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# ECHOTRON

OWNER'S MANUAL  
ADM 4096



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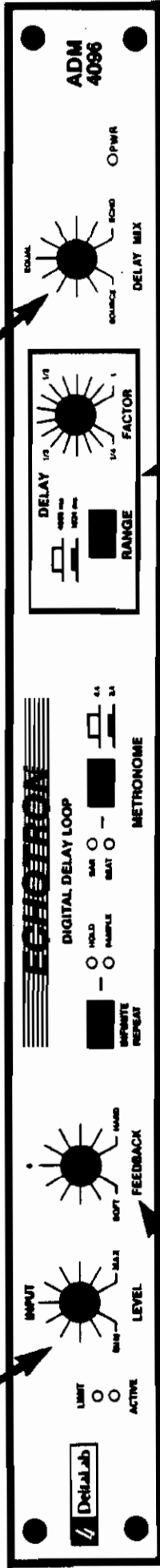
This section contains a brief overview of the front panel controls and switches. For more detailed information on applying these controls, refer to Applications.

## INPUT

- INPUT LEVEL:** The INPUT LEVEL control adjusts the incoming signal level for greatest compatibility with the Echotron. Use lower INPUT LEVEL settings with strong signals, increase the INPUT LEVEL (i.e. turn it clockwise) with weaker signals. Observe the two LEDs described below for best results in setting this control.
- LIMIT LED:** This light flashes when you reach the limits of the Echotron's headroom, indicating that the Echotron is either starting to clip or is on the verge of clipping. During normal operation, this light should flash on peaks of your playing; if it flashes consistently, turn down the INPUT LEVEL control to reduce the chance of distortion.
- ACTIVE LED:** This light indicates that the signal being processed is greater than -20 dB below the point where the LIMIT LED lights. The INPUT LEVEL control should be set so that the ACTIVE LED is on for most of the time. If the input is too low the ACTIVE LED will be off much of the time, resulting in poor signal-to-noise performance.

## OUTPUT

- DELAY MIX:** When fully counterclockwise, the output signal contains source (unprocessed) sounds only. At center position, the output signal contains an equal mix of source and echo (delayed) sounds. When fully clockwise, the output signal contains echo (delayed) sounds only. A master output control is available on the back panel (see next section, Rear Panel Outline).



## FEEDBACK

- FEEDBACK:** The FEEDBACK control varies the amount of signal being fed from the output of the Echotron back to the input. To help understand the operation of this control, consider its use when creating echoes. At the center (0) position, you will hear one repeat (echo) of the original signal since there is no feedback. Turning the knob clockwise increases the number of echoes; these echoes are virtually exact replicas of the source sound. Turning the knob counterclockwise also increases the number of echoes, but changes the tone of the echo to a less bright sound (less high frequencies) for situations where you want the echoes to sound more in the background than the source signal.

## INFINITE REPEAT/METRONOME

- INFINITE REPEAT:** Pushing this button in all the way stores (records) whatever sounds are being processed through the Echotron. While in "infinite repeat" mode, the stored sound repeats over and over again. Releasing the INFINITE REPEAT switch by pushing it a second time lets the Echotron exit from infinite repeat mode. Pushing, or releasing, this button halfway allows re-synchronization effects (as described later under Applications).

## DELAY

- RANGE:** When pushed in, the FACTOR control varies the delay range from 1024 milliseconds (ms) to 4086 ms. When released (out position), the FACTOR control varies the delay range from 256 to 1024 ms.
- FACTOR:** When counterclockwise, this control chooses the minimum delay time within the limits specified by the RANGE switch. Turning this control clockwise increases the delay time. The FACTOR control also determines the metronome tempo, as well as the tempo of any external devices (drum units etc.) being synchronized to the Echotron.

- SAMPLE LED:** This LED lights up when the Echotron is sampling (recording). Note that the sampling procedure is synchronized with the metronome (see below) so that recording always starts on the first beat of a bar (measure), and ends when the measure ends.
- HOLD LED:** This LED lights up after the sampling process is complete, and shows that the Echotron is holding the sampled sound and is therefore in infinite repeat mode.
- METRONOME:** This switch selects either 4/4 or 3/4 time signature; choose whichever setting is appropriate for the music being played. The FACTOR control, described later, sets the tempo of the metronome.
- BAR LED:** This light flashes on the first beat of each measure.
- BEAT LED:** This light flashes on each beat. In other words, with 4/4 time signature selected there are four flashes per measure. With 3/4 time signature selected, there are three flashes per measure.

## OUTPUT:

This varies the overall output level of the Echotron in order to match the Echotron signal level to various pieces of equipment. If the Echotron overloads a low level input, such as the kind found in guitar amplifiers, turn this control more counterclockwise to prevent distortion. When feeding high level inputs (such as mixing consoles), turn this control more clockwise in order to push as much signal as possible (short of distortion) into the mixer, thus giving the best signal-to-noise ratio through the mixer.

Patch a cord from this jack to your mixer, amplifier, or other monitor.

## CAUTION:

Some of the following jacks are stereo jacks, and therefore have two detents. Make sure when you plug into stereo jacks that any plugs are plugged in *all the way*.

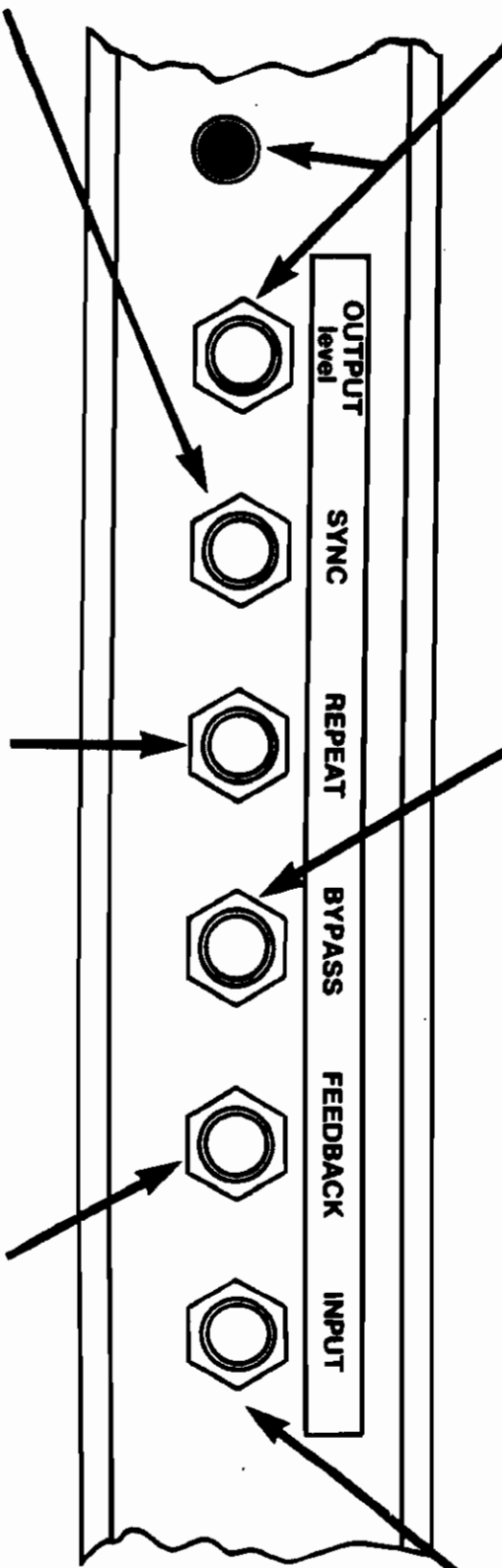
## BYPASS:

