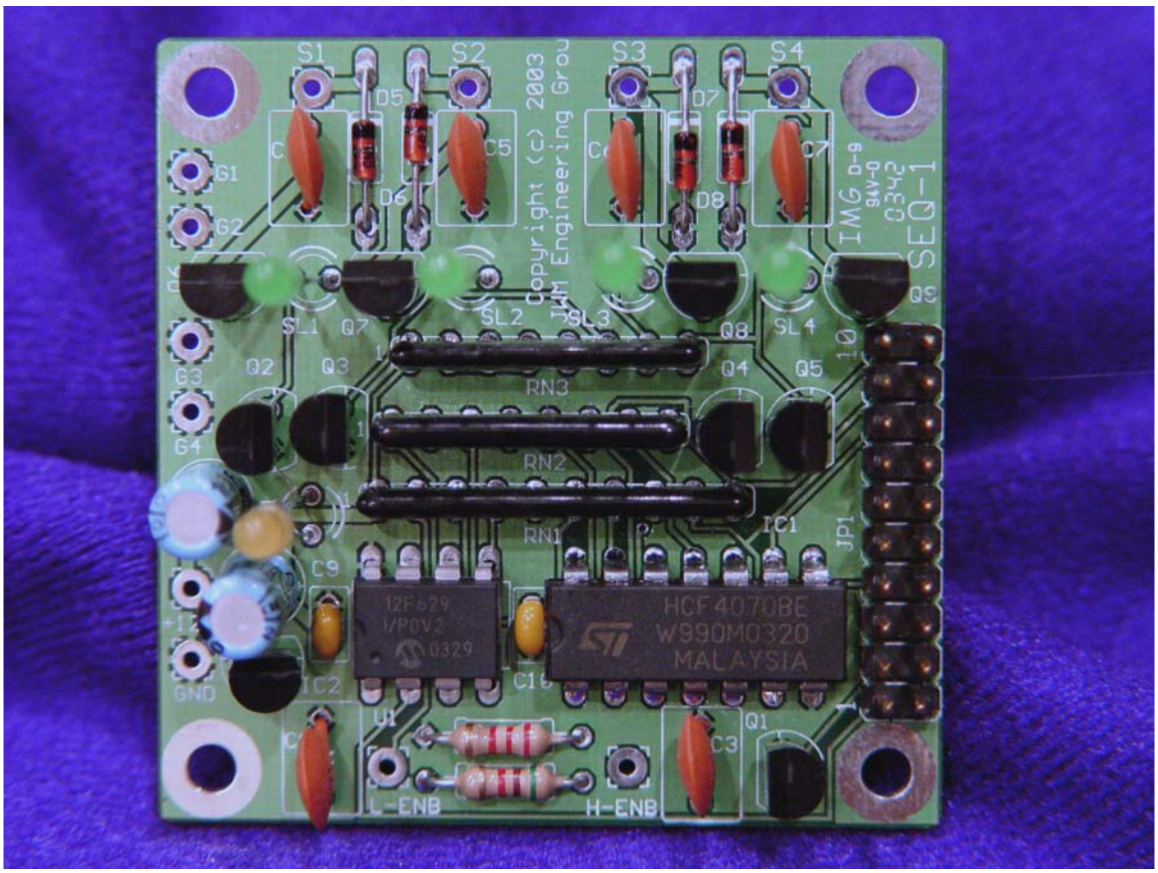
JWM ENGINEERING GROUP, INC.

Model SEQ-QSK High Speed T/R Sequencer



The Model SEQ-QSK High Speed Transmit/Receive Sequencer is a second generation microprocessor controlled sequencer with its origin from the SEQ-1 microwave sequencer product line. A one second Heartbeat is used to give a visual indication that the SEQ-QSK is functioning properly, and four green LED's give a visual indication of the sequenced step operations.

Today's Amateur operator likes the ability of fast break-in operation during contest operation, as well as during normal everyday operation. The SEQ-QSK provides this ability by allowing very high speed sequenced switching of both the Tranceiver and high power amplifier. Full VOX break-in and CW break-in operation are fast with no missed syllables, dots or dashes. Programmable delay times from 32 milliseconds to as little as 1 millisecond per step may be selected to match relays in your system.

