BLACK BOX NETWORK SERVICES

CLM-FF

Cable Length Meter

Measure and find faults in data, power, and communications video cable.

Customer Support Information

Order toll-free in the U.S.: Call 877-877-BBOX (outside U.S. call 724-746-5500) • FREE technical support 24 hours a day, 7 days a week: Call 724-746-5500 or fax 724-746-0746 • Mailing address: Black Box Corporation, 1000 Park Drive, Lawrence, PA 15055-1018 • Web site: www.blackbox.com • E-mail: info@blackbox.com

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This equipment generates, uses, and can radiate radio-frequency energy, and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of Industry Canada.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.

Normas Oficiales Mexicanas (NOM)
Electrical Safety Statement
INSTRUCCIONES DE SEGURIDAD

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.

2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.

3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.

4. Todas las instrucciones de operación y uso deben ser seguidas.

5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc.

6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.

7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.

8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.

9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.

10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.

11. El aparato eléctrico deberá ser connectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra fisica y la polarización del equipo no sea eliminada.

13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.

14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.

15. En caso de existir, una antena externa deberá ser localizada lejos de las lineas de energia.

16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.

17. Cuidado debe ser tomado de tal manera que objectos liquidos no sean derramados sobre la cubierta u orificios de ventilación.

18. Servicio por personal calificado deberá ser provisto cuando:

    A: El cable de poder o el contacto ha sido dañado; u

    B: Objectos han caído o líquido ha sido derramado dentro del aparato; o

    C: El aparato ha sido expuesto a la lluvia; o

    D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o

    E: El aparato ha sido tirado o su cubierta ha sido dañada.

Safety Information

To ensure safe operation of the Cable Length Meter, follow the instructions carefully and observe the warning messages listed below. Failure to observe warnings can result in severe injury or death and can cause damage to the tester.

WARNING: *Voltage!*

- *The Voltage! icon turns on when the voltage exceeds Safety Extra Low Voltage (SELV) rating of 60 volts peak AC or DC.*
- *Internal components are protected up to 400 volts peak AC or DC.*
- *Operating the Cable Length Meter when a voltage source exceeds 60 volts peak AC or DC may cause a safety hazard for the user.*
- *Do not use the Cable Length Meter when the Voltage! icon is present.*

WEEE

Do not place equipment or accessories in the trash. Items must be properly disposed of in accordance with local regulations.

Table of Contents

1. Specifications

Common Cable Length Ranges — Coaxial cable: 0–2000 feet;
Data cable: 0–1500 feet;
Electrical cable: 0–1000 feet

Input Protection — To 400 volts peak 50/60 Hz AC or DC (60V peak AC or DC). Measurement continues while warning is displayed.

Maximum Length — 3000 feet on cables with low attenuation

Measurement Method — Spread spectrum time-domain reflectometry (SSTDR)

NVP Accuracy Range — ±1% with known NVP and consistent cable parameters

NVP (VOP) Range — 20.0 to 99.9%

Operating Environment — Operating temperature: +32 to +122° F (0 to +50° C);
Storage temperature: -4 to +140° F (-20 to +60° C);
Humidity: 10 to 90%, noncondensing;
Altitude: 10,000 ft. (3050 m) maximum

Tone Generation — (4) selectable tone cadences centered on 1 kHz; constant output amplitude of 3 Vp-p

Voltage Warning — At maximum of Safety Extra Low Voltage limits

CE Approval — Yes

Power — (4) AA alkaline batteries;
Standby: 4 years;
Active: 15 hours average

Size — 6.8"H x 3.15"W x 1.3"D (17.3 x 8 x 3.3 cm)

Weight — 12 oz. (340 g) with battery

2. Overview

2.1 Introduction

The Cable Length Meter is a self-contained, battery-powered, test unit operated by contractors. This device is used to accurately test voice, data, and video cables. The Cable Length Meter determines cable length, identifies cable faults, and quickly discovers the Nominal Velocity of Propagation (NVP) for a cable using Spread Spectrum Time Domain Reflectometry (SSTDR).

2.1.1 Features

- 1% length accuracy.
- Ability to measure cables with voltage.
- Stores up to two NVP values.
- Displays length reading in feet or meters.
- Easy to operate.
- Extra large seven-segment, backlit LCD screen with icons clearly display test results.
- Tests any copper cable including data, voice, video, lamp wire, and Romex® cables.
- Discovers NVP value for cables with known length.
- Automatic pre-test voltage checks.
- Identifies cable faults.
- Tone generator with selectable tone cadence easily traces cables.
- Conserves power and supports long battery life with auto-off feature and battery life indicator

2.1.2 Terms and Descriptions

Table 2-1 defines the terms used throughout this document and provides information to assist you with proper operation and understanding of the test unit.

Table 2-1. Terms and descriptions.

Term	Description and Uses
Nominal Velocity of Propagation (NVP)	Also known as the Velocity of Propagation (VOP). NVP is the speed of an electrical signal traveling through a cable, measured as a percentage of the speed of light.
Safety Extra Low Voltage (SELV)	• A rating determined by the International Electro-technical Commission that defines safe voltage standard using electronic devices. • SELV is 60 volts DC or Peak AC (45 volts RMS).
F-connector	Connector for a coaxial cable
Spread Spectrum Time Domain Reflectometry (SSTDR)	• Spread spectrum is the technological foundation of cell phone communications and is used to transmit a small, but nevertheless recognizable, signal in a high noise environment. • By combining spread spectrum with TDR technology, SSTDR allows for a length test on cables without interference from voltage.

