



TR-2



**OPERATION
MANUAL**

**Test Equipment
Depot**

1-800-517-8431

 **TRILITHIC**
INNOVATIVE ENGINEERING

Trilithic Company Profile

Trilithic is a privately held manufacturer founded in 1986 as an engineering and assembly company that built and designed customer-directed products for telecommunications, military and industrial customers. From its modest beginnings as a two-man engineering team, Trilithic grew over the years and broadened its offerings of RF and microwave components by adding broadband solutions to its product line. This was accomplished with the acquisition of components manufacturer Cir-Q-Tel and instruments manufacturer Texscan.

Today, Trilithic is an industry leader providing telecommunications solutions for major broadband, RF and microwave markets around the world. As an ISO 9000:2001 certified company with over 40 years of collective expertise in engineering and custom assembly, Trilithic is dedicated to providing quality products, services and communications solutions that exceed customer expectations.

Trilithic is comprised of three major divisions:

- **Broadband Instruments & Systems**
Offers test, analysis and quality management solutions for the major cable television systems worldwide.
- **RF Microwave Components**
Provides components and custom subsystems for companies specializing in cellular, military and other wireless applications.
- **Emergency Alert Systems**
Leading supplier of government-mandated emergency alert systems used by HFC service providers.

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General Information

The following website contains general information which may be of interest to you:

<http://www.trilithic.com>

Trilithic's website contains product specifications and information, tips, release information, marketing information, Frequently Asked Questions (FAQs), bulletins and other technical information. You can also check this website for product updates.

Where to Get Technical Support

Trilithic technical support is available Monday through Friday from 8:00AM to 5:00PM EST. Callers in North America can dial 1-317-895-3600 or 1-800-344-2412 (toll free). International callers should dial 1-317-895-3600 or fax questions to 1-317-895-3613. You can also e-mail technical support at techsupport@trilithic.com.

For quicker support response when calling or sending e-mail, please provide the following information:

- Your name and your company name
- The technical point of contact (name, phone number, e-mail)
- The serial number of your TR-2
- A detailed description of the problem you are having, including any error or information messages

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Precautions

- Use only the AC adapter supplied with the TR-2. Any other adapter could damage the battery or meter.
- The maximum input voltage to the meter is 100 V (AC or DC). A larger voltage will damage the meter.
- The accuracy of the meter may be affected when in a strong electromagnetic field.
- Do not use the TR-2 in any manner not recommended by the manufacturer.

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This chapter:

- Describes the TR-2, equipment and features.
- Describes the TR-2 components.
- Provides information on battery changing.

Congratulations! You now own Trilithic's **TR-2 Signal Level Meter**. The TR-2 is an economical solution ideal for your basic HFC installation needs.

This simple to use meter provides fast and efficient measurements including: signal level with V/A level, dual channel and Tilt measurements to balance your system, carrier-to-noise measurement, a voltmeter function and features an extended battery life.

Weighing less than 1 pound, this simple to use, rugged little meter is convenient for one hand operation.

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Equipment

The TR-2 comes with the following:

- TR-2 Signal Level Meter
- Battery Charger (AC Adapter)
- Carry Strap
- Built-in 3.6V/2.1AH Ni-MH Battery
- Operation Manual
- Protective Bumper

The following items are also available:

- Replacement Battery (P/N 0090049000)
- Replacement Charger (P/N 0610168000)
- Replacement F-connector (P/N 0200579000)
- Replacement Protective Bumper (2131197000)
- Leather Cover & Beltclip (2131196000)

For more information, please contact Trilithic at www.trilithic.com or 1-800-344-2412.

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Features

The TR-2 supports the following functions:

- Single Channel Level Measurements
- Frequency Mode Level Measurements
- Voltmeter function
- Dual Channel Level Measurements
- Tilt measurement
- Carrier-to-Noise (C/N)

Meter Components

The TR-2's keypad and backlit display are on the front panel. The charge socket is on the bottom of the meter.

The following illustrations show:

- Front Panel and Display
- Back of meter
- LCD
- Keypad

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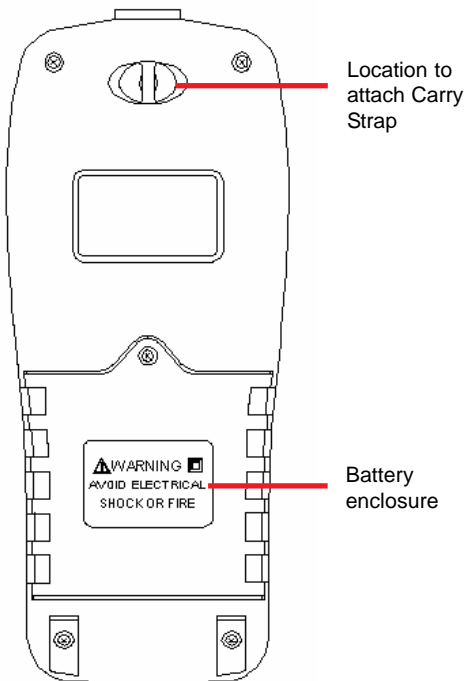
Front Panel and Display



