

DEM Part Number 10368-144_____

10_____ MHz Transverter, _____ MHz IF, Serial Number _____

Power Out:	>3W adjustable	LP version: > 10 mW
Noise Figure and Gain:	<1.2dB @ 20dBG	<3.5dB
DC Power Requirement:	10 - 15.5 VDC @ 2.5 Amp	<0.6 Amp
IF Option:	Common	Split
IF Drive Level Requirement:	1-250 mW 250mW-3W 3-10W	Other_____
Keying Option:	PTT - to ground	TTL - Positive Voltage
Aux. Connection Output Option:	TX RX High	Low RVD
Antenna Option:	Common (external relay provided)	Separate TX & RX
DIGILO 10 MHz Source:	Internal --RED LOC	External – GREEN LOC

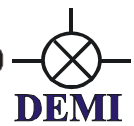
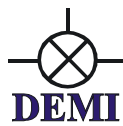
Operational Overview

The DEM 10368-144 is a 3 cm to 144 MHz transmit and receive converter. It has a linear output power of >3 watts (>10mW for LP version) and may be achieved with as little as 10mW or a maximum of 10 W of IF drive with the correct IF configuration. The receive section is a design using 2 stage PHEMT LNA (GaAs MMIC in the LP). The base local oscillator frequency is provided by the new DIGILO synthesizer. It operates with an external or its internal 10 MHz clock. The DEM 10368-144 has a built in transmit / receive relay driver to provide voltages required by common SMA relays and provisions for external switching so adding a high power amplifier or preamplifier to your 3 cm system is easy. IF level options have been built into the transverter. The IF levels are adjustable on both transmit and receive and have a dynamic range of approx. 25dB. This is useful for adjusting your maximum output power and setting the "S" meter level on your IF receiver. The IF connections are via BNC connectors. Options have been provided for a key line input PTT-H (+1 to 15 VDC) or PTT-L (a closure to ground) and auxiliary contacts on either transmit or receive with a common line for many applications. The control, power, and auxiliary connections are via DC feed thru connectors and the 10 GHz. connectors are SMA. The 10368-144 is housed in our standard 4.125" x 1.875" x 9.75" extruded aluminum enclosure that matches the all of our other microwave transverters. (LP model measures 4.125" x 1.875" x 7.750"

Connect your transceiver to the transverter:

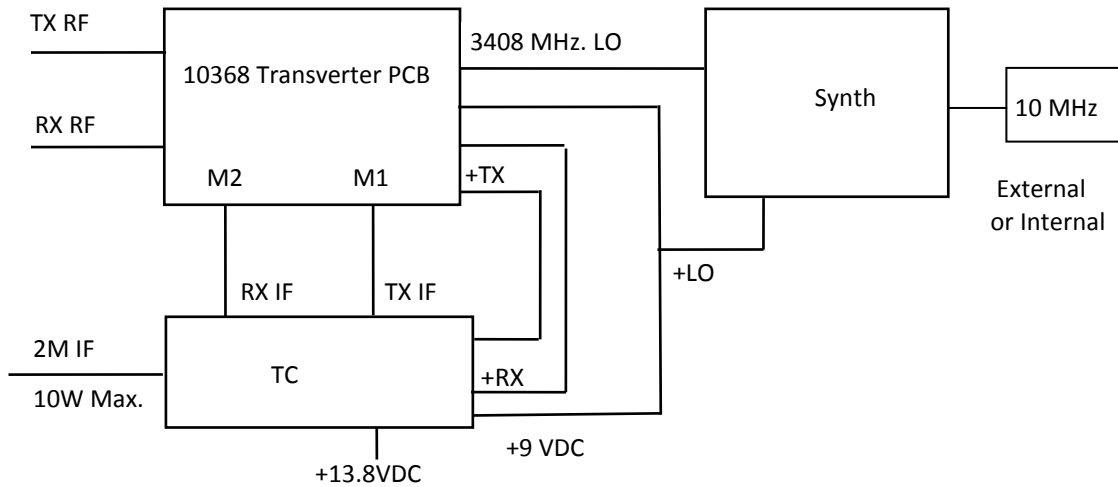
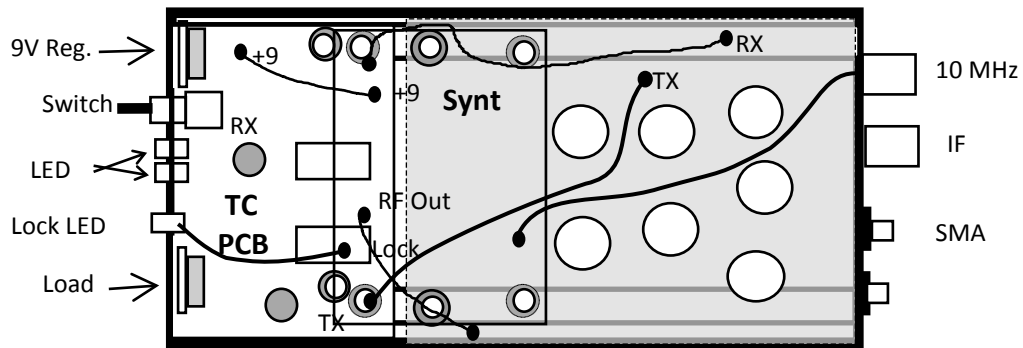
Interfacing the transverter to the transceiver is easy. First review the assembled configuration above. If the transverter was configured for direct connection to your transceiver (10 watts or less), follow the steps listed next.

1. Open the top lid of the transverter by removing 4 screws. (two front, two back)
2. Connect all IF cables. The transverter may have a common IF port or two separate ports TXIF and RXIF. Use good quality coax cable to connect the ports between your transceiver and the IF connectors on the transverter.