The SEQ-QSK provides four sequenced open collector outputs to control your Tranceiver and Amplifier sub-systems switching requirements. Each open-collector output is capable of switching up to 35 volts at 600 milliamps continuously. Using open-collector outputs allows for direct control of relay coils. Using additional analog circuitry, other switching schemes are possible with the SEQ-QSK sequencer. Also provided is the ability to invert the active Output State of any of the four open-collector outputs lines.

The sequencer is enabled by using either the Low-Enable input, or the High-Enable input pins. The Low-Enable input is a connection taken to ground to cause the sequencer to activate. The High-Enable input connection requires a positive input voltage from +2.0 to +14 volts to cause the sequencer to activate.[1]

For user convenience, provision has been made to allow the user the ability to re-program the time delay value used to control the sequencer on/off steps. This allows for fine-tuning the delay time for the environment being controlled. For example, if your RF switching is all solid state, like PIN diode switching or solid-state switching, then a smaller time delay value would be appropriate. If you are using mechanical relays, a longer time delay would be required to allow for contact settling. What's more, the time delay value can be programmed right in the circuit. No need to remove the SEQ-QSK from your system to change the delays values.[2]

[1] For proper operation, the signal used for the Low-Enable or High-Enable inputs MUST be de-bounced already as the SEQ-QSK does not de-bounce these inputs. This means you cannot use a relay output from your Tranceiver to activate the SEQ-QSK unit. Relays usually have some chatter when activated and could cause false triggering of the SEQ-QSK. The correct method would be to use a signal from your Transceiver that is either an open-collector output or an active output such as a FET output. Some Transceivers have an option to select this type of output keying.

[2] Each unit is shipped with a default delay value of 15 milliseconds per step.

SEQ-QSK Connections:

Figure 1 is an image of the SEQ-QSK silkscreen. The pads labeled S1, S2, S3, and S4 are the open-collector outputs used to drive your relays. A power supply voltage of +12 to +15 volts is connected to the pad called +12V. There are five ground pads on the board, GND, G1, G2, G3, and G4 and the four mounting holes in each corner of the board are grounds as well. The two pads labeled L-ENB and H-ENB, are the low enable input, and the high enable input respectively, which activate the sequencer. The 4 Green LED's are labeled SL1, SL2, SL3 and SL4. The Yellow Heartbeat LED is labeled HB1 on the silkscreen. The Time Delay programming and Output Polarity selection is changed using the jumpers on JP1 to the right.

