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OPERATION MANUAL

MODEL CLI-1450

SCANNING SIGNAL LEVEL & LEAKAGE METER

WARRANTY

Wavetek Wandel Goltermann warrants that all Products manufactured or procured by Wavetek Wandel Goltermann conform to Wavetek Wandel Goltermann's published specifications and are free from defects in materials and workmanship for a period of one (1) year from the date of delivery to the original Buyer, when used under normal operating conditions and within the service conditions for which they were designed. This warranty is not transferrable and does not apply to used or demonstration products.

The obligation of Wavetek Wandel Goltermann arising from a Warranty claim shall be limited to repairing, or at its option, replacing without charge, any assembly or component (except batteries) which in Wavetek Wandel Goltermann's sole opinion proves to be defective within the scope of the Warranty. In the event Wavetek is not able to modify, repair or replace nonconforming defective parts or components to a condition as warranted within a reasonable time after receipt thereof, Buyers shall receive credit in the amount of the original invoiced price of the product.

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Extended warranties and service contracts are available for new and currently owned equipment for an additional cost. Contact the Customer Service Department (800 851-1198) for details pertaining to extended warranties and service contracts.

Return Authorization Procedure

The customer MUST obtain a RETURN AUTHORIZATION NUMBER from the Customer Service Department (800 851-1198) prior to returning any equipment for warranty or non-warranty repair. Wavetek accepts no liability for any instrument or subassembly returned to the factory without this number. Any correspondence regarding returned instruments or subassemblies should be referenced to that number.

Contents

Appendices

MODEL CLI-1450

1 Introducing the CLI-1450

INTRODUCTION

The CLI-1450 Leakage/Signal Level Meter is a high performance instrument designed for cable television technicians. The durable, water-resistant CLI-1450 makes innovative use of a graphics LCD to simplify operation. The LCD backlight makes measurements easier in crawl spaces and behind television sets. The display is also easy to see in bright sunlight.

LEAKAGE DETECTION AND MEASUREMENT

Your CLI-1450 is a highly sensitive, hand-held leakage meter that makes finding and measuring RF leakage easy. Because it can accurately detect and measure video signals, it is not necessary to inject an additional RF carrier for the purpose of monitoring leakage. Your CLI-1450 is frequency agile — you can configure it to monitor a carrier frequency between 115 to 140 MHz.

You can use the optional LT1000 Leakage Tagger to modulate an existing carrier with a distinct tag signal. This enhances detection sensitivity in noisy environments and reduces false alarms. In overbuild situations, you can determine if a detected leak is emanating from the network that you are testing.

An audible alarm notifies you when your CLI-1450 has detected a leak. You specify the level threshold at which the alarm is triggered.

To reduce the likelihood of false alarms, you can configure the alarm to occur only when a tag signal is present. You can quickly adjust the volume of the alarm and even mute it if desired.

Your CLI-1450 makes the accurate leakage measurements that you need to verify compliance with government regulations. The type of antenna you are using and the distance from the leak are considered when measuring field strength. You can select from among four antenna types — monopole, dipole, vehicle mount and custom. The antenna factor for each type is programmable.

The most accurate and repeatable measurements are made using a dipole antenna located at the required reference distance. This is the only method recommended by Wavetek Wandel Goltermann for making compliance measurements. You can also make approximate measurements up to 30 meters away by entering the estimated distance from the leak. Your CLI-1450 will calculate what the equivalent field strength would be at the reference distance. These measurements are adequate for grading leaks you have found and prioritizing your repair schedule based on leak severity.

The CLI-1450 has the ability to interface with GPS tracking systems using its built-in serial port.

LEVEL MEASUREMENTS

Your CLI-1450 performs accurate signal level measurements — even on scrambled channels with horizontal or vertical sync suppression. A scan mode allows you to see the levels of all carriers in a spectral display. You can also view level measurements at a single frequency or for a specific channel. When tuned to a channel, the display indicates the levels of the video and audio carriers, and the difference between the carrier levels.

When performing an installation, you can press the Installation Check key to quickly verify that all channels are within limits that you have defined. You can use this feature to determine whether or not a subscriber connection meets government regulations.

A special channel plan building mode automatically determines

which channels are active on your cable system. Once you have defined a channel plan, you can copy it to other units. You can also create channel plans using StealthWare (Version 3.0), the Windows™ based data management package for Stealth products.

For documentation purposes, you can print any measurement screen to a serial printer (Wavetek P-Stealth Printer). Following an installation check, you can print an installation report and file it with the work order. You can also print a report that lists all configuration settings including the channel plan.

The CLI-1450 tunes from 45 to 559 MHz with options to extend the range to 5 to 890 MHz.

DIGITAL CARRIER MEASUREMENT OPTION 1450DIG

As digital services such as audio, video, Internet, and telephony become more common, a way of accurately measuring their carriers is needed. The 1450DIG digital carrier measurement option provides an average power measurement of QPSK, 16-QAM, 64-QAM, 256-QAM, QPR, BPSK, CAP-16, and other modulation schemes. To be measured, carriers must be in a state of continuous (i.e., non-burst) transmission.

MEASUREMENT LOGGING (signal level modes only)

With the CLI-1450, you can store installation checks that you have performed throughout the day. You can also store scan and tilt measurements. Each file is time and date stamped and can be recalled later for viewing on the LCD screen.

When viewing a file, you can adjust the screen settings the same as when you are viewing a "live" measurement. Using the built-in serial port, you can print files and even upload them to StealthWare (Version 3.0) for further analysis and archiving.

AUTO TESTS (signal level modes only)

Automated tests are easy with the CLI-1450 and provide a convenient way of acquiring proof-of-performance compliance data. Tests can be

executed immediately or scheduled over a period of time. To conserve battery life, CLI-1450 shuts itself off between scheduled intervals. When configuring an Auto Test, you can record information about the location at which the test is being performed. Files can be created for commonly tested locations so you need only enter the information once.

Auto Tests results are time, date, and temperature stamped and can be viewed on the LCD screen. Limits are applied to the measurement data with out-of-tolerance conditions concisely indicated. You can print a test report for each interval or a comprehensive 24 hour report that summarizes data collected from up to four intervals. Auto Test result files can be uploaded to StealthWare (Version 3.0).

