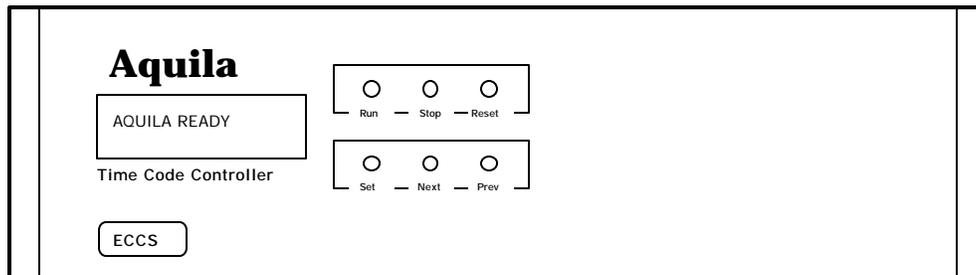


# The MegAquila Time Code Synchronizer



**Software Version 1.10**

**11/24/04**

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## The MegAquila

The *MegAquila* is a derivative product based on the *MegAquila* Time Code Controller. The *MegAquila* is designed to provide synchronization between a motion film projector and a SMPTE locked sound source. The *MegAquila* reads a projector based 'tachometer' that allows it to count movie frames, converts the frame count to an equivalent SMPTE time count (30 frame per second format), and outputs the SMPTE time to any sound source that can 'chase' and lock to the SMPTE signal. The *MegAquila* has additional digital inputs that can identify start and end frames. Also included are digital inputs that set the projector frame rate to which the *MegAquila* must synch.

In addition to its primary duties as noted above, the *MegAquila* can also operate as a stand-alone SMPTE time code generator.

### The LCD Display

During operation, the front panel LCD display shows current *MegAquila* time, which is referenced to the current film frame. This time is displayed on the bottom line of the display along with the current film speed setting.

The top line of the display is used to present the current projector status, including direction and speed information. On power up, the top line will indicate the current version of the *MegAquila* firmware.

### The LCD Display Backlight

Operation of the LCD display light is controlled by means of the 'NEXT' and 'PREV' buttons on the front panel. When the *MegAquila* is in normal mode of operations (not in 'SETTINGS' mode), the backlight may be activated by pressing the 'NEXT' button. Pressing the 'PREV' button will deactivate it.

### Using the Controls to Output Time Code

When the *MegAquila* is in the **NO PROJECTOR** mode, it can be used as a freestanding time code generator. Pressing the 'RUN' button will activate the time code output and start the *MegAquila* writing time code. Pressing 'STOP' will halt the time code output, but will not reset the time to 0. (A subsequent pressing of the 'RUN' button will restart the time code at the place it was 'STOPPED'.) Pressing the 'RESET' button will stop the time code and reset the time to 0.

## Using the Controls to Set the Personality

The *MegAquila* provides a convenient menu driven method of setting operating characteristics, or 'personality', by means of the LCD display and the 'SET', 'NEXT', and 'PREV' buttons. Menu selections may be viewed or altered at any time. However, changing the personality while the projector is operating may cause the *MegAquila* to lose synchronization with the projector.

To view or change menu selections, enter SETTINGS MODE by pressing 'SET'. The top line of the display indicates the characteristic under consideration, while the bottom line indicates the current selection for that characteristic. The 'NEXT' and 'PREV' buttons move you through the selections for the current characteristic. To keep a selection, press 'SET'. This will also move you to the next characteristic to be considered.

After all characteristics have been viewed, the *MegAquila* will return to the normal operating mode. Any changes made will be maintained until they are changed again, even if the *MegAquila* is powered down between uses.

If you press 'RESET' at any time during the menu selection process, the *MegAquila* will immediately exit the menu *without altering the current characteristic* and return to normal operations.

The following table lists the characteristics and selections available, and provides a short description of each.

The menu settings can be *locked* so that they can not be accidentally changed. The last menu selection will allow you to lock or unlock the settings.