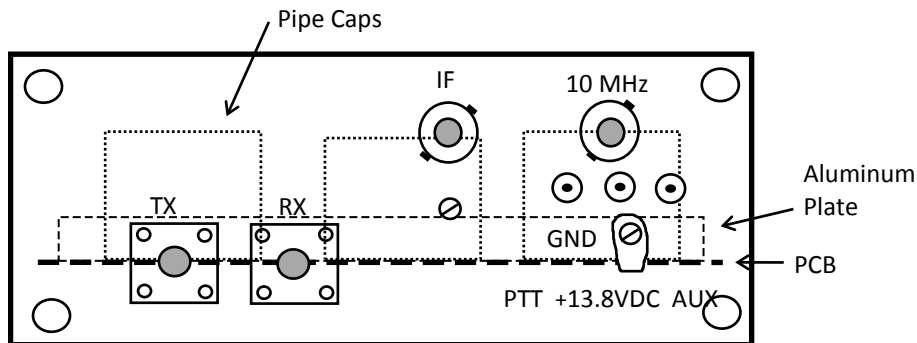


3. Connect the Push to talk line out of your transceiver to the transverter. It is labeled PTT on the transverter and uses a solder type DC feed through connector. The correct keying type can be configured for your transceiver at time of order or you may select it in the transverter now by moving the PTT jumper if required.
4. If the WTR option was not ordered, you will have separate TX and RX ports. You may connect your own transfer relay at this time or continue interfacing without it. Connect your 3cm antenna system or a dummy load with a power meter to the appropriate transverter ports. Always terminate the receive port with a 50 ohm load.
5. Connect the DC power to the transverter. It uses a DC feed through type connector. 13.8 volts is optimum but the transverter will operate normally from 11 to 15 volts.
6. Preset the TXIF and RXIF gain controls in the transverter. Turn the TXIF control fully counter-clockwise and the RXIF fully Clockwise. This is maximum attenuation on Transmit and minimum attenuation on Receive. (see the TC board component placement diagram for correct gain adjustments)
7. Power your transceiver "ON" and leave it in the Receive mode on 144.100 MHz (or see IF frequency selected on Cover Sheet) This should be 10368.100 unless you ordered a different frequency scheme. The Green "ON" LED and the Red "LOC" LED should be lit. You can test the internal/external 10 MHz clock by connecting/disconnecting an external 10 MHz source to the transverter. This should either produce a Red or Green LOC light.
8. Adjust the RXIF gain control until a slight noise increase is heard in the transceiver or just a slight movement in the "S" meter is detected. Power the transverter on and off to verify the change of noise in the transceiver. You may also remove the 50 ohm load to determine receiver performance. You can find a signal on the band if you have an antenna connected or use a weak signal source or signal generator to determine correct frequency, or minimum signal level desired.
9. It is recommended to test the transverter in the CW mode because most transceivers have carrier level controls in this mode only. Do not use full or semi break-in if possible. Do not use FM, SSB or AM because it may not be possible to obtain maximum output power with your transceiver in these modes. Set the carrier/output power control on your transceiver to minimum or "0" output power. Place the transceiver into transmit. If the PTT circuit is connected correctly, the transmit LED on the transverter will switch on. While observing a power meter on the 10 GHz system, slowly increase the carrier control (with key down) or increase the power output control to maximum on the transceiver. If the transverter is configured correctly for your transceiver, minimal power may be detected on the power meter. Slowly adjust the TXIF control in the transverter in a clockwise direction while observing the power meter. Set it to obtain a saturated power reading and then just back off a little to avoid total saturation. If a power meter is not available this will be difficult. You may use a current meter on the DC power line to determine if the transverter is transmitting. A maximum of 2.5 amps should be obtainable and it should not vary as the TXIF control is adjusted. When maximum power is achieved the current will suddenly decrease. This is saturation. Back off the TXIF drive to limit the amount of saturation. Switch the transceiver to USB and make a transmission. The power output and current drain should correlate to your speech pattern.
10. You may re-adjust both RXIF and TXIF again if desired. Do not adjust any of the filters unless you have access to a spectrum analyzer at minimum. It is also not recommended to adjust the bias pots of the LNA and power amplifier. They have been optimized.
11. Put the top on the enclosure and install the screws. Your transverter system is ready to use. Connect as you wish to use it in your 10 GHz system and have fun!

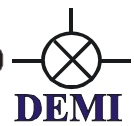
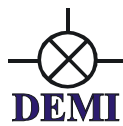
Internal view of LP version enclosure layout.



Wiring Block diagram



End Plate connector assembly.



