The Silencer Option Board for the DR-10/DS-8

The Silencer option board for the DR-10/DS-8 is installed as a daughter-board over the main printed circuit board (PCB), and derives its power, audio and other connections from its host board. The unit's goal in life is to pass high quality audio (from whatever source is feeding the device) without undesired Touch-Tones.

Anything the DTMF decoder detects as a valid DTMF tone gets muted from the Silencer's audio output. An integral 50 millisecond audio delay in line with the audio output ensures that the muting action occurs just before the tone makes it to the balanced audio output.

Getting Started Quickly

The Silencer-equipped DR-10/DS-8 is installed and wired just like a standard unit except that, for the DS-8, you will be getting your output audio from the terminals marked "Sil Out".

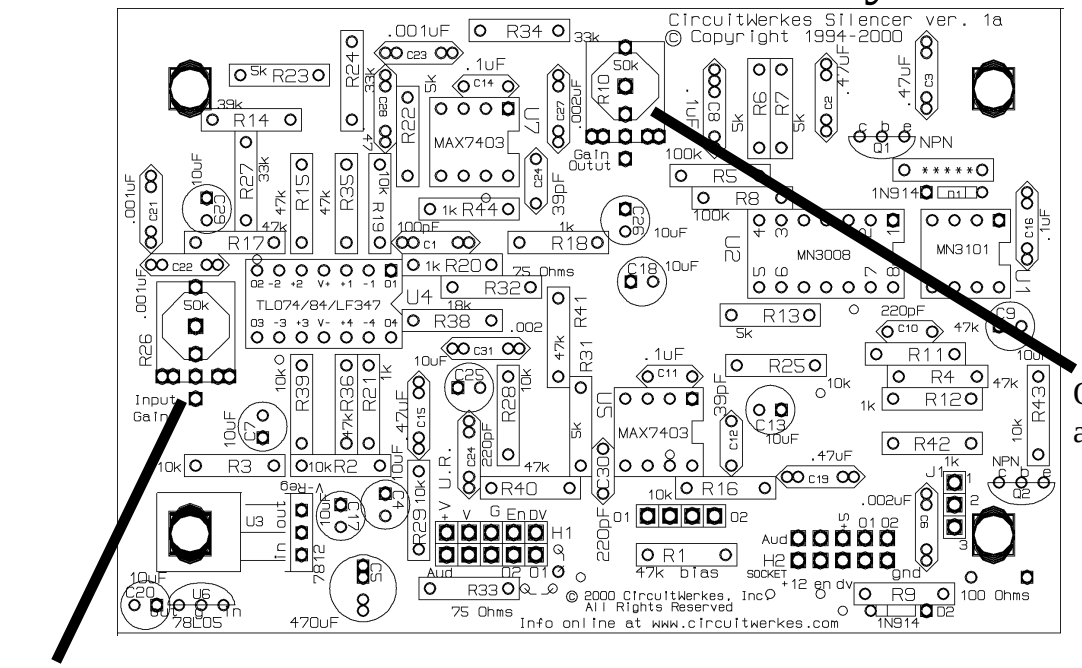
For the DR-10, your Silencer can be fed TELCO receive audio from the built-in hybrid or it can get audio from the AUX Audio in connections on the screw-terminal strip. Jumper J102 selects the feed. It is factory set for telco receive audio.

On the DR-10, jumper J101 selects whether Silencer out audio or straight telco receive audio is fed to the audio out screw terminals. A legend is drawn on the board for how to set these two jumpers (balanced audio) for your application. On DR-10 units with factory-installed Silencers J101 is set for Silencer out. There are no jumpers to change on the DS-8.

If you are retrofitting the Silencer to an existing DR-10/DS-8, please make sure that your unit is equippped with a 15 to 20V power adaptor. If your device was equipped with a 12 to 14V adaptor, please contact us for a free replacement power supply. Using less than 14 Volts may cause the Silencer's output to hum.

The pages that follow contain a parts layout for the Silencer board and a schematic and short theory of operation. If you experience trouble with your Silencer-equipped DR-10/DS-8 or need assistance, please feel free to call us at (352) 335-6555 or e-mail us at support@circuitwerkes.com.

