# MILTON TEST/CALIBRATION PROCEDURE - STANDARD CONFIGURATIONS

The following is a test procedure/rework guide for the Milton Sequencer in standard configuration (does not test added custom features added by user). Any failure will constitute the unit be reworked and repaired.

A. External connections:

1) Sub to audio range square wave (50% duty cycle not required) into CLOCK input ('Input' jack of Cynthia MIlton's (CMs))

2) Cable from Pulse Bank X axis output jack to external AD envelope generator's gate/trigger input -and- oscilloscope (as required).

3) Cable from Pulse Bank Y axis output jack to external AD envelope generator's gate/trigger input -and- oscilloscope (as required).

4) Cable from Obedient Clock Output ('thru' out on CMs) to external AD envelope generator's gate/trigger input -and- oscilloscope (as required).

5a) Variable DC voltage source into VC input which can manually select between 0 and +5 volts minimum (this could be the static stage of another sequencer (one that is not currently advancing and static at on stage) -or- any fixed voltage source

5b) The output of envelope generator into VC input

5c) An LFO through a manually controllable VCA into VC input

6) Stage gate outputs to oscilloscope as required

7) Bank A, C, B, D voltage out to VC frequency input of external VCO and scope as required

8) Scope Ground jack to Milton ground

B. Initial control settings:

1) All bank voltage pots to ground (fully counter (anti) clockwise).

2) All Pulse Bank switch to center position

3) VC mode to Standard ('sense' on CMs) - not in 1v/OCT response mode

4) If an ACB board is incorporated, Obedient Clock Out ('thru' on CMs) set to SYNC operation

5) External VC control listed in step A5a-c above set to ground

6) Run/Halt select buttons set to Halt (red light should be on indicating unit is halted)

7) Scope set for DC operation, no sync, vertical range at 2 volts/division, trace centered so ground signal is resting on center horizontal line on scope tube (set this up by switching scope form DC to GROUND)

C. Test Procedure:

Basic Operation:

1) Depress the "run" button and verify the following visually:

1a) Green light in Run indicator lights and stays lit

1b) Stage LEDS light sequentially (Milton advancing). Verify each stage LED illuminates

1c)  Adjust the incoming clock at slow to audio range. Verify that the stage LEDs track this change and that each LED lights sequentially (none skip if sequencer is run slowly or quickly).

2) Depress "halt' button and verify the following visually:

2a) Red light in Halt indicator lights and stays lit

2b) Stage LEDS light activity stops.

3) connect a cable form the BANK A voltage output to external VCOs VC freq input and listen to it through your monitors. Depress "run" button.  ONE AT A TIME, turn each stage voltage pot and verify that the frequency of the VCO reacts to this. Repeat this which each stage pot, making sure all others are set fully counter (anti) clockwise).  Repoeat this process with banks B, C and D.

4) Using a scope first connected to the BANK A voltage output, with all bank voltage pots set fully clockwise, verify that all stage rest at ground (not slightly above or below - there should be no vertical displacement of the scope trace when the lead is connected and then removed).

5)  Using the same set-up as step 4 above, turn all stage pots fully clockwise and verify that the scope trace is high (amount is determined by the value of the second feedback resistor in the each bank boards output buffer - on the print, the resistor that's before the R2 current limiting resistor which leads to the voltage output jack of each bank).

The voltage on the scope should be constant without vertical movement - each stage should go to the same high level.

Repeat this process with banks B, C and D.  If your Milton has been configured for multiple output jack per bank, verify this activity from each.

6)  with the same set-up described in step 4 above, turn each pulse bank at some random voltage level.  Listen to the VCO to verify it's frequency reacts to this and look at the bank voltage output on a scope.

NOTE: Milton's can handle an output range that's very small, all the way up to just below the +VCC level the instrument is powered by.  This range is determined by three things:

- the settings of the bank voltage pots

- the value of the second feedback resistor in each bank's output buffer

- the value of R1 on the bank's output buffer

- the value of R2 on the bank's output buffer

Looking at the print, you will notice a .0022uf cap in the feedback loop of the first op amp in the output buffer. If your output range is set to the system's higher capabilities (let's say a range of 8 volts and above) this .0022uf cap MAY cause slight sliding between voltage steps as it will work as an integrator (slew).  To eliminate this slewing effect, REMOVE THIS CAP. This cap though does help to filter out spikes which can occur as stages advance WHEN THE SYSTYEM IS SET FOR A LOWER OUTPUT RANGE, of about 6 volts maximum (Modcan and Serge limits).