MULTIPLE CHANNEL PLANS

The CLI-1450 stores channel plans that you have built and edited. This is convenient if you use your CLI-1450 for more than one plant. You can quickly select the correct channel plan for the plant at which you are working.
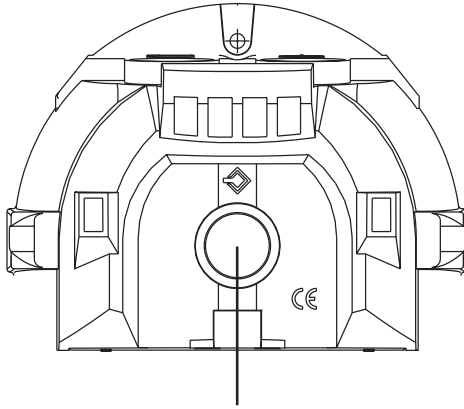
DOCKING STATION OPTION

The DS-1 docking station simplifies connection to a vehicle antenna and power source. Your CLI-1450 automatically recharges when resting in the docking station. The adjustable arm makes it easy to view the display from the driver's seat.

REVERSE INGRESS SCAN

Reverse ingress scan is a feature of the sub-band option for models CLI-1450 and MS1300. A continuous fast scan is performed that permits the installer to see ingress signals in the reverse band. The operator can set the start and stop frequencies of the scan, the interval, and the scan rate (dwell). In use, once the installation is complete, the meter can be connected to the tap end of the drop and the reverse scan mode selected. A user programmable limit can be set for simple identification of problem drops. To check for intermittent ingress, the meter can be set in the peak hold mode to catch transient signals. The screen can be saved for later viewing, printing, or upload to
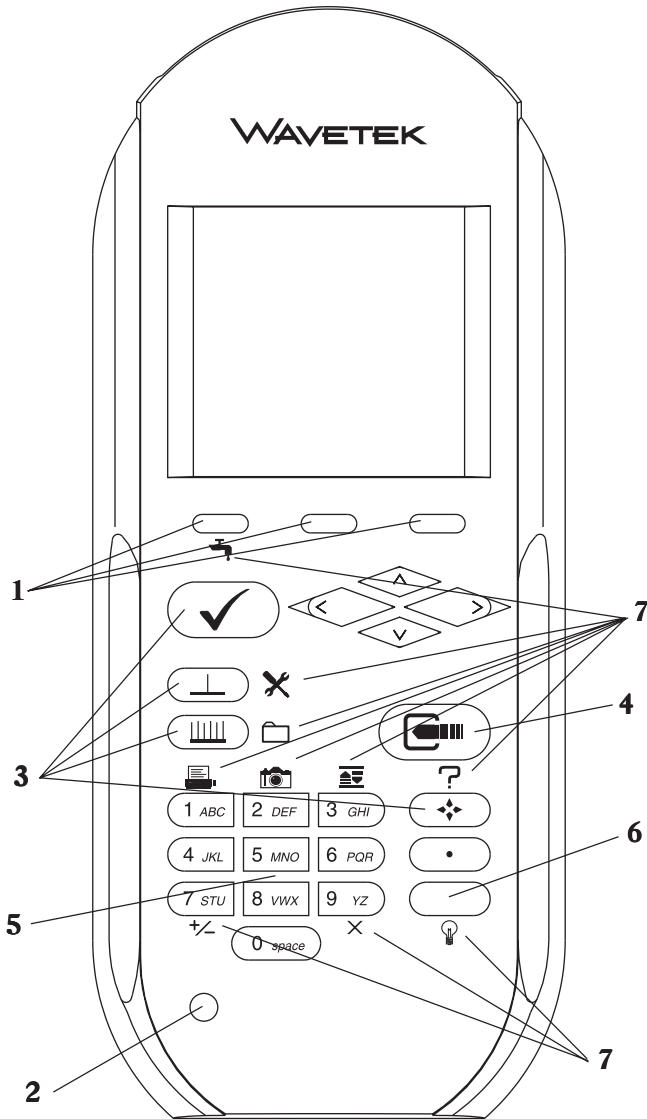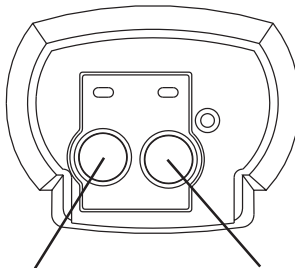
Docking Station Port
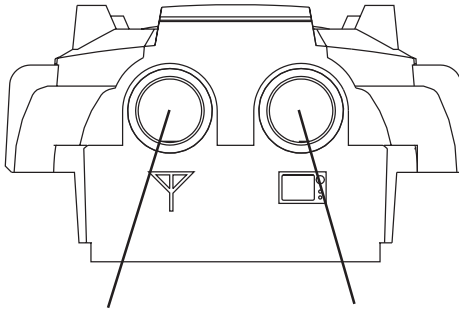
Antenna Port

RF Port

Serial Port

Charger Port

StealthWare 3.0. Refer to page 1-21 for configuration instructions and page 2-36 for operating instructions

GETTING ACQUAINTED WITH THE KEYPAD

The keypad consists of the following:
> • three Soft keys
> • a Power key
> • four Mode Selection keys
> • an Enter key
> • eleven Alphanumeric keys
> • a Shift key

1. SOFT KEYS
There are three horizontally oriented soft keys located below the display. The function of each soft key changes depending on the particular operation being performed and is represented by an icon immediately above the key.

2. ⏻ POWER KEY - ON/OFF
Turns your CLI-1450 on and off.

3. MODE SELECTION KEYS

✓ **INSTALLATION MODE**
> Easily check the channels that you have installed and verify that they are within limits.

⊥ **LEVEL MODE**
> Measure the signal level at a specific channel or frequency.

||||| **FULL SCAN MODE**
> View a spectrum graph of all carrier levels in your channel plan.

❖ NAVIGATOR

Instantly "travel" to any mode using the NAVIGATOR.

4. ◀▥ ENTER KEY

Press this key to terminate your entry or selection.

5. ALPHANUMERIC KEYS

You use the alphanumeric keys to enter data while operating your CLI-1450. Notice that these keys have a numeral and up to three alphabetic characters labeled on them. You can only access the characters when alphanumeric entry is appropriate. In the alphanumeric entry mode, you sequence through each character and the numeral by repeatedly pressing the key. You can also access a set of special characters that do not appear on the keypad by using the up and down arrows. Once the desired character is displayed, move the cursor to the next position using the right arrow. Be sure to terminate your entry by pressing the ◀▥ key.

6. SHIFT KEY

Some keys perform more than one function. The secondary function of a key is represented by an icon printed next to it. Notice that the icons are color coded with the **SHIFT** key. You access the secondary function by first pressing the **SHIFT** key and then the icon representing the desired function.

7. SECONDARY FUNCTIONS

⊥ LEAKAGE MODE

Detect and measure RF leakage

✕ CONFIGURE MODE

Configure your CLI-1450 for your own specific needs.

≜ AUTO REFERENCE

Let CLI-1450 automatically set the reference level for you.

SNAP SHOT

Hold the measurement. The measurement is retained even if the cable is disconnected from the input.

CLEAR

Clear-out your entry and start over again.