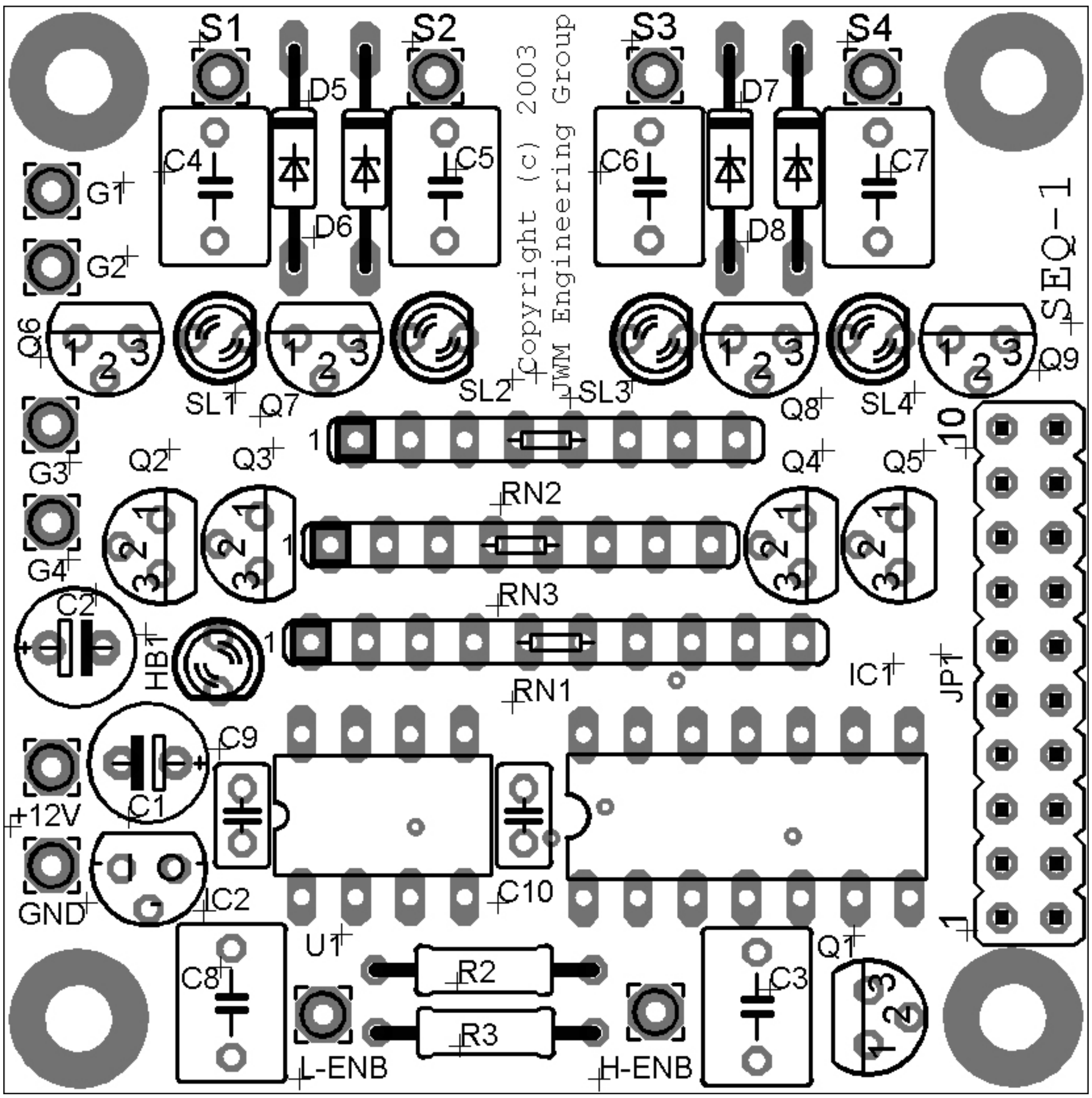


Figure 1

Mounting Dimensions:

Figure 2 shows the mechanical dimensions for mounting the board to a panel or wall of an enclosure. The SEQ-QSK can be mounted from either the front or the back. If mounted from the front, use a spacer on all 4 corners that is at least ½" high minimum. If mounting from the bottom, us a spacer at least 1/8" high minimum to prevent shorting any contacts on the bottom to ground. All dimensions are in inches. The LED's are mounted directly on the PCB and do not protrude above the board. If you wish to observe the LED's operation during key down, then drill the small holes marked S1-S4 and HB so the LED's light shows through. Otherwise, disregard the small holes. Measure and drill the appropriate holes as shown in figure 2. The board is exactly 2.0 inches x 2.0 inches.