2.2 What's Included

Your package should include the following items. If anything is missing or damaged, contact Black Box Technical Support at 724-746-5500 or info@blackbox.com.

- (1) Cable Length Meter (CLM-FF)
- (1) F-connector coupler
- (1) F-type to RJ-45 plug
- (1) F-type to BNC adapter
- (1) push on F-type to alligator clips
- (1) push on BNC to alligator clips
- This user's manual

2.3 Hardware Description

The Cable Length Meter, illustrated in Figure 2-1, has three main parts: the F-connector, the LCD display screen, and the keypad.

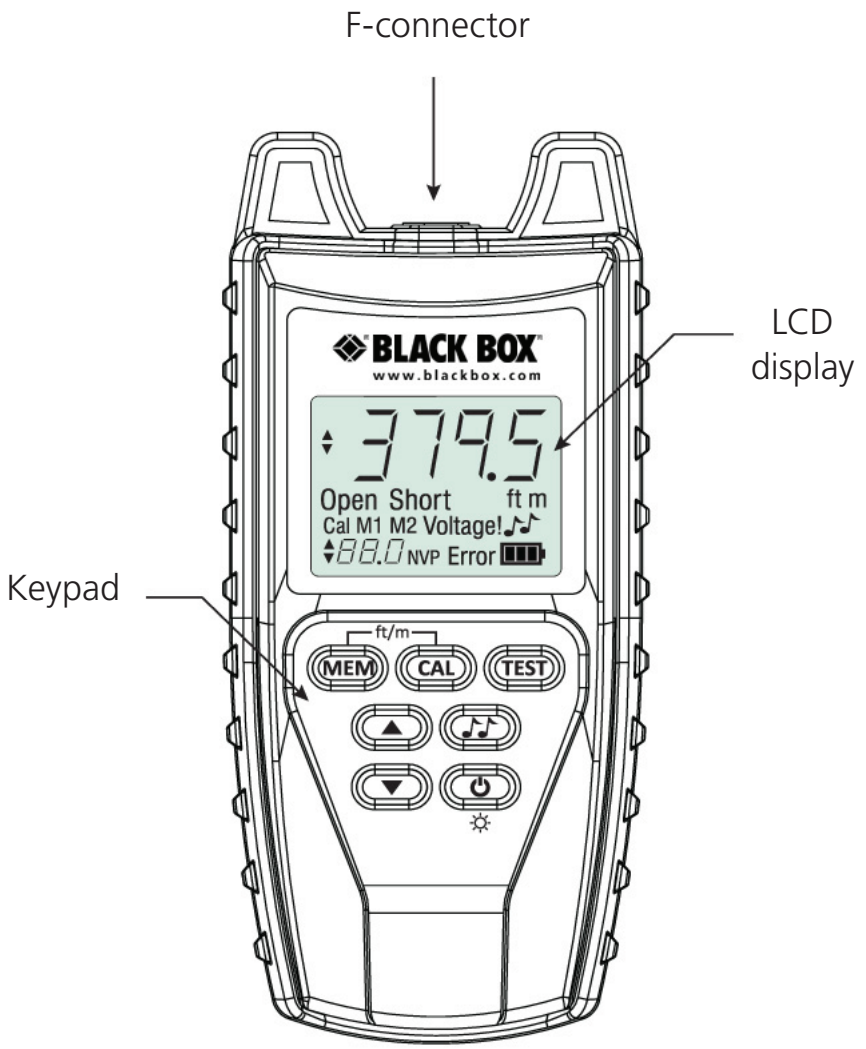


Figure 2-1. Cable Length Meter components.

One F-connector is located at the top of the Cable Length Meter. The connector enables you to test and measure single cables.

NOTE: *Additional accessories are provided with your purchase of the Cable Length Meter for use with twisted pair, coaxial, and two-wire cables. Refer to the Cable Testing General Guidelines section of the manual for more details.*

3. LCD Display Screen and Keypad Functions

3.1 LCD Display Screen

The Cable Length Meter has a high contrast LCD display screen, shown in Figure 3-1. The LCD display screen shows the following: modes and related icons, cable length, memory storage and related icons, NVP value, cable faults, error message, voltage detection warning, and battery life indicator.