BACKLIGHT ON/OFF

Quickly turn the backlight on when it is too dark to see the display.

POSITIVE / NEGATIVE

Enter positive and negative values (when allowed).

HELP

View a description of each icon found in the current soft key menu.

PRINT

Print a measurement screen, installation report, auto test report, or configuration report to a serial printer.

STORE FILE

Store an Installation, Scan, or Tilt screen for later viewing, printing or uploading to StealthWare (Version 3.0).

GETTING ACQUAINTED WITH THE SCREEN

There are certain elements of the screen that will become familiar to you as you use your CLI-1450.

The Title Bar

Notice the title bar at the very top of the screen. It presents the title and icon for the current mode you are using.

Title Bar Indicators

You may see indicators appear above the title bar from time to time. This is what they represent:

▭	This indicator appears in the top right-hand corner of the screen when you press the SHIFT key. This means that the CLI-1450 interprets the next key that you press to be a secondary function.
▭	This indicator is displayed to warn you that the battery is low. When you see this, recharge the battery or change to a fresh one as soon as possible.
⚷	This indicates that the RF synthesizer has become unlocked. If this condition persists, the unit may need repair.

The Status Bar

Look for the status bar in the lower portion of the screen. It displays the current date and time. A bar meter indicates the charge remaining in your CLI-1450's battery. When the battery meter reads low, you should switch to a freshly charged battery soon.

```
04/03/96   E▭F   02:35:05
```

Note
When viewing an Installation or Scan file, the status bar shows the date and time that the file was stored instead of the current date and time.

Soft Key Icons

There are three soft keys located immediately below the display. The function of a soft key is represented by the icon directly above it.

Note
If the soft key function is not currently available, the icon appears "grayed" or "dimmed".

Lists

Lists present several items for viewing and/or selecting. Notice that the currently chosen item is highlighted. You can scroll through the list using the up and down arrows.

```
┌────────────────────────────┬─┐
│SELECT CHANNEL PLAN...      │▓│
│VIDEO SIGNAL TYPE           │▓│
│CHANNEL SEQUENCE            │▓│
│BUILD CHANNEL PLAN...       │□│
│EDIT CHANNEL PLAN...        │▓│
│SELECT SCAN CHANNELS...     │▓│
│CHANNEL PACKAGES...         │▓│
└────────────────────────────┴─┘
```

A list can be either "active" or "inactive". You can tell by looking at the border. If the border is solid, the list is active and any keys that you press are directed toward it. If the border is dim, the list is inactive and is not affected by key presses. Usually you can make a list become active by pressing the ▇▬ key.

When there are more items in the list than can be displayed at one time, a scroll bar appears along the right-hand edge of the list. You can use this to get an idea of where you are. When you have reached the first or last item, an arrow appears inside the scroll box pointing to the direction you can go.

The Edit Box

The edit box appears in the lower portion of the screen when it is necessary to enter values into your CLI-1450.

```
┌──────────────────────────────┐
│STOP FREQ: ▐550▌MHz           │
└──────────────────────────────┘
```

An edit box can be either "active" or "inactive". You can tell by looking at the border. If the border is solid, the edit box is active and any keys that you press are directed toward it. If the border is dim, the edit box is inactive and is not affected by key presses. Usually, you can make the edit box become active by pressing the ▇▮▮ key. Be sure to press the ▇▮▮ again when you have finished making your entry.

✥ THE NAVIGATOR

You can easily travel to any mode using the NAVIGATOR. To access the NAVIGATOR, press the ✥ key.

An icon appears on the screen for each available mode. Use the up, down, left, and right arrows to highlight the icon that represents the mode you want to use. Notice that the name of the mode appears on the lower portion of the screen beneath the status bar. To get a description of the highlighted mode, press the SHIFT + ? key. To travel to the mode you have highlighted, press any one of the soft keys or the ▭ key.

Tip
You can also use the numeric keys to highlight the desired icon in the NAVIGATOR screen. Each key corresponds to an icon in the matrix.

✗ CONFIGURE

Before using your CLI-1450, you may want to configure it for your specific needs. The CONFIGURE mode allows you to select global, leakage and measurement related preferences and to build and edit a channel plan that matches your cable plant.

To configure your CLI-1450, press the SHIFT + ✖ keys or choose the ⬚ icon from the NAVIGATOR. The following screen appears:

Configuration settings are divided into five categories; GLOBAL, MEASUREMENT, LEAKAGE. CHANNEL PLAN, and INGRESS. Use the up and down arrows to highlight the category you want and then press the ⬚ key.

Tip
You can also use the left-hand and right-hand soft keys to scroll through the CONFIGURE categories and then press the middle soft key to select the highlighted category.

PRINTING A CONFIGURATION REPORT
In most configuration screens, you can print a comprehensive configuration report by pressing the SHIFT + ⬚ keys. A bar graph appears indicating the status of the printout. The report lists all of the configurable settings including the active channel plan.

⬚ **Global Configuration**

OPERATOR NAME
You can personalize your CLI-1450 by entering your name here. Your name will then appear on report printouts.

CONTRAST   LEVEL
Adjusts the contrast level of the LCD for optimum viewing.

Note
The contrast of the LCD is affected be variations in temperature. Your CLI-1450 will automatically optimize the contrast level based on the current temperature as measured from the built-in sensor.

SHUTOFF TIME-OUT
Sets the amount of inactive time allowed before your CLI-1450 turns off automatically. This feature is useful for conserving battery life by preventing the CLI-1450 from being left on accidentally when it is not in use. You can set the time-out period to 1, 3, or 5 minutes. There is also an "always on" setting that defeats the automatic shutoff feature if desired.

Note
You can manually turn off your CLI-1450 at any time by pressing the Ⓘ button.

Note
The Shutoff Time-out feature is disabled during LEAKAGE mode.

BACKLIGHT TIME-OUT
Sets the amount of inactive time allowed before the backlight turns off automatically. The backlight consumes significant power. This feature conserves battery life by minimizing the amount of time that the backlight is on. You can set the time-out period to; 5 or 10 seconds. There is an "always off" setting for when the backlight is not needed at all. There is also an "always on" setting that defeats the backlight time-out feature.

You can manually turn the backlight on or off at any time by pressing the SHIFT + 💡 keys. When manually activated, the backlight remains on continuously until the unit shuts off.

Tip
You can tell when the backlight is on even in bright sunlight by looking for the backlight indicator at the left-hand edge of the Title Bar. The ✳ indicator means that the backlight is currently on and will

turn off automatically. The ◆ indicator means that the backlight is on and will remain on continuously. If you see no indicator, the back-light is off.

TIME
Sets the time for the internal real-time clock. The time is set, dis-played and printed in 24 hour format only (HH:MM:SS).