This is a stereo jack. Shorting the tip and ring connections bypass the delay effect, so that only the source signal appears at the output. Please note that a standard "tip-to-ground" guitar amp-type footswitch will not work for this function.

## INPUT:

Patch your instrument into this jack. Note that high impedance output devices, such as some guitars, may not plug directly into this jack without picking up noise. Therefore, for best performances, make sure that you first send the high impedance output through an electronic device such as a preamp, compressor, or similar processor with a low impedance output.

2



## SYNC:

This is a stereo jack. The tip connection generates a 48 pulses-per-quarter note signal suitable for synchronizing drum units, sequencers, and similar devices to the Echotron. The ring connection generates a metronome signal which is synchronized to the flashing of the BEAT and BAR LEDs. With the RANGE switch in (4096 ms maximum delay), the metronome gives a click on each beat. With the RANGE switch out (1024 ms maximum delay), the metronome gives a click at the beginning of each measure. Note that if you do not need the metronome output but do need the sync output, you may use a standard mono cord to pick up the 48 pulses-per-quarter note sync signal.

## REPEAT:

Plug a standard footswitch into this jack for foot control of the infinite repeat function. Shorting the tip connection to ground through the footswitch performs the same function as pressing the INFINITE REPEAT switch in. Lifting the tip off ground performs the same function as releasing the INFINITE REPEAT switch. Note that with momentary footswitches, you will need to hold the footswitch down for as long as you want the sound to remain stored. With push-on/push-off type footswitches, simply press once to store, and again to release.

## FEEDBACK:

This is another stereo jack. It serves as a loop in the feedback path. Inserting a signal processor, such as a filter, between the tip (loop send) and ring (loop receive) of this jack allows processing of the feedback signal. For example, if you want successive echoes to sound brighter, you would insert a treble booster or high pass filter into this loop.



## INTRODUCTION

tm

The ECHOTRON<sup>tm</sup>, Digital Delay Loop, is a studio quality special effects processor designed to provide extremely long delays (over 4 seconds) for the performing musician. It is primarily intended for applications that require the use of "space echo" effects. The ADM 4096 is an extension of our highly successful line of EFFECTRON II signal processors. You can rest assured that your ECHOTRON will become an important part of your overall sound and performance.



## CIRCUIT DESCRIPTION

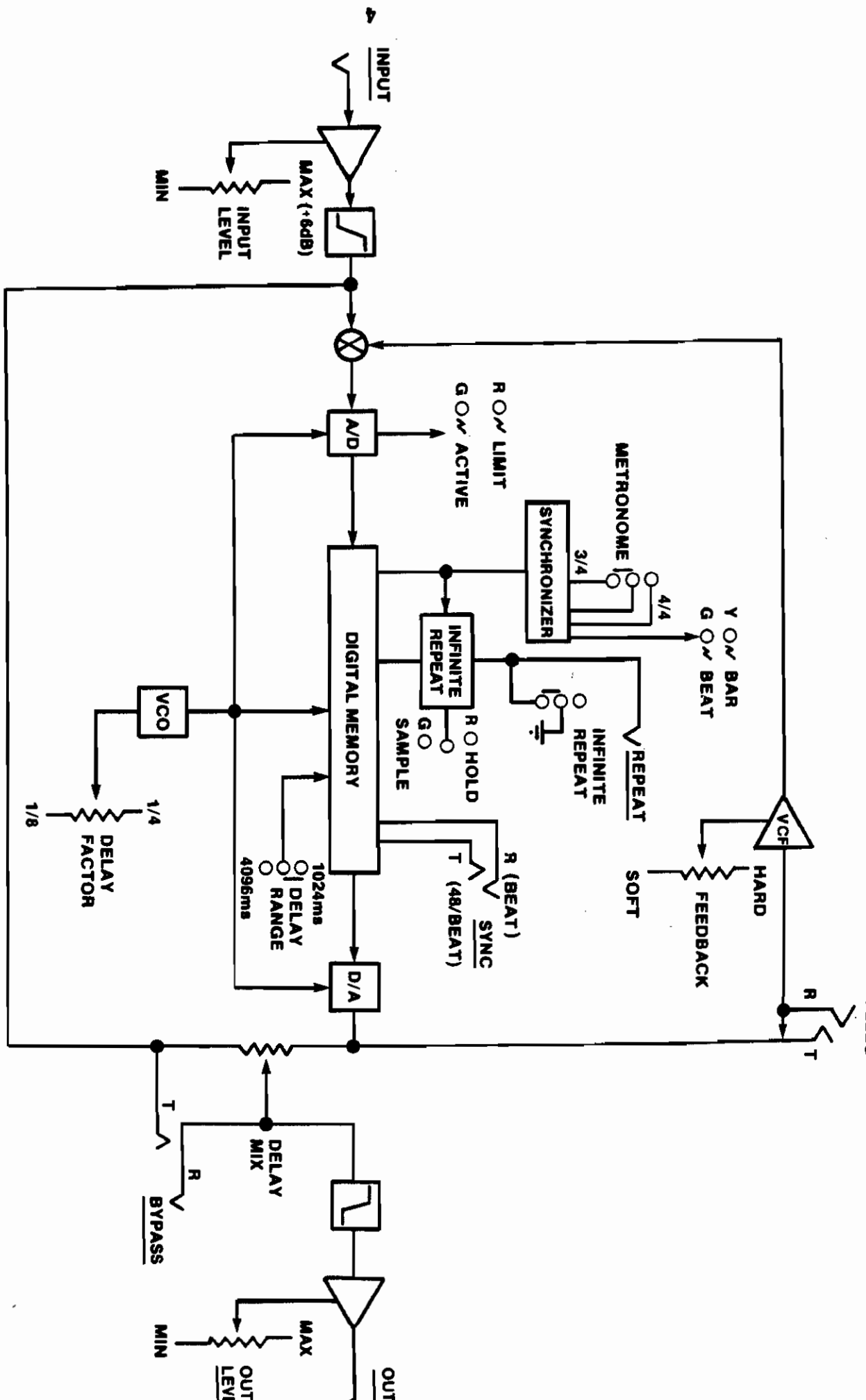
Even if you are not technically inclined, we urge you to read this chapter. A basic understanding of how signals are processed through the ECHOTRON will make it easier to predict the effect of control settings and easier to plan control settings to achieve desired sound effects. But, first a word about the "guts" of the design.