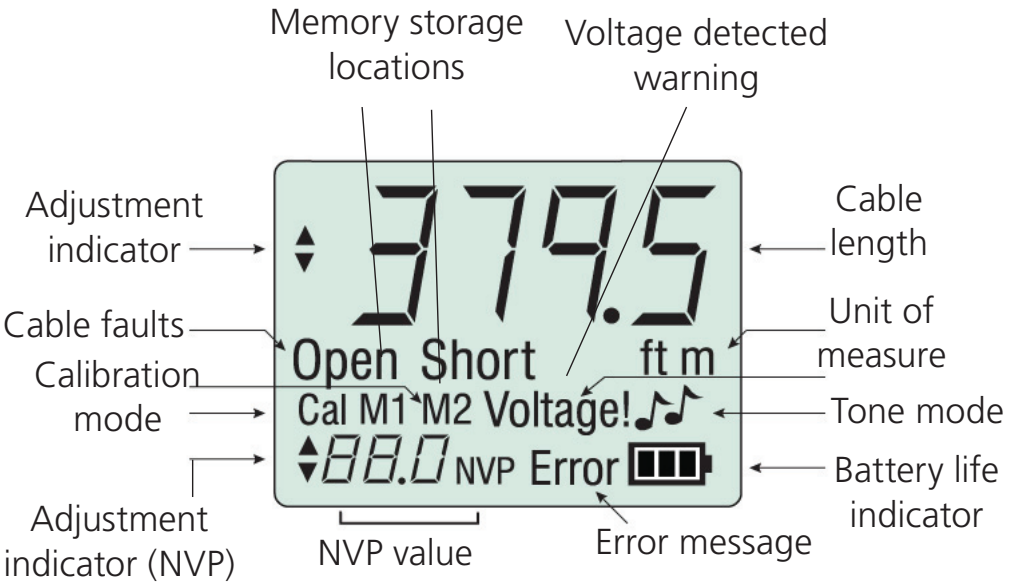


Figure 3-1. LCD display screen.

3.1.1 Test Mode

When the TEST button is pressed, the measured cable length (in units of feet or meters) appears at the top of the LCD display screen. The following values and icons display in the screen when a single test is run:

- **Storage Location**—The selected storage location (M1 or M2) appears in the lower left corner of the display screen above the NVP value.
- **NVP Value**—The value saved in the selected storage location appears in the lower left corner of the screen. This value is used to calculate the displayed cable length.

3.1.2 Memory Storage

When the MEM button is selected, a series of values and icons appear inthe LCD display screen. See Table 3-1 for a description of the display screen updates when Memory Storage is in use.

Table 3-1. Memory Storage icons and values.

Icons and Values	Description
Memory Storage Locations	The unit has two memory storage locations: M1 and M2. The selected storage location appears above the NVP value in the lower left corner of the display screen.
NVP Value	The NVP value for the selected storage location appears next to the "NVP" icon in the lower left corner of the screen.
Adjustment Indicator	The adjustment indicator icon demonstrates that the NVP value can be adjusted. The icon, displayed as two Up/Down arrows, appears to the left of the NVP value.
Cable Length	The cable length, displayed in feet or meters, appears in the upper right corner of the display screen. When a cable is not attached to the Cable Length Meter, the length will read "0."

NOTE: *Refer to the Using Memory Storage section to learn how to store multiple NVP values for testing purposes.*

3.1.3 Tone Mode

When the TONE button is selected, two musical notes blink in the lower right corner of the LCD display screen to demonstrate the unit is set to tone tracing. The following icons appear in the display screen when Tone Mode is in use:

- Cadence—There are four cadence options: HI, LO, HL1, and HL2. The last selected cadence appears in the top row of the display screen.
- Adjustment Indicator—Two arrows appear to the left of the selected cadence to indicate that cadence can be adjusted.

NOTE: A tone probe is used for the tone tracing functionality of the Cable Length Meter. This item is sold separately. Refer to the Additional Accessories Section for a listing of available products.

3.1.4 Calibration Mode

When the CAL button is pressed, the "Cal" icon appears in the lower left corner of the display screen. The icons and values described in Table 3-2 appear in the LCD display screen when the unit is set to Calibration Mode.

Table 3-2. Calibration Mode Icons and Values

Icons and Values	Description
Cable Length	The last entered cable length appears (in units of feet or meters) in the top row of the LCD display screen.
Adjustment Indicator	The adjustment indicator, denoted by two Up/Down arrows, indicates that cable length can be adjusted while in Calibration Mode. The icon displays to the left of the last inputted cable length.
NVP Icon	The "NVP" icon appears in the bottom row of the LCD display screen. Three dash lines "- - -" appear to the left of the NVP icon, demonstrating that the NVP has not been calculated for the entered cable length.

NOTE: *Refer to the Using Calibration Mode section to learn how to calculate the NVP of a cable.*

3.1.5 Cable Faults

The device checks for two cable faults during testing: Open and Short. The cable faults, explained in Table 3-3, appear in the middle of the LCD display screen.

Table 3-3. Cable Faults.

Cable Faults	Description
Open	An "Open" error indicates that a wire connection within the cable is not continuous throughout the length of the cable.
Short	A "Short" icon appears when the two wires within a cable are electrically connected. This is also known as a short circuit

3.1.6 Battery Life Indicator ()

The battery life icon appears in the lower right corner of the LCD display screen to demonstrate the approximate remaining battery life. A new battery shows three bars. The number of bars decreases as the battery is nearing depletion. The icon begins to flash at 4 volts when the battery needs to be replaced. Results may be unreliable at this point.

***NOTE**: The Cable Length Meter will turn off if the power supply goes out of regulation from a low battery condition.*

3.1.7 Voltage Detected Warning (Voltage!)

The "Voltage!" icon appears in the lower right corner of the display screen when the voltage detected on a cable exceeds SELV rating of 60 volts peak AC or DC. If the icon appears, the Cable Length Meter should be disconnected immediately from the source of the voltage.

NOTE: *The Cable Length Meter continually checks for the presence of voltage on a connected cable.*

3.1.8 Error

The "Error" message appears in the lower right corner of the LCD display under the following circumstances:

- Calibration results in an invalid NVP value outside of the 20 to 99.9 NVP value range.
- SSTDR reflection was not detected due to a properly terminated cable or excess signal loss.