DATE FORMAT
You can specify the format in which the date is displayed and printed. Select between the following formats:

> MM/DD/YY
> DD.MM.YY
> YY.MM.DD

DATE
Sets the date for the internal real-time clock. You can specify the format in which the date is set, displayed and printed (see DATE FORMAT).

PRINTER
Select the manufacturer of the printer that you will be using. A printer with a serial interface is required. Set your printer configuration as follows:

Baud Rate:	same as your CLI-1450
Date Bits:	8
Stop Bits:	1
Parity:	NONE
Flow Control:	Xon/Xoff

Important
The baud rate of both your CLI-1450 and your printer must match (see BAUD RATE).

Tip
A serial to parallel converter (such as the one manufactured by Black Box Corp.) can be used for printing to a parallel printer.

LINES/PAGE

For text reports, you can specify the number of lines that will be printed on each page before a form feed command is sent. Enter 0 if you do not want any form feeds to be sent.

BAUD RATE

This is the baud rate that is used when your CLI-1450 communicates with another device through the serial port. Generally, you will want to use the highest rate supported. Be sure that the baud rate setting of your CLI-1450 matches that of the device that it is connected to.

CLONE

You can easily transfer the entire configuration from one CLI-1450 unit to another. This saves you time when configuring multiple units. First, connect a cable between the two CLI-1450 units. Select CLONE **only on the unit that you want to copy the configuration to.** Press the OK soft key to begin the transfer. Cloning copies the configuration information and active channel plan only. If you wish to copy only channel plans, use the Copy Remote Channel Plan command.

Important
Be sure that the baud rate setting of your CLI-1450 matches that of the device that it is connected to (see BAUD RATE).

DIAGNOSTICS

Performs hardware diagnostics and defaults stored preferences to factory presets. Press the ▣ key to access the diagnostics options.

Factory Default
Sets all stored preferences to factory presets. Press the ▣ key to initiate the default operation.

Important
All stored settings are lost when you perform this operation.

Test Display
Exercises all pixels on the LCD for test purposes. Repeated pressing of the ▣ key sequences the display between all pixels "on", all pixels "off", and the display test screen.

Measurement Configuration

TEMPERATURE UNITS

Selects the units in which temperature measurements are displayed and printed. You can select between; °C or °F.

SIGNAL LEVEL UNITS

Selects the units that will be used for all signal level measurements. You can select between; dBmV, dBμV and dBm.

PROBE COMPENSATION

This can be used to compensate for losses associated with probe points found on certain amplifiers. You can enter a value between -99.9 and +99.9 dB. Probe compensation is added directly to signal level measurements. The compensation value is indicated in the upper left-hand corner of the measurement screens. There is no indication, however, if the compensation value is zero.

Important
The PROBE COMPENSATION value **does not affect IN-STALLATION mode**. Level measurements made while checking an installation are uncompensated.

FREQUENCY TUNING STEP SIZE

This setting affects the increment/decrement step size when you are tuning the frequency using the left and right arrows. You can select a value between 25kHz and 100MHz in steps of 25kHz.

SCAN AUDIO CARRIERS

Select YES if you want to see the audio carriers in the full scan screen. You can achieve a faster scan by omitting the audio carriers.

SCAN SCRAMBLED CHANNELS

Select YES if you want to see scrambled channels in the full scan screen.

EDIT   TEST POINTS

Your CLI-1450 is capable of performing tests at various locations including; SUBSCRIBER DROP, GROUND BLOCK, TAP, and USER DEFINED (or CUSTOM). Each test point has its own set of limits that you can edit. Press the ⬛ key to edit the test points. A list of available test points appears.
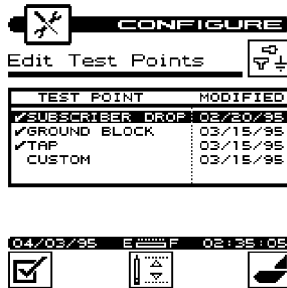
You can enable or disable each test point in the list. When a test point is disabled, you cannot use it when performing tests. Use the up or down arrow to highlight the desired test point. If the highlighted test point is disabled, you can enable it by pressing the ☑ soft key. A check mark appears in the left-hand column to indicate when a test point is enabled. If the test point is already enabled, pressing the ☑ soft key disables it.

Tip
You can change the name of the USER DEFINED (CUSTOM) test point. Notice that the edit box appears when this test point is highlighted. When you press the ⬛ key, the edit box becomes active and you can enter any name up to fifteen characters long. Be sure to press the ⬛ key when finished to terminate your entry.

You can edit the limits for the highlighted test point by pressing the ⬚ soft key. The limits appear on the screen. Scroll down the list to see all the limits.

You can selectively enable or disable each individual limit. When a limit is disabled, your CLI-1450 excludes it when checking limits. If the highlighted limit is disabled, you can enable it by pressing the

☑ soft key. A check mark appears in the left-hand column to indicate when a limit is enabled. If the limit is already enabled,

pressing the ☑ soft key disables it.

Note
Analog limits are enabled by factory preset default. Digital limits are disabled by factory preset default.

Note
If you disable all of the limits within a test point, the test point becomes disabled. You cannot enable a test point that has no enabled limits.

You can edit the value of the highlighted limit by pressing the ▭ key. When the edit box becomes active, enter the desired value. Be sure to press the ▭ key when finished to terminate your entry. Once all desired test points are enabled and edited, the unit will be able to measure digital signals during an Installation Check or an Auto Test.

Press the 🏰 soft key to return all limits in the test point to their factory preset values.

CALIBRATION
Performs user calibration for optimum measurement accuracy. Press the ▭ key to access the calibration options.

Noise Floor Correction
This calibration measures the noise floor of your CLI-1450. You should perform it periodically to ensure accurate measurements.

IMPORTANT
Before performing the Noise Floor Correction calibration, you should make sure that there is **nothing** connected to either the ▭ or Ⴤ ports (including Docking Station, DS-1) of your CLI-1450.

Press the ◄▥ key to initiate the calibration procedure. Your CLI-1450 will guide you through the process.

IMPORTANT
The CLI-1750 meter assumes that leakage tag depth of modulation is set for 3 dB. This is precisely set on the WWG Model LT-1000 Leakage Tagger at the factory. If another manufacturer's tagger is used, some calibration of percent modulation may be necessary for optimal accuracy. Follow the tagger manufacturer's procedure for performing this calibration.

INGRESS
Sets the measurement and limit parameters for the reverse ingress scan feature. Press the ◄▥ key to access the ingress options.
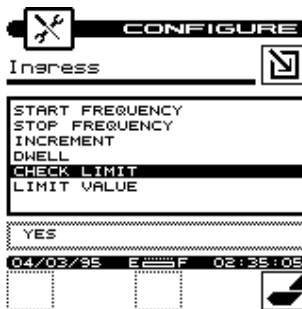
Start Frequency

Enter the start frequency that you want to monitor for reverse ingress. You can select from 5 to 80 MHz.