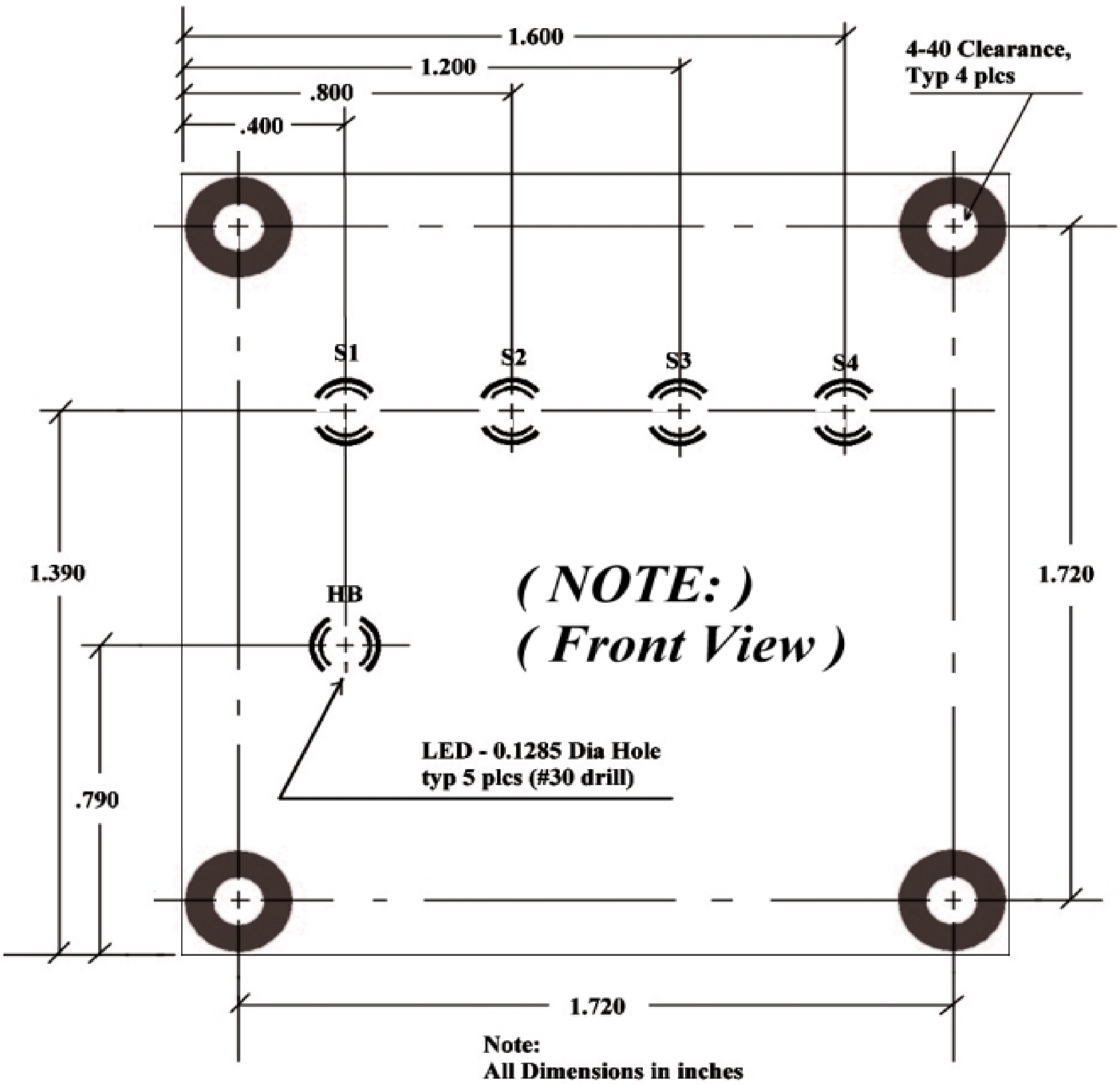


Figure 2

Programming Options:

The SEQ-QSK has a programming capability that will allow the user to set the amount of delay between steps on the S1 to S4 outputs. This capability can be performed while in your system, so the SEQ-QSK does not have to be removed to make the programming changes. All four outputs will have the same amount of delay programmed, see Figure 5.

The amount of delay is adjustable from 1 millisecond to 32 milliseconds per sequence step. Figure 3 shows a table of delay step values that may be programmed on jumper JP1. Below are the steps to follow so the on-board programming will work correctly.

__ 1.) Power down the SEQ-QSK unit.
__ 2.) Jumper JP1 –1 with a shunt provided.
__ 3.) Select the amount of Delay desired in milliseconds from the table in Figure 3.
__ 4.) Set the jumper selection on JP1 2 thru 6 for the desired delay wanted in step 3.
__ 5.) Apply voltage to the SEQ-QSK and observe that the Heartbeat LED is on solid.
__ 6.) Wait for about 5 seconds for programming to complete.
__ 7.) Remove power from SEQ-QSK and remove all jumpers from JP1 pins 1 to 6.