NOTE: *Refer to the Using Calibration Mode and Using Test Mode sections for troubleshooting the "Error" message when using either of these modes.*

3.2 Keypad

The Cable Length Meter has seven buttons, shown in Figure 3-2, Four buttons, appearing in the top two rows of the keypad, are used with Test and Tone Modes. Two Up/Down buttons are used to edit. One button is used to power the unit On/Off. The button functions are explained in Table 3-4.

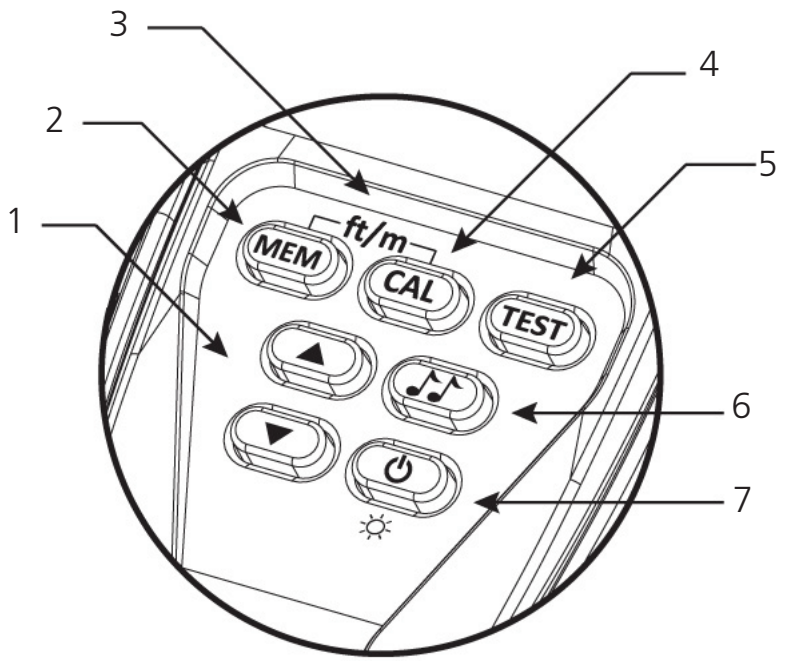


Figure 3-2. Keypad.

1. Up/Down
2. Memory
3. Toggle units
4. Calibration
5. Test
6. Tone
7. Power/Backlight

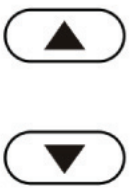
Table 3-4. Keypad.

Button Name and Icon	Description
Memory MEM	The Memory button is used to store up to two NVP values for testing purposes. • Short presses of the Memory button toggle between the two memory storage locations: M1 and M2. • A long press (two seconds) of the button stores an NVP value in the selected storage location. • A long press (two seconds) of the Memory and Calibration buttons simultaneously toggles between units of measurement (feet and meters).
Calibration CAL	The Calibration button enables you to discover the NVP value based on an entered cable length. • Short presses of the Calibration button adjust cable length in increments of 50 feet (20 m) within the range of 50 to 1000 feet (20 to 300 m). • A long press (two seconds) of the Calbration button aborts Calibration mode and enters Test mode. • A long press (two seconds) of the Memory and Calibration buttons simultaneously toggles between units of measurement (feet and meters).

Table 3-4 (Continued). Keypad.

Button Name and Icon	Description
Test 	The Test button initiates length testing on the connected cable. • A short press runs a single test on demand. • A long press (two seconds) of the Memory and Calibration buttons simultaneously toggles between units of measurement (feet and meters).
Tone 	The Tone button enables you to trace cables by sound. • A short press of the button transmits an audio tone from the unit through the connected cable. • Subsequent presses of the Tone button toggle between Test and Tone modes.

Table 3-4 (Continued). Keypad.

Button Name and Icon	Description
Up/Down 	• In Tone mode, the Up/Down buttons enable you to select a cadence (HI, LO, HL1, and HL2). • In Calibration mode, the buttons are used ot adjust the measured cable length within the following length range: 24 to 100 feet (10 to 300 m). • In Memory Storage and Test mode, the up/down buttons enable you to adjust the NVP value for the selected memory storage location (M1 or M2).
Power 	• A short press of the Power button turns the cable length meter on. • Subsequent presses of the button toggle the backlight On and Off. • A long press (two seconds) of the Power button turns the unit off.

4. Operation

To ensure safe operation of the Cable Length Meter, follow the instructions carefully and pay attention to the warning and caution symbols. Failure to observe warnings can result in severe injury or death and can damage the unit.

4.1 Turning the Unit On/Off

4.1.1 Turn Unit On

Press the Power button to turn the unit ON.

4.1.2 Turn Unit Off

Press and hold down the Power button for two seconds to turn the unit OFF. The display screen goes blank.

4.2 Automatic Power Down

The Cable Length Meter automatically turns off after a period of inactivity to conserve battery power. The default power-off time is set for 20 minutes of no activity. The automatic power down feature depends on which mode is in use and if voltage is detected on the cable being tested (see Table 4-1).

Table 4-1. Automatic power down.

