X0.25) to (X1) of the pushbutton delay setting, allowing over two octaves of sweep. Should any setting less than MAX be used, the DELAY FACTOR control should be adjusted to set the desired center of the sweep. The WIDTH control should be set to the 0 position if the LFO is not being used and accurate delay times are required.

- SPEED: The SPEED control varies the rate of modulation of the internal oscillator from 0 (MIN) to approximately 10Hz (MAX).

INPUT

- INPUT LEVEL: The input level control adjusts the signal level processed by the system.

  - At the MIN setting, the system gain will be 0.

  - At the MAX setting, the system gain is 30dB (X30) to allow low level signals to be processed.

- HI: The red HI LED indicates that the signal level being processed is at the 0dB reference point. 0dB indicates the onset of clipping and/or slew rate limiting. There is an additional 6dB of headroom beyond what is indicated to allow for unanticipated overloading in actual usage.

- LO: The green LO LED indicates that the signal being processed is greater than -20dB below reference. The input level should be set such that the green LO LED is full on for most of the time. If the input is too low, the green LO LED will be off for most of the time.

DELAY

- The delay function consists of a bank of pushbutton switches including a full memory INFINITE REPEAT and a DELAY FACTOR control.

  - DELAY FACTOR: The DELAY FACTOR control adjusts from MIN (X0.25) of the delay setting) to MAX (X1.0 of the delay setting), a 4-to-1 range, over the counterclockwise half of the control. The DELAY FACTOR control also activates an envelope follower (ENV) signal in the clockwise half of the signal. This signal is used effectively for both flanging and doubling.

  - MIN: Multiplies the delay button setting X0.25.

  - MAX: Multiplies the delay button setting X1.0.

  - Of course, intermediate settings between MIN and MAX are possible.

- FLANGE: Three white pushbuttons are used to select short time delays normally used for flanging effects. The range of each button can be varied by the DELAY FACTOR of the LFO controls.

  - DOUBLE: The last white pushbutton and the gray pushbutton can be used to select the delay range suitable for doubling effects.

  - ECHO: The black pushbutton(s) are used to select delays which create echoes. Adjustable repeats. The ADM 512 provides one echo button with up to 1012ms (1/2 sec delay) and the ADM 2048 provides two echo buttons for up to 2048ms (2 sec delay).

  - INFINITE REPEAT: The red pushbutton is used to recalculate the data stored in the full memory of the unit. On the ADM 512 the full memory varies from 128ms to 512ms, depending on the DELAY FACTOR adjustment. Similarly, the ADM 2048 full memory varies from 512ms to 2048ms.

  - CAUTION: When all the delay buttons are in the OUT position, the delay in the system is 1ms with the DELAY FACTOR set to MAX. NOTE: This is an acceptable setting for delay and can be used as a 'short' range, it is fully programmable.

OUTPUT

The output level is adjustable via the OUTPUT LEVEL control on the rear panel.

- DELAY MIX: The processed signal can be mixed in or out of phase with the source via the delay mix control.

  - At -100%, the output consists of only the delayed signal (out-of-phase).

  - At -50%, the output consists of equal amounts of source and out-of-phase delayed signal.

  - At SOURCE, the output consists only of the source signal.

  - At +50%, the output consists of equal amounts of source and in-phase delayed signal.

  - At +100%, the output consists of only the delayed signal (in-phase). Of course, intermediate settings are also possible.
Due to its simplicity, there are no special setup rules that need to be observed. The only situation that can cause annoyance is if the INFINITE REPEAT button is in the "in" position when the unit is first plugged into the AC power line. Usually the HI LED will light up to indicate this condition. Simply push the red INFINITE REPEAT button to the "out" position and all will clear up.

We do; however, recommend the following be used as a starting point until you familiarize yourself with each control:

- PROGRAM: All buttons "out"
- INPUT LEVEL: MIN: full counterclockwise (OFF)
- FEEDBACK: 0; center position
- DELAY (BUTTONS): Start with GRAY button "in"
- INFINITE REPEAT: Button "out"
- DELAY FACTOR: MAX position; center detent
- WIDTH: 0; full counterclockwise
- SPEED: 0; full counterclockwise
- DELAY MIX: SOURCE; Center position

The INPUT LEVEL can now be adjusted for proper level via the LED monitors. All other functions can be varied at will to create the various effects.

