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LO1 Local Oscillator Daughter Board by Expanded Spectrum Systems

The LO1 is a local oscillator daughter board accessory for the TM1 Time Machine. The LO1 board is shipped fully assembled. The LO1 provides frequency agility by replacing the on-board crystal oscillator/multiplier with an external generator operating at 4X the desired center frequency. If the phase noise performance of the external generator is better than that of the on-board multiplier, then the dynamic range of the Time Machine will also be improved.

How it works
The LO1 daughter board plugs into the Time Machine board in place of U9, the 16V8 PLD. The PLD is removed from the Time Machine and plugged into a socket provided on the LO1. The LO1 receives its DC power from the Time Machine. An external generator connects to the female SMA RF input connector on the LO1. The LO1 contains a level shifter circuit that accepts sine wave input signals from the external generator and drives the input of the PLD. Limiter diodes are incorporated to prevent damage due to over drive. The input of the PLD is biased to the switching threshold for maximum sensitivity.

Installing the LO1
Disconnect the power supply from the Time Machine, and carefully remove U9, the PLD, from its socket. Plug the PLD into socket U1 of the LO1, and then plug the LO1 into the U9 socket of the Time Machine. The LO1 board is shaped to fit over the corner of the Time Machine when properly plugged into the PLD socket. A spacer can be installed, if desired, so that the LO1 shares the corner mounting hole with the Time Machine board for better mechanical integrity.

At the time of manufacture, potentiometer R1 on the LO1 is set for 1.63 VDC at PLD pin 1, with no PLD installed. Because the input threshold varies slightly from one PLD to another, R1 should be adjusted until your Time Machine functions with the lowest drive level (typically -6 dBm). The drive level should then be increased during normal operation. The recommended drive level range is 0 dBm to +13 dBm. Don't forget that the RF input must be at four (4) times the desired center frequency of the Time Machine.

Selecting an external generator source
Spectral purity and frequency stability are important qualities for your frequency agile external generator that tend to be mutually exclusive. A surplus Hewlett Packard (HP) 8640B generator has excellent spectral purity, yet is lacking in frequency stability performance. Do not attempt to use the frequency lock on the 8640B, as it tends to result in significant low frequency "wobble" or FM. Some synthesized generators, such as the HP 8656B, offer excellent frequency stability, but are lacking in spurious performance. The Programmed Test Sources (PTS) frequency synthesizers, such at the PTS 160, have proven to be cost effective generators that provide excellent performance in both spectral purity and frequency stability. The PTS synthesizers are available with different frequency resolution options, ranging from 0.1 Hz steps to 100 kHz steps. Compare the model number on the rear of the synthesizer with the information available on the PTS web site to be sure it meets your needs. Hamfests and eBay are good places to look for signal generators at good prices.

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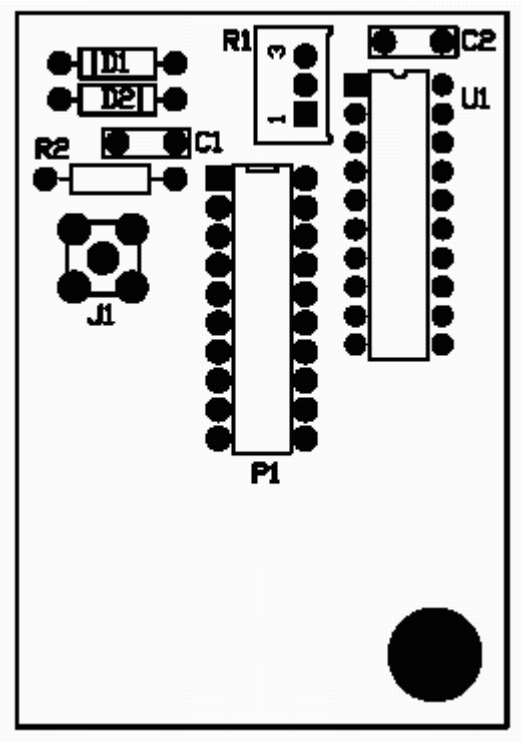
Parts Placement: Local Oscillator Daughter Board LO1



Parts List: Local Oscillator Daughter Board LO1

Quantity	Item/Designation	Label-Value	Attributes	Vendor	PN
1	1	PCB	2-layer, PTH, SS, SM		
2	C1, C2	.1uF 50V		Digi-Key	BC1101CT-ND
2	D1, D2	1N4148	Axial leads	Digi-Key	1N4148DICT-ND
1	J1	Connector, SMA	Johnson 142-0701-201	Digi-Key	J500-ND
0.33	P1	Connector	2x 10-pin section cut from 66-pin strip	Digi-Key	ED2064-ND
1	R1	2k potentiometer		Digi-Key	CT94Y202-ND
1	R2	56 ohms	0.25W	Digi-Key	56QBK-ND
1	XU1	Socket, machined	DIP20	Digi-Key	A404AE-ND

Schematic Diagram: Local Oscillator Daughter Board LO1