Mode	Time
Test mode	1 minute
Loop testing	3 minutes
Tone mode	15 minutes
Calibration mode	1 minute

4.3 Cable Testing General Guidelines

The Cable Length Meter determines the length of a variety of cable types, calculates the NVP value of a cable with a known length, and identifies cables by sound.

NOTES: The accessories provided with the Cable Length Meter must be used to properly connect cables.

- *For coaxial cables, affix the F-connector coupler to the F-connector on the top of the unit. Then connect the end of the cable to be tested to the other side of the F-connector coupler.*
- *When testing a cable with an RJ-45 jack, connect the F-connector coupler to the F-connector on the top of the unit. Then attach the insulated push-on F-connector to RJ-45 plug.*
- *To run tests using the alligator clips, first affix the F-connector coupler (or F-jack to BNC jack) to the top of unit. Then attach the proper cable assembly to alligator clip accessory.*

WARNING:

- *The Voltage! Icon appears when the voltage surpasses SELV rating of 60 volts peak AC or DC. It is not recommended to operate the Cable Length Meter on cable systems exceeding a voltage value of 60 volts.*
- *If the Voltage! icon appears, the Cable Length Meter should be disconnected immediately from the source of the voltage.*
- *Internal components of the Cable Length Meter are protected to 400 volts peak AC or DC. Connecting the unit to cabling systems with voltage above 400 volts peak AC or DC may damage the test unit and pose a safety hazard for the user.*

4.4 Using Memory Storage

The Cable Length Meter features two memory storage locations (M1 and M2), enabling you to save two NVP values for cable testing.

NOTE: *For the first use of the Memory Storage feature, the default NVP values for both M1 and M2 storage locations is 84.6 NVP. This is a common value for testing RG6 coaxial cables.*

4.4.1 Recalling Stored NVP Values

1. Connect one end of the cable to the Cable Length Meter. Use connection accessories according to the type of cable you are testing.
2. Press the POWER button to turn the unit ON.
3. Press the MEM button to recall the stored NVP Value. The LCD display screen, illustrated in Figure 4-1, shows the following:

- The current storage location (M1 or M2) and the NVP value last saved in the selected location.
- The adjustment indicator icon appears in the screen indicating NVP is editable.
- The cable length calculated during the last test.

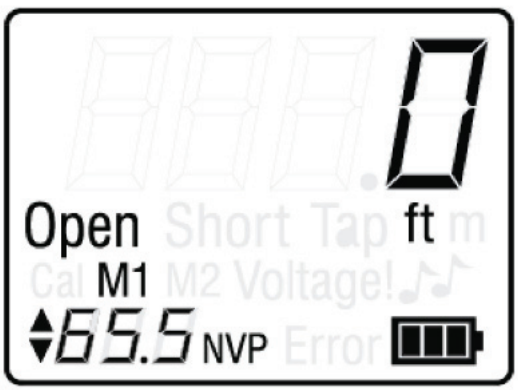


Figure 4-1. LCD display screen in memory storage.

NOTE: *Single presses of the MEM button toggles between the two memory storage locations.*

Cable length does not update automatically when toggling between the two memory storage locations. To achieve an accurate length measurement when selecting a different stored NVP value, a test must be run. Refer to Section 4.6, Using Test Mode, for instructions on measuring cable length.

4.4.2 Adjusting NVP Values

1. Power the unit ON.
2. Select the memory storage location you would like to adjust (M1 or M2) through short presses of the MEM button.
3. Press the UP and DOWN buttons to increment or decrement the NVP value. Press and hold the UP or DOWN buttons to quickly increase or decrease the NVP value.

NOTE: *If the NVP value is unknown, you can determine the NVP value for the cable you are testing in the following ways:*

- View the listing of common NVPs by cable type on the back side of the Cable Length Meter.
- Refer to Appendix A for an extended listing of NVP values.
- Use Calibration Mode to set the NVP value if the length of the cable is known. Refer to the Section 4.5, Using Calibration Mode section for instructions on calculating NVP.

4. Press and hold down the MEM button for two seconds to save the adjusted NVP value. The adjusted NVP value will be stored in the unit's memory for the specified storage location.

NOTES:

A short press of the MEM button or selection of any other buttons during editing will discard the adjusted value.

If the unit is turned OFF prior to saving the edited NVP value, the Cable Length Meter will recall the adjusted NVP value. However, the adjusted value will not be saved in either of the two storage locations.

4.5 Using Calibration Mode

Use Calibration Mode to calculate the NVP value for a known cable length of 25–1,000 feet (10–300 m). The determined NVP value can be stored in the unit's memory allowing you to easily test cables without recalibrating the NVP every test.

NOTES: *Calibration Mode is used with unterminated cables only.*

For the first use of Calibration Mode, the unit defaults to a cable length of 50 ft. when the unit is set to feet, or 20 m when the Cable Length Meter is set to meters.

When Calibration Mode is in use, the connected cable is tested for the presence of voltage. If detected, a dynamic voltage warning displays until the unit is disconnected from the voltage source.

1. Connect a cable to the Cable Length Meter. Use connection accessories according to the type of cable you are testing.

NOTE: *The Cable Length Meter cannot be calibrated without a cable attached to the unit.*

2. Press the POWER button to turn the unit ON.
3. Press the CAL button. The LCD display screen, illustrated in Figure 4-2, shows the following upon entering Calibration Mode:

- The last entered cable length, in units of feet or meters.
- The adjustment indicator icon appears in the screen indicating the cable length is editable.
- The "Cal" icon appears in the lower left corner.
- Three dashes "- - -" are displayed to demonstrate that the NVP value has yet to be calculated.