10368-144LP Transverter Board Parts List

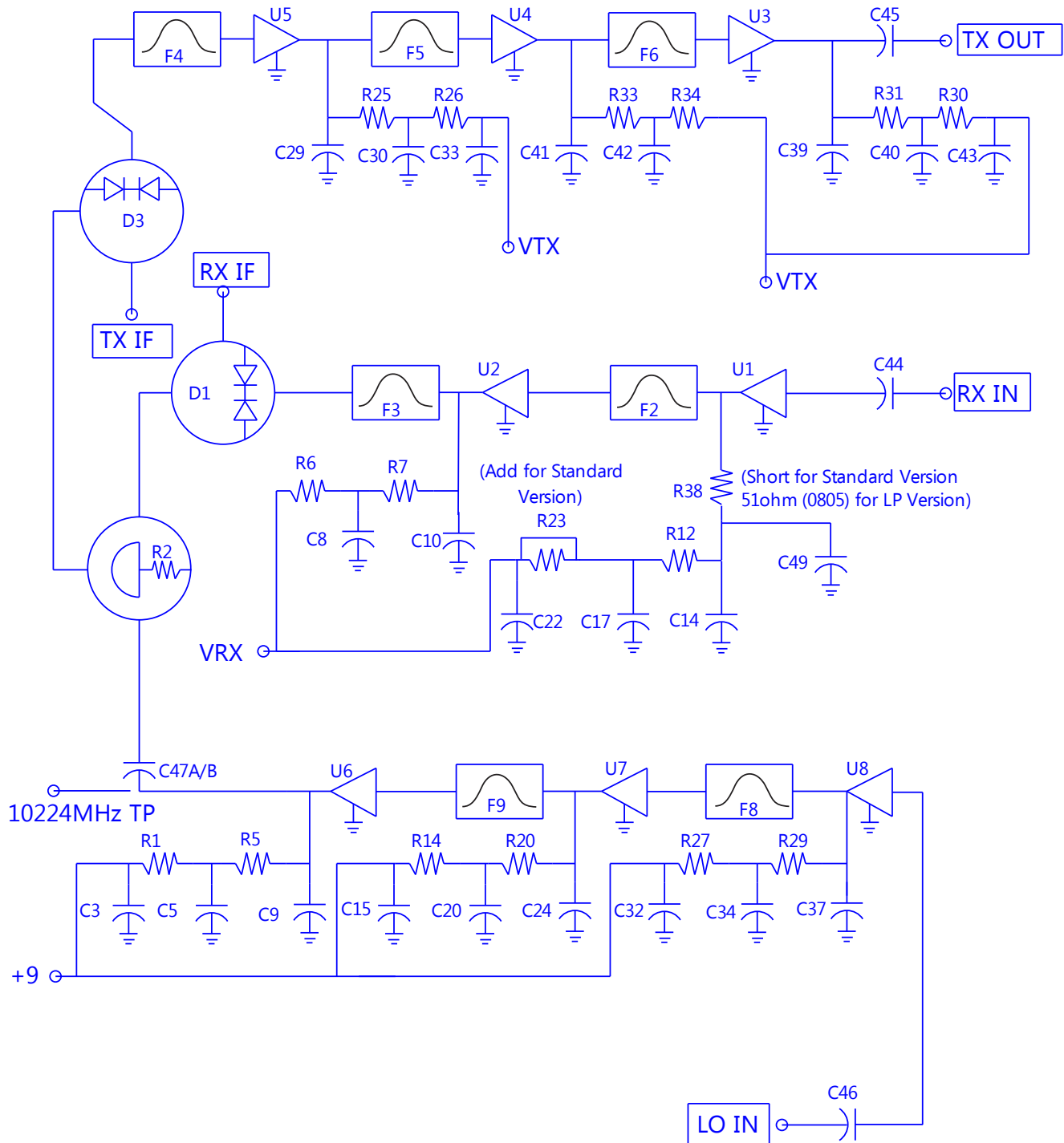
All components are Surface Mount. All resistors are 1206 size unless indicated. All capacitors are 1206 size except for 1.0pF are 50mil ATC. All others are as indicted.

C3 1.0 pF	C29 1.0 pF	C44 1.0 pF	R7 51 Ω	R33 51 Ω
C5 0.1μF	C30 0.1μF	C45 1.0 pF	R12 100 or 51 Ω	R34 36 Ω
C8 0.1μF	C32 100 pF	C46 5 pF (0805)	R14 36 Ω	R38 Short or 51
C9 1000 pF	C33 100 pF	C47 1.0 pF	R20 51 Ω	U1 N6
C10 1.0 pF	C34 0.1μF	C49 0.1μF	R23 36 Ω	U2 N6
C14 1.0 pF	C37 1.0 pF	D1 HSMS8202	R25 51 Ω	U3 N6
C15 100 pF	C39 1.0 pF	D3 HSMS8202	R26 36 Ω	U4 N6
C17 0.1μF	C40 0.1μF	R1 51 Ω	R27 75 Ω	U5 ERA-5 or N6
C20 0.1μF	C41 1.0 pF	R2 51 Ω	R29 51 Ω	U6 N6
C22 100 pF	C42 0.1μ	R5 36 Ω	R30 36 Ω	U7 N6
C24 1.0 pF	C43 100 pF	R6 36 Ω	R31 51 Ω	U8 N6

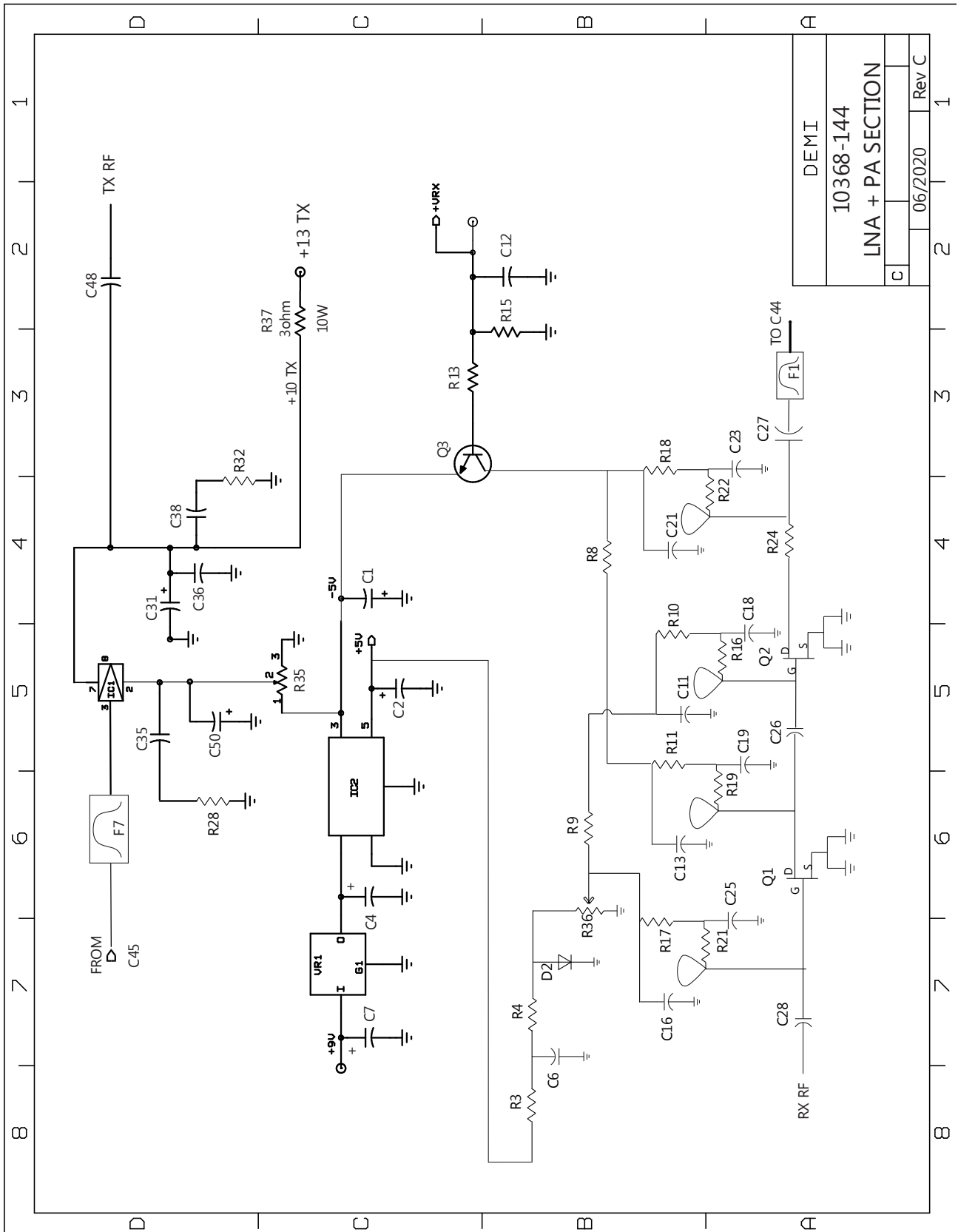
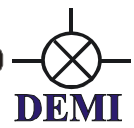
10368-144 3 watt version additions.

