

### DEM LTRS Transmit / Receive Sequencer



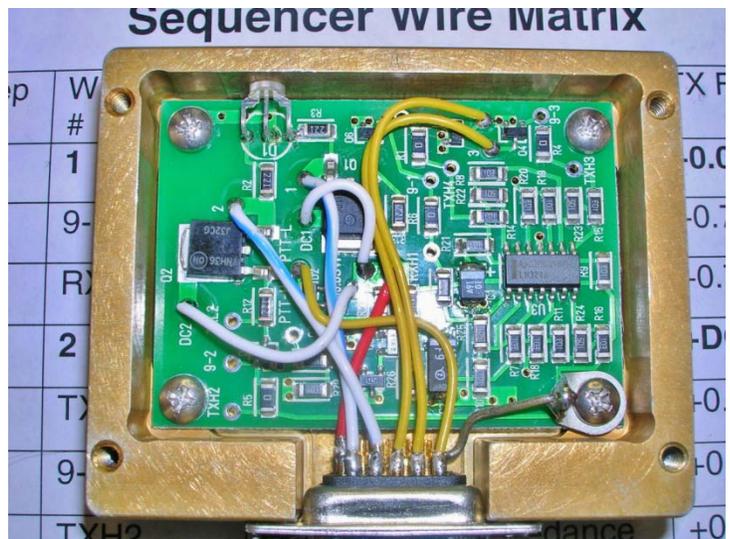
Our new DEM LTRS Sequencer is a copy of the solid state sequencer we have utilized in our past VHF/UHF and Microwave transverter designs. It is similar to our previous design by WB5LUA but without the relays, making it a completely solid state unit. As in previous designs, this sequencer is intended to be used with any lash-up that requires separate sequenced switching circuits to control pre-amps,

TR relays, transmitters, and power amps. The LTRS is a standalone unit that is activated by either a push to talk to ground (PTT - L) or by applying a + 1.5 - 17 VDC (PTT-H). At the time of activation,( Transmit) an R/C timing circuit in combination with a voltage divider network begins to turn on each individual op-amp, (1<sup>st</sup> through 4<sup>th</sup>) in sequence. The op-amps in turn drive their respected switching transistor circuits. When the PTT circuit is released, the sequencer moves back to the resting state (or Receive) in the reverse order (4<sup>th</sup> through 1<sup>st</sup>)

Each of the 4 sequenced stages have separate outputs (13 total) that may be changed by the user to produce a voltage, a connection to ground or an open circuit in either transmit, receive or both. This provides many options of switching functions and output combinations that should fit any requirement. Unless specified at the time of order, your sequencer is wired to a standard configuration highlighted on the Sequencer Wire Matrix found later in this document.

#### DB-15 Connection with Additional Connections:

If you require any additional connections, you may pick and wire the connector as you choose utilizing wire and remaining 4 pins (7 – 10) of choice. Some examples of this are if you utilize a 28 VDC relay, then choose one of the pins on the connector as the +28VDC input and prep a 2" maximum wire for connection to the DC1 or DC2. You may also require an additional output of a specific step and desire to double up a connection on the sequencer for additional equipment for a TX/RX indication. Just do not exceed the current limit as specified on the Sequencer Wire Matrix. Inspect for solder shorts when you complete the connector wiring. To add any of these connections, it is best to remove the bottom plate and then remove the connector assembly with the circuit board. Make any modifications utilizing the Sequencer Wire Matrix for proper connection and re-install.



## Sequencer Wire Matrix

**Operation and Use:**

The Sequencer outputs are indicated below. Steps 1-4 are Pins 1-4 on the DB-15.

