

Your OEI Frequency Counter has been designed to give years of trouble-free service. This manual contains important information on its use and care. Please take a few moments to familiarize yourself with the contents prior to using your counter.



Where this symbol appears on the counter, it means:
"SEE EXPLANATION IN MANUAL"

"CAUTION" The use of this word in this manual is reserved for conditions or actions that may damage your counter.

General Features.....	2
Specifications.....	3
Operator Controls.....	4
Battery Operation.....	5
Calibration.....	6
Schematic.....	7
Using the Counter.....	9
Parts List.....	11
Product Warranty.....	13
Factory Service & Return Policy.....	14

The Model 1300H/A features 1 MHz TO 1.3 GHz frequency coverage in a small pocket size instrument. An aluminum cabinet, internal rechargeable NiCad batteries and exceptionally high sensitivity make this counter an outstanding value. The 1300H/A uses a miniature surface mount RF amplifier IC to achieve input sensitivity below 1 millivolt from 27 to over 200MHz. This is significant because frequency counter input sensitivity is considered good at 10 to 25 millivolts over the VHF range by most manufacturers today. The excellent sensitivity permits using an antenna to read transmit frequencies from greater distances than ever before. The 1300H/A may be used to pick up transmit frequencies from handheld, fixed or mobile radios such as: police, fire, ham, taxi, aircraft, marine, etc. at distances approaching one to two hundred feet (depending upon transmitter power, antenna, background RF level, obstructions, etc.).

SPECIFICATIONS

Frequency Range:	1 MHz TO 1.3 GHz
Input Impedance:	50 Ohm
Typical Sensitivity:	< 2mV @ 10MHz < 1mV @ 30MHz < 1mV @ 150MHz < 4mV @ 450MHz < 10mV @ 850MHz
Max power Input:	+15 dBm

⚠CAUTION

Damage may occur to the counter if the Maximum Power Input is exceeded. Damage occurring from input overload is not covered by your warranty. See warranty for details. Never direct couple a transmitter output to the counter input. When using an antenna, always hold the counter at least several feet away from transmitter's outputting 5 watts or more. Transmitter's outputting over 10 watts should be read from even greater distances.

Time Base:

Frequency: 3.90625Mhz
Stability: +/- 1 part per million, 25-35C,
Standard TCXO - typical
+/- .5ppm, 20-40C with HT/TCXO-20
Option-typical

Aging: 1ppm per year after first year - typical
Calibration adjust: Through front panel

Accuracy:

+/- Time base inaccuracy, +/- 1 count

Gate Period:

.25 or 2.5 seconds, selectable

Resolution:

100 Hz-2.5 second gate, 1000Hz-.25 second gate

Power: Internal NiCad batteriesPack (4 x NR-AA, 1.2V, 500mAh)
2-5 hour discharge, 12-16 hour recharge cycle - typical
110VAC, 60Hz to 9VDC, 200-500mA nominal, Center-
Positive, AC-Charger/Adapter included for AC operation.

Display: 8 LED Digits, .28" high

Size: 3.9" highx 3.5" wide x 1" deep

Weight: 9 oz.

Construction: Aluminum cabinet with durable finish. NiCad batteries are soldered in and not field changeable. Manufactured in U.S.A. Specifications subject to change without notice.

OPERATOR CONTROLS

PWR: Selects Battery "ON/OFF" or AC Operation/Battery Charge.

BATT: Powers counter "ON" from internal NiCad batteries.

AC-CHG: Powers counter "OFF" when not using AC-Charger/Adapter Powers counter "ON" from wall current and charges NiCad batteries when AC-Charger/Adapter plugged in. (Counter may be operated continuously from wall current without over charging batteries. Physically disconnect AC-Charger/Adapter from wall and counter to turn "OFF").

GATE: Selects Signal Sample Period

FAST: .25 second sample time, displays 1000Hz resolution.
(Use Fast Gate setting for FREQUENCY FINDING)

SLOW: 2.5 second sample time, displays 100 Hz resolution.

SENS: Selects Input Sensitivity

HIGH: Counter is most sensitive in this position and will self-oscillate, displaying a random count. This is normal. When signal of sufficient strength is received, counter will "lock on" and display correct frequency. Use this setting for FREQUENCY FINDING when maximum reception distances are desired.