The Silencer PC Board Layout



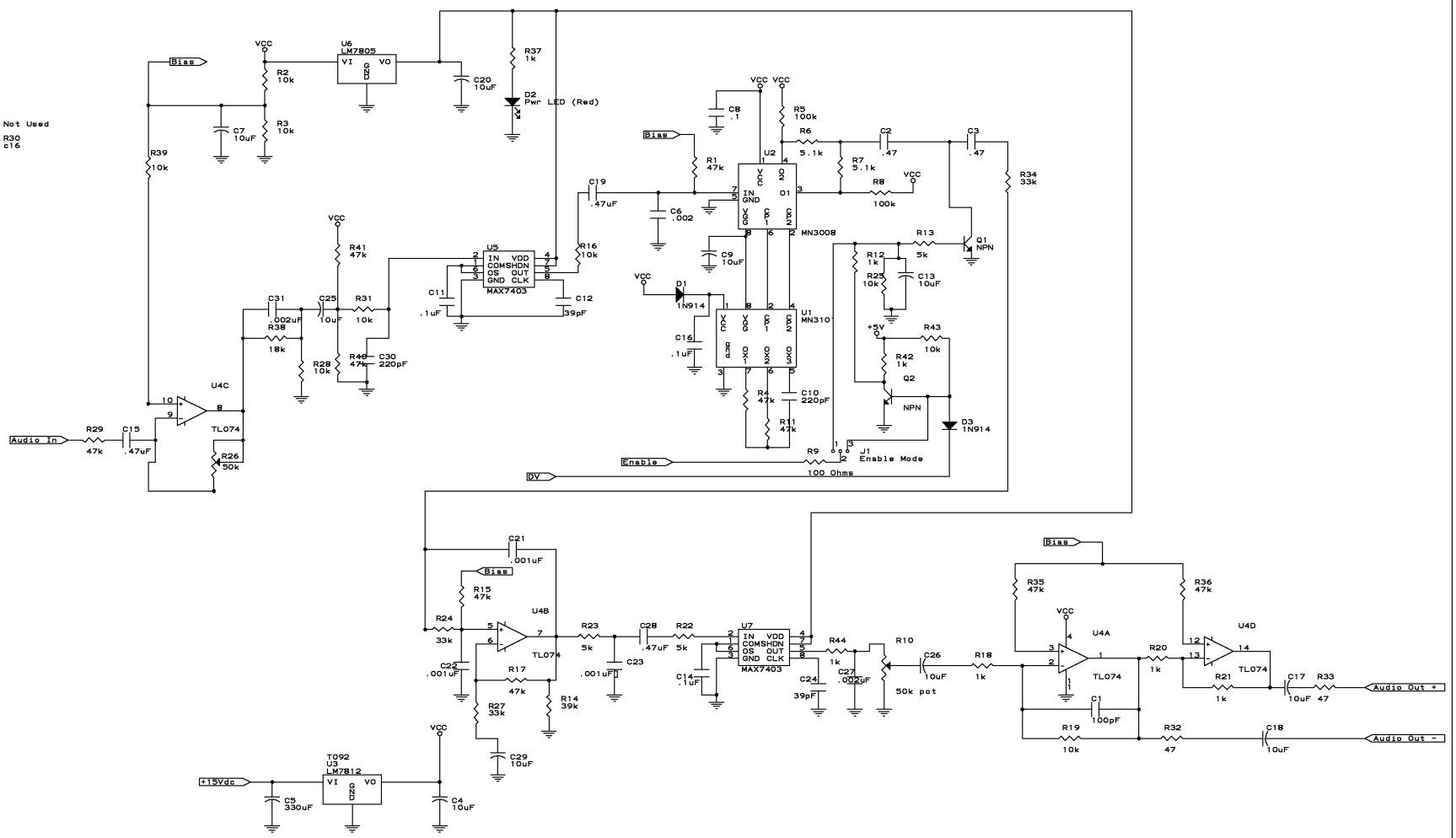
The only user adjustments on the silencer board are input and output level adjust pots and the disable mode jumper J2. The input level adjust can be optimized for best S/N ratio when dealing with varying input levels such as applications where the input audio peaks at -10dBm (audio from an FCC registered telephone coupler like our AC). Jumper J2 is normally left ON. If used with a DR-10 & J2 is ON, the Silencer's audio output will be muted anytime the DR-10 is locked. When J2 is OFF, audio will still pass through the Silencer board (un-muted) even while the DR-10 is locked. This does not apply to the DS-8.

Connection to the DR-10/DS-8 main board is made through a 10 pin header/socket arrangement.