All chip resistors are 1206 size unless indicated. All 1.0pF capacitors are ATC 50mil. 10.0 μF is a tantalum and white band indicates positive polarity.

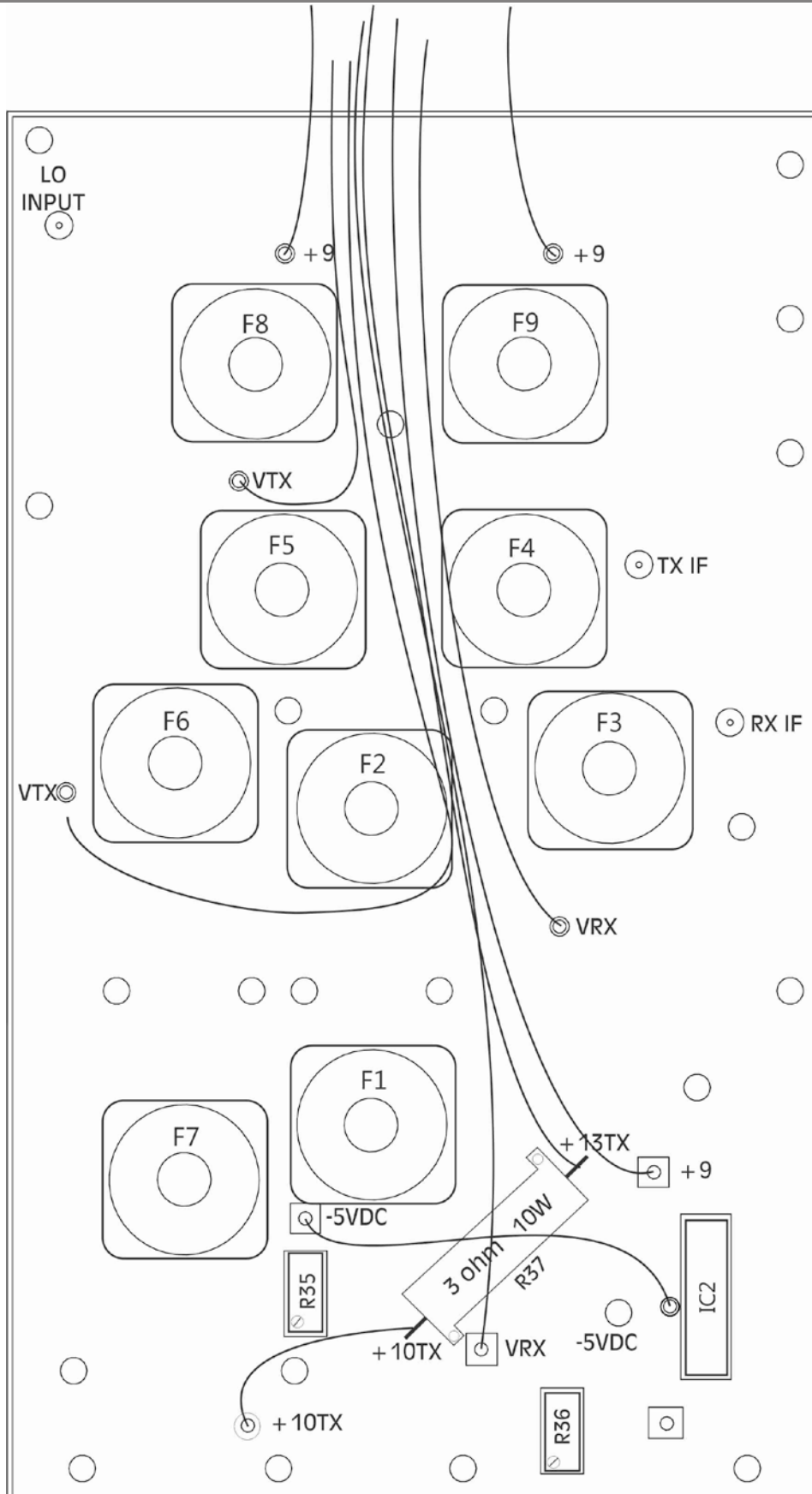
C1 10.0μF	C21 100pF(0805)	C50 10.0μF	R9 0Ω	R24 12Ω(0805)
C2 10.0μF	C23 0.1μF (0805)	D2 MMBD914	R10 470Ω	R28 51Ω(0805)
C4 10.0μF	C25 0.1μF (0805)	FB1 Ferrite Bead	R11 240Ω	R32 51Ω(0805)
C6 0.1μF(0805)	C26 1.0 pF	IC1 FMM5061VF	R13 5.1KΩ	R35 200Ω Pot
C7 10.0μF	C27 1.0 pF	IC2 NMA0505S	R15 5.1KΩ	R36 1KΩ Pot
C11 100pF(0805)	C28 1.0 pF	Q1 CE351K2	R16 51 Ω(0805)	R37 3Ω, 10 W
C12 100pF(0805)	C31 10.0μF	Q2 CE351K2	R17 470Ω	VR1 78M05
C13 100pF(0805)	C35 0.1μF (0805)	Q3 MMBT3904	R18 220Ω	
C16 100pF(0805)	C36 1.0 pF	R3 0Ω	R19 51 Ω(0805)	
C18 0.1μF (0805)	C38 0.1μF (0805)	R4 5.1K	R21 51Ω(0805)	
C19 0.1μF (0805)	C48 1.0 pF	R8 0Ω	R22 51Ω(0805)	