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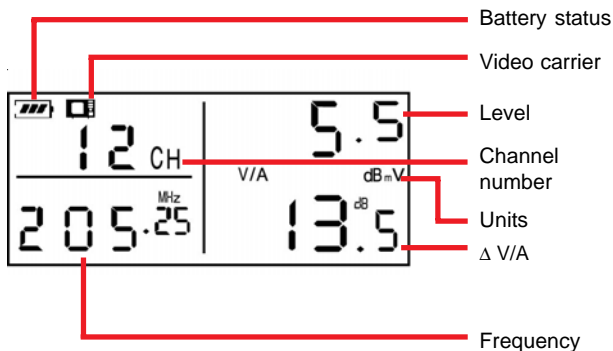
Back of Meter



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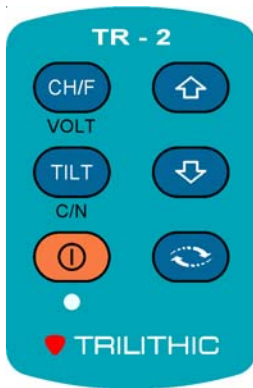
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LCD



Single Channel measurement screen is shown.

Keypad



Toggles between Single Channel, Frequency mode, and Voltmeter function.



Toggles between Dual Channel Measurement, Tilt mode, and C/N mode.



Power switch (ON/OFF).



Steps the control to the next field.



Increases channel or frequency.




Decreases channel or frequency.

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Battery Charging

The TR-2 has a built-in 3.6V/2.1AH Ni-MH battery. When fully charged, it can be used for over six hours.

When the battery Voltage drops below 3.2V, the battery symbol () at the top of the display screen will have no bars displayed. When the Voltage drops below 3.1 V, the TR-2 shuts off automatically to protect the battery. The battery will need to be recharged.

To charge the TR-2's battery, connect the charge cube to the charge socket on the bottom of the meter and plug the charger into an AC outlet.

WARNING: The battery MUST be charged with the Trilithic charge cube provided with the TR-2. Using any other charge cube may damage the battery.

While charging, the LED on the TR-2 front panel will have a RED light. The TR-2 should be charged for 10 to 14 Hours for a full charge.

Battery Replacement

To replace the TR-2 battery, remove the screw from the battery enclosure door on the back of the meter. Lift off the door and remove the TR-2 battery pack.

Replace the battery in the compartment with the proper polarity as shown by the Battery Installation Guide on the battery.

Replace the battery only with a TR-2 battery (P/N 0090049000).

This chapter:

- Provides information on TR-2 operation and measurement modes.

Before You Begin

Your TR-2 battery should be charged for 10 to 14 hours for full-charge.

The thin protective film layer placed over the display for protection during shipping should be removed.



General

LCD Backlight

The LCD backlight is automatically enabled when any key (except power) is pressed. The backlight will shut off after 20 seconds to conserve battery power.

Auto Shutdown

The TR-2 will automatically power off when there has been no keyboard activity for 3 minutes. It will also power off when the battery is low.

Digital levels (QAM)

The TR-2 will display levels for TV signals with Video and Audio carriers. For level readings on Digital channels (QAM 64, 128, or 256), add +8.2dB to the displayed level. This will provide the correct power level for the digital channel.

Single Channel Measurement

Use the CH/F key to select Single Channel measurement.



The Single Channel Measurement screen shown above displays the selected Channel, Video frequency, Video level (dBmV), and Δ V/A (level difference between the video and audio carriers in dB).

Use the  and  keys to select the desired channel.

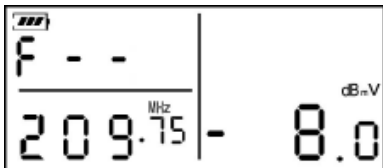


When the signal level is less than -30 dBmV, the display will indicate “Lo”.






Frequency

Use the CH/F key to select the Frequency mode.



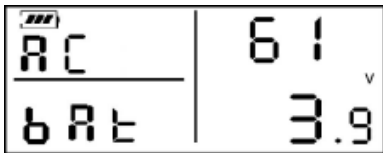
The Frequency screen shown above displays the audio frequency of the channel that was selected in the Single Channel mode. The level of the audio carrier is also shown.

The audio is automatically enabled in the Frequency mode when the signal level is greater than -25 dBmV. The volume is not adjustable.

In the frequency mode, the TR-2 can be tuned to any frequency from 46MHz to 864MHz. To change the frequency, press the  key until the desired digit in the frequency is blinking and then press the  and  keys to select the desired value.

Voltmeter Mode

Use the CH/F key to select the Voltmeter mode.



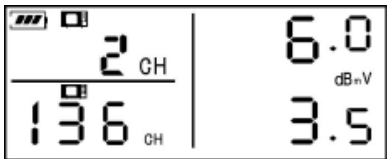
In the Voltmeter mode, the TR-2 will detect the trunk voltage at the RF input and display the AC or DC voltage.

