



Cat. No. 22-306
OWNER'S MANUAL

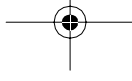


Please read before using this equipment.

LCD RF Frequency Counter



RadioShack®



FEATURES

Your RadioShack LCD RF Frequency Counter is a microcomputer-based instrument that accurately measures radio frequency (RF) or logic frequency signals. It is ideal for the home electronic hobbyist or a small repair shop. Use it to measure cordless telephone, ham, CB radio, radio-controlled toy remotes, radio/TV circuits, or digital instrument frequencies.

Your counter can measure RF signals within a 1 MHz–1.3 GHz range or logic frequency signals within a 0 Hz–10 MHz range. You can display the frequency with different resolutions and update rates.

The counter's features include:

Selectable Measurement Gate Times — let you choose a fast setting for quick measurement updates or a slow setting for maximum resolution.

Selectable Input Impedance — lets you select 50-ohm impedance (for use with the supplied antenna or an optional 50-ohm coaxial cable) or high input impedance (for use with an optional high-impedance probe).

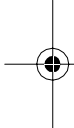
© 1997 Tandy Corporation.
All Rights Reserved.

RadioShack is a registered trademark used by Tandy Corporation.

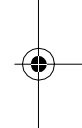


Selectable Input Frequency Range — you can choose between 1 MHz and 50 MHz or between 50 MHz and 1.3 GHz for RF, or between 0 Hz and 10 MHz for logic frequency.

BNC Connector — lets you connect the supplied antenna to measure through-air RF signals, or a cable with a male BNC connector (not supplied) for direct frequency measurements.



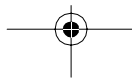
Backlight — makes the display easy to see in low-light conditions.



Hold — freezes the data on the display.

Recharging Circuit — lets you recharge nickel-cadmium batteries while they are installed in the counter.

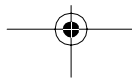
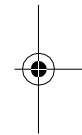
You need four AA batteries or an AC adapter to use this counter (see "Connecting Power" on Page 5).





CONTENTS

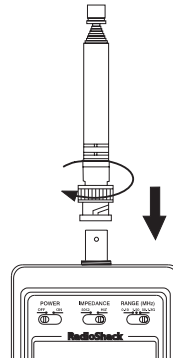
Preparation	5
Connecting the Antenna	5
Connecting Power	5
Using Batteries	6
Recharging Nickel-Cadmium Batteries	9
Using AC Power	11
Connecting an Optional Coaxial Cable	13
Operation	14
Turning On/Off the Counter	14
Setting the Input Impedance	14
Setting the Frequency Range	15
Setting the Gate Speed	16
Using the Backlight	18
Using Hold	18
Measuring Frequencies	19
Care and Maintenance	23
Specifications	25
Typical Input Sensitivity	28



PREPARATION

CONNECTING THE ANTENNA

To connect the supplied antenna to the connector, place it over the connector on top of the counter and align the recess on the antenna with the two tabs on the connector. Then slightly push down on the antenna's connector and turn it clockwise until it locks.



Note: You can also connect an antenna (not supplied) that is tuned to the frequency band of the signal you want to measure.

CONNECTING POWER

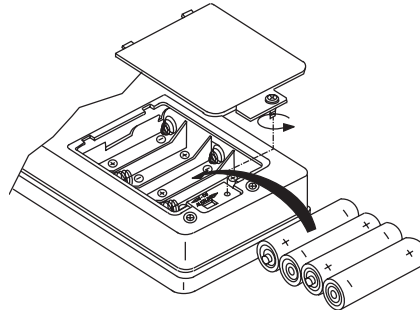
You can power your counter from four AA batteries (alkaline or rechargeable nickel-cadmium) or from a standard AC outlet using an AC adapter (not supplied).

Using Batteries

Your counter can use four AA batteries (not supplied) for power. We recommend alkaline batteries, such as RadioShack Cat. No. 23-552. You can also use rechargeable nickel-cadmium batteries, such as Cat. No. 23-125.