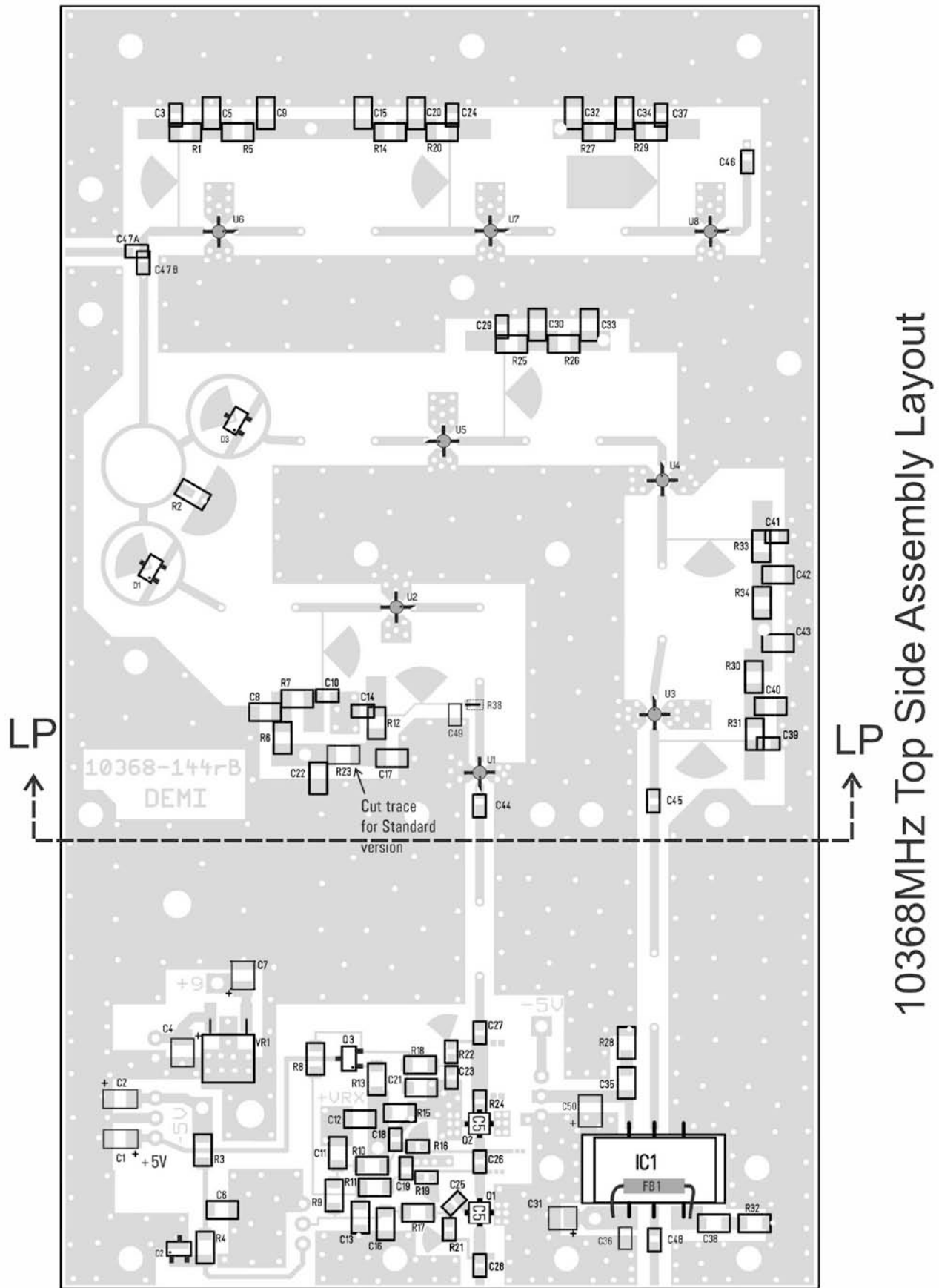
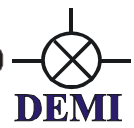
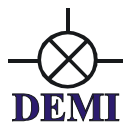
10368-144LPPrC TRANSVERTER SCHEMATIC

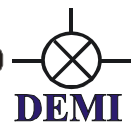
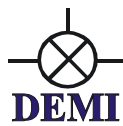


DEMI	
10368-144	
LNA + PA SECTION	
C	06/2020
	Rev C



10368-144
BOTTOM SIDE ASSEMBLY





DEM Part Number TC DEM TRANSVERTER CONTROL

The DEM Transverter Control (DEM TC) was redesigned in 2019 to perform with both separate IF and common IF microwave transverter boards or Mixers and to accommodate the connections for the DIGILO synthesizer such as frequency switching and "LOC" indication. It is still our basic "TC" board with the extra hooks incorporated. It is used in every DEMI microwave transverter 2304 and up and provides the regulated +9VDC, IF switching and attenuation functions, DC switching functions and external 24 VDC relay driver.

Circuit Description:

The DEM TC circuit board measures 3.75" x 2.15", which is designed to fit all DEMI microwave enclosures. ***It is not designed*** to be a drop in replacement for the original PIN Switch board. The TC offers all of the functions our microwave transverters require such as providing a common or split IF operation with up to a 10 watt IF drive level with either a PTT High or Low for keying. It also incorporates adjustable attenuators for both transmit and receive and has an option for additional receive gain if required. It will perform all dc switching functions for the transverter including switching 24 VDC microwave relays. A new optional feature in the TC includes a PIN diode switch network that connects the TC to a single mixer transverter while still allowing the TX and RX gain to have independent adjustments. With this new design, the TC is more versatile and will accommodate other makes of microwave transverters or offer more flexibility for homebrew equipment.