NOTE: IN ORDER TO INSURE RELIABILITY AND LONG LIFE BY PREVENTING FAILURES DUE TO UNNECESSARY THERMAL SHOCK, I.E., (HOT AND COLD VARIATIONS), THE SUPER TIME LINE DOES NOT HAVE AN OFF/ON SWITCH. THE AVERAGE POWER CONSUMPTION IS LESS THAN 10 WATTS; THIS SHOULD NOT AFFECT THE OPERATING ECONOMY OF YOUR TOTAL SOUND SYSTEM.
The PROGRAM function enables the user to save frequently-used effect setups. All the front panel controls with the exception of INPUT LEVEL are programmable. Additionally, the DIGITAL DELAY pushbutton settings have the capability of overriding the programmed DIGITAL DELAY settings on command.

SAVING A PROGRAM

Saving the front panel control settings is performed by momentarily depressing the WRITE button and then selecting one of the four program channels (A, B, C or D). The READY LED will indicate that the unit is ready to store a program and will remain lit for 1 to 2 seconds after the WRITE button is released. Simply depress one of the four program channels you wish to select before the READY LED goes out in order to save the front panel control settings in that channel location. Note that all four of the program channel pushbuttons be OUT before depressing the WRITE button for the READY LED to come on. In any case, A PROGRAM CAN ONLY BE SAVED WHEN THE READY LED IS "ON".

RECALLING A PROGRAM

Recalling front panel control settings that have already been saved is achieved by simply selecting one of the four program channels (A, B, C or D). Note that all of the DIGITAL DELAY pushbuttons must be OUT in order to hear the originally programmed delay setting. Also, note that when all the PROGRAM buttons are out, the Super TIME LINE is in the "manual" mode i.e., all the front panel controls are fully operational and active.

OVERRIDING THE PROGRAMMED DELAY

Selecting any of the DIGITAL DELAY pushbuttons automatically overrides the preprogrammed setting for this function. Returning all of the DIGITAL DELAY buttons to the OUT position will, once again, restore the originally programmed delay. Remember, none of the other front panel controls (except INPUT LEVEL) have any effect when a program has been selected.
While the Super TIME LINE is capable of providing a very large array of effects, they all fall into the basic categories (or combination of these) outlined below:

1. **STRAIGHT DELAY**
   a. DISCRETE ECHOS, SLAPBACK
   b. DOUBLING, THICKENING, BROADENING
   c. PRE-REVERB DELAY
   d. HAAS-EFFECT IMAGE SHIFTING

2. **FEEDBACK OF SHORT DELAYS**
   a. COMB FILTERING
   b. FLANKING
   c. FLANKING WITH FEEDBACK
   d. FEEDBACK PHASE INVERSION
   e. TUNED RESONANCE

3. **FEEDBACK OF LONG DELAYS**
   a. MULTIPLE ECHOS

4. **TIME BASE MODULATION**
   a. MANUAL PITCH SHIFTING
   b. VIBRATO, AUTOMATIC PITCH SWEEPING
   c. ENVELOPE FOLLOWER

5. **INFINITE REPEAT**
1. STRAIGHT DELAY

Sound travels in air at a finite speed — approximately 340 meters per second (1100 feet per second), or about one foot per millisecond — and many of the uses of a digital delay processor involve the controlled electronic recreation of effects which occur in acoustics due to this finite speed.

For instance, for practical reasons, vocals and instrumentals are usually recorded in a nearly anechoic fashion by close-miking in an acoustically absorptive studio, but this sometimes yields an anemic, uninteresting sound. Whenever we hear vocal instrumental sounds in a living room or concert environment, the dry sound is accompanied by reflections off nearby walls, floor and furniture. These early reflections accompanying the direct sound — slightly delayed because of their longer airpath — add apparent volume and fullness and thus enrich the character of the sound.

The subjective effect of reflections (delayed replicas of an original sound) depends on the length of the delay as follows:

— Single or multiple delays up to about 40 milliseconds after the direct sound alters the apparent character of quality, but are not perceived separately. Typically, they add the sort of "fullness" and body which a voice has in a living room, but lacks when heard outdoors. They are called "early" reflections.

— A single delay within about 40 milliseconds and having the same volume level as the direct sound, produces an effect something like that heard when a solo voice is replaced by two identical voices singing in unison. This is called "doubling".

— A single delay longer than 40 to 50 milliseconds starts to break away from the original sound and be perceived as an echo.