### *MegAquila* Characteristics and Settings

MODE:	FLYING START	SMPTE follows film frames only between the START OF FILM flag and END OF FILM flag.
	CONTINUOUS	SMPTE always follows film frames unless INHIBIT TIME CODE flag is asserted.
	NO PROJECTOR	SMPTE generation controlled from front panel controls.
BAUD RATE:	300	Sets baud rate of serial port (for firmware updates).
	..... 76800	
COMM ECHO:	OFF	Characters from host not echoed back to host
	ON	Characters from host echoed back to host.
SET DEBUG MODE:	OFF	Used primarily for software debugging, this mode can be activated to allow certain operational variables to be displayed on the LCD
	ON	
LOCK:	OFF	EDIT SETTINGS OK
	ON	SETTINGS LOCKED

## The RESET Button

When the MegAquila is in either FLYING START or CONTINUOUS mode, pressing the RESET button twice in succession will reset the time code to 00:59:52:00. If the unit is in FLYING START mode, the time code will not advance until the START OF FILM flag has been activated.

## Counting Motion Picture Frames

The MegAquila supports a quadrature mode incremental encoder (tachometer) to track the projector frame count in both forward and reverse motion. It assumes that there are 10 tach pulses per movie frame. It can also supply a small amount of supply current to operate the encoder, so that a separate power supply is not required. The connector pinout follows:

### DB-9 Tach Connector Pinout

1	Vext - 5VDC, internally fused at 500ma	6	Shield ground
2	Signal ground	7	Signal A
3	Signal B	8	NC
4	NC	9	NC
5	NC		

### SMPTE Time Code Out

The SMPTE time code generated by the MegAquila is fixed at 30 frames per second. The time code signals are available at a female DB-15 connector located on the rear panel. This connector is known as the *Auxiliary Connector*. These are balanced, floating, high impedance signals which allow direct connection with most time code sources without worrying about ground loops and hums. The time code pins of interest are listed in the table below. Note that Frame Ground (pin 9) cannot be used as a signal ground. Use the (+) and (-) pins for Time Code In and Time Code Out for proper operation.

### DB-15 Auxiliary Connector Pinout

1	NC	9	Ground
2	Time Code In (+)	10	Time Code In (-)
3	Time Code Out (+)	11	Time Code Out (-)
4	+5VDC Out	12	NC
5	NC	13	NC
6	NC	14	NC
7	NC	15	NC
8	NC		

## Digital Inputs and Signaling

The *MegAquila* provides two switch closure outputs (SW1, SW2) and six digital input bits (IB1 - IB6) to provide various signaling and control functions.

The switch closure outputs are defined as follows:

- SW1 - Active (closed) when tach is running.
- SW2 - Active (closed) when valid time code is being generated.

The meanings of some of the input bits will vary according to the **MODE** of operation to which the *MegAquila* is set. **MODE** selection is performed by means of the front panel menuing system of the *MegAquila*.

These input bits are defined as follows for the **FLYING START MODE** of operation. Note that *MegAquila* time code will not follow tach motion until Input Bit 1 (IB1) is triggered.

- IB1    **START OF FILM** flag - An active input pulse will reset frame time to 59:52:00. Time Code will follow tach after this trigger pulse.
- IB2    **END OF FILM** flag - An active input pulse will reset frame time to 59:52:00. Time Code will not follow tach until the **START OF FILM** flag is triggered.

These input bits are defined as follows for the **CONTINUOUS MODE** of operation. Note that *MegAquila* time code *always* follows tach motion, unless IB2 is held active.

- IB1    **RESET TIME CODE** - An active input pulse will reset frame time to 59:52:00.
- IB2    **INHIBIT TIME CODE** - *MegAquila* time code will follow tach unless this input is held at an active level.