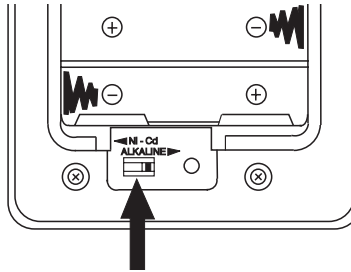
Cautions:

- Only use fresh batteries of the required size and type.
- Do not mix old and new batteries, different types of batteries (standard, alkaline, or rechargeable), or rechargeable batteries of different capacities.



Follow these steps to install batteries into the counter.

1. Use a Phillips screwdriver to loosen the screw on the counter's battery compartment cover. Then remove the cover.
2. Using a small screwdriver, set the counter's battery type switch to the appropriate position — **ALKALINE** for alkaline batteries or **Ni-Cd** for rechargeable nickel-cadmium batteries.

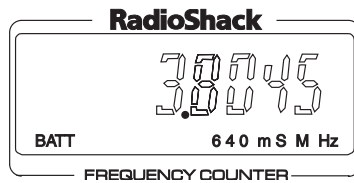


3. Put the batteries in the compartment as indicated by the polarity symbols (+ and -) marked inside.

Warning: If you use alkaline or other non-rechargeable batteries, do not connect the AC adapter to the counter with the battery type switch set to **Ni-Cd**. Doing so activates the counter's charging circuit. Trying to charge non-rechargeable batteries can cause the batteries to leak or explode, possibly causing personal injury.

4. Replace the battery compartment cover, then tighten the screw to secure the cover.

When the battery voltage becomes too low, or there is a low AC voltage condition, **BATT** appears on the lower left corner of the display and the counter might display incorrect measurements. If **BATT** appears, replace or recharge the batteries or check the AC connection.



To ensure consistent operation, replace alkaline batteries at least every 12 months.

Recharging Nickel-Cadmium Batteries

To recharge nickel-cadmium batteries, you need an AC adapter (such as Cat. No. 273-1455) (see "Using AC Power" on Page 11).

Warning: Do not try to recharge alkaline or other non-rechargeable batteries. They might rupture or explode.

Follow these steps to recharge nickel-cadmium batteries while they are inside the counter.

1. Be sure the battery type switch is set to **Ni-Cd**.
2. Plug the AC adapter's barrel plug into the **DC 9V** jack on the left side of the counter.
3. Plug the other end of the adapter into a standard AC outlet.
4. Charge the batteries for 12 to 14 hours.

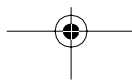
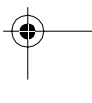
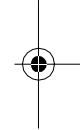
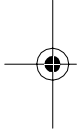
Caution: Charging batteries for longer than the recommended time can damage them.

5. Unplug the adapter from the AC outlet first. Then unplug it from the **DC 9V** jack.



Note: Occasionally, fully discharge nickel-cadmium batteries before you recharge them. Otherwise, the batteries lose their ability to fully charge.

Important: Your counter can use rechargeable nickel-cadmium batteries. At the end of a battery's useful life, it must be recycled or disposed of properly. Contact your local, county, or state hazardous waste management authorities for information on recycling or disposal programs in your area. Some options that might be available are: municipal curbside collection, drop-off boxes at retailers such as your local RadioShack store, recycling collection centers, and mail-back programs.

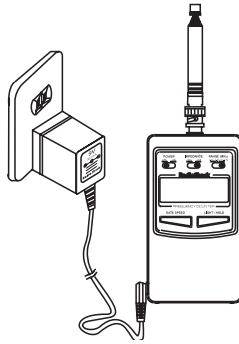


Using AC Power

You can power your counter from a standard AC outlet using a 9-volt AC adapter (not supplied), such as Cat. No. 273-1455.