Stop Frequency

Enter the stop frequency that you want to monitor for reverse ingress. You can select from 5 to 80 MHz.

Increment

This setting affects the increment/decrement step size when you are tuning the ingress scan frequency using the left and right arrows. You can select from 25kHz to 1MHz.

IMPORTANT

There is a maximum of 140 measurement points. If you select the start, stop and increment such that more than 140 points are required, your CLI-1450 will create only as many points as possible. This means that the stop frequency may be lower than what you desired.

Dwell

This setting affects the scan rate of the ingress feature. You can select from 1 to 25. As you increase the dwell, the scan rate is slowed down. A slower scan rate allows for more sensitivity when performing the ingress scan.

Check Limit

Select YES here so that the ingress level can be compared to a defined limit. If selected, a visual pass/fail indicator is displayed on the measurement screen.

Limit Value

Enter the limit value at which a fail indication will occur. You can select from -45 to +60 dBmV.

Leakage Configuration

ALARM CONDITION

This setting determines under what conditions the alarm is triggered. You can disable the alarm entirely if desired. Select from the following options:

· when the threshold is exceeded
· when a tag signal is detected
· when the threshold is exceeded and a tag signal is detected
· disable the alarm

ALARM THRESHOLD
This is the leakage measurement level at which the alarm will occur.

ALARM MUTE TIME-OUT
When performing leakage measurements, you can mute the audible alarm by pressing the ▣▮▮ key. This setting determines the amount of time that will elapse before the alarm is reactivated.

LEAKAGE UNITS
This determines the units in which leakage is measured and the alarm threshold is set. You can select between; µV/m, dBµV/m, dBmV, dBµV, µV, dBm and dB20µV.

MEASUREMENT FREQUENCY
Enter the frequency of the carrier that you want to monitor for RF leakage. You can select from 115 to 140 MHz.

MEASUREMENT CARRIER TYPE
For accurate measurements, be sure to select the type of carrier that you will be measuring leakage on — either Carrier Wave (CW) or video.

DISTANCE UNITS
Select the units in which you want distance values to be displayed and entered. You can select between feet or meters.

TAG MODULATION FREQUENCY
Enter the modulation frequency to detect when searching for a tag. This should match the setting of the LT1000 Leakage Tagger that you are using. It is recommended that the tag modulation frequency be adjusted to a minimum of 20 Hz. By maintaining the 20 Hz tag criteria, false tags will be reduced while still preserving the video quality of the tagged carrier. You can select a Tag Modulation frequency from 3 to 25 Hz.

REFERENCE DISTANCE

This is the specified distance at which leakage is to be measured. For example, in the United States, the FCC requires that all measurements be referenced to 3 meters or 10 feet. If your application requires a different reference distance, enter it here.

PEAK HOLD RESET PERIOD

The peak hold feature momentarily holds the peak leakage measurement value. This peak value is displayed numerically and indicated on the analog meter. This setting allows you to specify how often the peak hold value is reset. In the Find and Fix mode, the graph scale is updated to reflect the leakage reading in relation to the new peak value.

EDIT ANTENNA TYPES

There are several different types of antennas that you can use with your CLI-1450 when measuring leakage. Press the ![key] key to edit the antenna factor for each type.
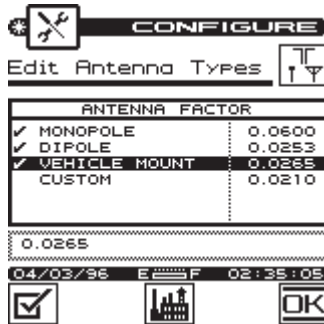
You can edit the antenna factor of the highlighted type by pressing the ![key] key. When the edit box becomes active, enter the desired value. Be sure to press the ![key] key when finished to terminate your entry.

Press the ![soft key] soft key to return the antenna factor of the highlighted type to its factory preset value. The factory preset antenna factor for

the dipole antenna corresponds to theHD-1 Dipole Antenna that was shipped with your unit. If you choose to use another type of dipole antenna, you must change the antenna factor to that specified for the antenna.

You can enable or disable each antenna type. When a type is disabled, you cannot use it when performing tests. Use the up or down arrow to highlight the desired antenna. If the highlighted type is disabled, you can enable it by pressing the ☑ soft key. A check mark appears in the left-hand column to indicate when an antenna type is enabled. If the type is already enabled, pressing the ☑ soft key disables it.

Channel Plan Configuration

This is a critical element of operating your unit.

CHANNEL PLAN CONFIGURATION

What is a Channel Plan?

A channel plan is a framework of cable network parameters chosen by the user for his network. The basic entities are:

• Channel format (analog, digital, scrambled, etc.)
• System Bandwidth
• Test Limits (digital and analog)
• Carriers (audio and video)

Why do we need a Channel Plan?

A well thought-out channel plan is necessary for the proper operation of the unit. This is accomplished by specifying tilt and scan, and taking full advantage of the Auto Test and Installation Check features in the WWG instruments. Remember that the WWG instruments are capable of *learning* a channel plan from a cable system and storing it as a built-in plan.

How to build a Channel Plan?

Use the following step-by-step procedures to build a channel plan.

The starting point is the Configure screen. Press the Shift key and the Level/Configure key to bring up the Configure screen.
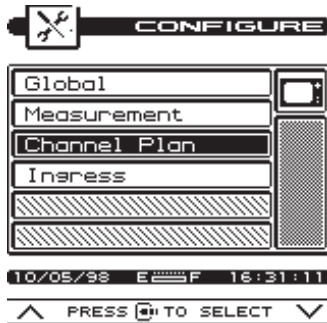
Using the up/down arrow keys, highlight Channel Plan and then press to bring up the Configure - Channel Plan screen. This screen lists the various ingredients/processes for building (configuring) a channel plan.

Select a Channel Plan

Use the up/down arrow keys to highlight SELECT CHANNEL PLAN and then press . This will bring up the Select Channel Plan screen showing the Default and other available channel plans stored in the unit. The currently active channel is denoted by an arrow tip to its left. To enable a different plan, use the up or down arrow to highlight and then press the center softkey. To delete a plan, press the left softkey.
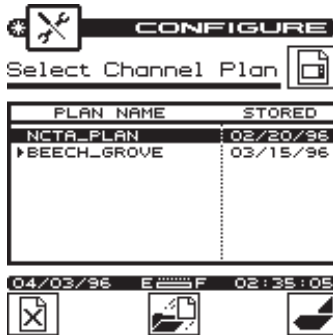
NOTE: You cannot delete a currently active plan. You must load a different plan first.