The new delay value is now saved in the memory of the microprocessor and will be used each time the SEQ-QSK is powered on.

NOTE: If you leave any jumpers on JP1 pins 2 thru 6, the Heartbeat LED will flash 5 short ON cycles followed by 5 long ON cycles. This will repeat until the jumper(s) on JP1 pins 2 to 6 are removed. . This is a safety precaution and the sequencer will not function correctly until this is completed.

JP1 Pin Selection

2	3	4	5	6	Delay (msec)	2	3	4	5	6	Delay (msec)
O	O	O	O	O	**32**	O	S	O	O	O	**16**
O	O	O	O	S	**31**	O	S	O	O	S	**15**
O	O	O	S	O	**30**	O	S	O	S	O	**14**
O	O	O	S	S	**29**	O	S	O	S	S	**13**
O	O	S	O	O	**28**	O	S	S	O	O	**12**
O	O	S	O	S	**27**	O	S	S	O	S	**11**
O	O	S	S	O	**26**	O	S	S	S	O	**10**
O	O	S	S	S	**25**	O	S	S	S	S	**9**
S	O	O	O	O	**24**	S	S	O	O	O	**8**
S	O	O	O	S	**23**	S	S	O	O	S	**7**
S	O	O	S	O	**22**	S	S	O	S	O	**6**
S	O	O	S	S	**21**	S	S	O	S	S	**5**
S	O	S	O	O	**20**	S	S	S	O	O	**4**
S	O	S	O	S	**19**	S	S	S	O	S	**3**
S	O	S	S	O	**18**	S	S	S	S	O	**2**
S	O	S	S	S	**17**	S	S	S	S	S	**1**

Figure 3

Notes:
O = Jumper Removed, S = Jumper Installed
Remove JP1 pin 1 to pin 6 for proper operation after programming is completed

State 1 to 4 Output Polarity Selections:

Each open collector output, S1 thru S4, has the ability to have its output state inverted independent of the other outputs. Normally the S1 thru S4 states when active, pull down a circuit to activate it. Typically, this is the bottom end of a relay that is connected to +12 volts on its other terminal. Under normal conditions, if the sequencer is not active, the output of S1 thru S4 will be disabled, de-energizing the relay. There are situations where it is desirable to have a relay energized when the sequencer is not active, and when the sequencer is activated, the relay will become de-energized. This option may be selected by jumper JP1, pins 7, 8, 9, and 10. The table in figure 4 illustrates what happens to each output pin, S1 thru S4, when the inversion is selected verses normal polarity. An output port is inverted when a jumper is placed on any JP1 pin 7 to pin 10 connections.

JP1 Pin	S1 Output		S2 Output		S3 Output		S4 Output	
7 - Open							Inactive	
7 - Short								Active
8 - Open					Inactive			
8 - Short						Active		
9 - Open			Inactive					
9 - Short				Active				
10 - Open	Inactive							
10 - Short		Active						

Figure 4

The Table shown in Figure 4 represents the idle state of the sequencer. In other words, the sequencer is not activated. When an inversion is selected, the LED indication of the inverted channel will also be inverted. Normally the four LED’s are off when the sequencer is not activated. If a state is inverted using one of the jumpers on JP1 7 to 10, then that output LED will be on when the sequencer is inactive, turning OFF when the sequencer is activated. So the LED indication will be inverted as well. This allows the user to see that a state has been inverted simply by looking at the LED’s.

Timing Diagram:

Figure 5 shows the Sequencers timing states. The states are shown for the case where the inversion option is not used, so the open collector outputs at S1, S2, S3 and S4 are active low when enabled.

