

*Human*  
**CLOCK**  
T.M.

WHAT IS THE HUMAN  
CLOCK ANYWAY?

BASIC SET-UP  
RECOMMENDED  
SETTINGS  
CONTROL AND  
ADJUSTMENT  
FRONT PANEL  
CONTROLS  
REAR PANEL  
CONTROLS  
SPECIFICATIONS

# OWNER'S MANUAL AND OPERATING INSTRUCTIONS

AN AMERICAN INVENTION BY™

**Kahler**  
MADE IN USA



© APM P.O. BOX 9305 ANAHEIM, CA 92802

PATENT PENDING

**WHAT IS THE  
HUMAN CLOCK,  
ANYWAY?**

The HUMAN CLOCK is a device that listens to rhythmic analog input, calculates tempo and outputs MIDI clocks. You will find the HUMAN CLOCK useful in a variety of musical situations such as:

1. syncing drum machines and sequencers to live musicians on stage allowing them to enhance their sound without the cost of extra musicians or "playing to a machine".
2. eliminating MIDI delay.
3. syncing drum machines and sequencers to a tape that contains no "sync" code.
4. enhancing the feel of sequenced material by allowing the machines to follow the subtle variations in tempo created in "live" performance.
5. replacing lost sync tracks.
6. Allowing record producers to make records in a new way in which drum machines and sequencers are utilized but driven by live musicians so the resulting music has the sound and consistency of machines **as well as** the feel of live performance.

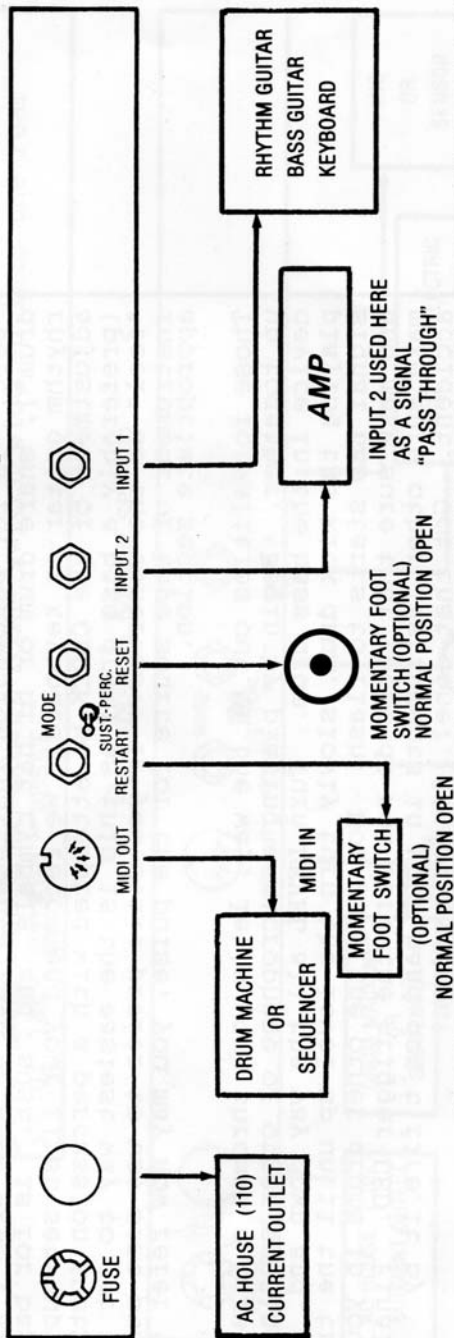
**GETTING STARTED**

**BASIC SET-UP**

First, you will need a MIDI device to drive, such as a drum machine or sequencer. Any device which has a MIDI "sync" input that accepts MIDI clocks will do. (See set up diagrams) Preferably, the musical material is something with which you are familiar.

Next, you will need to determine how to connect your instrument to the **HUMAN CLOCK**. Basically, you need only get a signal to the **CLOCK** hot enough to activate the trigger. (about -30db is required) A simple microphone is great for percussion instruments and a direct signal out from electric guitars, basses and keyboards works well.

### Sustain Mode set-up



**NOTE:** Should you choose to use a contact-type mike when connecting a percussion instrument to the clock, be sure it is securely fastened to the drum surface so as to preclude vibration. This will prevent any "after-shock" or mike-bounce from being read by the clock as additional trigger input.