— A longer delay, i.e., over 100 ms and substantially lower in level than the original sound, is heard as a "slapback" echo like that from the rear wall of a cathedral or other large space. Of course, to be acoustically authentic, any delay must be lower in level than the direct sound. A delay which is substantially louder than the dry sound will be perceived as the original, and the original sound will appear to be a false pre-echo.

— Repeated delays at intervals greater than 50 milliseconds are perceived simply as multiple echos. If the pattern of multiple delays becomes more complex with dozens or hundreds of echos per second in a pattern which fades progressively away into inaudibility, then the echos are perceived as a single continuous sound — reverberation. Acoustically authentic reverberation includes some "early" reflections beyond 100 ms becoming progressively closer in spacing as they fade away. If the reflections are spaced at uniform intervals in time (e.g., a simple string of echos 40 ms apart), the reverberation of transient sounds acquires a chattering quality known as "flutter echo", or "hard reverb".
a. DISCRETE ECHOS, SLAPBACK

Feed a signal into the Super TIME LINE's input, push the echo button and then increase the DELAY FACTOR until the delay time is long enough to be perceived as a discrete echo. While this echo can be mixed directly with the dry sound, a more interesting result is usually obtained by panning the echo elsewhere in the stereo image with a stereo mixer; i.e., place the dry sound on the left and the echo opposite it on the right. The echo usually should be a bit lower in level than the dry source.

This left-right echo bouncing effect is particularly useful with a regular drum beat or a two-note guitar figure that is used to set the beat. By varying the DELAY FACTOR, you may be able to synchronize the echo interval to match the rhythm of the music so that the source and its echo fall on alternate beats.

If the delay is 10 to 20 dB lower in level than the source, it will be perceived as an echo — especially if it is placed in the opposite channel. If the delay is reproduced at the same level as the source, it will be identified as a repeat rather than as an echo such as from a distant wall or canyon.

b. DOUBLING, THICKENING, BROADENING

Two voices singing together, or a single voice which is double-tracked (overdubbed to accompany its previously recorded self) produce a combined sound which is richer and more interesting than simply turning up a single vocal track 3 dB in level. One reason is that the two separate voices are never recorded in exactly precise synchronism. The waveform of one is usually a few milliseconds ahead or behind the other despite the most careful of rehearsals.

This effect can be simulated with any single source simply by delaying it by 16 to 64 milliseconds and mixing the delayed signal with the original at equal levels. This is called doubling. It thickens the texture producing a more "full-bodied" sound while it increases the apparent loudness without significantly raising VU meter levels. It is particularly useful for adding strength and character to a thin-sounding vocal.

You should experiment with the length of the delays used for doubling. With delays in the 16-20 ms range, the sound remains relatively tight and focused. Delays of 30-40 ms produce a more obvious broadening. Doubling with delays shorter than about 16 ms is not recommended because of the risk of coloration due to comb filtering. If you extend the delay beyond about 40 ms it may be heard as a distinct echo.

This process simulates two vocal tracks with a small, but constant delay between them. Of course, when real voices are recorded or
overdubbed, they have varying small differences between them. So, to make its doubling seem more realistic, use the MODULATOR to continuously vary the delay. The action must be subtle so as to avoid audible pitch wobble. Setting the width and speed controls both to between 7:00 and 9:00 o'clock, usually produces a pleasingly realistic doubling effect with no audible side effects.

c. PRE-REVERB DELAY

Authentic acoustic reverberation in a large space requires many dozens of milliseconds to build up. But, in many studio reverb units (spring, plate or acoustic chamber) an output signal begins to appear very rapidly after the onset of the input signal. The subjective performance of reverberators is usually improved by delaying the signal fed to them. Both the ADM 256 and the ADM 1024 can provide this delay. The delays used for doubling often serve as pre-reverb delays.

In a concert environment, the listener hears the direct sound from the performer, followed by "early" reflections from the floor and walls of the stage and finally the reverberation comprised of long delays as sound is reflected among the walls of the auditorium. When using a reverb system to process dry studio sound, pre-reverb delay can also serve as the "early" stage-area reflections, simply by including them in the mix.

d. HAAS-EFFECT IMAGE SHIFTING

The ear has an integration time of about 40 ms. If a sound is heard from one direction and the same sound also arrives at a later time from another direction, the second arrival will not be heard at all if the interval between the two arrivals is less than 40 ms. The later arriving sound may even be several dB higher in level than its earlier counterpart; nevertheless, the ear will hear both sounds as a single louder sound located in the direction of the first arrival. This is the precedence effect — or Haas effect — and it can be used to stabilize images in a stereo sound field.