Only the latest technology has been used in the design of the ECHOTRON. This applies to components as well as circuit design.

For example:

1. The power supply uses a toroidal transformer to minimize hum and eliminate stray magnetic fields.
2. The digital memory consists of the latest 64k dynamic RAM's (Random Access Memory).
3. All digital integrated circuits are CMOS for low power consumption.
4. All analog integrated circuits consist of both bipolar and MOS technology for both low noise and reliability.
5. Precision resistors (+/-1%) are used in critical circuits to insure repeatability.
6. The printed circuit board is standard mil-spec G-10 material.
7. All other components such as potentiometers, switches, etc., have been similarly selected for optimum quality and reliability.
8. For roadability the chassis is all steel with an aluminum front panel.

The circuit design incorporates DELTALAB's patented Adaptive Delta Modulation (ADM) technology regarded by audio professionals as the most natural and cleanest sounding digital encoding technique. A detailed explanation of the circuit design, via the block diagram shown, follows:



ADM 4096 ECHOTRON BLOCK DIAGRAM

The input audio signal is fed into the ECHOTRON via the INPUT phone jack located on the rear panel. This signal is routed through an input amplifier stage to properly set the operating signal level via the INPUT LEVEL control located on the front panel. The INPUT LEVEL control can also set the gain of the total system (there is a compensating OUTPUT LEVEL control on the rear panel). The minimum input voltage is 0.1 VRMS.

The correct operating level is set by observing the green ACTIVE monitor and the red LIMIT monitor located on the front panel. These LED's monitor the level as seen by the encoding circuits. For maximum dynamic range, the active LED should be full-on with a rare flashing of the LIMIT LED during peak passages in the audio input.

Once the proper input level has been set, the audio signal is directed to a pre-emphasis circuit to pre-condition the signal before the actual Analog-to-Digital conversion takes place.

After pre-emphasis, the pre-conditioned signal is now sent to the A/D encoder to be converted to a digital signal. It is here that DELTALAB holds all the aces. The Analog-to-Digital encoding scheme is unique. A carefully designed Adaptive Delta Modulator converts the audio signal by analyzing both the value and slew rate of the signal. The result is the most accurate digital representative of the audio signal possible over the full dynamic range.

Next, the digital signal representing the audio is stored in the digital memory. Access to this memory is via the DELAY RANGE pushbutton switch located on the front panel. Upon selection of a given delay, as indicated by the pushbutton, the digital signal is extracted from the memory and sent to the Digital-to-Analog decoder. Note that the A/D, the memory and the D/A are synchronized to a common clock to insure the proper addressing of the memory banks and to provide the sampling rate for the A/D encoder and D/A decoder.

The D/A decoder is the perfect compliment of the Adaptive Delta Modulation encoder. At the D/A output, the signal is directed to both the FEEDBACK and DELAY MIX controls located on the front panel.

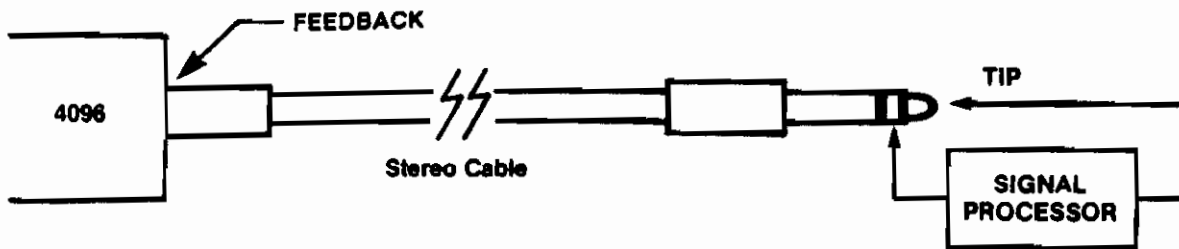
The DELAY MIX control mixes the processed signal with the input (source) signal. The final mix is then de-emphasized to restore the audio to its proper levels. The output is available at the OUTPUT phone jack on the rear panel. The OUTPUT LEVEL control on the rear panel adjusts the amplitude of the OUTPUT signal.

Meanwhile, back at the FEEDBACK control, the processed audio (delayed signal) is fed back to a summing point and mixed with the incoming signals at the A/D converter input. The FEEDBACK control is a center tapped potentiometer. The center tap is grounded so that there will be no feedback when the control is on the center position. Both a 3kHz (SOFT) and a 12kHz (HARD) audio filter are available at each half of the potentiometer setting.

Before being mixed with the pre-conditioned input, the feedback signal is filtered via a 12kHz low pass filter, for HARD feedback, and a 3kHz low pass filter, for SOFT feedback to create a more natural and pleasant sounding

echo repeat. The 12kHz hard filter is used only to keep the noise level from building up when maximum feedback is used.