Theory of Operation:
Incoming audio is buffered by U4c and sent through a pre-emphasis network to U5, a MAX7430, switched capacitor filter. Input gain is set by the input level control pot in the feedback circuit of U4c. This pot is factory set for -10 peak audio in the DR-10/DS-8. The filter chip is configured to limit generation of aliasing noise in the next stage. U5 and U7 are 8 pole lowpass elliptical filters. The conditioned audio is fed to Analog delay chip U2. U1 generates the appropriate (approximately 21kHz) clock for U2's operation as a 50mSec delay line. The delayed output has a 21kHz clock component that is virtually eliminated by switched capacitor lowpass filter U7. Before the audio gets to U7 it connects in an AC-coupled-only node to the mute circuit made up of q1, q2 and their associated components. When the DR-10/DS-8 detects a valid DTMF-tone, it activates the mute circuit on the Silencer. The muted circuit simply shunts the audio to ground for the duration of the incoming tone. Output from the delay goes to U4b which is configured as a Butterworth, low pass filter to reduce the possibility of aliasing noise being generated at the next stage, U7. The filtered, delayed audio from the output of U7's filter passes through the output gain control, r10, and is amplified by U4a and U4d. These opamp elements are set up to provide a balanced transformerless output. R32 and R33 limit output current. A 5 Volt regulator provides power for the MAX7430s while power for the rest of the active devices is provided by a 12 Volt regulator.

The Silencer 1a by CircuitWerkes

Audio Delay / Mute Board



CircuitWerkes 3716 SW 3rd Place Gainesville, Florida 32607 (352) 335-6555 (fax) 380-0230 Internet: www.circuitwerkes.com		
Title	Silencer 1a - DTMF Mute Board	
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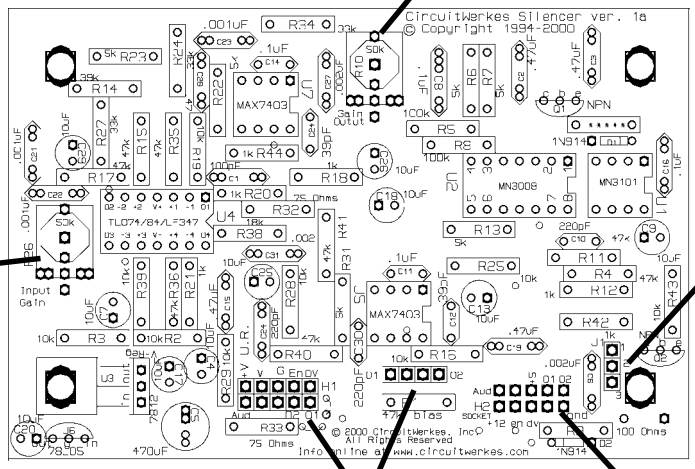
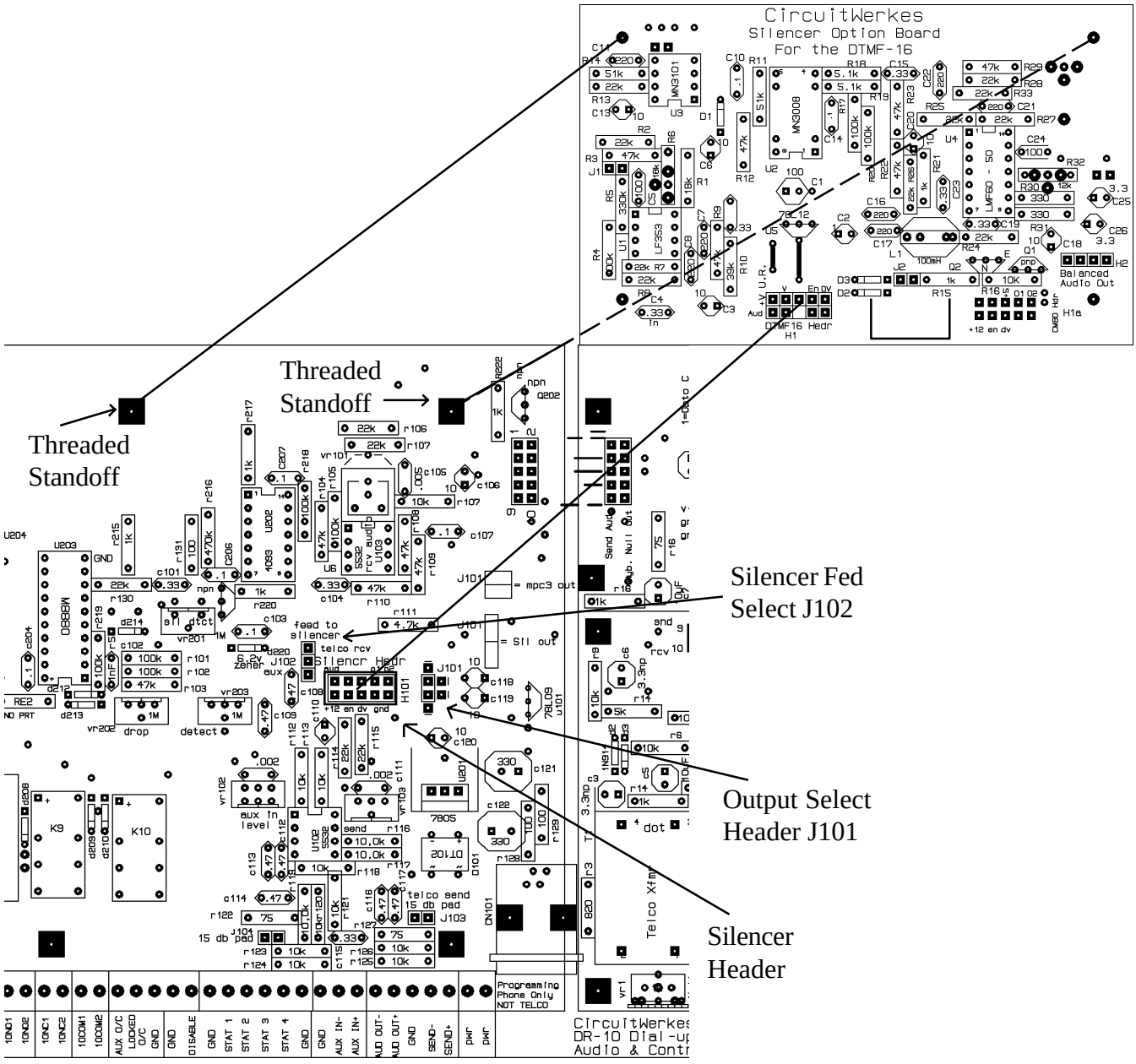
Date: March 28, 2000	Sheet 1 of 1	