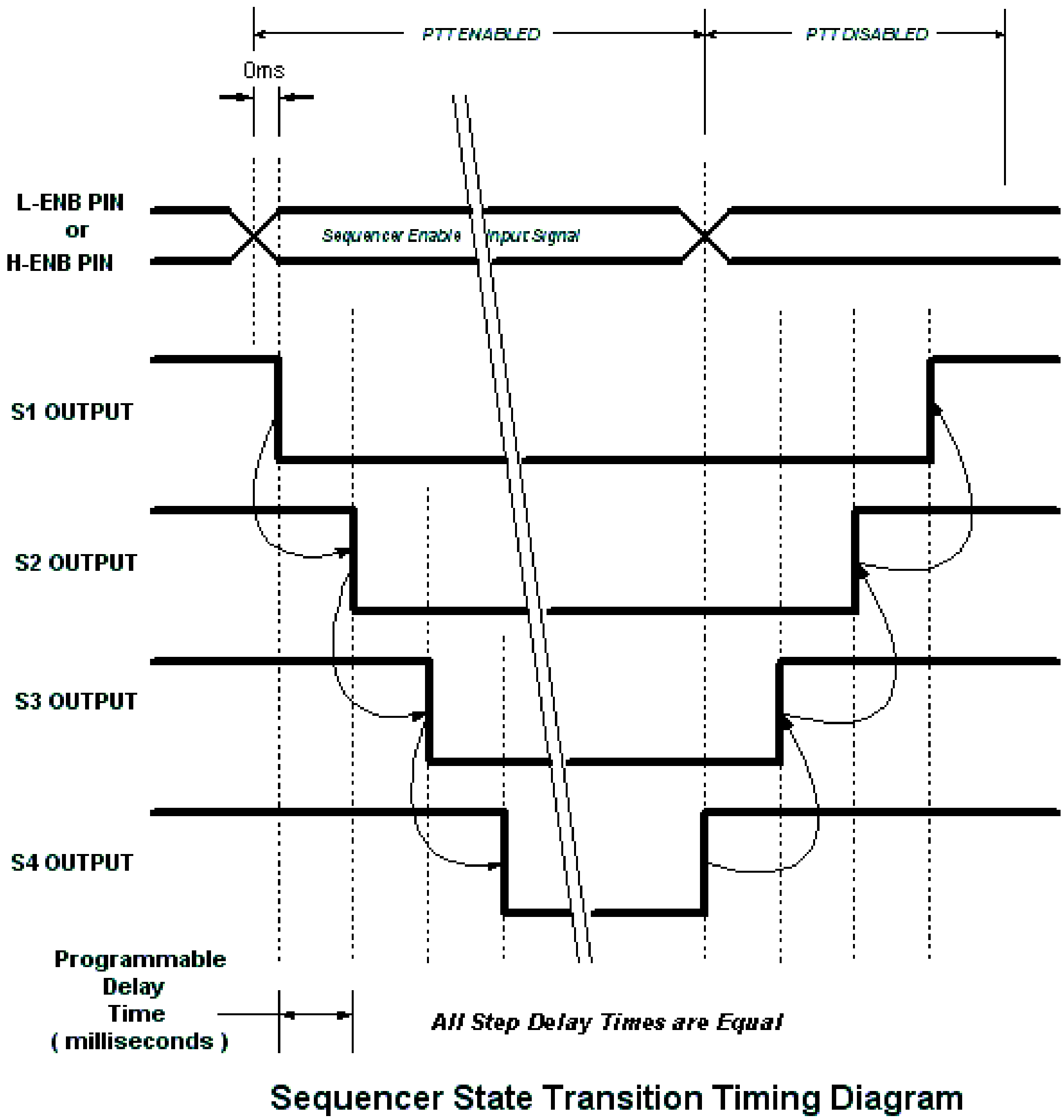


Figure 5

Warranty
All JWM Engineering Group, Inc. products are warranted against defects in materials and workmanship. This warranty applies for one year from the date of manufacture. JWM Engineering Group, Inc. will repair or replace products that prove to be defective during the warranty period, provided they are returned to JWM Engineering Group, Inc. No other warranty is expressed or implied. JWM Engineering Group, Inc. is not liable for consequential damages.

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