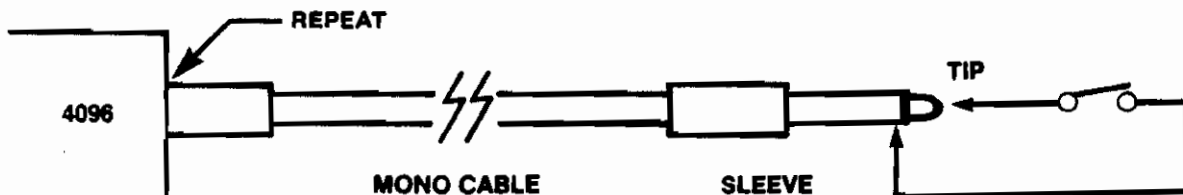
An external FEEDBACK jack is available at the rear panel to break the feedback path and allow the use of an external signal processor, such as a compressor, filter or EFFECTRON II, to operate on the echos as they are fed back. The TIP is the send terminal and the RING is the receive terminal as shown below.



A digital feedback path exists from the memory output to the memory input constituting an infinite repeat cycle. By depressing the red INFINITE REPEAT pushbutton to the "in" position, the digital memory is recirculated indefinitely. The resulting audio out is an echo that never dies out. To defeat the repeat function, simply push the red INFINITE REPEAT button so that it is returned to the "out" position.

The INFINITE REPEAT function is synchronized to the Metronome BAR indicator, i.e., the signal is sampled for a full bar before being held in infinite repeat. The SAMPLE/HOLD LED's indicate the actual operation.

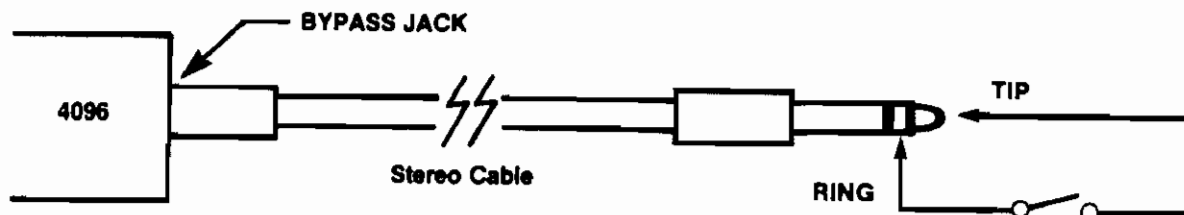
When the INFINITE REPEAT button is in the "out" position, you have the option of using the rear panel INFINITE REPEAT jack. By using a mono phone plug, you will now be able to activate the infinite repeat function via a foot switch. As shown below, by shorting the TIP to the SLEEVE, the digital memory will be recirculated indefinitely. To defeat this function, you simply disconnect the TIP from the SLEEVE.



Switch Close = Infinite Repeat  
Switch Open = Normal

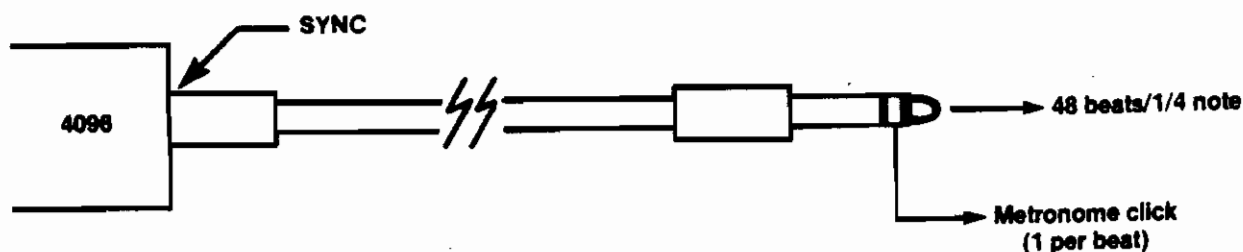


The last possible signal path is the BYPASS which requires the use of a stereo (three conductor cable) phone plug to be connected to the BYPASS jack located on the rear panel. By shorting the TIP to the RING, the pre-conditioned audio is directly routed through the cable and back to the de-emphasizing circuitry in the unit to bypass all digital and feedback signal paths. A simple scheme for doing this is shown below.



The following function is not in the signal path, but is used to control the basic bit rate clock to create special effects other than those that result by simple feedback. The DELAY FACTOR control varies over a 4-to-1 range.

The Metronome is used to synchronize your performance to the ECHOTRON simply by observing the BAR/BEAT LED's and/or listening to the "click" track available on the ring of the SYNC jack located on the rear panel. Also, the tip of the SYNC jack provides a signal that is intended to be used to sync various drum machines to the ECHOTRON as shown below.



The ECHOTRON is basically a simple to understand device, but because of its simplicity it is a very powerful effects tool.

## INITIAL SET UP

Due to the ECHOTRON's simplicity, there are no special setup requirements that need to be observed. We do, however, recommend the following settings be used as a starting point until you familiarize yourself with each control:

INPUT LEVEL	-	10 o'clock position (adjust as described later, using the LIMIT and ACTIVE LED's as guides).
FEEDBACK	-	0 (Center position)
INFINITE REPEAT	-	Start with button "out"
METRONOME	-	Start with button "in"
RANGE	-	Start with button "out" (Shorter delay range)
FACTOR	-	Center position
DELAY MIX	-	Center position (equal blend of source and echo sounds)
OUTPUT	-	(located on rear panel) Center position

Remember, these are initial settings which will be altered in later examples. Also, note that for best performance, the ECHOTRON should be fed from a low impedance output. High impedance outputs, such as guitar pickups will not drive the ECHOTRON properly and will pick up an annoying background tone.

**NOTE: IN ORDER TO INSURE RELIABILITY AND LONG LIFE BY PREVENTING FAILURES DUE TO UNNECESSARY THERMAL SHOCK, I.E., (HOT AND COLD VARIATIONS), THE ECHOTRON DOES NOT HAVE AN OFF/ON SWITCH. THE AVERAGE POWER CONSUMPTION IS LESS THAN 5 WATTS; THIS SHOULD NOT AFFECT THE OPERATING ECONOMY OF YOUR TOTAL SOUND SYSTEM.**

ECHOTRON applications fit in the following three categories:

1. CONVENTIONAL ECHO
2. SOLID-STATE TAPE LOOP EFFECTS ("INFINITE REPEAT")
3. SYNCHRONIZING DRUM MACHINES TO ECHO/LOOP TIMES

While similar, these involve different techniques and different typical control settings as described below.

#### 1. CONVENTIONAL ECHO

##### a. BACKGROUND:

Until recently, echo units were based on tape recording technology. While musically useful, these early echo units were prone to reliability problems since they included many moving parts. Solid state delay lines (which have no moving parts) are much more reliable, convenient and offer greater flexibility. The ECHOTRON is unique in that it can provide over 4 seconds of delay (or as little as 256 ms of delay), at a price which is far less than units with similar capabilities.