7)  Depress the Run switch do the system begins sequencing. Run a patch cord from the stage 2 GATE OUTPUT to the RESET input. Verify that the sequencer resets on stage 2 by seeing that the stage 1 LED is remaining constantly lit.

Move the reset to stage 3, verifying proper reset by the LEDs now alternating between stages 1 and 2. Continue this all the way down - taking the reset form each stage's GATE output. You should see the LEDs cycle sequentially from stage 1 to the stage BEFORE the one running to the reset input.  PAY SPECIAL ATTENTION TO RESETS ON STAGES 4, 8, 12, and 16 - there is a known anomaly trend with these stages which MAY cause resets on stages BEFORE the one selected by the reset cable.

IF FALSE RESETS ARE FOUND, SOLDER A .1uf CAP FROM THE GATE OUT JACK THE RESET IS COMING FROM TO GROUND.

8) Remove the patch cord from the RESET jack and insert it into the HALT jack. Start the sequencer by a depression of the RUN button and verify it stops running and that the HALT LED lights when it stops.

Repeat this a few times and verify that the sequencer stops when it reaches the stage out the cord is patched from.

9) With the Sequencer still halted, remove the patch cord form the HALT jack and insert it into the RUN jack and Verify the sequencer begins running continuously.

Remove this patch cord completely.

10) With the sequencer running in normal operation and the SYNC/ASYNC switch set to SYNC mode, run a scope probe the OBEDIENT CLOCK (OB CLK) output (THRU output on CMs) and verify a short on time pulse wave of approx. 10 to 12 volts in amplitude and 2 ro 30ms in duration (the test here is not so much the amplitude, but the off-time curve of the pulse and the fact that it stops and starts with the setting of the sequencer's RUN and HALT buttons).

Still monitoring the output on a scope, depress the HALT button and verify the pulses from the OB Clk output stops with that depression.

11) If there is a long taper to the falling edge of the OB CLK signal, correct it by connecting a 10k resistor from the OB CLK jack to ground (10K pulldown resistor)

12) Connect the output of the OB CLK to the gate or pulse input of an envelope generator. With the EGs attack turned fully CCW and the decay long enough so that you can see the envelope LED light, verufy that the envlope fires each time Milton advances a stage when it's running in normal operation.

Stop the sequencer. Verify the EG stops firing as well.

13) Run the sequencer VERY SLOWLY and verify the EG only fires when the sequencer advances and that there are no false triggers coming from the EG. Slowly increase the Milton;s speed and continue verifying there are no false triggers. If you have a two channel scope, a better way of doing this is monitoring the EG out in one channel and the external clock DRIVING THE SEQUENCER in the second channel and verify at any speed that the two beging at the same time.

14) Set Milton's STD / 1V/OCT switch (SENSE switch on CMs) to Standard (Sense on CMs). Using the fixed voltage source described in step 5a, turn that pot fully CCW so that the signal is ground and run a patch cord from its output into Milton's VC input.

Verify that the sequencer's normal operation is uneffected by this connection.

Slowly turn the fixed voltage pot CW and verify that it does then stop the sequencer from advancing nornally and now tracks the movement of the voltage pot. Turning the pot fully CW should send the sequencer to step 16. turning it fully CCW should allow it to run normally again. In this mode, there is an engagement threshold when the sequencer takes effect.

Tune the fixed voltage so that MIlton rests on step 4.

15) Now flip the STD / 1V/OCT switch (SENSE switch on CMs) to 1V/OCT operation (set away from Sense on CMs). Verifiy that the sequencer now jumps to step 8. Flip the switch back again and verify it's back on step 4.

Now adjust your fixed VC voltage and verify that whichever stage the sequencer rests on in 1V.OCT mode, that that position number is divided by two when the sequencer is switched back to STD mode as follows:

| STD | 1V/OCT |
|---|---|
| 1 | 2 |
| 2 | 4 |
| 3 | 6 |
| 4 | 8 |
| 5 | 10 |
| 6 | 12 |
| 7 | 14 |
| 8 | 16 |
| 9-16 | 16 |

If it does not double like this in every combination, adjust the 10K trim pot on the engine board so it does. This trim pot will effect the 1V/OCT jump, not the location of the STD mode stage.