Figure 4-2. LCD display screen in calibration mode.

4. Verify that the Cable Length Meter is set to your desired unit of measurement (feet or meters). To change the unit of measurement, press and hold down the MEM and CAL buttons simultaneously for two seconds. The unit of measurement will adjust in the LCD display screen.
5. Enter the length of the attached cable. See Table 4-2 for a description of how to adjust cable length using the Up/Down and Calibration buttons.

Table 4-2. Adjusting cable length.

Cable Faults	Description
Up/Down	The Up/Down buttons enable you to adjust the cable length within the range of 25 to 1000 feet (30 to 300 m). • Press the UP and DOWN buttons to increment or decrement the length. • Press and hold the UP or DOWN button to quickly increase or decrease the cable length.
Calibration	Press the CAL button to increase cable length in 50 feet (20 m) increments according to the unit of measurement selected (feet or meters).

NOTES: *Once the maximum length (1,000 ft. or 300 m) is reached through use of the CAL button, a subsequent press of the button adjusts the cable length to the default cable length (50 feet or 20 m).*

To abort Calibration Mode and retain your previous inputted cable length, press and hold down the CAL button. The unit defaults to Test Mode.

6. Press the TEST mode button. The following updates occur in the LCD display screen (see Figure 4-2):

- The three dashes in the lower left corner disappear. The calculated NVP value for the inputted cable length appears in place of the three dashes.
- The cable length displays in the upper right corner.
- The Memory Storage location last selected (M1 or M2) appears above the NVP value.
- The adjustment indicator icon appears in the lower left corner.
- The "Open" icon displays when Calibration Mode is used with unterminated cables only.

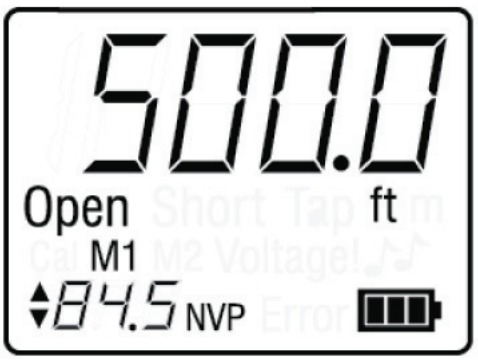


Figure 4-2. Calculated NVP value.

NOTE: *The valid NVP value range is 20 to 99.9. If you achieve an NVP value that's out of this range, the following occurs:*

- *The "Error" message blinks at the bottom of the LCD display screen (see Figure 4-3).*
- *The unit recalls the last calculated NVP value.*
- *The Cable Length Meter exits Calibration Mode and enters Test Mode.*
- *The last cable result displays at the top of the screen.*

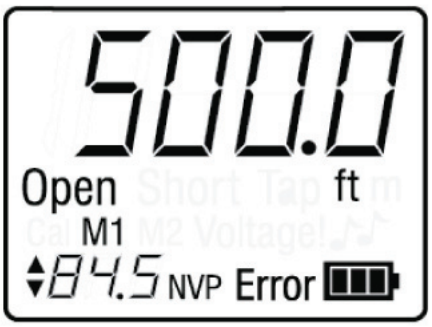


Figure 4-3. Error message in calibration mode.

7. Interpret display results and troubleshoot potential cable faults (Open and Short).

4.6 Using Test Mode

Use Test Mode to calculate the length of unterminated cables. A termination with impedance closely matching the characteristic impedance of the cable can produce inaccurate test results. One of the following error messages may appear in the LCD display screen:

- "Short" icon appears demonstrating the cable is terminated.
- "Error" message blinks to indicate that SSTDR reflection was not detected due to a properly terminated cable or excess signal loss.

NOTE: *When Test Mode is in use, the connected cable is tested for the presence of voltage. If detected, a dynamic voltage warning displays until the unit is disconnected from the voltage source.*

1. Connect a cable to the Cable Length Meter. Use connection accessories according to the type of cable you are testing.

NOTE: *Connection to the cable should be as short as possible to minimize the impedance discontinuity at the cable attachment point. Otherwise, The Cable Length Meter may see a fault at the connection point.*

2. Press the POWER button to turn the unit ON.
3. Select the memory storage location (M1 or M2) with the desired NVP value for testing. The NVP value requires adjustment if neither storage location contains an NVP value matching the type of cable you are testing.

NOTE: *Refer to Section 4.4, Using Memory Storage, for instructions on adjusting NVP values.*

A listing of common NVPs by cable type is on the back side of the Cable Length Meter. You may also refer to Appendix A for an extended list of NVP values.

4. Press the TEST button. The LCD display screen shows the following upon entering Test Mode (See Figure 4-4):

- The measured cable length in units of feet or meters.
- The storage location (M1 or M2) with its associated NVP value used to calculate the connected cable's length.
- The adjustment indicator icon appears in the lower left corner.
- The cable fault (Open or Short).