## SETTING THE LEVEL

The **HUMAN CLOCK** is designed to read pulse output from a musical instrument such as the bass drum (kick drum) of a drum kit, an electric bass, rhythm guitar or keyboard. These instruments fall into two categories as far as the **HUMAN CLOCK** is concerned. (See "perc. and sust." switch on the back panel) Be sure this toggle switch is set to correspond to the type of instrument you will be using to trigger the **CLOCK**. As the switch position names imply, "perc." is for percussion instruments such as bass drum ("kick drum"), snare drum or hi hat cymbals, and "sust." is for bass, rhythm guitar or keyboard. We recommend your first set-up and adjustment of the **CLOCK** be attempted with a percussion instrument (preferably a bass drum) as this is the easiest way to get the "feel" of the controls. If you still prefer to use some other instrument or tape source for the pulse, you may now refer to the appropriate section.

Those formalities out of the way, let's work through a first set-up together. Begin by placing a microphone or other sensing device in the bass drum. Turn **LEVEL** all the way down and, while playing the kick drum, slowly turn the level up until the trigger signal **LED** starts to flash. Now play the other drums in your kit and make sure that these do not fire the trigger **LED**. Finally, make sure other instruments in your band don't fire it by accident. Got that done? If so, read on!

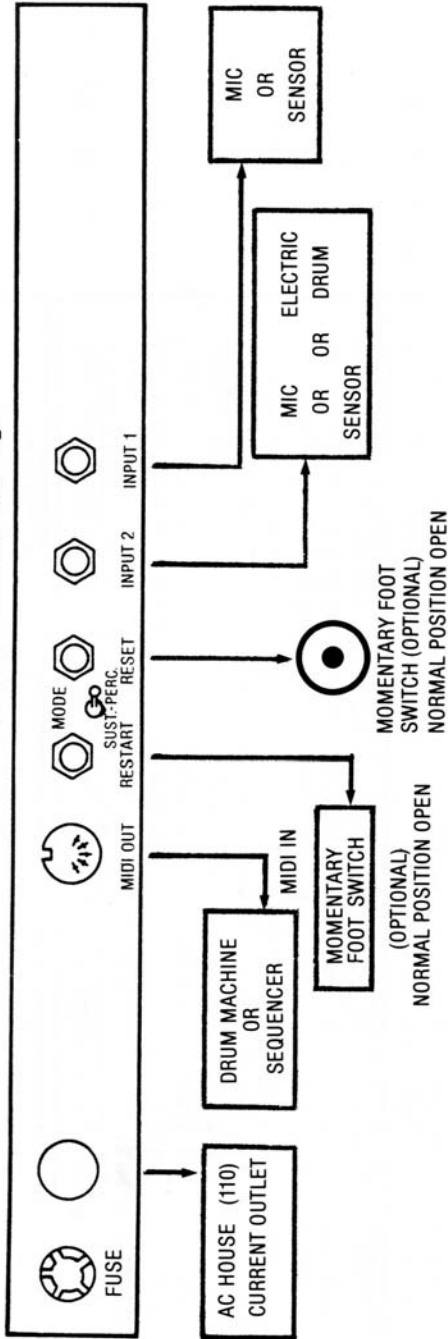
## SETTING MASK

For drums, set **MASK** to 1 or 2. To prevent retriggering on sustain instruments, set **MASK** to a higher number.

**USE THESE SETTINGS**

Next, set **ADVANCE** and **FEEL** to 1, **SENSIVITY** to 2 and **SMOOTH** to 3.  
 (Note: If you want to see how much you can make the **HUMAN CLOCK** move the tempo around, place the **SMOOTH** setting at 1. After you've gotten this urge out of your system and you've proven to yourself that the **CLOCK** really does do something, place the **SMOOTH** setting to 3 as this setting will allow the **HUMAN CLOCK** to accept complicated patterns and not be confused.) These settings will work for 90% of playing situations. Press **RESET** on the front panel or a momentary foot-switch plugged into the rear panel jack marked "RESET."