16) With the STD / 1V/OCT switch back into 1V/OCT mode, now vary the fixed voltage inserted into the VC input and verify that when dialed fully CCW that the sequencer rests (holds) on stage 1 and when turned fully CW that it rests on stage 16 and that you can see it increment /decrement on every stage while the pot is being turned.

17) Keeping the 1V/OCT switch in 1V/OCT mode, now switch the VC into ASYNC operation. Adjust the clock running Milton very slowly. Turn your fixed voltage pot and verify that the stage advance occurs independently to the incoming clock.

18) Now REMOVE the incoming clock and verify that the sequencer STILL advances as the fixed voltage source into the VC inout is increased and decreased.

19) While in ASYNC mode run a patch cord from the OBEDIENT CLOCK output (Thru out on CMs) to to an external Envelope Generator's gate or trigger input and adjust that EG for zero attack. run the output of that EG into the control input of a VCA and use it to gate an oscillator which you will be listening to. Once this is done, turn the fixed voltage pot inserted into Milton's OB CLK output slowly, verifying that a tone is heard the moment the sequencer advances or decrements a stage. Each time Milton changes stage, a tone should be heard immediately. There should be no tones fired unless the sequencer changes a stage.

20) Connect a scope probe to the OB CLK clock output and repeat step 19. Verify a 20ms pulse is fired each time the sequencer changes stage.

21) Return the VC configuration to it's original settings -- STD SYNC operation. Verify that the Pulse bank enable switch is set to ENABLE pulse bank operation. Remove the VC input. move the patch cord connected to the external EG from the OB LCK output to the X axis output of the two Programmable Pulse Banks. Re-insert the external clock which was driving Milton and one at a time, flip each pulse bank switch into the X position and verify the envelope fires ONLY at that position. Run your external clock at a speed slow enough to determine this is occurring.

Verify that the X axis LED lights momentarily with each stage selected to the X axis. Verify that there is no activity in the Y axis LED at any time during this test. If your Milton has been configured for multiple outputs per pulse bank axis, verify this activity from each output.

22) Repeat step 21, but this time coming out of the Y axis output and flipping to the Y position on each stage.

23) Now set up random patterns on the bank you are now monitoring and verify that a pulse is fired on each selected step. Intentionally dial a pattern which selects adjacent stages and verify that a tone is heard (the EG is fired) on each adjacent step. Slowing down the sequencer, verify that no pulse is fired in between steps (they are fired ONLY when the sequencer advances to the a stage where a pulse bank output is currently enabled)

24) Repeat step 23, but this time coming out of the other pulse axis output and enabling the other axis' selection switches on each stage.

25) Keeping the previous switch pattern selected, flip the Pulse Bank Enable switch to the DISABLED position and verify that all activity (Pulse Bank LED, tone ngeneration form VCAQ) stops from that bank. There is no need to repeat this with the other axis output - if it works with one, it will work with another.

If you have configured your Milton for a Pulse Bank enable/disable option, verify the LED functions correctly with the configuration you have installed (it should light when the bank is disabled if you've wired the LED as a disable indicator, and it should light when the pulse bank is enabled if your LED has been configured as an ENABLE indicator)

26) With the Pulse Bank still DISABLED via the switch, turn your fixed variable voltage source used n the VC input tests fully CW and insert it into the Milton's PULSE ENABLE input and verify that the pulse bank again becomes active AS LONG AS A HIGH SIGNAL IS INSERTED INTO THE JACK. When the signal is removed form that input, or when the fixed voltage source is turned fully CCW, verify the activity stops from the pulse banks.

Troubleshooting

Tests 1-26 above should be adequate to fully test the functionality of your sequencer. I am available technical assistance is any failures occur. If you run into a failure, contact me (Peter Grenader) via email, indicating which test has failed (by test number - 1 thru 26 above), followed by a short description of the failure and the test conditions you've incorporated.

Peter Grenader

peter@buzzclick-music.com

In the US at: 818 761 9906