NORM: Counter will not self-oscillate in this position unless RF is present. Sensitivity is sufficient for most applications.

RANGE/MHz: Selects Frequency Range

500: Counter is most sensitive to read frequencies between 1MHz and 500MHz in this position.

1300: Counter is most sensitive to read frequencies between 500MHz and 1.3GHz in this position.

INDICATORS

DISPLAY: 8 Red LED digits of .28 inch height indicate frequency. Decimal point will be placed at the appropriate "MHz" position. The lead zeros are blanked above the frequency displayed.

GATE: Red LED illuminates during the gate or input signal sample period. The indicator is off during the time between sample periods.

RECHARGEABLE BATTERY OPERATION

The counter can operate several hours from fully charged internal NiCad batteries when the "PWR" switch is in the "BAT" position. The batteries are charged when the unit is powered by the AC-Charger/Adapter and the "PWR" switch is in the "AC-CHG" position. Full recharge will occur in 12 to 16 hours. The counter may be operated over prolonged periods by AC adapter operation with no harm to batteries as the charge current is regulated. It should take about 16 hours to full charge a discharged battery pack.

The batteries should be deep cycled occasionally by allowing them to completely discharge and fully charge several times to maintain maximum battery capacity.

CAUTION

The NiCad batteries should last several years, however, it is recommended that the counter be checked inside periodically for any sign of battery leakage or corrosion. Replace all batteries if any visible damage is observed.

To inspect the NiCad battery packs it is necessary to open the cabinet. This is accomplished by removing two machine screws from each end of the cabinet and removing the top cover.

CAUTION

110V AC and External DC Operation

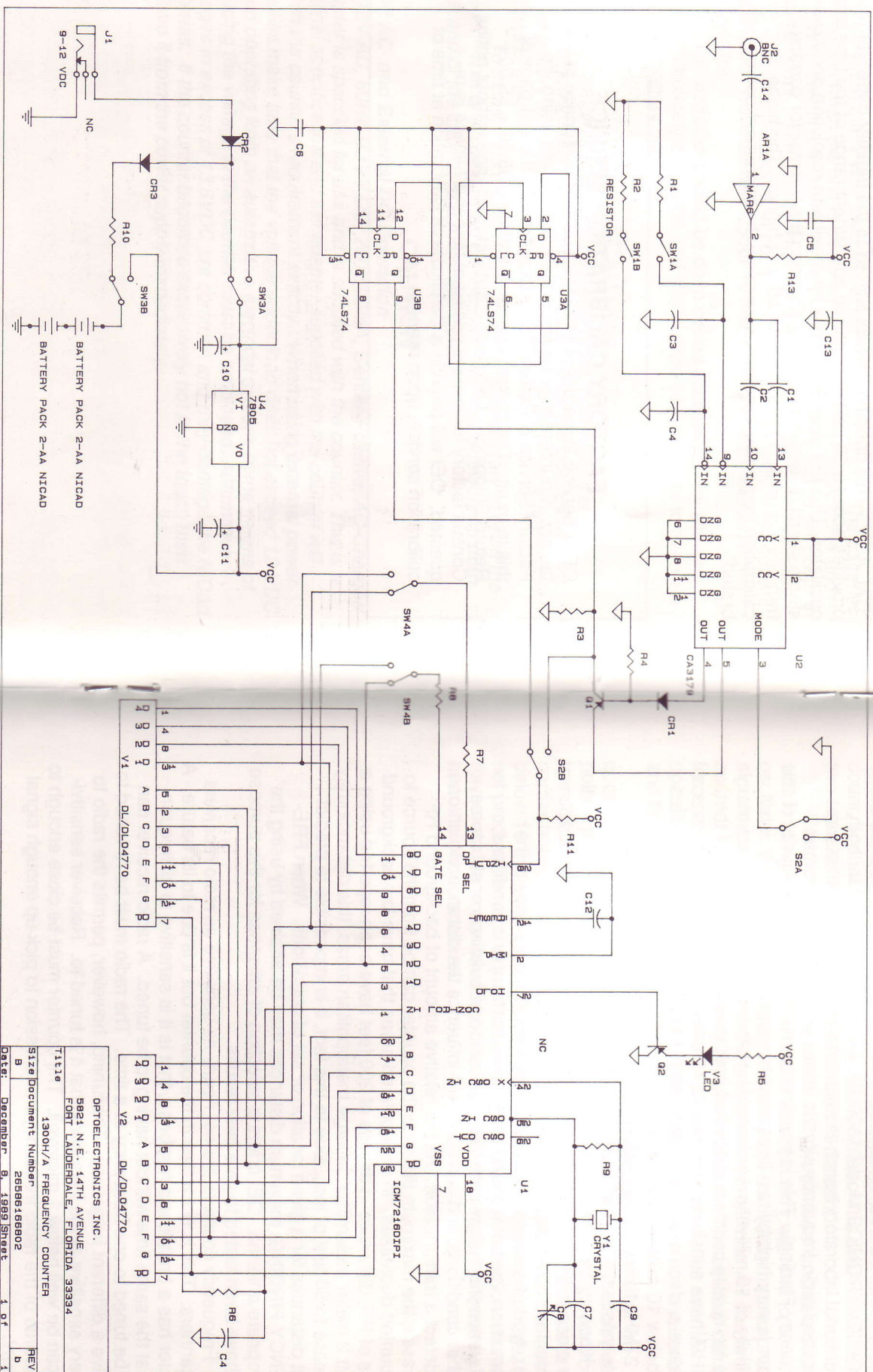
A 110V AC, 60Hz TO 9V DC, 200-500mA, Center-Positive, AC-Charger/Adapter is specified for use and is supplied with the counter. This is a nominal specification and the adapter supplied with the counter will match the counter's requirement exactly. When using external power supplies make sure that the voltage under load does not exceed 12 VDC. When operating from an automotive electrical system, some means of reducing the voltage to the counter must be employed. Automotive voltages in excess of 13.8VDC are common and may damage the NiCad batteries. If the counter becomes excessively hot to the touch then remove it from the power supply immediately.