**Percussion Mode set-up**



## GET A MEASURE LENGTH

The **HUMAN CLOCK** needs to know how long a measure is in order to know what tempo at which to play initially. Communicating this to your **CLOCK** is easily done during a typical count-off. Think of the tempo you want and hit the Kick drum on 1 (that is, the first beat of the imaginary measure at the desired tempo). Now think to yourself "2, 3, 4," in tempo, and hit the Kick drum on the next 1. Now the **HUMAN CLOCK** knows how long a measure is so it knows the tempo. The next time (the third time) you strike the drum, the **HUMAN CLOCK** will start whatever sequenced material is programmed. The **CLOCK** will assume that this third hit is on 1. (Every time the drum is struck thereafter, the **HUMAN CLOCK** recalculates the tempo) **NOTE:** You can also plug another mic or electronic drum pad into **INPUT 2** on the rear panel and set the measure length as described above with a second device. This is the silent, sneaky way.

## TRY IT OUT

Now give the bass drum that third hit and start playing some simple time and your drum machine or sequencer will play along with you. With the settings given above, the **HUMAN CLOCK** will follow normal tempo variations. That is to say, if you change tempo fairly drastically while the **HUMAN CLOCK** is set in the above manner, it will ignore you. This is a safety feature: In case you fall off your drum throne, the tempo won't go to 500 beats per minute. Now stop playing. Notice the drum machine or sequencer continues to play at the last tempo you played until you resume playing and change tempo or turn it off by pressing **RESET** or **RESTART** at the front panel or with the footswitch.

## SETTING ADVANCE

Most drum machines, code converters or sequencers have a bit of delay (frankly, so do some "live" players we've encountered) which ruins the feel of the music. The **ADVANCE** control is

## SETTING SMOOTH

High **SENSITIVITY** - 1 or 2 - means that little changes in tempo go right to the drum machine or sequencer. If this setting makes the result feel jerky to you, set the **SENSITIVITY** to a higher number. Low **SENSITIVITY** - 3 or 4 - means little tempo changes are smoothed out (ignored). If the results from the **CLOCK** feel sluggish to you, set the **SENSITIVITY** to a lower number. A sensitivity setting of 2 works for most situations.

This section will provide clarification on Window and Speed, the two clock performance factors controlled by the **SMOOTH** adjustment. Window refers to the period of time around each 8th note that the trigger signal is accepted by the **CLOCK**. Each Window setting carries with it certain characteristics of which you need to be aware in order to decide which setting best suits your particular application of the clock:

Window A (1 & 4): This is the widest setting and will allow the **HUMAN CLOCK** to follow more drastic changes in tempo. However, in this mode the **CLOCK** is more apt to interpret a complex bass pattern, 16th note triplets for example, as a major change in tempo.

Window B (2 & 5): This is a medium setting and is a compromise of the characteristics of A & C.

Window C (3 & 6): This is a narrow setting which will allow the **HUMAN CLOCK** to behave dependably through bizarre patterns. However, you have to change the tempo more gradually for the **HUMAN CLOCK** to follow you.

## WINDOW

**NOTE TO DRUMMERS:** If your style of playing incorporates simple bass and snare patterns then try a **SMOOTH** setting of 1. If your style of playing



utilizes complex bass drum patterns (such as triplets), try a **SMOOTH** setting of 3. Whatever your style, experimentation is the key to getting the best results.

### SPEED

**Speed** refers to how fast the **HUMAN CLOCK** will adjust to a change in tempo. Speed A (Smooth knob settings 1, 2 and 3) will allow quick changes. (This is especially useful if you play a lot of circus gigs!) Speed B (Smooth knob settings 4, 5 and 6) will smooth out more drastic tempo changes. Use Speed B if the even 16th's your sequencer puts out sound jumpy when you play. NOTE: Use 4, 5 and 6 only as "fixes" for jerkiness. The best performance is usually found with **SMOOTH** set at 2 or 3.

Now you're ready to push the **HUMAN CLOCK**. If you're like us, you'll immediately try to see how badly you can confuse the clock. Let's face it, it's an irresistible challenge. So go ahead and play your best (or worst) stuff and find the limits of the machine. BUT, once you have done that, just play time underneath some of your favorite sequenced stuff and you'll learn to love the clock. Have fun!

