

LC77 CALIBRATION PROCEDURE

WARNING: THESE SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID ELECTRIC SHOCK, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN THE OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

ACCESS/DISASSEMBLY

Access to the interior of the LC77 for recalibration and/or service may be obtained using the following procedure.

1. Unplug the unit from the AC Power adapter.
2. Remove the four screws (two on each side) at the rear of the instrument.
3. Place the unit on end with the handle and front panel pointing upward. Pull gently on the handle while holding the back portion of the case. The case will now slip from the chassis and rear portion exposing the printed circuit boards and all the calibration controls.

EQUIPMENT REQUIRED FOR CALIBRATION

The following equipment is recommended for use in calibrating the LC77. These are high accuracy standards and will allow the calibration of the meter to the specifications in the front of the manual. Lower accuracy standards will reduce the accuracy of the LC77. If capacitors and inductors of known values are available, they may be used for calibration.

If known values of capacitors and inductors of the following equipment is not available, the meter may be returned to the Sencore Service Department for check out and recalibration for a nominal service charge.

EQUIPMENT	RECOMMENDED MINIMUM SPECIFICATIONS		
Capacitance Sources	1500pF	± .25%	
	1.2uF	± .25%	
	500uF	± .5%	
Inductance Sources	20uH	± .5%	
	80uH	± .5%	
	800uH	± .5%	
	8mH	± .5%	
	60mH	± .5%	
	80mH	± .5%	
	800mH	± .5%	
	2H	± .5%	
	8H	± .5%	
Resistance Sources (Note: Wirewound resistors should not be used)	1 ohms	1/2W 1%	
	15 ohms	1/2W 1%	
	20 ohms	1/2W 1%	
	150 ohms	1/2W 1%	
	250 ohms	1/2W 1%	
	1500 ohms	1/2W 1%	
Digital Voltmeter	50K ohms	1W 1%	± .5%

Adjustable DC voltage source 0-15Vdc 250mA

100 Hertz sine wave source 4Vpp

Oscilloscope $\pm 3\%$

NOTE: Allow a 10 minute warm up period for the LC77 before calibrating.

INDICATOR LAMP CHECK

Push each "COMPONENT TYPE" switch on the LC77 noting that the corresponding indicator lights.

POWER SUPPLY

Connect the DVM ground to the LC77 ground (black clip on test leads) for the power supply measurements.

1. Probe the anode of CRL6 on the leakage supply board (3000) and adjust R40 for a DVM reading of 14.5Vdc $\pm .1V$.
2. Probe IC6, pin 3, on the leakage supply board (3000) and adjust R53 for 18Vdc $\pm .1V$.
3. Probe IC14, pin 2, on the main board (2000) and adjust R48 for a .2Vdc $\pm 1mV$.
4. Probe IC27, pin 9, on the main board (2000) and adjust R71 for 1.7Vdc $\pm .02V$.

NOTE: Connect the probe of the DVM to the red clip of the LC77 leads for the following measurements:

5. Enter into the keypad "100V" and push capacitor leakage on the main board, adjust R201 (pot that is in series with R181) for 97.5Vdc on the DVM.
6. Enter into the keypad "4V" and push "CAPACITOR LEAKAGE". On the main board, adjust R202 (pot in series with R182) for 3.90Vdc on the DVM.
7. Enter into the keypad "1V" and push "CAPACITOR LEAKAGE". On the Leakage supply board (3000), adjust R69 for a .975Vdc on the DVM.
8. Repeat steps 6 and 7 until they are correct.
9. Enter into the keypad "1.5V" and check that the DVM reads between 1.425Vdc and 1.500Vdc.

CAPACITANCE CALIBRATION

1. Short the LC77's leads and push the "LEAD ZERO" switch on the LC77 front panel to "SHORT".
2. Open the LC77's leads and push the "LEAD ZERO" switch on the LC77 front panel to "OPEN".
3. Connect the LC77 test leads to a 1500pF cap and push "CAPACITOR VALUE" button. Adjust R55 on the main board (2000) for a reading of 1500pF $\pm 5pF$ on the LC77 readout.

4. Rezero and repeat step 3 until reading is correct.
5. Connect a 1.2uF capacitor to the LC77 leads and press the "CAPACITOR VALUE" button. Adjust R59 on the main board (2000) for $1.2\mu F \pm .005\mu F$.
6. Connect a 500uF cap to the LC77 leads and press the "CAPACITOR VALUE" button. Adjust R158 on the main board (2000) for a reading of $500\mu F \pm 2\mu F$.
7. Switch the DVM to DCmA and connect the leads to the LC77 leads.
8. Push the "DIELECTRIC ABSORPTION" button and adjust R80 on the main board (2000) for a DVM reading of $417mA \pm 2mA$. (This test will cycle, so adjust only when the source is on). If the LC77 display goes to "WAIT" function, release the "D/A" button and adjust R80 on the main board (2000) until a reading is displayed on the LC77 LCD display.
9. Set the DVM back to DVC and disconnect the leads.