Cautions:

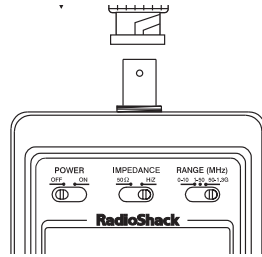
- Use only an AC adapter that supplies 9 volts, delivers at least 300 milliamps, and has a center negative plug that properly fits the counter's **DC 9V** jack. The recommended adapter meets these specifications. Using an adapter that does not meet these specifications could damage the counter and the adapter.
- Always plug the AC adapter into the counter before you plug it into the AC outlet. Always unplug the AC adapter from the AC outlet before you unplug it from the counter.



1. Insert the adapter's barrel plug into the **DC 9V** jack on the left side of the counter.
2. Plug the adapter's other end into a standard AC outlet.

CONNECTING AN OPTIONAL COAXIAL CABLE

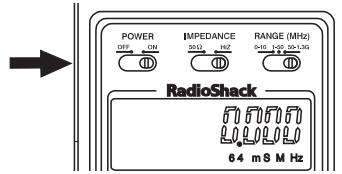
If you want to measure RF frequencies directly, or a logic frequency, connect a 50-ohm coaxial cable (or oscilloscope probe) with a male BNC connector from the device to the counter's connector.



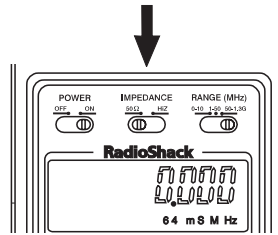
OPERATION

TURNING ON/OFF THE COUNTER

To turn on/off the counter, set **POWER OFF/ON** to the appropriate position.



SETTING THE INPUT IMPEDANCE



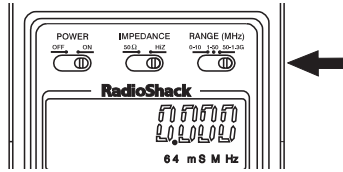
To test RF frequencies, set **IMPEDANCE** to **50 W** if you connected the supplied antenna or an optional 50-ohm coaxial cable.

Set **IMPEDANCE** to **HiZ** if you connected an optional high-impedance probe, such as an oscilloscope probe.

Note: The **IMPEDANCE** switch is disabled in the logic mode (when **RANGE** is set to **0-10**).

SETTING THE FREQUENCY RANGE

To ensure accurate measurements, set **RANGE** to the proper position for the frequency you want to measure.



1-50 — to measure RF between 1 MHz and 50 MHz.

50-1.3G — to measure RF between 50 MHz and 1.3 GHz.

0-10 — to measure logic frequencies between 0 Hz and 10 MHz. (The input must be a TTL/CMOS circuit output.)

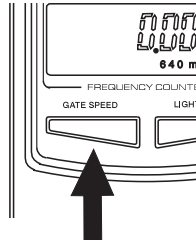
Note: If the measured frequency is outside the counter's set range, the reading will be inaccurate.

SETTING THE GATE SPEED

In the RF test mode (with **RANGE** set to **1-50** or **50-1.3G**), you can choose between two gate speeds: 64 mS and 640 mS. The 64 mS gate speed updates the display every 128 milliseconds, but the resolution is lower than at 640 mS. The 640 mS gate speed updates the display only once every 1.28 seconds, but provides the maximum display resolution (the least significant digit is in units of 100 Hz).

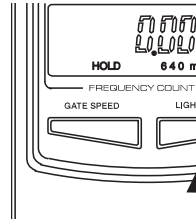
In the logic input mode (with **RANGE** set to **0-10**), you can choose between two gate speeds: 1 S and 10 S. The 1 S gate speed updates the display every 2 seconds, but the resolution is lower than at 10 S. The 10 S gate speed updates the display only once every 20 seconds, but provides the maximum display resolution (the least significant digit is in units of 0.1 Hz).

Press **GATE SPEED** to toggle between the 64 mS and 640 mS gate speed for RF, or between the 1 S and 10 S gate speed for logic measurements.