### AND NOW, MORE ON CONTROL AND ADJUSTMENT

### SYNCING TO "SUST." INSTRUMENTS

The **HUMAN CLOCK** looks for and interprets rhythmic events. As mentioned earlier, the internals of the clock are designed to accommodate two general types of instruments, sustaining and non-sustaining. When utilizing sustaining type instruments such as rhythm guitar or bass guitar with the **HUMAN CLOCK**, set the mode switch on the rear panel to the "sust." position. If you're playing chords, using a noise gate will eliminate false triggering. Notice that the trigger **LED** will only go after a silence. Notes within a sustain are ignored.



## HINTS FOR LIVE MUSICIANS

If you want to change the tempo on purpose, it is better to play more rather than less. You can change tempo more radically by playing quarter notes or 8th notes than you can with just down-beats. Doing bizarre patterns while changing tempo is not guaranteed. A little experimentation is the best way to discover all that is possible.

## SYNCING TO TAPE

The **HUMAN CLOCK** will sync to any rhythmic event. Imagine you have a recording in progress to which you wish to add some sequenced material and you have no sync track or even worse, you **HAD** a sync track and somehow it dropped off the tape. Here's an example of what you can do:

In a test process we encountered a record producer that had lost the sync track on a tune he was developing. All he had left was a composite rhythm track. We EQ'd the track to make the bass the loudest instrument, gated the result, and came up with a belch-like sound that was rhythmic enough for the **CLOCK** to sync to. It was necessary to **ADVANCE** the **CLOCK** a bit to compensate for the gate, but we were able to regenerate the lost sync track and save the producer lots of time, effort and money.

Not all cases are this extreme because usually you'll have a bass drum on a separate track. In this case, simply gate to eliminate leakage (if necessary) and you're ready to proceed.

If you run into a case in which the tempo is somewhat erratic and you want to lay an even 8th note or 16th note pattern on top of it, you may hear the pattern flex with the movement of the track. Here's what to do. If adjusting the **SENSITIVITY** and **SMOOTH** knobs doesn't make enough of it go away, here are two suggestions:

- 1.) Make the **HUMAN CLOCK** sync to both the kick and the snare. The drummer's time may be sort of an average between the two. Note: This technique is also useful in live situations.
- 2.) Sync the **HUMAN CLOCK** to the drums as normal and make the **CLOCK** drive a drum machine or sequencer playing quarters or halves and record that. Now sync the **HUMAN CLOCK** to what you've recorded and you should find that it will drive right down the middle of the drummer's time.

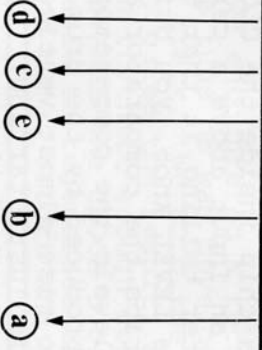
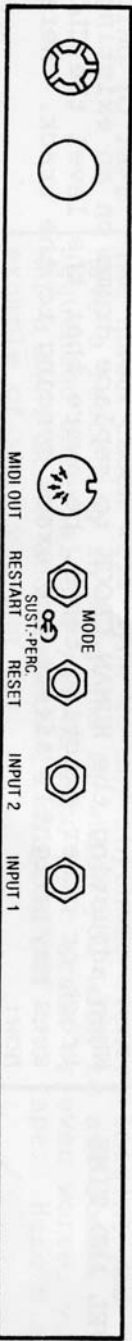
## LEVEL AND TIME

When adjusting the **HUMAN CLOCK** to replace drums on an existing track or other exacting tasks, be aware that the level the **CLOCK** sees may slightly affect the exact syncing to the track. Here's how:

There is a chip inside the **CLOCK** called a comparator. When this chip sees an input above a certain level, it sends a message to the computer telling it that the drum has been hit. (When you adjust the **LEVEL** knob, you bring up the input signal to the point that it trips the comparator and you see the trigger **LED** flash). At lower levels the comparator will trip at the very top of the waveform produced by the drum. At high levels, the waveform appears to rise almost vertically and the comparator will trip as the wave is just starting. There can be a time difference between the top of the wave and when the wave is just starting, so **LEVEL** will affect when the **CLOCK** sees the drum hit. Keep the **LEVEL** the same when fine tuning the **FEEL** and **ADVANCE** settings when you're after very exact syncing and everything will be fine.

Also, the warning about too much advance doesn't apply when syncing to tape. Certainly you can advance it too much and it's best to be careful, but those of you into madness may enjoy the effect of humongous **ADVANCE**.