Operation:

RF Input power to the TC is dependent on the attenuation installed between C5 and C4. The 50 ohm load resistor is designed to handle 35 watts with proper heat sinking. When mounted to the front panel of the transverter, it will not tolerate more than 10 watts reliably for a long period of time. You may experiment with external heat sinking if you desire additional external attenuation. External attenuation may be used in the transceive path. The added attenuation on the receive signals may be overcome by adding the RXIF gain stage. The level may be adjusted with the RXIF adjustment.

The RX/TX IF isolation is ≈ 60 dB. The adjustable RXIF and TXIF controls have 20 - 25 dB of range. Simply grounding the PTT-L line or applying a voltage between 1-15V to the PTT-H input will switch all RX/TX functions in your transverter and provide external DC switching functions. The output of the +24 volt relay driver should measure +24 to +28 VDC with no load. It will measure the DC input voltage of the transverter if it is loaded with a common type SMA relay.

The TC is not designed to be a RF sensed switch. It has 3 relays and it may be connected to external mechanical relays. If any RF sensing scheme is added to the circuit, it will cause excessive relay chatter that will not only wear out the relays prematurely, but could cause other failures to external preamplifiers and or power amplifiers if used in your system. RF sensing circuits are not recommended with any circuit that contains mechanical relays at RF frequencies!!