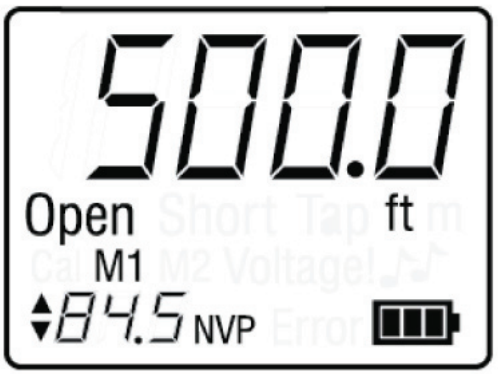


Figure 4-4. LCD display screen in test mode.

NOTE: *If the test is unable to determine a valid result, four dashes "- - - -" appear in place of the measured cable length reading and the "Error" message flashes (see Figure 4-5). The following scenarios may result in an invalid result:*

- *The connected cable is terminated.*
- *Excess signal loss.*

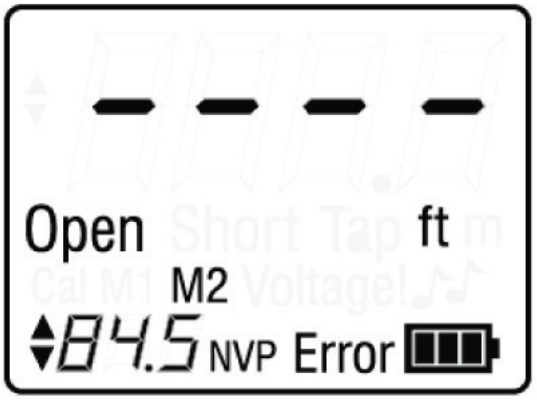


Figure 4-5. Error in test mode.

5. Interpret display results and troubleshoot potential cable fault (Open or Short).

4.7 Using Loop Testing

The Cable Length Meter can run a continuous test on a connected cable allowing you to accurately measure long cables susceptible to signal loss. Loop testing offers ease of use by enabling you to test multiple cables without repeatedly pressing the TEST button.

1. Press the POWER button to turn the unit ON.
2. Verify the unit is set to the desired unit of measurement (feet or meters). To change the unit of measurement, press and hold down the MEM and CAL buttons for two seconds.
3. Select the memory storage location (M1 or M2) that contains the NVP value for the type of cable you are testing.

NOTE: *Refer to Section 4.4, Using Memory Storage, for instructions on adjusting the NVP value.*

4. Press and hold down the TEST button for two seconds to run a continuous test. The following values and icons appear in the LCD display screen (see Figure 4-6):

- The "LOOP" message flashes once in the upper right corner to demonstrate the unit is set to continuous testing.
- The measured cable length replaces the "LOOP" icon and flashes to indicate test activity. The length flashes for the duration of a test.
- The selected storage location (M1 or M2) and its respective NVP value appear in the lower left corner.
- The adjustment indicator icon displays to the left of the NVP value.
- The cable fault (Open or Short) displays.

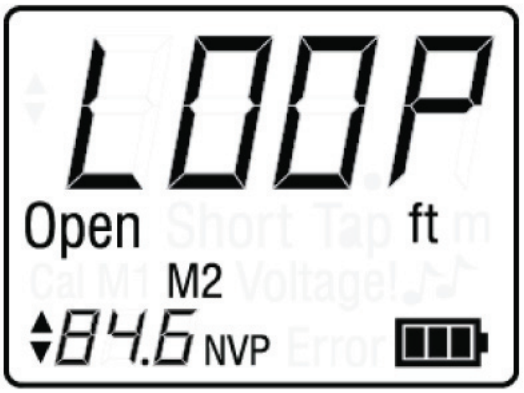


Figure 4-6. LCD display screen in loop testing.

NOTE: *Pressing any button, other than Power, terminates the loop test. The unit turns off after three minutes of testing.*

5. Interpret display results and troubleshoot potential cable faults (Open and Short).

4.8 Using Tone Mode

Tone Mode is used to trace cables by sound. Selection of this mode emits a cadence from the unit through the connected cable. Cadence is detected by a tone probe.

NOTE: *When Tone Mode is in use, the connected cable is tested for the presence of voltage. If detected, a dynamic voltage warning displays until the unit is disconnected from the voltage source.*

1. Connect a cable to the Cable Length Meter. Use connection accessories according to the type of cable you are testing.
2. Press the POWER button to turn the unit ON.
3. Press the TONE button. The LCD display screen updates with the following symbols and icons (see Figure 4-7):

- Two musical notes blink in the lower right corner to indicate Tone Mode is in use.
- The last selected cadence (HI, LO, HL1, and HL2) appears in the upper right corner.

- The adjustment indicator appears to the left of the cadence indicating the cadence can be adjusted.

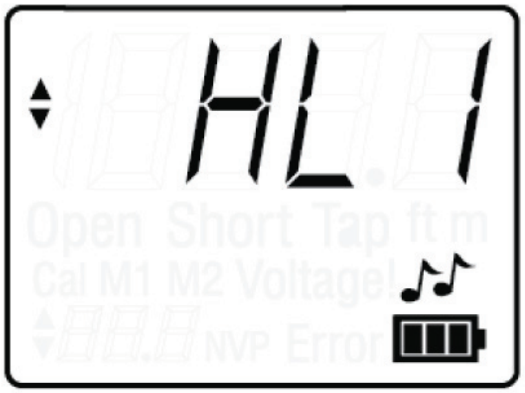


Figure 4-7. Tone mode with HLI cadence.