CALIBRATION

A calibration adjustment opening in the instrument top cover is labeled "CAL ADJ". This opening permits access to the trimmer capacitor which provides about a 60 parts per million adjustment range of the time base oscillator. Use the slow Gate Time for maximum resolution and read a stable signal of known frequency adjusting the trimmer for correct frequency display. Calibrate at 10 MHz or higher. The higher the calibration frequency, the more accurately the instrument can be calibrated.

FACTORY CALIBRATION SERVICE

OEI's Service Department provides a calibration service at the factory. Counters may be shipped for this service using the Factory Service & Return Policy explained on the last page of this manual. The current charge is \$40.00 (\$35.00 + \$5.00 Return Shipping). This price is subject to change without notice. Consult factory for current pricing at time this service is requested. OEI will provide a Certificate of Calibration at time of calibration service, upon request.



OPTOELECTRONICS INC.	
5921 N.E. 14TH AVENUE	
FORT LAUDERDALE, FLORIDA 33334	
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1300Hz/A FREQUENCY COUNTER	
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Low-cost Handi-Counters (Handheld Frequency Counters) such as the OPTOELECTRONICS Model 1300H/A are now being used for both conventional laboratory bench measurements as well as to measure transmitted radio frequency signals from a wide variety of sources (Frequency Finding). This is possible because the input sensitivity of this counter is very high by test instrument standards. Until recently, input sensitivity of 10 millivolts was considered to be quite good. In fact many of the lab quality counters today that cost many times the price of the 1300H/A have sensitivity specified to 10 millivolts. The 1300H/A uses a miniature surface mount wide band amplifier IC to achieve sensitivities well below 10 millivolts over a large part of its range (below 1 millivolt from 27MHz through 200MHz). This makes the 1300H/A one of the worlds most sensitive frequency counters at any price!

Knowing the sensitivity of the counter does not answer the question "How close to the transmitter must one be to pick up the frequency?". Several factors will determine the distance question. The radiated power, type of antenna and radiation pattern, the frequency of the transmission, the background level of RF, atmospheric conditions, interference from other transmitters, position of buildings or structures, weather conditions, and sun spots will influence the distance which one can detect a transmission. As the relative amount of background RF increases, the maximum distance the counter can be from the source to be counted decreases. In unpopulated areas that have low background levels of RF, distances in excess of 200 feet have been reported using a 5 watt 2 meter transmitter. In large metropolitan areas, this distance may decrease to 50 feet or less. Due to this fact, it is impossible to predict exact distances for a given location or set of conditions. When FREQUENCY FINDING, maximum distances may be attained by using the appropriate antenna. OEI offers a selection of antennas for this purpose that have been tested to give best results.