You may implement a plan from this list or let your instrument "learn" the cable plant's existing channel plan. You may then edit it as desired.

To return to the Channel Plan screen, press the right softkey.

Select Video Signal Type

Highlight VIDEO SIGNAL TYPE from the Channel Plan screen
(page 1-26). Choose from NTSC, PAL and SECAM types.
Press .

Select Channel Sequence

Highlight CHANNEL SEQUENCE from the Channel Plan screen
and press to make the Edit box active. Use up/down arrow keys to
select numeric or frequency. Press .

NOTE: The SCAN screen always displays channels in order of
frequency regardless of the CHANNEL SEQUENCE setting.

Learn the Channel Plan

The CLI-1450 is capable of identifying which channels are on your
cable plant. This allows you to quickly and easily generate a custom-
ized channel plan.

With the instrument connected to the cable system, highlight BUILD
CHANNEL PLAN in the Channel Plan screen (page 1-26) and then
press . This will bring up the Build Channel Plan - STEP 1 screen.

In the Edit box, type the name (up to 15 characters) of your channel
plan and press . Press the softkey to proceed to the Build Channel
Plan- STEP 2 screen. The screen contains a list of standard channel
plans to serve as a basis for your own plan.
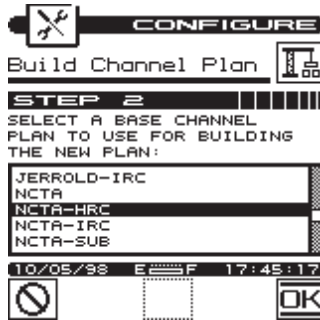
NOTE: If your system is a PAL M type, select NTSC for your channel plan.

Using up or down arrow key, highlight a base channel plan from the list and then press . Press the softkey to proceed to the Build Channel Plan - STEP 3 screen
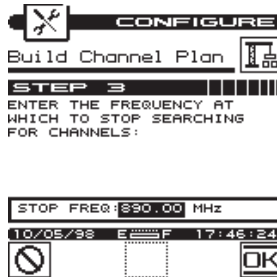
Using the numeric keypad, type in a value for the Stop Frequency in the Edit box and press . Then press the right softkey. The unit will start searching for active channels and display the Build Channel Plan - STEP 4 screen.
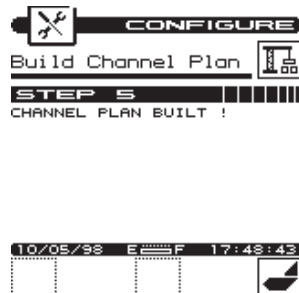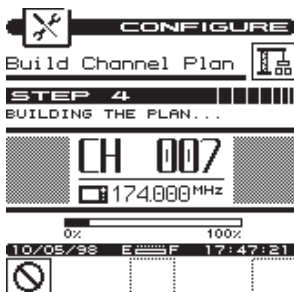
The unit will complete the build and display the Build Channel Plan-STEP 5 screen (shown right above).

Press the right softkey to return to the main Channel Plan menu (page 1-26).

How to Edit the Channel Plan

Why edit the Channel Plan?
An accurate channel plan is essential for testing the cable system, including limits for analog and digital carriers.

Editing is required to verify that the channel plan is built correctly (has the right parameters).

From the Channel Plan screen (page 1-26), use the up/down arrow keys to highlight EDIT CHANNEL PLAN, then press . This will bring up the Edit Channel Plan screen.

The screen contains a list of all channels, their frequencies and activation status (enabled channels carry a check mark under the ENA column). To disable a channel, highlight the channel and then press the left softkey.

To edit a channel's parameters, highlight that channel and then press the center softkey. This will bring up the Edit Channel screen.
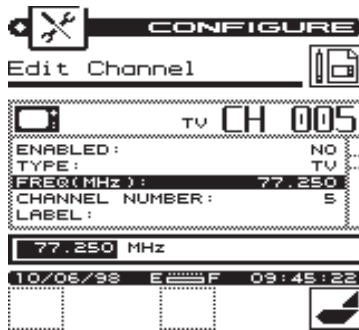
IMPORTANT: You may find an enabled channel that is not in your channel plan. This should be disabled. A channel may be missed if the frequency is special or level too low.

IMPORTANT: You must enable a channel to perform measurements on it.

Channel Plan Parameters/Characteristics to edit

The Configure- Edit Channel screen lists the following parameters/ characteristics:

> ENABLED
> TYPE
> FREQ (MHz)
> CHANNEL NUMBER
> LABEL
> CARRIER
> CENTER FREQ (MHz)— Digital
> MEAS BW (MHz)— Digital
> PACKAGE
> SCRAMBLED
> AUD OFFSET (MHz)

Enabled
As mentioned earlier, a channel must be enabled in order to be measured. This is another place where you can enable or disable the channel.

1-30

Type

There are three channel types from which to choose:

TV   -the standard video and audio carriers

DUAL   -a video carrier with two independent audio carriers (a European format)

SNGL   -a single carrier

Carrier (SNGL Type only -1450DIG Option)

Select the format of the carrier to be measured

Analog
QAM (Digital)
QPSK (Digital)
QPR (Digital)
CAP-16 (Digital)

IMPORTANT: Digital signal level measurements are accurate only when performed on carriers that are in a state of continuous (non-burst) transmission.

Frequency

This is the frequency of the video carrier in MHz. For a digital channel, the center frequency is required.

Measurement Bandwidth (digital format only)

Enter the width in frequency of the digital carrier to be measured.

Channel Number

The channel number can range from 1 to 999.

Label

You can enter a label up to four characters in length for each channel. This label appears next to the channel number on most screens to help you remember what programming is on that channel.

Package

You can organize channels into packages. In the edit box, you can select any package that is enabled (see the section on CHANNEL PACKAGES). When you are checking an installation, you can specify which packages the subscriber has ordered and your CLI-1450 will verify that the channels are correctly installed.

Scrambled

If the channel is scrambled, select YES here so that accurate measurements can be made.

IMPORTANT: CLI-1450 supports several scrambling formats including the following:

> Horizontal Sync Suppression
> Vertical Sync Suppression
> Positive Trap

Audio Offset (TV and DUAL type only)

This is the offset between the video and audio carriers in MHz.

Audio Offset 2 (DUAL type only)

This is the offset between the video and second audio carriers in MHz.

When you are finished editing the channel, press the soft key to return to the channel list.

How to configure a digital carrier

1. From the Configure - Edit Channel Plan screen (page 1-29), highlight the channel that you wish to configure as digital, or select an unused channel.