USING THE BACKLIGHT

The counter's display has a backlight to help you see the display in low light conditions. To turn on the backlight, press **LIGHT/HOLD**. The backlight stays on for about 5 seconds.



USING HOLD

HOLD freezes the data on the display.

To turn on HOLD, press **LIGHT/HOLD** to turn the backlight on, then press it again. **HOLD** appears and the data stays on the display until HOLD is released.

To release HOLD, just press **LIGHT/HOLD** again. **HOLD** disappears.

Note: You cannot use the backlight without turning off HOLD.

MEASURING FREQUENCIES

Once you have turned on the counter and set the frequency range, input impedance, and gate speed, do the following to measure frequencies.

If you connected an antenna, fully extend the antenna and be sure **IMPEDANCE** is set to **50 W**. Then turn on the device whose frequency you want to measure.

Caution: Do not let the counter's antenna touch the antenna of the device under test. Doing so might exceed the power or voltage rating of the counter and could damage the counter and the device.

For example, to check the frequency of a channel on a CB radio, turn on the CB, then select a channel and press the CB's talk button. The counter's display shows what frequency the CB is transmitting on.

You can measure an RF or a logic frequency using an oscilloscope or other high-impedance input probe if you have connected the device's cable as explained in "Connecting an Optional Coaxial Cable" on Page 13. Be sure **IMPEDANCE** on the counter is set to **HiZ**, then turn on the device.

Caution: The RF signal you are measuring should not exceed 1.4V peak-to-peak. The logic frequency signal you are measuring must be a TTL level output. Measuring signals with a higher voltage could damage the counter.

Notes:

- The **IMPEDANCE** switch is only activated in the RF mode when **RANGE** is set to **1-50** or **50-1.3G**.
- In the logic mode with the gate speed set to 10 S, if the measured frequency is over range (higher than 9.9999999 MHz), the display shows --- **OF** ---.---

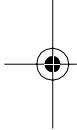
When you measure RF, you might see occasional random readings on the display. The counter has special "anti-oscillation" detection routines that detect random values and zero the display if the microprocessor detects more than four counts, each of which differs more than 50 kHz from the previous count. For example:

Count (MHz)	Difference (kHz)	Display (MHz)
19.5500		19.5500
18.7800	770	18.7800
18.8400	60	18.8400
18.7000	140	18.7000
20.1500	1450	0.0000

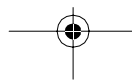
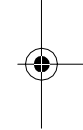
The counter continues to monitor the input and displays the input frequency once it finds a stable frequency source.



If you are measuring an unstable frequency source or trying to adjust an oscillator, this feature will interfere with your adjustment. You can disable it by turning off the counter, then turning it back on while you hold down **LIGHT/HOLD**. The display shows all icons. Once you release **LIGHT/HOLD**, the counter resumes normal operation. However, the special anti-oscillation detection routines are disabled. To enable them again, set **POWER** to **OFF**, then back to **ON** again.



Note: This feature does not operate in the logic mode.



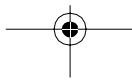
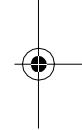
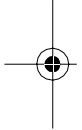
CARE AND MAINTENANCE

Your RadioShack LCD RF Frequency Counter is an example of superior design and craftsmanship. The following suggestions will help you care for the counter so you can enjoy it for years.

- Keep the counter dry. If it gets wet, wipe it dry immediately. Liquids can contain minerals that corrode electronic circuits.
- Use and store the counter only in normal temperature environments. Temperature extremes can shorten the life of electronic devices and distort or melt plastic parts.
- Handle the counter gently and carefully. Dropping it can damage circuit boards and cases and can cause the counter to work improperly.
- Keep the counter away from dust and dirt, which can cause premature wear of parts.
- Use only fresh batteries of the recommended size and type. Old batteries can leak chemicals that can damage your counter's electronic circuits.
- Wipe the counter with a damp cloth occasionally to keep it looking new. Do not use harsh chemicals, cleaning solvents, or strong detergents to clean your counter.