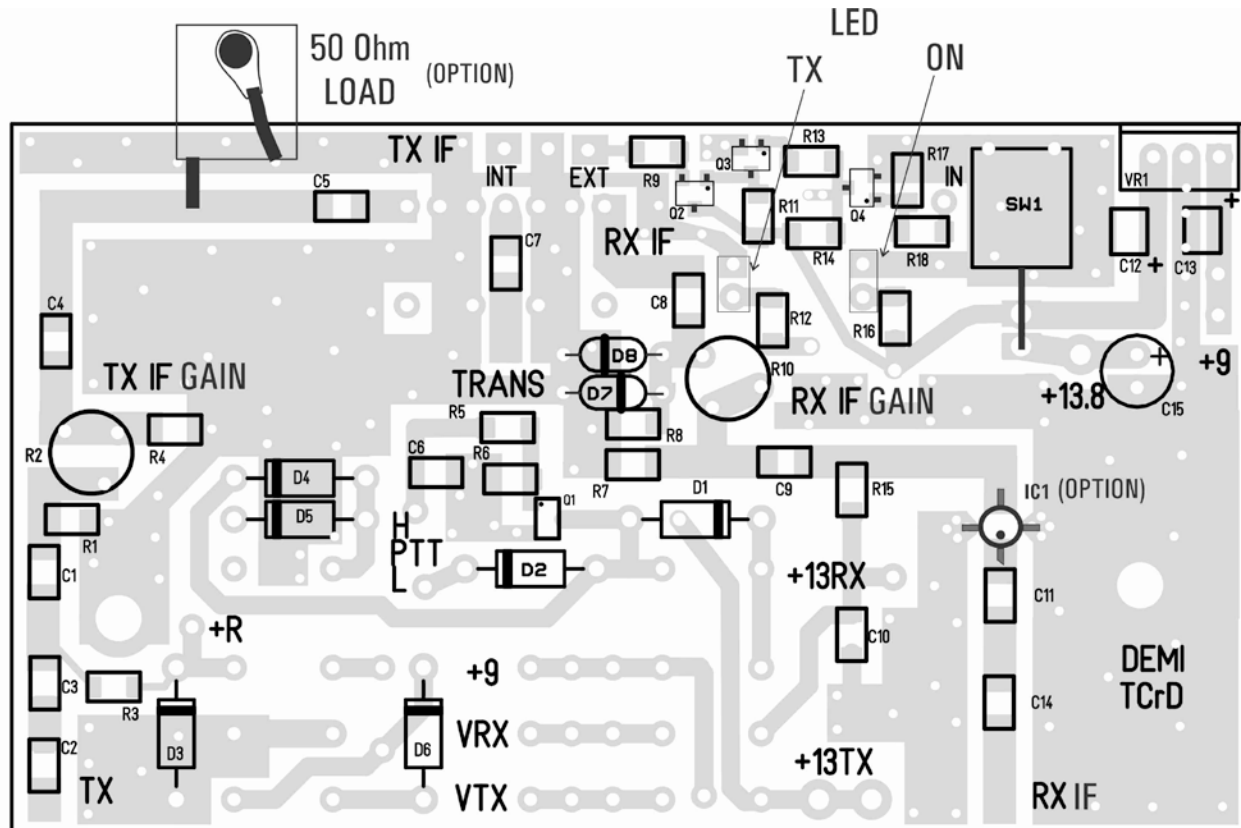
Parts List

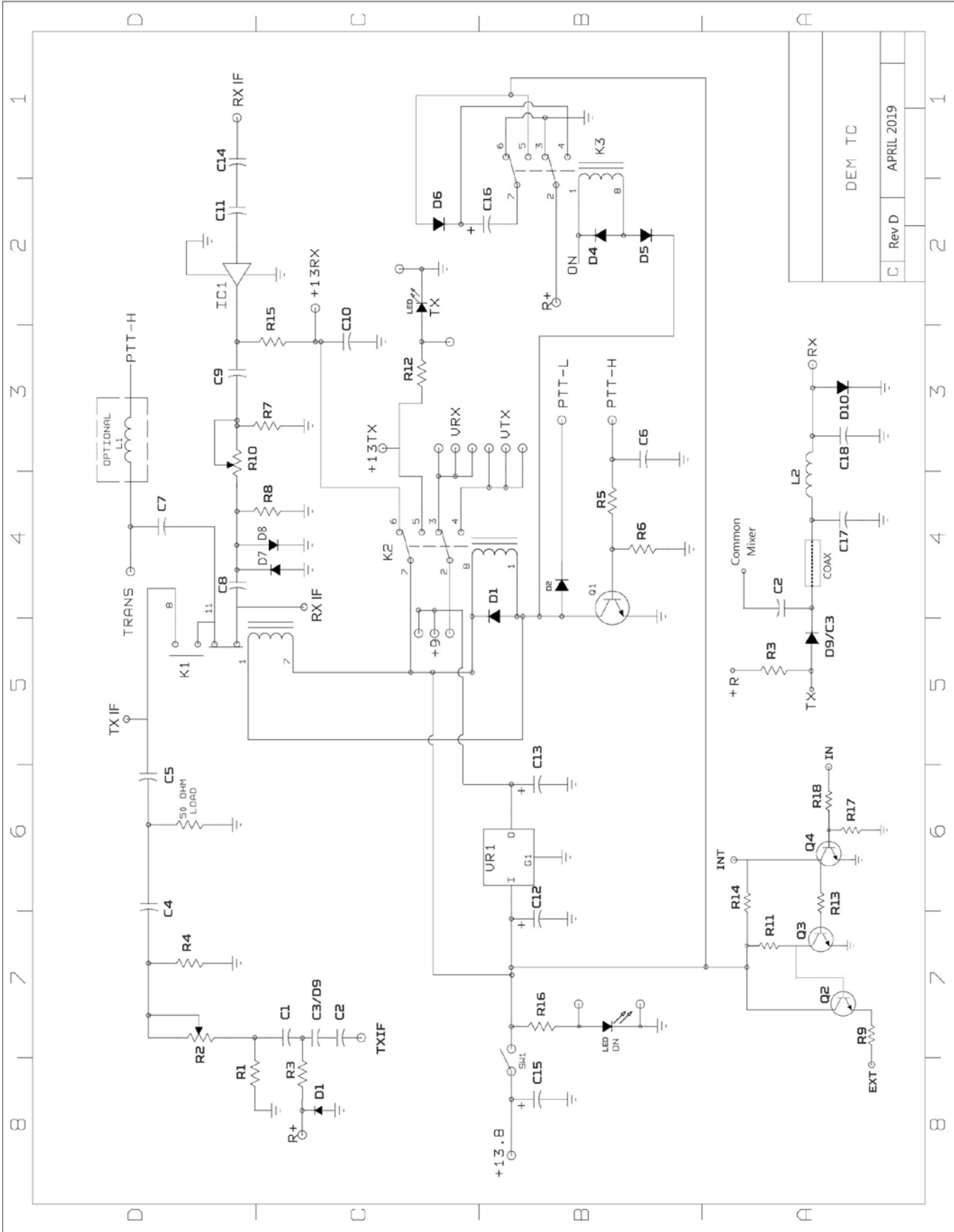
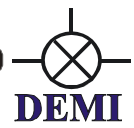
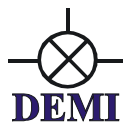
All components on this list are 1206 size and are hand solder.

C1 0.1 μ F	C14 0.1 μ F (optional)	Q4 MMBT3904	R13 10K Ω
C2 0.1 μ F	C15 100 μ F elect.	R1 220 Ω	R14 1K Ω
C3 0.1 μ F	C16 330 μ F elect.	R2 1K pot	R15 330 Ω
C4 0.1 μ F or 1 pF	D1 -D6 1N4000	R3 1K Ω	R16 1K Ω
C5 0.1 μ F	D7 1N914 or 1N4148	R4 220 Ω	R17 10K Ω
C6 0.1 μ F	D8 1N914 or 1N4148	R5 5.1K Ω	R18 1K Ω
C7 0.1 μ F	IC 1 MAR6 ❶	R6 5.1K Ω	2 - single LED
C8 0.1 μ F	K1 G5Y relay	R7 220 Ω	VR1 78S09
C9 0.1 μ F	K2 G5V or equiv. relay	R8 220 Ω	50 Ω load
C10 0.1 μ F	K3 G5V or equiv. relay	R9 1K Ω	1 pF ❷
C11 0.1 μ F	Q1 MMBT3904	R10 1K pot	1 - Dual LED
C12 4.7 μ F Tant	Q2 MMBT3904	R11 1K Ω	
C13 4.7 μ F Tant	Q3 MMBT3904	R12 330 Ω	

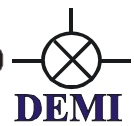
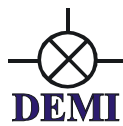
Note: All relays and C16 are installed in the bottom side of board

- ❶ The optional RXIF Gain stage may be replaced with a 1000 pF 1206 chip capacitor.
- ❷ Depending on the drive level used, C4 may be a 0.1 μ F chip, or a 1pF leaded capacitor, a 220 ohm leaded resistor or a variable capacitor.





DEM TC	
C	Rev D
APRIL 2019	



digiLO – A Wideband PLL Synthesizer

The digiLO is a Wideband Fractional-N / Integer-N PLL Synthesizer based on Maxim's MAX2870 capable of generating signals from 23.5MHz to 6GHz. It measures only 2" x 3" and comes programmed with over a hundred popular frequencies. A connection to an external 10MHz reference is provided. But the digiLO automatically switches to its on-board TCXO reference when its 10MHz external reference is not detected.

The recommended supply voltage for "+V" is 9V. But reliable operation is possible down to 7V. The digiLO is tolerant of supply voltages up to 15V. But operation beyond 9V results in excessive heating of the voltage regulator. So if 12V operation is desired, it is recommended to use a 27 Ohm 2-Watt resistor in series with the power connection. This should drop the voltage to the digiLO to a safer level. A +5V direct connection which bypasses the voltage regulator is also available.

The MAX2870's internal voltage controlled oscillator (VCO) operates from 3GHz to 6GHz. The MAX2870 generates output frequencies lower than 3GHz by inserting dividers after its VCO up to a maximum of 1/128. Every divider slightly increases the MAX2870's current consumption. Therefore, the supply current increases as output frequency decreases. Below 47MHz, supply current is a maximum of 200mA. And above 3GHz, the supply current drops to 130mA.

The 10MHz External Reference should be from a clean and stable source. Keep in mind that the digiLO's output is directly affected by the quality of its reference. The recommended input range for "REF IN" is 0dBm to +13dBm. At levels below 0dBm, the digiLO automatically switches over to its internal TCXO reference.