For example, if a signal is recorded in both channels at identical levels, the feed to the right channel is delayed, then the sound will be perceived as originating exclusively in the left channel. In principle, the delay to the opposite channel may be anything from 1 ms to 40 ms. But, long delays carry the risk that some listeners may begin to perceive the delayed sounds as an echo; and if the delay is under 10-15 ms, coloration due to comb filtering could become a problem if the two channels are later mixed together (for AM broadcast, for instance). A delay of around 20 ms usually turns out to be optimum for Haas-effect image panning.
It is possible to keep the signal level constant in both channels and cause the image to jump back and forth from left to right by swapping the delayed and undelayed signals by panning the mixer.

2. FEEDBACK OF SHORT DELAYS

By using the feedback control, the delayed signal is fed back and mixed with the incoming audio signal and then the composite signal is encoded and read into the digital delay circuits. The strength and tonal quality of the feedback may be adjusted by the user. The maximum feedback gain is less than unity; thus, like a real sound reflecting off any surface, the recycled signal is at least a little weaker than the original, and as the sound is repetitively recycled through the system, it gradually fades away.

a. COMB FILTERING

Whenever any original sound and a delayed version of itself are mixed together, the two sounds are mutually reinforced at some frequencies and tend to mutually cancel at other frequencies. This occurs in an electronic delay line and it also is a common acoustic phenomenon both in recording (where the mike picks up both the direct sound and a reflected sound from the floor, wall or music stand) and in playback (where a loudspeaker's direct sound combines in the air with reflections off room boundaries and furnishings). This pattern of alternating reinforcement and cancellation causes an audible coloration of the sound.

Two things are noteworthy. One is that the reinforcements and cancellations occur at harmonically-related frequencies. The other is that the pattern of peaks and dips can be varied, i.e., tuned, just by varying the delay time. In almost all normal vocal and musical sounds, most of the energy is found at fundamental frequencies and their harmonic overtones. By varying the delay time of a delay-and-mix circuit, we can easily but dramatically alter the overtone structure and the tonal quality of any steady sound. The precise delay times and unusually flat frequency response of the Super TIME LINE make it ideal for comb filtering on demand.

b. FLANGING

If the unit is setup to produce comb filtering and then the delay time is smoothly varied, the pattern of peaks and nulls will shift in frequency. Modulate the delay time rapidly and the pattern of peaks and nulls will sweep rapidly up and down the frequency spectrum passing in and out of synchronization with the frequencies of musical signals and their overtones. Select relatively short delays so that the spacing of the nulls corresponds to that of musical harmonics. As the delay is swept, at one moment, the odd-numbered harmonics are enhanced by 6 dB —
a moment later, the harmonic structure of that note is sliding into alignment with the harmonic overtones of a different note. This sweeping, shifting change is called "flanging".

To achieve it, one need only setup the delay and mixing as required for comb filtering and then activate the modulator to sweep the delay time up and down. Typically the modulator WIDTH is set at maximum in order to produce a broad sweep and the modulator SPEED is set at a modest value (e.g., between 7:00 and 9:00 o'clock) so that the comb filter sweeps up and down every few seconds. A high setting of the modulator SPEED would sweep the notch pattern over the musical spectrum too rapidly for the changing harmonic structure of the music to be heard and might also cause audible pitch wobble of the musical signal itself. You should experiment to find the settings of DELAY, WIDTH, SPEED and mixing ratio which yield interesting flanging effects with various vocal and instrumental sounds. In general, higher-pitched sounds work best with shorter delays.

c. FLANCING WITH FEEDBACK

Mixing the dry and delayed signals at approximately the same level causes comb filtering (a pattern of nulls and peaks in frequency response). Modulation of the delay time causes the pattern of nulls and peaks to sweep through the musical spectrum producing "flanging".