##### b. SUGGESTED CONTROL SETTINGS:

INPUT LEVEL — Adjust to suit.

FEEDBACK — At the center (0) position, you will hear one echo of the original signal. Turning the knob clockwise increases the number of echos; these echos are virtually exact replicas of the source sound. Turning the knob counterclockwise also increases the number of echos, but changes the tone of the echo to a less bright sound (less high frequencies). This option is extremely useful when you want the echos to sound more in the background than the source signal.

INFINITE REPEAT — Leave out for conventional echo effects.

METRONOME — Does not apply to this application except when doing the "Frippertonic" (extremely long echo) effects described later.

RANGE — For most echo applications, leave the RANGE switch out (256 to 1024 ms range). If greater delay is necessary, as with "Frippertonic" effects, push the RANGE switch in to cover the 1024 to 4096 ms range.

**FACTOR** — Select the exact desired echo time with this control.

**DELAY MIX** — To mimic the echo sounds associated with natural acoustic spaces (i.e., distance wall or canyon), mix the echo sound lower than the source signal (turn knob counterclockwise from center). For more of a repeat effect, mix the echo in equally with the source signal (center knob position).

c. **SPECIAL APPLICATIONS:**

**STEREO SPREADING** — For stereo effects, use a "Y" cord or similar signal splitter to feed a signal into both the ECHOTRON signal input and one mixer channel (or one amp of a stereo pair of amps). Send the ECHOTRON output to the other channel or amp, and set the DELAY MIX control to echo (full clockwise). Thus, only the echo signal goes to the second channel. If you're using a stereo mixer, adjust panning (stereo placement) to suit; typically, the source signal will go center or slightly off center, with the echo sound mixed oppositely.

**SYNCHRO-SONIC ECHO** — To synchronize echo time to the beat of a song, listen to the metronome output available at the ring connection of the SYNC jack. Adjust the FACTOR control so that the metronome clicks at a rate appropriate to the music — for example, a click every quarter note, eighth note, quarter note triplet, or whatever. It will take some trial-and-error before the metronome signal syncs up with the song; however, in most echo applications this synchronization need not be exact, but simply as close as you can set it. Alternately, if you do not want to listen to the metronome, turn the FEEDBACK control all the way clockwise and play a highly percussive note or tone into the ECHOTRON as the song is playing. If the percussive notes occur at too fast a rate relative to the tempo of the song, turn the FACTOR control clockwise. If they are too slow, turn the FACTOR control counterclockwise. Through a process of trial-and-error, you will eventually be able to closely match the echo time to the beat of the song.

**CHANGING ECHO PITCH** — If you vary the FACTOR control while a signal is passing through the ECHOTRON, the pitch of the signal will change. This is similar to varying the variable speed control on a tape recorder and of course, changes the delay time as well.

**"FRIPPERTONICS"** — This playing technique requires long echo times and has been popularized by guitarist Robert Fripp. Push the RANGE switch in, turn the FEEDBACK control fully clockwise, and play either long sustaining notes or clusters of repetitive notes (on guitar, synthesizer, or whatever). For example, play the tonic of a chord and let that repeat; play the third and let that repeat; then play the fifth and let that repeat. All three notes will now be echoing and feeding back to create a chord. At this point, either continue playing over the repeating chord or store the chord (as described in Section 2 below) and play a lead on top of the repeating chord sound.

NOTE that with this playing technique, if you have selected the longest delay range (1024 to 4096 ms) it is often difficult to feel the rhythm associated with long echo times. In this application, the metronome is invaluable. Set the metronome switch for the appropriate time signature (4/4 or 3/4); the BAR light will indicate the first note of each measure, with the BEAT light indicating each beat. By observing the flashing of these lights and playing along with them and/or listening to the metronome clicks available from the sync jack, your playing will be in sync with the echo rhythm.

## 2. SOLID-STATE TAPE LOOP EFFECTS

### a. BACKGROUND:

"Tape looping" is a popular electronic music effect which normally requires the use of a tape recorder. A particular sound (usually a few seconds long) is recorded and the end is spliced back to the beginning, creating a loop. This loop is threaded on to the tape machine and after the end has played, it loops back to the beginning and starts all over again. For example, if you looped two measures of drums, those two measures would repeat over and over and over and over and...

However, again this is a system with moving parts; the tape can wear out, and often the tape recorder will not work optimally when trying to play a loop instead of a conventional reel of tape. Once more, solid-state electronics comes to the rescue. The ECHOTRON can store (record) up to 4096 ms of a sound and automatically loop it indefinitely. These loops may also be easily synchronized to a piece of music.

### b. SUGGESTED CONTROL SETTINGS:

INPUT LEVEL — Adjust to suit.

FEEDBACK — Adjust as described earlier for the particular effect you want. If you want to loop a sound which includes lots of echos, turn the control off center. If you want to record just the source sound, set the knob to the center (0) position.

RANGE — For most looping applications, push in.

INFINITE REPEAT, METRONOME AND FACTOR — These controls work together to store sounds in a rhythmically correct fashion. Once stored, these sounds will repeat indefinitely.

Begin by selecting the correct time signature with the METRONOME switch. Carefully observe the BAR and BEAT lights and adjust the FACTOR control so that the time between flashes of the BAR light is the desired length of the loop. You may also listen to the metronome click

output from the ring connection of the SYNC jack if you would like to hear a click along with the flashing lights.

To store a sound, play at the tempo indicated by the metronome clicks or BAR/BEAT lights. Push the infinite repeat button in at any time between flashes of the BAR light. When the BAR light flashes again, the green SAMPLE LED will light to indicate that the ECHOTRON is storing whatever you are hearing. After the measure is finished (indicated by the next flash of the BAR light), the SAMPLE LED will go out and the HOLD LED will light, indicating that the ECHOTRON is in infinite repeat mode. Note that since the sample time is exactly one measure and starts and stops on the beat, it is easy to synchronize the sampling process to your playing.

To exit from the repeat loop, push the INFINITE REPEAT button a second time so that the switch is in the out position; the ECHOTRON will "play out" the stored sound once if there is no feedback, or the sounds will fade out if you have added some feedback.

NOTE that pushing in or releasing the INFINITE REPEAT button should be done relatively quickly. Pushing or releasing the button slowly allows re-synchronization options as described later.