CAUTION: The maximum input voltage must not exceed 100 V (AC or DC). A larger voltage can cause damage to the meter.

The TR-2 will also display the battery voltage in the Voltmeter mode.

Dual Channel Measurement


Use the TILT key to select the Dual Channel measurement mode.




The Dual Channel Measurement screen shown above displays the 2 selected Channels and the video level for each.

Any 2 channels may be selected for monitoring video levels in the Dual Channel Mode.

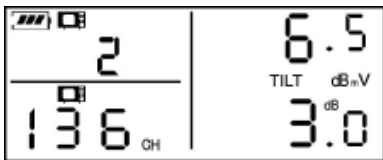
The “CH” symbol will blink for the selected channel.

Press the  and  keys to tune to the desired channel.

To set the other channel, press the  key and the “CH” symbol will blink for the other channel so it can be tuned.

Tilt Mode

Use the TILT key to select the Tilt mode.






The Tilt screen shown above displays the 2 selected Channels and the video level for the first (top) channel.

The difference between the video levels of the 2 selected channels (tilt) is also displayed in the lower right side of the display (in dB).

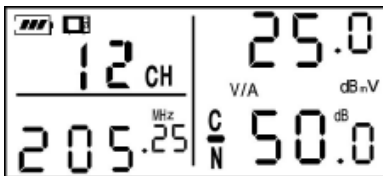
Any 2 channels may be selected for monitoring the tilt (like the Dual Channel measurement mode):

The “CH” symbol will blink for the selected channel.

Press the  and  keys to tune to the desired channel. To set the other channel, press the  key and the “CH” symbol will blink for the other channel so it can be tuned.

C/N Measurement

Use the TILT key to select the C/N mode.



The C/N screen shown above displays the channel that was selected in the Single Channel mode, the video carrier frequency, and the video level.

The selected channel can be changed by using the

 and  keys.

When the video level of the selected channel is at least 25 dBmV, the C/N measurement will be displayed. If the video level is too low (less than 20dBmV), the meter will display "Err".

A Carrier-to-noise measurement can be made with the video carrier on or shut off (after entering C/N mode to read the video level).



A more accurate C/N reading is obtained if the video carrier is shut off during the test. This allows the noise measurement to be taken within the channel bandwidth.

A C/N measurement greater than 50 dB will display 50dB.

A C/N measurement less than 20 dB will display 20dB.

To perform another C/N measurement, you must exit C/N mode and enter it again. (Press TILT key 3 times)

Frequency:

Range: 46 MHz to 864 MHz

Resolution: 50 KHz

Level Measurement:

Range: -30 to +60 dBmV

Accuracy: ± 2 dB ($20^{\circ}\text{C} \pm 5^{\circ}\text{C}$)

Resolution: 0.5 dB

Carrier-Noise Ratio (C/N):

Range: 20 dB to 50 dB

Input Level: ≥ 25 dBmV

Accuracy: ± 2.5 dB ($20^{\circ}\text{C} \pm 5^{\circ}\text{C}$)
(with carrier off)

Resolution: 0.5 dB

Voltage:

Input range: 1 to 100 V (AC or DC)

Accuracy: ± 2 V

Resolution: 1 V

Miscellaneous:

Dimensions: 169mm X 71mm X 41mm

Weight: 0.85 lbs. (386g)

Display: LCD with backlight

Working Temperature: -10°C to 40°C

Audio: Built-in speaker

(Auto on in FREQUENCY mode)

Battery:

Built-in 3.6V / 2.1AH Ni-MH battery

Work Time: More than 6 Hours with full charge
(without audio and backlight off)

Charge Time: 10 – 12 Hours (with meter off)

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Warranty Information

Trilithic, Inc. warrants that each part of this product will be free from defects in materials and workmanship, under normal use, operating conditions and service for a period of one (1) year from date of delivery. Trilithic, Inc.'s obligation under this Warranty shall be limited, at Trilithic, Inc.'s sole option, to replacing the product, or to replacing or repairing any defective part, F.O.B. Indianapolis, Indiana; provided that the Buyer shall give Trilithic, Inc. written notice.

Batteries are not included or covered by this Warranty.

The remedy set forth herein shall be the only remedy available to the Buyer under this Warranty and in no event shall Trilithic, Inc. be liable for incidental or consequential damages for any alleged breach of this Warranty. This Warranty shall not apply to any part of the product which, without fault of Trilithic, Inc., has been subject to alteration, failure caused by a part not supplied by Trilithic, Inc., accident, fire or other casualty, negligence or misuse, or to any cause whatsoever other than as a result of a defect.

Except for the warranty and exclusions set forth above, and the warranties, if any, available to the Buyer from those who supply Trilithic, Inc., there are no warranties, expressed or implied (including without limitation, any implied warranties of merchantability of fitness), with respect to the condition of the product or its suitability for any use intended for it by the Buyer or by the purchaser from the Buyer.

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