Silencer PC Board Layout



DR-10 / Silencer Installation



The Silencer Daughterboard is easily installed in the DR-10.

1. First you must remove the unit's top. To remove the top cover of the DR-10, first remove the optional rack mount panel (if so equipped) then press the Red and Green LEDs on the front panel in with your fingertip so the fronts of their lenses are even with the front of the case. Next remove the four (keps) nuts from the case and remove the top half. You now have access to the main board.

2. Move the two jumpers at J101 to the Silencer out position as depicted on the printed circuit board legend. The two jumpers will then be "stacked" in a column.

3. If your Silencer is to be fed Telco (dialed-in) audio, J102 should be in the Telco (upper two pins jumpered) position. This is the factory default position. J102 should be in the lower two positions (Aux) only of you wish to feed the Silencer with non-telco audio from the DR-10's aux. input.

4. Refer to the drawing on the previous page and, if necessary, install 1/2" threaded standoffs in place of normal 6/32 machine screws. Your unit may already have standoffs installed.

5. Gently press the Silencer board's underside header onto the mating DR-10 header pins below. Visually check to make sure the pins lined up properly. Use the two included 1/4" 6-32 machine screws to secure the Silencer to the standoffs.

6. Next set up your Silencer and test its operation. The setup involves two adjustments : input level and output level. The input level pot should be adjusted as high as possible, while making sure that maximum level audio does not show noticeable distortion in the unit's output. Doing this maximizes the signal to noise ratio of the Silencer. The output level pot should be adjusted for desired output level, however, approximately 10dB of headroom below clipping is advised to take care of transient audio peaks. Both of these adjustments are made at the factory prior to shipping your Silencer retrofit kit, but variations in local Telco lines occasionally cause some adjustment to be necessary.

7. Once your Silencer is adjusted to your satisfaction, gently pull the two front-panel; LEDs straight forward about 1/4" so the flat edges (where the leads come out) are roughly even with front edge of the bottom plate. Next angle the fronts of the LEDs down just slightly, somewhere around 30 degrees. Place the top of the box on with the front angled down to roughly match the angle of the LEDs and position it so the LEDs enter their round holes in the front edge of the box. Gently move the box-top into position over the front two 6-32 studs (at each side of the bottom plate) and lower the top onto the front studs first then the back. With just a little luck your LEDs will have made it through the front panel with no problem.

8. Replace the (keps) nuts that hold the top in place and reattach your rack plate, if so equipped.

This completes installation of your Silencer daughterboard.

To Retrofit a Silencer to a DS-8a or Higher:

Installation is similar to the DR-10 and we strongly suggest that you read the DR-10, instructions first as they cover the installation in more useful detail. To begin, just remove the top cover of your DS-8 and remove the DS-8 circuit board from the bottom plate.

You will need three 6-32 by 1/4" screws, three nylon standoffs with nylon washers and keps nuts.

Mount the standoffs to your Silencer PCB using the 6-32 screws. Note that the Voltage regulator does not use a standoff.

Inside, near the front panel LEDs, you will find a double row of pins labelled H2 & "Silencer". This is where the Silencer mates with the DS-8.

Attach the nylon standoffs to the DS-8 using the nylon washers and KEPS nuts.

Perform Steps 6, 7 & 8 above.