Modifying or tampering with the counter's internal components can cause a malfunction and invalidate your counter's warranty. If your counter is not performing as it should, take it to your local RadioShack store for assistance.



SPECIFICATIONS

GENERAL

Gate Time

RF Mode64 mS; 640 mS
TTL Mode1 S; 10 S

Display 8-Digit Liquid Crystal

Display Update Rate

RF Mode128 mS (Gate Time 64 mS)
1.28 S (Gate Time 640 mS)
TTL Mode2 S (Gate Time 1 S)
20 S (Gate Time 10 S)

Display Resolution

RF Mode1 kHz (Gate Time 64 mS)
100 Hz (Gate Time 640 mS)
TTL Mode1 Hz (Gate Time 1S)
0.1 Hz (Gate Time 10 S)

Accuracy (when AC powered) ± 3 ppm
 ± 1 Last Significant Digit (At 25°C ± 1 °C)

Operating Temperature. +0°C (+32°F) to
+43°C (+109°F)

Power Requirements..... 4 AA Alkaline Batteries
(Cat. No. 23-552), or 4 AA Rechargeable Ni-Cd
Batteries (Cat. No. 23-125), or 9V AC Adapter
(Cat. No. 273-1455)

Low Power Detect5.0 \pm 0.25 V
(Use AA Alkaline Batteries)
4.3 \pm 0.25V (Use AA Ni-Cd Batteries)

Backlight On Time 5 Seconds \pm 2 Seconds

INPUT CHARACTERISTICS

Range

RF Mode 1 MHz to 1.3 GHz
TTL Mode..... 0 Hz to 10 MHz

RF Sensitivity 150 mV MIN. 1 Hz to 1.3 GHz

TTL Input Voltage

Logical "1" Level..... 4.0 V Minimum
Logical "0" Level..... 0.8 V Maximum

Dynamic Range (For RF Range)..... 10 mV to 1 V RMS

Coupling

RF Mode AC
TTL Mode..... DC

Input Impedance

RF Mode50 ohm or HiZ
TTL ModeHiZ

Absolute Maximum Input Level

RF Mode1.4V p-p
TTL Mode.....5.0 V
(The counter may be damaged if this is exceeded)

TIME BASE

Frequency 4 MHz
Initial Accuracy ± 1 ppm

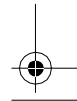
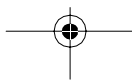
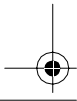
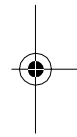
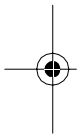
Specifications are typical; individual units might vary.
Specifications are subject to change and improvement
without notice.

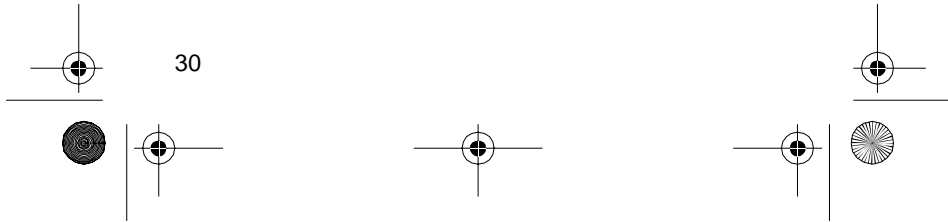
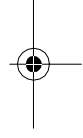
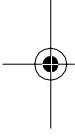
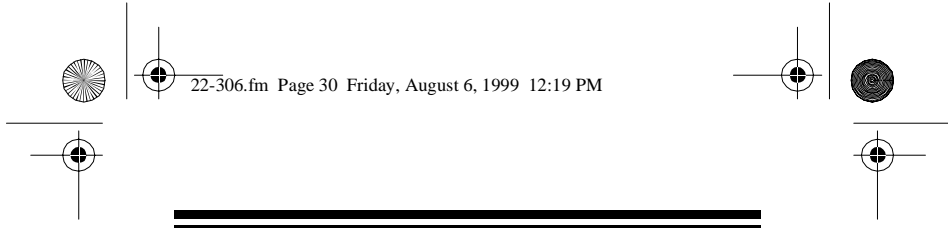
TYPICAL INPUT SENSITIVITY (50 W MODE)