These input bits are defined to handle certain auxiliary functions in either **MODE** of operation:

- IB3    **RESET TIME CODE** - An active input pulse will reset frame time to 59:52:00.
- IB4    **OUTPUT ASCII STRING** - Transmit ASCII string 'RS<cr>' on serial port.

These input bits are defined to set the expected film speed in either **MODE** of operation. In the following table, '1' represents an 'active' input, while '0' represents an 'inactive' input.

	IB6	IB5	
24fps	0	0	; this is the default if left unconnected
30fps	0	1	
48fps	1	0	
60fps	1	1	

All six digital inputs can be configured so that they will operate by being pulled high or pulled low. Also, the digital inputs can be configured so that either the inputs can be actively driven, or so that the inputs can be triggered with simple switch closures.

## Digital Inputs Configured For Low Common (High Active) Operation

*Note: This is how MegAquila units are normally shipped.*

On the 6811MEG Rev A circuit board inside the MegAquila, shorting jumpers should be placed as follows for *high active* operation:

1. On the 6 five pin headers W13-W18, place jumpers so that pins 1-2 and 3-4 are shorted.
2. Place a jumper on the two pin header W25.
3. Place a jumper on the two pin header W26.

Inputs are brought high (usually user supplied 5-24VDC) to turn them on. Inputs left unconnected will be off.

### DB-25 Control Pinout

*(Inputs Jumpered Low Common/High Active)*

1	SW1-Com (Tach Running)	14	SW1-NO (Tach Running)
2	SW1-NC (Tach Running)	15	GND
3	SW2-Com (Time Code Valid)	16	SW2-NO (Time Code Valid)
4	SW2-NC (Time Code Valid)	17	GND
5	IB1 (high = on)	18	
6	IB2 (high = on)	19	
7	IB5 (high = on)	20	
8	IB6 (high = on)	21	
9	IB3 (high = on)	22	
10	IB4 (high = on)	23	
11	+5VDC Out	24	+5VDC Out
12	Signal Ground	25	Signal Ground
13	GND		

The Input Bits can be driven with TTL or CMOS logic, with transistors, or with switch closures. You can use the +5VDC (pin 24) as the voltage source to provide the logic 'high' signal.

Note that for current MegAquila units (using the 6811MEG Rev A circuit board), either the Control 1 connector or the Control 2 connector may be used, as their pinouts are identical. On earlier MegAquila units (using the 6811MEG Rev 0 circuit board), use the Control 1 connector.

## Digital Inputs Configured For High Common (Low Active) Operation

On the 6811MEG Rev A circuit board inside the MegAquila, shorting jumpers should be placed as follows for *low active* operation:

1. On the five pin headers W13-W18, place jumpers so that pins 2-3 and 4-5 are shorted.
2. Place a jumper on the two pin header W26.
3. Place a jumper on the two pin header W25.

Inputs are brought to ground to turn them on. Inputs left unconnected will be off.

### DB-25 Control Pinout

*(Inputs Jumpered High Common/Low Active)*

1	SW1-Com (Tach Running)	14	SW1-NO (Tach Running)
2	SW1-NC (Tach Running)	15	GND
3	SW2-Com (Time Code Valid)	16	SW2-NO (Time Code Valid)
4	SW2-NC (Time Code Valid)	17	GND
5		18	IB1 (low = on)
6		19	IB2 (low = on)
7		20	IB5 (low = on)
8		21	IB6 (low = on)
9		22	IB3 (low = on)
10		23	IB4 (low = on)
11	+5VDC Out	24	+5VDC Out
12	Signal Ground	25	Signal Ground
13	GND		

The Input Bits can be driven with TTL or CMOS logic, with transistors, or with switch closures. You can use the Signal Ground (pin 25) to provide the logic 'low' signal.

Note that for current MegAquila units (using the 6811MEG Rev A circuit board), either the Control 1 connector or the Control 2 connector may be used, as their pinouts are identical. On earlier MegAquila units (using the 6811MEG Rev 0 circuit board), use the Control 1 connector.