# Rear Panel Controls/Jacks



REAR PANEL CONTROLS/JACKS

- (a) **INPUT 1:** Low impedance input for whatever triggering device you choose to use for the clock.
- (b) **INPUT 2:** Auxilliary input (parallel wired to input 1) which can be used for:
  - a. instrument through
  - b. additional triggering source for silent count off or double triggering
- (c) **MODE:** Mode tells the clock what type of instrument it is listening to. Place the mode switch in PERCUSSION position when triggering from drums. Use SUSTAIN position for basses, guitars, keyboards or other instruments whose sound sustains. Note: in this mode the human clock is deaf to additional input signal while the instrument is sustaining. It will retrigger only after a brief period of silence.
- (d) **RESET:** When connected to a momentary switch (normal position open) clears the **HUMAN CLOCK** and tells it to get ready for a new tempo.
- (e) **RESTART:** When connected to a momentary switch (normal position open) prepares the **HUMAN CLOCK** to resume with the tempo it last maintained when it sees the next trigger input.

## FRONT PANEL CONTROLS

- a** **SENSITIVITY:** Controls how much of a tempo change is sent from the **HUMAN CLOCK**. A setting of 1 means the **most** change; a setting of 4 means the **least** change. For most applications, use a setting of 2.
- b** **SMOOTH:** Controls two different functions, **WINDOW** and **SPEED**. **WINDOW** refers to the time around each 8th note that trigger signal is accepted. **SPEED** refers to how fast the clock will adjust to change in tempo.  
**NOTE:** **SMOOTH** is read only when **RESET** or **RESTART** is pushed.
- c** **ADVANCE:** Compensates for processing and/or **MIDI** delay in the drum machine, sequencer or code converter the **HUMAN CLOCK** is driving. A higher number means more advance.  
**NOTE:** Advance is only read when **RESET** or **RESTART** is pushed.
- d** **FEEL:** Allows you to put the drum machine or sequencer more "on top of" or "behind" the beat. This is in addition to or separate from **ADVANCE**. The **FEEL** parameter is read at every measure, allowing adjustment while the machine is playing.
- e** **LEVEL:** Controls the gain of the trigger source to the **HUMAN CLOCK**. Note: Over-driving the level will cause poor performance. ALSO SEE: **LEVEL & TIME**.
- f** **MASK:** Controls how long the **HUMAN CLOCK** is "deaf" (or masked) to more incoming trigger signal. The length of time the trigger LED glows is the length of the mask. To read a kick drum, a mask of 2 should work fine. To read a bass, piano or other sustain type of instrument, a longer mask is recommended.
- g** **RESTART:** Prepares the **HUMAN CLOCK** to resume with the tempo it last maintained when it sees the next trigger input.
- h** **RESET:** Clears the **HUMAN CLOCK** and tells it to get ready for a new tempo.

HELP!!!!  
 THIS @##`&\*+=!?:  
 THING DOESN'T  
 WORK!!!!

1. Is the **CLOCK** "seeing" what you think it's "seeing". Is there a loose connection to your microphone or are other instruments possibly triggering the **CLOCK**. To determine whether or not the proper pulses are being delivered to the clock, simply watch the trigger LED while you are playing and watch for continuity.
2. If triplets are confusing the **CLOCK**, use a narrower window.
3. If sudden changes in tempo are not tracked, use a wider window or also feed the snare drum along with the bass drum into the **CLOCK**.
4. If a bass drum pattern with a lot of "space" is played, and the **CLOCK** seems to get lost, try feeding the snare drum to the **CLOCK** in addition.
5. When all else fails, place **SENSITIVITY** on 2, **SMOOTH** on 3, **ADVANCE** and **FEEL** on 1. Then retry suggestions 1 through 4.

HUMAN CLOCK  
SPECIFICATIONS

Input impedance: 100k ohms	ADVANCE SETTINGS	MIDI CLOCKS	FEEL SETTINGS	mS (milliseconds)
Input Level: -50db to 0db	1	+1	1	-1
Response Time: .5uS @ 10K Hz	2	+2	2	-3
110V A/C	3	+3	3	-5
	4	+4	4	-7
	5	+5	5	-9
	6	+6	6	-11
	7	+7	7	+1
	8	+10	8	+3
Output MIDI Clocks (\$F8), MIDI START (\$FA)				