A stronger, richer flange is reproduced by using maximum feedback to create a chain of closely-spaced delays whose uniform spacing sharpens and strengthens the comb filter peak and nulls. Select short delays such as 2 or 8 ms and set the FEEDBACK near the maximum setting, either positive or negative. Finally, modulate the delay by setting modulator WIDTH at maximum and SPEED between 7:00 o'clock (for a slow flange) and 12:00 o'clock (for a fast flange). Note that is is important to use near maximum feedback so that each successive recycled delay is at nearly the same strength as its predecessor, yielding the strongest reinforcement/cancellation pattern. The flange can be varied, of course, by selecting different front panel delays. If the WIDTH control is set less than maximum, the DELAY FACTOR can be used to alter the delays and thus shift the frequencies of the comb-filter pattern. Finally, the flanged signal must be mixed with the dry signal via the delay mix control.

d. FEEDBACK PHASE INVERSION

The feedback phase control gives you the option of mixing the feedback delays either in phase (+) or out of phase (-) with the incoming dry signals. This choice alters the frequency distribution of any comb-filtering coloration which may occur as a result of combining dry and delayed signals. You can make this choice by ear. When using feedback, simply rotate the feedback
control) to find out whether positive or negative feedback sounds better in each particular situation.

e. TUNED RESONANCE

Select medium-length delays (between approximately 2 and 32 milliseconds) to produce comb-filtering and then use maximum feedback to create a string of closely spaced delays whose uniform spacing sharpens and strengthens the peaks and nulls of the comb-filter pattern. As a result, some of the peaks will be fed back at almost sufficient strength to cause a sustained feedback oscillation. Whenever the system is stimulated by a broadband input signal such as drums or a speaking voice, it will tend to "ring" at frequencies of the comb-filter peak. Since the peaks in a comb-filter form a harmonic series, a distinctly musical tonality will be produced. By varying the delays, the pitch of the tuned resonance can be tuned as desired. Inverting the polarity of the feedback will also alter the pitch of the resonance. For best results, the FEEDBACK control will normally have to be at a maximum setting.

A principal application of tuned resonance is the processing of human speech to produce "computer speech" by adding a fixed-pitch, metallic resonance. Such resonances can also be used to color various percussive sounds in interesting ways.

The pitch of the tuned resonance may be varied dynamically by means of the VCO — typically by setting the WIDTH close to maximum SPEED between 9:00 and 12:00 o'clock. An unpitched broadband sound such as a repeating drumbeat can be made to sound rather like a guitar.

3. FEEDBACK OF LONG DELAYS

In terms of control operation, the feedback of long delays is essentially the same as that for short delays. The feedback of long delays is primarily for the creation of strings of echos.

a. MULTIPLE ECHOS

To create a string of echos, setup a long delay (over 40 ms) to produce a discrete echo and then use feedback to recycle the signal repetitively through the delay. In general, echos are more interesting if they are separated spatially from the dry source and from each other by panning at the mixing console.
4. TIME BASE MODULATION

Much of the Super TIME LINE's flexibility and usefulness as a studio or onstage tool arises from its ability to vary the speed of the "clock" which governs how rapidly signals are shuttled through the digital memory, under either manual or automatic control.

The effects obtainable by varying the clock are easily understood by analogy with a tape recorder having variable tape speed whose recording and playback heads are separated by some distance. The time-delay between recording and playback is governed by the separation of the heads and by the tape speed. If the speed is doubled, the tape will traverse the distance in half the time. As long as the tape speed remains constant while the tape is being recorded and played, then the tape speed will affect only the delay. But if the tape is recorded at 7 1/2 ips and then the speed is doubled before the tape arrives at the playback head, the waveforms will pass the playback head twice as rapidly as they passed the recording head and the frequency of each sound will be doubled, i.e., the musical pitch will rise an octave. Thus, a change in tape speed which occurs in the interval between recording and playback alters not only the delay time, but also the pitch — delay modulation causes pitch modulation.

a. MANUAL PITCH SHIFTING

The DELAY FACTOR control adjusts the clock speed over a 4-to-1 range and consequently is capable of varying the pitch of a musical tone over a 4-to-1 range in frequency — or two full octaves in pitch. This is easily demonstrated with the aid of the infinite repeat mode. Set the DELAY FACTOR control to X1(MAX), set delay maximum and monitor the delayed output. Play "middle C", for example, and while the note is sounding, push the repeat button to store a fragment of the note in memory. Then, vary the DELAY FACTOR from X1(MAX) down to X.25(MIN) and as you do, the pitch of the sound will rise by approximately two octaves and it will fall as the DELAY FACTOR is moved back toward X1(MAX).