## Using the MegAquila with the Fostex D2424LV Digital Audio System

The ECCS MegAquila and the Fostex D2424LV (D24) can be used together to provide multi channel synchronized sound playback for motion picture systems. The D24 must have the Fostex Model 8346 TC/SYNC card installed.

In this scenario, the MegAquila is used to generate a film frame based SMPTE time code reference. The reference is sent to the D24, which uses it to synchronize the audio playback. It is necessary to hook up the time code output of the MegAquila to the time code input of the D24. You must also put the D24 in CHASE mode by pressing and holding the <SHIFT> key and pressing and releasing the <ENTER/YES> key on the D24 controller.

As for the D24, certain configuration settings are critical for proper operation, while others are not applicable. For details on the setup and operation of the D24, please consult the manual for that unit. What follows is an attempt to provide just enough information to get started.

In order to use the D24 in this application, configuration menu settings must be correct. These settings are edited using the detachable controller included with the unit. To check or change settings, press <SETUP>. Use the jog wheel to scan through the Parameters. To change a Setting for a Parameter, press <ENTER/YES>, then use the jog wheel to scan through the Settings for the given Parameter. To accept the new setting, press <ENTER/YES>. To exit without making changes, press <EXIT/NO>. To return to operational mode, press <EXIT/NO> until the main menu is reached.

The following parameter list is valid for D2424LV firmware version 1.05. Other versions may have different parameters or settings. If encountered parameters are not listed here, check the Fostex manual in an attempt to determine the correct value. If a setting is not listed, the best bet is to leave it be. Each new PGM (program) will require the user to check the settings. This setup is intended only as a “quick setup” reference. If your unit is not working as expected in your situation, you’ll have to crack the manual. Good luck!

On the D24 Front Panel you should see:      16-bit, 48.0 kHz, clock=INT

<b>Parameter</b>	<b>D2424 Settings and Notes for This Application</b>
Signature Set	<i>Not applicable</i>
Tempo Map Set	<i>Not applicable</i>
Title Edit	<i>Enter name of Program (Film)</i>
Track Name Edit	
Delete PGM	<i>Deletes current program; be careful.</i>
Click	Off
PreRoll Time	00s
Midi Sync Out	Off
Frame Rate	<b>30nd</b>
MTC OFFSET	<i>When chasing external TC, set this value to sync with master</i>
Offset Mode	<b>ABS</b>
Ref TC	<b>LTC</b> active only with TC option installed
Slave Type	<b>Vari</b> or <b>Free</b>
Rec Protect	On ( <i>Off only when ready to record.</i> )
Data In	<i>Select analog or digital source for recording.</i>
Data Out	<i>Select digital format for optical output.</i>
Resolution	Off
Device ID	<b>00</b> (01 if MIDI automated by ECCS)
Clock Sel	<b>Int</b> only valid when recording digital inputs
Sync Preset	<i>Active only when TC option installed</i>
No. of Event	<i>Not applicable</i>
Virtual LTC	Ena <i>active only when TC option installed</i>
Offset Disp	Off <i>active only when TC option installed</i>
Auto EE Mode	Off
Foot SW	Punch IO
Mark Stop MD	Off
Reserved	<i>Not implemented in this version</i>
BAL/UNBAL	<i>Selects balanced or unbalanced analog I/O</i>
Contrast	00 – 12 <i>this number represents meter brightness</i>
Reserved	<i>Not implemented in this version</i>
Sample Rate	
Drive Info	<i>Displays information about the Hard Disk</i>
Drive Sel	<b>IDE1</b> ( <i>backup drive is IDE2 if implemented</i> )
Load PGM	<i>Not applicable</i>
Save PGM	<i>Not applicable</i>
Date & Time Set	<i>Clock setup</i>
Zero File	
Disk Optimize	
Add. Trk Convert	
Disk Format	<i>Careful! This does exactly what it implies!</i>