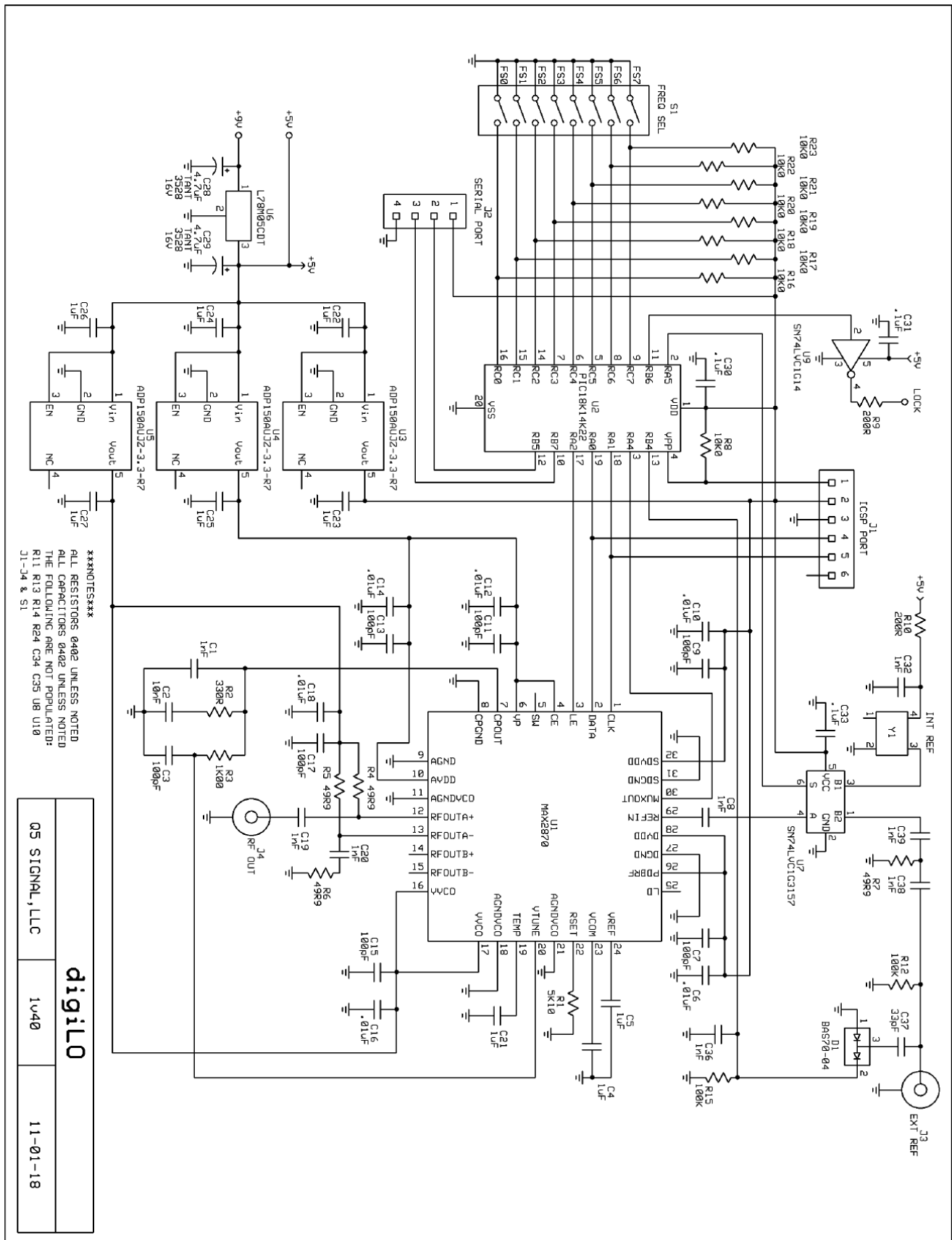
When the digiLO is locked to its external 10MHz reference, the "LOCK" output switches from 0V to 5V through a 200 Ohm resistor. This output can also serve as a simple indication of which reference (external or internal) is sourcing the digiLO. Up to 20mA can be safely sourced from this connection. Therefore, a LED can be connected directly from the "LOCK" output to ground.

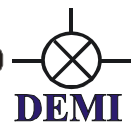
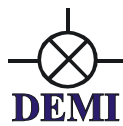
The RF output of the digiLO appears on the "RF OUT" connection. The output level is virtually flat from 23.5MHz up to 2GHz. And it maintains a level of +2dBm \pm 2dB up to 3GHz. Beyond 3GHz, the output gradually falls to -10dBm at 6GHz.

Further details of the DIGILO Synthesizer can be found at :

http://q5signal.com/image/catalog/digiLO%20Doc%2019_9_1.pdf

The DIGILO in this transverter is set for 3408MHz for 10368 = 144 MHz. If you ordered some other IF frequency it will be indicated below.





Issue Date : January 11, 2018

Part Number: **XTCLH10M000CHJA1P0** (Frequency: 10.000000MHz/ Size: 5.0 x 3.2mm)

Item	Specification
Supply Voltage: Vcc	-0.6~+6.0V
Control Voltage: Vc *1	-0.6~Vcc+0.6V
Storage Temperature Range	-40~+85°C

*1 And not to exceed the maximum value of Rating Supply Voltage.

Electrical Characteristics.

Item	Specification	
5-1	Nominal Frequency	10.000000MHz
5-2	Operating Temperature Range	-40~+85°C
5-3	Supply Voltage : Vcc	DC: +3.3V±5%
5-4	Current Consumption	3.0mA /max.
5-5	Output Level	Hi : 90%Vcc min. Lo : 10%Vcc max.
5-6	Load Condition	15pF±10%
5-7	Output Wave	CMOS
5-8	Frequency Characteristics	
5-8-1	Frequency Shift by Temperature	±0.28ppm max.(-40~+85°C) from initial value @+25°C)
5-8-2	Frequency Voltage Coefficient	±0.1ppm max. (DC:+3.3V±5%)
5-8-3	Frequency Load Coefficient	±0.1ppm max. (15pF±10%)
5-8-4	Frequency Aging	±0.5ppm max. (1year.) (@+25±2°C)
5-8-5	Frequency Tolerance after Reflow-soldering	±1.0ppm max. (2times.)
5-9	Frequency Tolerance	±0.5ppm max. (@+25±2°C, Vc:+1.5V)
5-10	Voltage Control Range	±3.0 ppm min. ±6.0 ppm max. (Vc:+1.5V±1.0V) Positive.