DELAY MIX — To hear only the looped sound, turn this control full clockwise. To hear the looped and source sounds equally, turn the control to center position. To hear the source only, turn the control fully counterclockwise.

#### c. SPECIAL APPLICATIONS:

CHANGING THE PITCH OF A LOOP — Once a sound is stored, it may be transposed with the FACTOR control. Turn this control counterclockwise to raise pitch; clockwise to lower pitch. This is similar to the variable speed control found on tape recorders. Note that this will change the elapsed time of the loop as well as the pitch (higher pitch gives a shorter loop; lower pitch a longer loop).

EDITING THE LENGTH OF A LOOP — The ECHOTRON has limited editing facilities which may be useful in certain applications. If you store a sound with the RANGE switch in, and you are in infinite repeat mode, switching the RANGE switch to out will shorten the loop by one-fourth. Which section of the loop remains depends upon when you release the RANGE switch to the out position.

NOTE that these editing techniques will not work to lengthen loops if you store a sound while using the shorter delay range (RANGE switch out).

MULTI TRACKING — After storing a sound as indicated above, make sure that the FEEDBACK control is fully clockwise (hard setting). To store the new sound along with the old ones, push the INFINITE REPEAT button a second time so that the switch is in the out position. The

HOLD light will remain lit for one measure and you will continue to hear the previously stored sound(s). After the HOLD light goes out, immediately push the INFINITE REPEAT button in again. Start playing at the next flash of the BAR light: The ECHOTRON will begin storing your new sounds and the previously recorded sounds — since they are being fed back from output to input via the FEEDBACK control — will be recorded as well.

NOTE that once you go out of infinite repeat mode, the previously recorded sounds may become slightly softer with each succeeding measure, especially if the FEEDBACK control is not fully clockwise. Therefore, after going out of infinite repeat mode, go back into it as soon as possible (adding your new part at the same time) if you want to preserve the volume level at which the older "tracks" were recorded. With practice, you will be able to loop one set of notes; then add on, say, a continuous chord; then a bass figure; and so on, until you have a highly complex repeating pattern (just try that with a conventional tape loop!). Or, add a number of percussion parts — first a tambourine, then shaker, then handclaps, etc.

Remember to record background sounds first, since during subsequent passes they may go slightly more into the background. Also, remember to keep the FEEDBACK control all the way up when multi-tracking.

PRACTICING A LEAD OVER A CHORD PROGRESSION — If you have a chord progression which lasts less than 4096 ms, you may store it in the ECHOTRON as described above and practice playing leads over the repeating progression.

RE-SYNCHRONIZING THE METRONOME — It is possible to re-start (re-synchronize) the metronome by careful use of the INFINITE REPEAT switch. For example, suppose you are playing in 4/4, and want to re-start the metronome on the second beat of the measure rather than the first beat. Press the INFINITE REPEAT button in partway until the BAR light stays on. It will take some practice to work the INFINITE REPEAT switch so that the BAR light stays on. Release the INFINITE REPEAT button fully on the beat after where you want it to re-start (for example, if you want to re-start on the second beat, release the button on the third beat; to re-start on the third beat, release on the fourth beat and so on).

RE-SYNCHRONIZING THE METRONOME WHILE A LOOP IS PLAYING — While a loop is being held, let the INFINITE REPEAT switch out partway until the BAR light stays on. It will take some practice to work the INFINITE REPEAT button so that the BAR light stays on. Release the INFINITE REPEAT button fully on the beat after where you want it to re-start (see example above). Then, before the HOLD light goes out, quickly push the INFINITE REPEAT switch back in so that the loop continues to be held.

— If your drum machine is designed to a 96 pulses-per-quarter note standard, you must program the drum machine at double time. In other words, program eighth notes where you would usually program quarter notes, sixteenth notes where you would usually program eighth notes, and so on.

— Some drum units accept a variety of different clock pulses. For example, the E-mu "Drumulator", while set up initially for the 24 pulses-per-quarter note standard, can be programmed to accept 48 pulses-per-quarter note clock signals. Consult your particular drum unit's manual for information on external clock requirements.

— The PAIA Electronics "Master Synchronizer" will accept the ECHOTRON clock signal. However, the outputs are all at double-time; in other words, the quarter note output delivers eighth notes, the eighth note output delivers sixteenth notes, and so on. (Make sure this unit is switched to 24 pulses-per-quarter note and not 16 pulses-per-quarter note.)

c. SUGGESTED CONTROL SETTINGS:

INPUT LEVEL — Adjust to suit.

FEEDBACK — Adjust as described earlier for the particular effect you want.

RANGE — For most sync-to-drum applications, push this switch in.

INFINITE REPEAT — This switch may be in or out, depending on whether you're using the ECHOTRON for loop or echo effects.

METRONOME — Set for the desired time signature.

FACTOR — Set the tempo of the song using this control. Check tempo visually by looking at the BAR and BEAT LED's or audibly by listening to the metronome. Remember, with the RANGE switch in, BAR flashes on the first beat of each measure; BEAT on each beat of the measure. Note that in most cases you will not want to vary the FACTOR control in order to transpose the pitch of a stored sound as this will also vary the tempo of the drum unit.

DELAY MIX — Set as described earlier for the particular effect you want.

d. SPECIAL APPLICATIONS:

STARTING DRUMS IN SYNC WITH THE ECHOTRON — Observe the BAR and BEAT lights and/or listen to the metronome clicks. Press the drum unit's RUN (also called START) button simultaneously with the flash of the BAR light or the corresponding metronome click. If you are looping a sound, the drum unit will start playing at the beginning of the loop.



ECHO SYNCHRONIZED TO DRUM UNIT — Follow the steps given above for "Starting the Drums in Sync with the ECHOTRON". An echo will occur once per measure and will be synchronized with the drum sound as long as your playing is synchronized with the drums.

OTHER SYNCHRONIZATION TRICKS — If you have a drum such as the Drumulator which can accept a variety of pulse standards, you can play additional tricks (such as setting the ECHOTRON for double time, and dividing the external clock signal reaching the Drumulator by a factor of four; or setting the ECHOTRON for quadruple time and dividing the external clock signal reaching the Drumulator by a factor of eight). Thus, you can have relatively fast echo or loop times without having a correspondingly fast drum tempo.