2. Press to bring up the Configure - Edit Channel screen.

3. Highlight TYPE, choose SNGL and press .

4. Highlight Carrier and press . Select a digital carrier (QAM, QPSK, QPR, CAP-16) and press .

5. Highlight Frequency, press . Type in a value for Center Frequency and press .

6. Highlight Measurement BW (MHz), press . Type in a value for the bandwidth and press .

7. Highlight channel number, press . Type in a value for the channel number and press .

8. Press the return softkey.

Select Tilt Channels

From the Channel Plan screen, highlight SELECT TILT CHAN-NELS and press to specify carriers to measure on the TILT screen. A list of all enabled channels in the current plan appears.

Up to six channels can be selected. To select a channel, use the up or
down arrow to highlight the desired channel in the list, then press the
soft key. A check mark appears in the left-hand column of the list
indicating that this is now a TILT channel. Also, the channel number
appears in one of the six boxes above the list.

Press the a second time to deselect the TILT channel.

Select Channel Packages

From the Configure- Channel Plan screen (page 1-26), choose
CHANNEL PACKAGES. Press to bring up the Channel Packages
screen listing all available packages. These are the packages that will
be available when you edit a channel. You can select from one of
these packages for each channel plan.
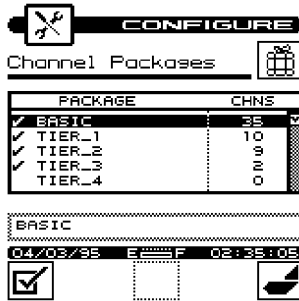
To enable a package, press the left softkey. A check mark will appear
to the left. To disable, press the left softkey again. The check mark
will disappear.

To edit the name, highlight the package and press ENTER . Use the
Edit box to change the name. To complete, press ENTER again.

IMPORTANT: The number in the right-hand column of the
package list indicates how many channels are currently using the
package. When you disable a package, all channels using that package
default to NONE (no package).

Copy Remote Plan

Once a plan has been created in one unit, it can be copied to another similar unit (Example: CLI-1450 to CLI-1450). Connect the two units with the cloning cable. Set the baud rates for the two units equal. On the host unit's Configure - Channel Plan screen (page 1-25), select COPY REMOTE PLAN and press the OK softkey. The channel plan will be copied to the host.

MODEL CLI-1450

2 Using the CLI-1450

INTRODUCTION

The best way to learn about the CLI-1450 is to use it. Section *2* discusses the individual measurements available with the CLI-1450. Each measurement mode discussion includes detailed descriptions on how to perform the measurement as well as operating controls and indicators.

LEAKAGE

The CLI-1450 has two sub-modes of operation that detect and measure RF leakage: the Measure mode and the Find and Fix mode. The Measure mode is used to obtain the most accurate leakage measurements. The Find and Fix mode is optimized for locating the source of RF leaks. See the Searching for a Leak section (p. 2-5) for a complete description of the Find and Fix mode.

To detect and measure RF leakage, press the SHIFT + 🚰 key or choose the 🚰 icon from the NAVIGATOR screen. The LEAKAGE screen will default to the last sub-mode entered. If the CLI-1450 defaults to the Find and Fix mode, press the 🔍 soft key to the Measure mode.

You can read the leakage measurement numerically and on an analog meter. The units in which leakage is being measured appears directly below the meter.
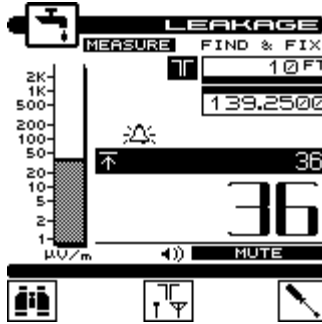
The frequency being monitored appears in the upper right-hand portion of the screen.

ANNUNCIATORS
Annunciators appear in the area below the measurement frequency to alert you of the following conditions:

       Alarm
This icon flashes when the alarm has triggered.

       Tag Detected
If you are using the LST 1700 with tagger activated or the optional LT1000 Leakage Tagger, this icon appears when your CLI-1450 has detected the tag signal. This is an indication that the source of the leak originates from the plant you are testing.

2-2

MEASUREMENT PEAK

The peak leakage value is indicated on the analog meter as a solid line. It also appears numerically as shown below:

```
⬆        75.3
```

The peak value is reset periodically. You can specify how quickly you want it to reset (see PEAK HOLD RESET PERIOD in the Leakage Configuration section).

Tip
You can manually reset the peak value at any time by pressing the SHIFT + ⬇ keys.

ADJUSTING THE ALARM VOLUME

An audible sound is produced when the alarm is triggered. You can raise or lower the volume of the alarm by pressing the left and right arrows. There is a bar meter in the lower right-hand portion of the display to help you set the volume. You can mute the alarm by pressing the ◀▮▮ key. The alarm will remain muted for a period of time. You can adjust the length of this time (see ALARM MUTE TIME-OUT in the Leakage Configuration section).

Note
You can adjust the threshold and specify the conditions at which the alarm is triggered when you configure your unit (see the Leakage Configuration section).

SELECTING THE ANTENNA TYPE

You can use your CLI-1450 with several different types of antennas. For accurate measurements, you should be sure that you have se-lected the correct type for the antenna you are currently using. Press the 🔲 soft key to sequence through the available antenna types. The type you have selected is represented in the upper portion of the screen by one of the following icons:

⊤	Monopole
⊤⊤	Dipole (HD-1)
⬛	Vehicle Mount (VMA-3)
⊻	Custom

ENTERING THE LEAKAGE DISTANCE

If you find a leak in an inaccessible area, you can enter the estimated distance from the leak and your CLI-1450 will calculate what the equivalent field strength would be at the reference distance. These measurements are adequate for grading leaks you have found and prioritizing your repair schedule based on leak severity. You should, however, always perform regulation compliance measurements at the required reference distance.

The leakage distance appears in the upper right-hand corner of the display. To enter a different value, use the numeric keys followed by the key.

2-4

COMPENSATION

Compensation allows you to adjust your CLI-1450 to a calibrated leak field (see Appendix D).

Press the ![soft key] soft key to adjust compensation. A new set of soft keys will appear. Use the ![up] and ![down] soft keys to increment and decrement the compensation value. You can find the compensation value in the upper right-hand portion of the screen directly below the measurement distance. Press the ![soft key] soft key when you have finished.

Tip
You can quickly clear out the compensation value by pressing the SHIFT + ![X] keys.

Important
Your CLI-1450 stores a separate compensation value for each antenna type. The value automatically goes into effect when you select the antenna. If you are using a calibrated leak field, be sure to make the adjustment for each type of antenna that you want to use.

Note
Compensation is only useful when performing field strength measurements. If the measurement units you have selected result in an absolute measurement, the ![soft key] soft key will not be available.