LEAKAGE CALIBRATION

1. Open the leads.
2. Turn R189 on the main board (2000) full CCW.
3. Connect the scope to IC43, pin 6, on the main board (2000) and slowly adjust R189 until the scope toggles high.
4. Enter into the keypad "1V" and select "TANTALUM CAPS" and press "CAPACITOR LEAKAGE". Adjust R46 on the main board (2000) for $0.000\mu A \pm .01\mu A$ on the LC77 display.
5. Set the DVM to read DCmA.
6. Connect a 50K ohm resistor in series with the leads of the LC77 and DCmA meter.
7. Enter into the keypad "5V" and push the "CAPACITOR LEAKAGE" button. Note that the LC77 reads approximately $80.0\mu A$ and agrees with the DVM within 20 counts.
8. Enter into the keypad "50V" and press "CAPACITOR LEAKAGE". Note that the LC77 reads approximately $780\mu A$ and agrees with the DVM within 20 counts.
9. Enter into the keypad "500V" and press "CAPACITOR LEAKAGE". Note that the LC77 reads approximately $7.7mA$ and agrees with the DVM within 20 counts.

DIELECTRIC ABSORPTION

1. Short the leads.
2. Adjust R191 on the main board (2000) fully CCW.
3. Push the "DIELECTRIC ABSORPTION" button and adjust R191 until the LC77 reads 0%.

ESR CALIBRATION

1. On the main board (2000) set R14, R19, R20, R188 to mid rotation.
2. Connect the 20 ohm resistor to the LC77 test leads and push the "CAPACITOR ESR" button. Adjust R20 on the main board (2000) for a readout of 20 ohms $\pm .5$ ohms.
3. Connect the 150 ohm resistor to the LC77 test leads and push the "CAPACITOR ESR" button. Adjust R19 on the main board (2000) for a readout of 150 ohms ± 2 ohms.
4. Repeat steps 2 and 3 until both are correct.
5. Connect the 1500 ohm resistor to the LC77 test leads and push the "CAPACITOR ESR" button. Adjust R188 on the main board (2000) for 1500 ohms ± 20 ohms.
6. Connect the 250 ohm resistor to the LC77 test leads and push the "CAPACITOR ESR" button. Check that the LC77 reads 250 ohm ± 10 ohms.
7. Rezero the LC77 leads (short).
8. Connect the 15 ohm resistor to the LC77 test leads and push the "CAPACITOR ESR" button. Adjust R14 on the main board (2000) for 15 ohms $\pm .2$ ohms.
9. Connect the 1 ohm resistor to the LC77 test leads and push the "CAPACITOR ESR" button. Check to see that the LC77 reads 1 ohm $\pm .05$ ohms.
10. Rezero the leads (short) and repeat steps 8 and 9 until the two steps are correct.

RINGER CALIBRATION

1. Hook a 8H coil across the LC77 leads.
2. Set the scope's channel A to 1V/DIV, Channel B to 5V/DIV, time base to 10M sec, normal trigger, + polarity trigger source to EXT.
3. Connect the EXT. trigger input of the scope to the gate of TR26 on the 2000 board, Channel A across the test leads of the LC77 and Channel B to pin 3, IC2 on the 2000 board.
4. Push the "COILS" button listed under component type and then push the inductor ringer button.

5. Channel A of the scope will display a waveform that consists of a series of decaying pulses, and Channel B is a series of square waves.
6. Disregarding the first pulse on Channel A, adjust R2095 so that the duration of the Channel B waveform is as long as one of the ringing pulses on Channel A.
7. Push the yokes and flybacks button and determine the point at which the ringing pulse decreases to 25% of its maximum amplitude. Adjust R91 on the 2000 board so the duration of the Channel B pulses end at the 25% point of Channel A pulse.

INDUCTANCE CALIBRATION

The following procedure requires the use of standard inductors or inductors of known value. The inductors of known value must be close to the values shown in the procedure to insure that the proper range is calibrated. Each time a control is to be adjusted, the "VALUE" pushbutton must be depressed on the front panel.

1. Short LC77 leads and zero the unit.
2. Connect the leads to a 8H coil and adjust R117 for a reading of $8H \pm .16H$.
3. Connect the leads to a 2H coil and adjust R147 for a reading of $2H \pm .04H$.
4. Repeat steps 2 and 3 until correct.
5. Connect the leads to a 800mH coil and adjust R115 for a reading of $800mH \pm 16mH$.
6. Connect the leads to a 80mH coil and adjust R2113 for a reading of $80mH \pm 1.6mH$.
7. Short the leads and rezero the unit.
8. Connect the leads to a 8mH coil and adjust R111 for a reading of $8mH \pm .16mH$.
9. Connect the leads to a 800uH coil and adjust R109 for a reading of $800uH \pm 16uH$.
10. Rezero the leads.
11. Connect the leads to a 80uH coil and adjust R107 for a reading of $80uH \pm .5uH$.
12. Rezero leads and repeat step 11.
13. Connect the leads to a 20uH coil and adjust R105 for a $20uH \pm .10uH$.
14. Rezero the leads and repeat step 13.