#### 4. MISCELLANEOUS NOTES

USING THE FEEDBACK JACK ON THE BACK — The ability to feedback either "hard" (full bandwidth) or "soft" (less treble) signals already adds much flexibility to the ECHOTRON. However, if you want even less treble than that provided by the "soft" feedback option, you may insert a parametric, graphic or similar filter in the feedback path in order to further decrease high frequency response. Send the TIP signal to the input of the filter and return the filter output to the RING connection of the FEEDBACK jack. You may also boost the treble so that successive echos sound brighter or boost the midrange so that successive echos sound more "peaked". Or, add a phase shifter...or a pitch transposer...or a tremolo...or a special effects signal processor such as the DELTALAB EFFECTRON II...you get the idea.

NOTE that the hard and soft feedback option is still operative when you use the FEEDBACK loop jack and that the FEEDBACK control still determines the amount of feedback. Also note that if the processor inserted into the loop has greater than unit gain, oscillation (runaway echos) may result. If this occurs, turn down the output level of the external processor or reduce the amount of feedback set by the FEEDBACK control.

THE VIRTUES OF EXPERIMENTATION — The only way to fully appreciate the value of the synchronized effects offered by the ECHOTRON is through experimentation. Naturally, you can use the ECHOTRON as a straightforward echo unit with excellent results. However, it is the sync options which really make this unit stand out. Synthesizer-based groups can drive drum units and other equipment designed for the 48 pulses-per-quarter note standard with the ECHOTRON thus preserving correct synchronization between echo/loop times and song tempo. This opens up the potential for new types of synchro-sonic music which would otherwise be difficult to implement.

# SPECIFICATIONS

<u>DELAY RANGE</u>	256ms to 4sec.
<u>FREQUENCY RESPONSE</u> +1, -3dB @ -10dB below LIMIT	20 to 16kHz @ all delay settings
<u>DYNAMIC RANGE</u> A - Weighted	90dB typ., 85dB min
<u>DISTORTION</u> Ref 1kHz @ LIMIT	0.2% max
<u>INPUT RANGE</u>	(0.1Vrms to 8Vrms)
<u>OUTPUT LEVEL (@ LIMIT)</u>	+6dBV (2.0Vrms)
<u>METERING</u> LIMIT ACTIVE	0dB ref -20dB below ref
<u>REPEAT</u>	Repeats signal in full memory independent of delay setting. Varies with DELAY FACTOR.
<u>FEEDBACK</u>	Recirculates delayed signal to create multiple repeats through 12kHz Low Pass Filter (hard) or 3kHz Low Pass Filter (soft)
<u>SYNC (EXTERNAL)</u>	48 pulses per 1/4 note. TTL Level.
<u>BYPASS</u> REAR PANEL (EXTERNAL)	Shorted - bypasses total system; Open-normal operation.
<u>SIZE</u>	1 3/4x19x7in (4.45x48.3x17.8)cm
<u>SHIPPING WEIGHT</u>	10 lbs

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



## IN CASE OF DIFFICULTY

In many instances where difficulty is experienced, it is best to check out a few simple questions before "panic" sets in:

1. If the ECHOTRON appears to be inoperative, first see if the ACTIVE LED is lit most of the time. If it is not, check the INPUT LEVEL control. If it is, check the rear-panel OUTPUT control. If either of these controls is fully counterclockwise, you will not hear any signal coming out of the ECHOTRON.
2. If the sound is gritty and distorted, check the LIMIT LED. If it is lit consistently, reduce the input level control. Note that if you multi-track sounds using the infinite hold feature, the overall volume level can build up to a point where the LIMIT LED will light even though the individual "tracks" were recorded within acceptable limits.
3. If the sound is noisy, make sure you're feeding enough signal into the ECHOTRON. The LIMIT LED should light occasionally for best results.
4. Should you experience difficulty synching to drums, consult the operating manual for your drum unit. If the drums unintentionally play in double-time, check if the drum can be altered to accept 48 instead of 24 pulses-per-quarter note.
5. If this is your first use of the ECHOTRON, have you referred to the initial setup as suggested in the Owner's Manual?

Every effort has been made to insure trouble-free performance from each ECHOTRON. Should a problem occur, simply call collect and ask for Bruce Wayne at (617)256-9034. Should this be impractical, notify us by writing to:

DELTALAB RESEARCH, INC.  
ATTN: Customer Service  
19 Alpha Road  
Chelmsford, MA 01824

Describe the nature of the problem, the steps you have taken to diagnose it, serial number of the unit and whether or not you have retained the original shipping carton.

NOTE: If the unit must be returned to our factory, we will provide you with a Return Authorization (RA) Number which must be prominently displayed on the outside of the shipping carton. Any unit which arrives without a visible RA number may be refused by our Receiving Department.

 LIMITED WARRANTY

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DELTALAB RESEARCH, INC., ("DELTALAB") warrants to the first purchaser of a new DELTALAB ECHOTRON that the unit is free from defects in material and workmanship. DELTALAB's sole obligations under this warranty shall be to provide, without charge, parts and labor necessary to remedy defects, if any, which appear within ninety (90) days from the date of purchase.

This warranty is the sole and exclusive express warranty given with respect to the unit and all other express warranties are hereby excluded. IMPLIED WARRANTIES, INCLUDING THOSE OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED TO NINETY (90) DAYS FROM THE DATE OF PURCHASE. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU. DELTALAB IS NOT RESPONSIBLE FOR INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

This warranty does not apply if the unit has been:

- (1) Repaired, worked on or altered by persons unauthorized by DELTALAB in such a manner as to injure, in DELTALAB's sole judgment, the performance, stability or reliability of the unit;
- (2) Subjected to misuse, negligence or accident; or
- (3) Connected, installed, adjusted or used otherwise than in accordance with the instructions furnished by DELTALAB.