Frequency (MHz)	Sensitivity (mV)	Frequency (MHz)	Sensitivity (mV)
1.0000	18	80.0000	15
2.0000	15	90.0000	15
3.0000	13	100.0000	13
4.0000	11	200.0000	10
5.0000	10	300.0000	10
6.0000	10	400.0000	10
7.0000	10	500.0000	10
8.0000	10	600.0000	10
9.0000	10	700.0000	14
10.0000	10	800.0000	14
20.0000	12	900.0000	14
30.0000	14	1000.0000	14
40.0000	17	1100.0000	18
50.0000	20	1200.0000	20
60.0000	18	1300.0000	30
70.0000	18		



NOTES





Limited Ninety-Day Warranty

This product is warranted by RadioShack against manufacturing defects in material and workmanship under normal use for ninety (90) days from the date of purchase from RadioShack company-owned stores and authorized RadioShack franchisees and dealers. EXCEPT AS PROVIDED HEREIN, RadioShack MAKES NO EXPRESS WARRANTIES AND ANY IMPLIED WARRANTIES, INCLUDING THOSE OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO THE DURATION OF THE WRITTEN LIMITED WARRANTIES CONTAINED HEREIN. EXCEPT AS PROVIDED HEREIN, RadioShack SHALL HAVE NO LIABILITY OR RESPONSIBILITY TO CUSTOMER OR ANY OTHER PERSON OR ENTITY WITH RESPECT TO ANY LIABILITY, LOSS OR DAMAGE CAUSED DIRECTLY OR INDIRECTLY BY USE OR PERFORMANCE OF THE PRODUCT OR ARISING OUT OF ANY BREACH OF THIS WARRANTY, INCLUDING, BUT NOT LIMITED TO, ANY DAMAGES RESULTING FROM INCONVENIENCE, LOSS OF TIME, DATA, PROPERTY, REVENUE, OR PROFIT OR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, EVEN IF RadioShack HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES.

Some states do not allow the limitations on how long an implied warranty lasts or the exclusion of incidental or consequential damages, so the above limitations or exclusions may not apply to you.

In the event of a product defect during the warranty period, take the product and the RadioShack sales receipt as proof of purchase date to any RadioShack store. RadioShack will, at its option, unless otherwise provided by law: (a) correct the defect by product repair without charge for parts and labor; (b) replace the product with one of the same or similar design; or (c) refund the purchase price. All replaced parts and products, and products on which a refund is made, become the property of RadioShack. New or reconditioned parts and products may be used in the performance of warranty service. Repaired or replaced parts and products are warranted for the remainder of the original warranty period. *(Continued)*



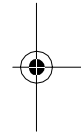
(Continued) You will be charged for repair or replacement of the product made after the expiration of the warranty period.

This warranty does not cover: (a) damage or failure caused by or attributable to acts of God, abuse, accident, misuse, improper or abnormal usage, failure to follow instructions, improper installation or maintenance, alteration, lightning or other incidence of excess voltage or current; (b) any repairs other than those provided by a RadioShack Authorized Service Facility; (c) consumables such as fuses or batteries; (d) cosmetic damage; (e) transportation, shipping or insurance costs; or (f) costs of product removal, installation, set-up service adjustment or reinstallation. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

RadioShack Customer Relations, Dept. W, 100 Throckmorton St., Suite 600, Fort Worth, TX 76102

We Service What We Sell

3/97



RadioShack
A Division of Tandy Corporation
Fort Worth, Texas 76102



7A7

811080530A
Printed in China