It is not necessary to recirculate a signal to manipulate its pitch. With the repeat button OFF, any signal passing through will change in pitch as the DELAY FACTOR is changed. As noted earlier, the pitch shift depends on the change in clock speed. The faster the DELAY FACTOR knob is turned, the greater the pitch shift will be and the longer the delay time is, the easier it will be to alter the clock speed significantly during the delay. This pitch is shifted downward as the DELAY FACTOR is increased and vise versa.

Gradual pitch changes are sometimes referred to as Doppler shifts, an analogy to the Doppler effect which occurs with moving sound sources such as train and auto horns (the pitch rises when a sound source is moving toward the listener and falls as the source recedes).
b. **VIBRATO, AUTOMATIC PITCH SWEEEPING**

It is difficult to accomplish really smooth pitch changes by manually rotating the DELAY FACTOR control so the modulator function provides an automatic method of achieving smooth pitch modulation effects. The LFO modulates the internal clock up and down by an amount set by the WIDTH control and at a rate set by the SPEED control.

As with manual pitch shifting, the amount of modulator-actuated frequency shift will depend on the choice of delay time as well as on the modulator controls. With delay of a few milliseconds and with the WIDTH and SPEED controls set at about 10:00 o'clock, a subtle pitch modulation is produced which most listeners can just detect. Lengthening the delay or increasing the WIDTH yields a larger and more obvious sweeping of the pitch up and down.

Increasing the SPEED beyond 12:00 o'clock, not only sweeps the pitch up and down more rapidly, but also sweeps it over a wider frequency range — up to several octaves.

Vibrato is a rapid, low-amplitude pitch modulation which is attractive with most vocals and with some instrumental sounds. It must be used with caution lest it sound ludicrous — excessively wide vibrato will simply be perceived as an off-key pitch wobble.

Typical control settings for producing an authentic-sounding and attractive vibrato are: DELAY 32 ms, WIDTH between 7:00 and 9:00 o'clock, SPEED between 1:00 and 3:00 o'clock.

c. **ENVELOPE FOLLOWER**

By detecting the amplitude of the input signal, the envelope follower is used to modulate the clock. This results in a variable time delay that varies with the amplitude of the signal. Using this type of clock modulation produces flanging effects that "sweep up" with signal decay. The effect is most pleasing when used with drum and guitar tracks.

Also, in the doubling mode, the envelope follower can "detune" the doubling effect during transients to create a very natural effect. Remember, two vocalists do not always sing in perfect tune. The Super TIME LINE can simulate a real situation.

5. **INFINITE REPEAT**

With digital feedback we can sustain a repeating echo perpetually. Simply push the red button and a small portion of the input signal will be stored in the full memory as long as the red button is in the "in" position. This function can also be operated via the rear panel INFINITE REPEAT jack. See Page 6 for diagram.
**SPECIFICATIONS**

**DELAY RANGE**
ADM 512
ADM 2048

0.5 to 512 ms
0.5 to 2048 ms

**FREQUENCY RESPONSE**
+1, -3dB @ -10dB below LIMIT

20 to 16k Hz @ all delay settings

**DYNAMIC RANGE**

90 dB typ., 85 dB min (A-weighted)

**DISTORTION**
Ref 1kHz @ limit (HI)

0.2% max

**INPUT RANGE**

-33 to + 22dBV (0.024 to 12.3Vrms)

**INPUT LEVEL GAIN**
MIN
Unity @ (center position)

0 dB (X1.0 gain)

MAX
+30 dB (X30 gain)

**OUTPUT LEVEL (@ Max)**

+12dBV (4.0Vrms)

**METERING**
HI
LO

0 dB ref
-20 dB below ref

**DELAY FACTOR**
MIN
MAX
ENV

X 0.25 of DELAY setting
X 1.0 of DELAY setting
DELAY varies with amplitude of input

**MODULATION**

WIDTH
SPEED
CONTROL (External)

0 to max depth (5-to-1)
0 Hz to 10 Hz nominal
0 to +5V (X1 to X0.25)

**REPEAT**

Repeats signal in full memory.

**FEEDBACK**

Recirculates delayed signal thru 12 kHz Low Pass Filter.

**BYPASS (External)**

Shorted - bypasses total system;
Open - normal operation.

**PROGRAM LIFE (Internal battery)**

3 mo. between charges

**SIZE**

1 3/4x19x10in (4.45x48.3x25.4cm)

**SHIPPING WEIGHT**

12 lbs

Manufacturer reserves the right to make improvements without notice or obligation; therefore, all specifications are subject to change.