4. To adjust the cadence, press the UP and DOWN buttons until your desired selection updates in the LCD display screen.
5. Use the tone probe to trace cables.

5. Maintenance

5.1 Battery Replacement

1. Using a #1 Philips head screwdriver, remove the single screw on the battery door, located in the back of the Cable Length Meter towards the bottom of the unit.
2. Take off the battery door and remove the old batteries.
4. Replace with four AAA alkaline batteries. Slide the batteries into the battery cartridge according to the diagram printed on the bottom of the battery compartment.
5. Return the battery door to the unit and tighten the screw to secure the battery door. The door is keyed to fit in only one direction.

CAUTION: *Do not overtighten the battery door. Doing so can damage the test unit.*

5.2 Cleaning

Use a damp, clean cloth to clean the tester.

WARNINGS:

1. *Disconnect all cables from the Cable Length Meter before cleaning. Failing to do so can damage the unit and result in personal injury.*
2. *Do not use abrasive, harsh cleaners or solvents to clean the Cable Length Meter.*

5.3 Storage

When the Cable Length Meter is not in use, store it in a dry, protective case. The battery should be removed if the tester is stored for a long period of time.

Do not expose the Cable Length Meter to high temperatures or humidity. When stored in temperatures exceeding the limits listed in Chapter 1, Specifications, allow the Cable Length Meter to return to the normal, recommended operating conditions before using it.

6. Troubleshooting

6.1 Contacting Black Box

If you determine that your Cable Length Meter is malfunctioning, do not attempt to alter or repair the unit. It contains no user-serviceable parts. Contact Black Box Technical Support at 724-746-5500 or info@blackbox.com.

Before you do, make a record of the history of the problem. We will be able to provide more efficient and accurate assistance if you have a complete description, including:

- the nature and duration of the problem.
- when the problem occurs.
- the components involved in the problem.
- any particular application that, when used, appears to create the problem or make it worse.

6.2 Shipping and Packaging

If you need to transport or ship your Cable Length Meter:

- Package it carefully. We recommend that you use the original container.
- If you are returning the unit, make sure you include everything you received with it. Before you ship for return or repair, contact Black Box to get a Return Authorization (RA) number.

Appendix A. Common NVP Values and Ranges by Cable Type

Table A-1. Common NVP values and ranges by cable type.

Cable Type	NVP	Range
Coaxial Cables		
RG58	65.4	64.5–66.4
RG59	83.9	83.0–85.0
RG6U	84.6	83.5–85.5
RG6 Quad Shield	84.9	84.0–86.0
Phone Cables		
CAT3 4-Pair	67.3	65.5–68.0
CAT3 3-Pair CMX	67.5	66.5–68.1
24-/25-Pair CAT3	64	63.0–65.0
Data Cables		
CAT5e (Orange/ Orange White)	65.9	65.0–67.0
CAT5e STP	65.2	64.2–66.2
CAT5e FTP	73.1	72.1–74.1
24-/25-Pair CAT5e	71	70.0–72.0
CAT6	68.8	67.5–69.5

Table A-1 (Continued). Common NVP values and ranges by cable type.

Cable Type	NVP	Range
Electrical Cables		
10/2 Romex Coiled	68.8	68.0–70.0
10/2 Romex Uncoiled	71.2	70.2–72.2
12/2 Romex Coiled	67.1	66.0–68.0
12/2 Romex Uncoiled	73.2	72.0–74.0
12/3 Romex Coiled	63.7	63.0–64.5
12/3 Romex Uncoiled	70.6	69.5–71.5
12/3 Romex Twisted Coiled	68.4	67.8–69.4
12/3 Romex Twisted Uncoiled	68.4	67.8–69.0
14/2 Romex Coiled	66.4	65.0–68.6
14/2 Romex Uncoiled	71.9	71.0–73.0
14/3 Romex Coiled	64.8	64.0–65.5
14/3 Romex Uncoiled	68.6	67.5–69.5

Table A-1 (Continued). Common NVP values and ranges by cable type.

Cable Type	NVP	Range
Security Cables		
12/2 Fire PLN	59.9	59.9–60.9
18/4 Fire PLN	60.4	59.5–61.5
16/2 Fire PVC	65.9	65.0–67.0
18/6 Fire PLN	61.6	60.5–62.5
14/2 Audio Cable	71	70.0–72.0

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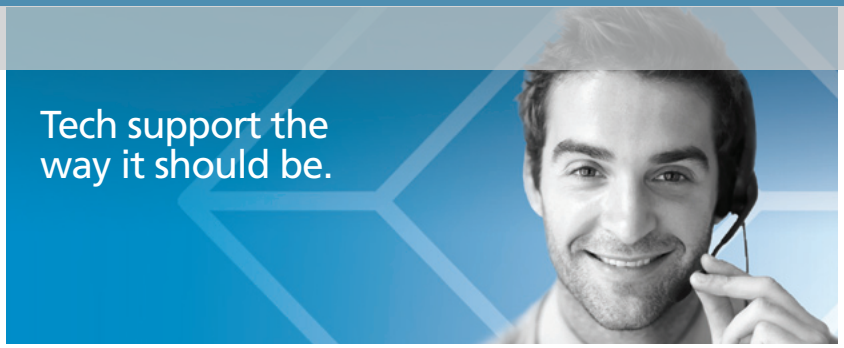

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