This warranty is valid only when the unit is returned to DELTALAB within ninety (90) days from the date of purchase, two-way freight prepaid, together with a copy of the original invoice from an authorized DELTALAB dealer.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

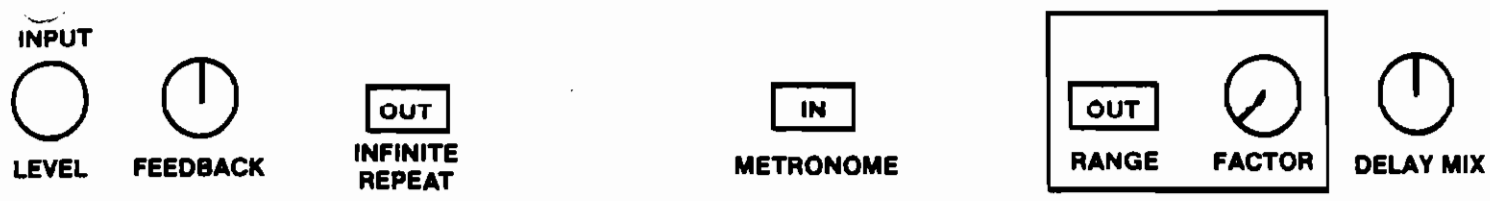
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**TYPICAL SET UPS**

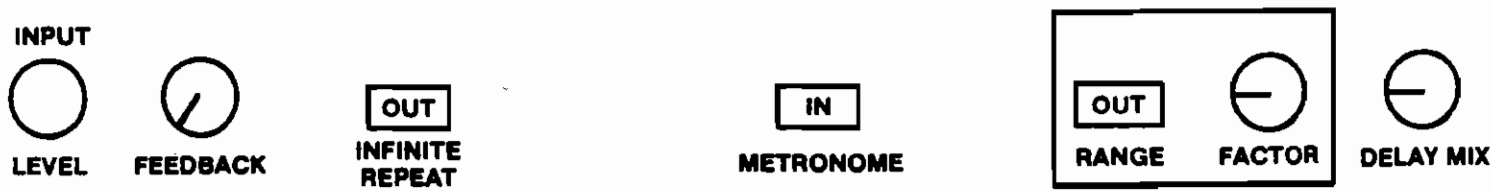
by: CRAIG ANDERTON

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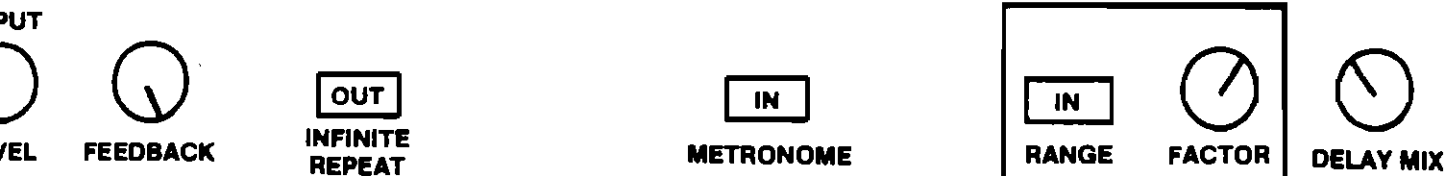
EFFECT: REPEAT

This setup gives a single repeat at the level as the original signal. Adjust INPUT LEVEL as described earlier; adjust FACTOR for desired amount of delay.



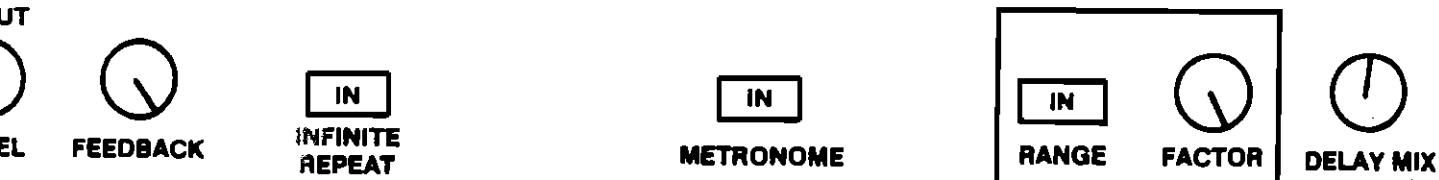
EFFECT: "NATURAL" ECHO

This setup simulates the sound of echo occurring in a natural space, where the echos lose brilliance as they fade away. Adjust INPUT LEVEL as described earlier and set FACTOR for the desired amount of delay.



**EFFECT: "FRIPPERTRONICS"**

This setup gives the long echo sound usually associated with the use of two tape recorders. Adjust **INPUT LEVEL** as described earlier, set **FACTOR** for the desired amount of delay, and adjust **DELAY MIX** for the correct blend of echoed and source sounds.



**EFFECT: SOLID-STATE RECORDING/LOOPING**

This setup lets you record a sound and repeat it. Adjust **INPUT LEVEL** as described earlier, set **FACTOR** for the desired time of the loop, and **METRONOME** for the desired time signature. Start off with the **INFINITE REPEAT** button out, push it in just before the beginning of a measure (as indicated by the **BAR** light or the metronome click), and play for one measure. Once stored, vary **FACTOR** to change pitch, and **DELAY MIX** to vary the mix of stored to source sounds.

INPUT



LEVEL



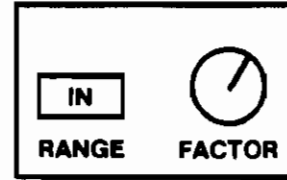
FEEDBACK



INFINITE REPEAT



METRONOME



RANGE



FACTOR



DELAY MIX

EFFECT: SYNC-TO-DRUMS

Refer to previous instructions on synchronizing the ECHOTRON to drums. Adjust INPUT, FEEDBACK, INFINITE REPEAT, METRONOME, and DELAY MIX for the desired ECHOTRON effect. Adjust FACTOR for the tempo of the song, as indicated by the BAR and BEAT lights or the metronome click; in most cases, you will want to leave the RANGE switch in. Start the drums on the beat by pushing the drum unit's RUN (also called START) button.

INPUT



LEVEL



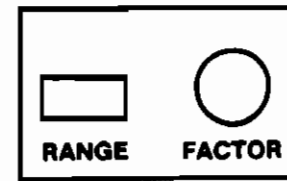
FEEDBACK



INFINITE REPEAT



METRONOME



RANGE



FACTOR



DELAY MIX

EFFECT:

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\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



PUT  
LEVEL

○  
FEEDBACK

□  
INFINITE  
REPEAT

□  
METRONOME

□ ○  
RANGE FACTOR

○  
DELAY MIX

EFFECT:

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PUT  
LEVEL

○  
FEEDBACK

□  
INFINITE  
REPEAT

□  
METRONOME

□ ○  
RANGE FACTOR

○  
DELAY MIX

EFFECT:

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The information contained herein is believed to be reliable but no responsibility is assumed for inaccuracies. Circuit diagrams are included to illustrate typical circuit applications and do not necessarily contain complete constructional information. Furthermore, the information contained herein does not convey any license under the patent rights of DELTALAB RESEARCH, INC or others.