Pin 5 = PTT-H (Positive voltage to enable) PTT-L (connect to Ground to enable)

Pin 6 = +13.8 VDC (+9 to +17 VDC)

Pins 7-10 Open Other \_\_\_\_\_

Pins 11-15 Ground and Negative power supply connection

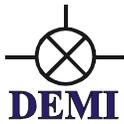
Installed	Sequencer Step	Wire Hole #	RX Function	TX Function
	<b>Step # 1</b>	<b>1</b>	<b>+DC Voltage ,+ 2 Amps</b>	<b>+0.0 VDC (when loaded)</b>
	Step # 1	9-1	0 VDC, High Impedance	+0.7VDC (50mA)
	Step # 1	RXH1	0 VDC, High Impedance	+0.7 VDC (50mA)
	<b>Step # 2</b>	<b>2</b>	<b>+0.0 VDC (when loaded)</b>	<b>+DC Voltage, +2 Amps</b>
	Step # 2	TXL2	+DC Voltage @ 50mA	+0.3 VDC (50 mA)
	Step # 2	9-2	0 VDC, High Impedance	+0.7 VDC (50mA)
	Step # 2	TXH2	0 VDC, High Impedance	+0.7 VDC (50mA)
	<b>Step# 3</b>	<b>3</b>	<b>0 VDC, High Impedance</b>	<b>Low Impedance to GND</b>
	Step# 3	9-3	0 VDC, High Impedance	+0.7 VDC (50mA)
	Step# 3	TXH3	0 VDC, High Impedance	+0.7 VDC (50mA)
	<b>Step# 4</b>	<b>4</b>	<b>0 VDC, High Impedance</b>	<b>Low Impedance to GND</b>
	Step# 4	9-4	0 VDC, High Impedance	+0.7 VDC (50mA)
	Step# 4	TXH4	0 VDC, High Impedance	+0.7 VDC (50mA)

Wire the matching DB-15 connector with the wire connections to match the above Pin connections and Sequencer Wire Matrix indications that suits your application. Also include any modifications to suit your application utilizing any unused pin or pins. Do not leave any wired connections un-

terminated. Now, if you are unsure of the correct operation of a sequencer or need recommendations of proper sequencer system operation, we recommend reading a paper that is on our website at:

<http://01895fa.netsolhost.com/PDF/SL2005CSVHF.pdf>





If you have the experience and understand the function of a sequencer, connect it to your system testing one device at a time for proper operation and If satisfied with individual equipment performance, connect it all together and have fun!

**FYI:**

One question that is most often asked is “How should I fuse a sequencer in my system”. This is a question that is determined by its use. The complete unit can be fused but the size of fuse should be the total current drain of all circuits in either TX or RX with margin of a 100 mA for the sequencer itself. If the fuse blows, nothing functions and is the perfect situation for most setups. Normally a 1 -2 Amp slow blow fuse will serve this purpose.

But if you have an instance where one step by itself exceeds 2 Amps, you may want to fuse that line separately to protect it but with that, the lower current drain lines are unprotected with a 3 Amp on the main +DC input. A dead short on one of the other three stages could be harmful.

AND, if you fuse the high current output stage, that one stage can blow a fuse and the others will still sequence. This is OK if it is a power amp or a mast mount preamp in the system. You just won’t have any receive or transmit. But if a fuse blows on an output that is activating a RF relay, and your power amplifier still transmits, serious damage may be caused. So think it over, and plan it out. Utilize the extra outputs on the TRS Circuit board and the extra pins on the connector if required to build AUX circuits for a truly failsafe system.

**Performance Option:**

There is one performance option in the sequencer. It is an adjustment of the switching time. If you examine the circuit diagram you will see that the delay is generated by the RC circuit comprised of R26 and C1. Faster switching times will occur if C1 is decreased in value. Slower times if the value is increased. You have that option or install a variable resistor in place of R26.

**Parts List**

All parts are surface mount and pre-installed.

Components			
C1	4.7uF Tant	R1, 4, 5, 6	0
C2	10.0 or 15.0 uF Tant	R2, 3, 12, 13	220
D1, D2	MMBD914	R7-11, 14-21, 26,29-30, 36, 38	10K
D3	Dual LED	R22-25	1 MEG
Q1	MJD31	R28	22K 1/4W
Q2	MJD32	R27	470
Q3-Q8, Q10-Q12	PMBT3904	R35, 37, 39-40	1 K 1/4W
U3	LM 324AD		