Frequency counters are not nearly as sensitive as radio receivers or scanners. This is not a flaw in the counter but it is due to its nature. A counter has a broadband response, that is it is sensitive to all frequencies at the same time without having to be tuned. A radio receiver can only be tuned to one frequency at a time. The radio must be re-tuned to receive a different frequency. The tuning, however, permits the radio to be very sensitive at the frequency that it is tuned to. Receiver sensitivities can be well below 1 microvolt. The counter must be close enough to the source of the radio frequency transmission to pick up enough signal to count.

There will typically be only one strongest source of RF for the counter to count, even in the presence of two transmitters. The counter will not mix two signals together and display an incorrect count.

Counters that are very sensitive will give random unstable counts with no signal present. The sensitive input circuitry will tend to self-oscillate. The frequency displayed during self-oscillation has no practical significance. The presence of RF at sufficient amplitude will cause the counter to "lock up" and display the correct count. The counter can be forced to not self-oscillate by making it less sensitive. The counter operator can very quickly learn to differentiate between self-oscillation and reading a frequency.

Several types of RF transmissions cannot be counted by frequency counters. Suppressed carrier (single sideband) transmissions, pulse-modulated signals from garage door openers of remote control transmitters cannot be counted. The counter must have continuous RF carrier to count. Very low level transmitters with radiated power levels below 10 milliwatts (such as the Radio Shack wireless microphone) do not produce enough signal to be counted. Cordless telephones also have very low power levels but can be counted using an antenna held near the phone antenna.

PARTS LIST

ITEM	QTY	REF	DESCRIPTION
1	1	U1	IC, ICM7216DIP1
2	1	U2	IC, CA3179/9321-012
3	1	U3	IC, 74LS74
4	1	U4	IC, VREG, 7805
5	1	ARI A	IC, MMIC, RF AMP, MAR-6
6	1	Q1	XSTR, PNP, PN3638A
7	1	Q2	XSTR, PNP, PN5139
8	2	V1, V2	DISPLAY, LED, DL/DLO4770
9	1	V3	DIODE, LED, T1 RED
10	1	CR1	DIODE, 1N4148
11	2	CR2, CR3	DIODE, 1N4005
12	1	V1	XTAL, 3.90625 MHz
13	1	C4	CAP, DISC, 100PF
14	2	C3, 4	CAP, MONO, 470 PF
15	1	C7	CAP, DISC, 15PF NPO
16	1	C8	CAP, TRIMMER, 1-23PF
17	1	C9	CAP, DISC, 39PF
18	1	C10	CAP, LYTIC, 220UF 16V
19	1	C12	CAP, MONO, .1UF 50V
20	3	C14, 1, 2	CAP, CHIP, 1000PF 50V (1206)
21	4	C5, 6, 11, 13	CAP, CHIP, .1 UF 50V
22	1	R1	RESISTOR, 20K OHM 1/4W 5%
23	1	R2	RESISTOR, 270K OHM 1/4W 5%
24	2	R3, 5	RESISTOR, 510 OHM 1/4W 5%
25	1	R4	RESISTOR, 1K OHM 1/4W 5%
26	4	R6, 7, 8	RESISTOR, 10K OHM 1/4W 5%
27	1	R4	TRMMR, 500 OHM 10 TURN
28	1	R9	RESISTOR, 22 MEGOHM 1/4W 5%

29	1	R10	RESISTOR, 47 OHM 1/4W 5%
30	1	R13	RESISTOR, 100 OHM 1/4W 5%
31	1	J1	JACK, DC POWER INPUT
32	1	J2	CONNECTOR, BNC MODIFIED
33	2		BATT, NICAD, 2 CELL AA PCK
34	1		SOCKET, DIP, 28 PIN
35	2		SOCKET, DIP, 14 PIN
36	4	SW1, 2, 3, 4	SWITCH, SLIDE DPDT
37	1		SPACER, NYLON, .2 X .25
38	1		PC BOARD, 1200 H REV3
39	1		ADAPTER, 9VDC (200-500MA)
40	1		CABINET, BOTTOM 1200H
41	1		CABINET, TOP, 1200H
42	4		SCRW, MCH, BTIN HD SCKT BLK
43	1		CABINET, LENS, RED