SEARCHING FOR A LEAK

The Find and Fix mode is the ideal mode for locating leaks. The Find and Fix mode detects and displays leakage measurements; however, the leakage measurement is not as accurate as the Measure mode. The leakage measurement value should only be used to locate the source of a leak. To enter the Find and Fix mode from the Measure mode, press the ![binoculars] soft key.
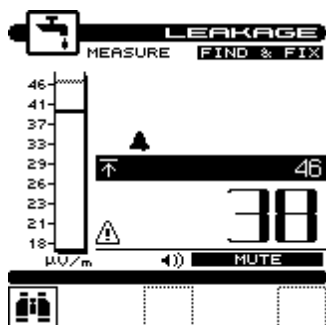
The Find and Fix mode assists the operator in locating the leakage source through numeric and audible alarm indicators. As your distance from the leakage point increases or decreases, the numeric indicator on the bottom-right of the screen changes to reflect the leakage level. The graph scale on the left side of the screen is controlled by the peak value, and displays the current leakage level in relation to the peak value. When the leakage level meets or exceeds the alarm threshold, an audible alarm is triggered. The alarm rate will increase as you move closer to the leakage source.

The Find and Fix mode uses the antenna type, leakage distance, and compensation features established in the Measure mode. When you want to change the parameters of these features or obtain a more accurate measurement of the leak, press the softfkey to return to the Measure mode.

Hint
Reflections can sometimes increase or decrease received strength. Be sure to move the receiving antenna toward or away from the suspected source to obtain the maximum signal reading.

MEASUREMENT HOLD
You can freeze the leakage measurement at any time by pressing the SHIFT + keys. Notice that the mode icon in the upper left-hand portion of the screen flashes when the measurement is on hold. Press the SHIFT + keys again to release the hold. The measurement is not retained when another mode is selected or the CLI-1450 is shut off.

PRINTING THE SCREEN

You can print the entire screen at any time by pressing the SHIFT + ![printer icon] keys. A bar graph appears indicating the status of the printout.

WARNING INDICATORS

If the current measurement is inaccurate due to an out-of-range condition or a hardware failure, your CLI-1450 warns you by displaying one of the following warning indicators:

▣ Over-range
The leakage level is above the measurement range of the instrument.

▣ Under-range
The leakage level is below the measurement range of the instrument.

▣ Error
A hardware problem exists. If this condition persists, the unit may need repair.

⚠ Find and Fix
Reminds the operator that the leakage measurement obtained in the Find and Fix mode is not as accurate as the Measure mode.

Note
The battery level is not monitored when in LEAKAGE mode.

Note
The Shutoff Time-out feature is disabled during LEAKAGE mode.

✓ INSTALLATION

The INSTALLATION mode allows you to easily check the channels that you have just installed and verify that they are within limits. If you have configured channel packages, you can tell your CLI-1450 which packages the subscriber has ordered and it will display only those channels.

Press the ✔ key to select the INSTALLATION mode or choose the ☑ icon from the NAVIGATOR. Your CLI-1450 will begin measuring all the enabled channels in the plan. A bar graph indicates the percentage of channels measured. When your CLI-1450 has finished, you can view the results and verify that all channels are within limits.

SELECTING CHANNEL PACKAGES

If you have configured channel packages, a list of available packages will appear. From this list, you can select the packages that the subscriber has ordered. The number to the right of the package name tells you how many channels are included in each package. Use the up or down arrows to highlight a package and then press the ☑ soft key to select it. A check mark appears in the left-hand column of the list indicating that the package is selected. If the highlighted package is already selected, pressing the ☑ soft key deselects it.

Tip
Select "ALL CHANNELS" if you want to include **all** the enabled channels in the plan.

Press the ☐OK soft key or ◄▌▌ when you have finished. Now your CLI-1450 will only evaluate the channels from the packages that you have selected.

Tip
You can return to this screen at any time to change your package selection by pressing the 🗄 soft key.

SELECTING THE TEST POINT

The next thing you should do is tell your CLI-1450 at which test point you are located. This determines which set of limits are used. Press the 🖳 soft key to sequence through the available test points. The test point that you have selected is represented in the upper portion of the screen by one of the following icons:

⬛ Subscriber Drop

⏚ Ground Block

⊤ Tap

⧖ User Defined

INSTALLATION RESULTS SUMMARY

This is the overall limit check summary for all channels in the packages that you have selected. You may have to scroll down the list to see all the limits results.

```
        ☑ INSTALLATION

        Subscriber Drop    ⬛

            P  A  S  S

MIN VID LVL:      +8.0dBmV ✓
MAX VID LVL:     +12.2dBmV ✓
MAX Δ VID LVLS:      4.2dB ✓
MIN Δ V/A:          11.8dB ✓
MAX Δ V/A:          16.4dB ✓
MAX Δ ADJ CHANS:     1.9dB ✓
MIN DIG LVL:      +9.2dBmV ✓
11/24/98   E▭▭F   14:46:26

   ⟳        ⊞        ⧉
```

To quickly determine the status of the overall limit check, look at the PASS/FAIL indicator located in the upper portion of the screen. This indicates FAIL if any channel is not within the required limits. For each limit, the worst case actual value is displayed along with a pass/fail status.

THE CHANNEL LIST

Press the ⟳ soft key or ◀▥ to sequence to the channel list screen.

The channel list provides essential information about each channel.

In the list you will find the channel number in the first column followed by the label. The level of the video carrier is in the next column. The package in which the channel is contained is displayed in the fourth column. Finally, the overall limits pass/fail result for the channel is found in the last column.

THE PASS/FAIL INDICATOR

Use the PASS/FAIL indicator located directly above the channel list to quickly determine whether the highlighted channel has passed the limits check. If the channel failed, you can identify the reason(s) for the failure by looking at the symbols that appear in this indicator.

Adjacent Channel Failures

◄ CHAN   lower adjacent channel level

CHAN ►   upper adjacent channel level

◄ CHAN ► both upper and lower adjacent channel levels

Video Level Failures

VID ▲   video level too high

VID ▼   video level too low

DVA Failures

DVA ▲ DVA too high

DVA ▼ DVA too low

CHANNEL MEASUREMENT

Press the [⟲] soft key or [⟸▮▮] to sequence to the channel measurement screen.

This screen displays video and audio carrier level measurements along with the DVA for the selected channel. Use the up or down arrows to select the previous or next channel in the list.

PRINTING AN INSTALLATION REPORT

Press the SHIFT + 🖨 keys to print a comprehensive report of the installation results. A bar graph appears indicating the status of the printout. The report lists level measurements for all the channels that you installed and indicates out-of-limit conditions with an overall PASS/FAIL conclusion. Space is provided for you to fill in subscriber information. You can attach the report to your work order or file it for future reference.

STORING INSTALLATION RESULTS

Press the SHIFT + 🗂 keys to store the results of the installation check into a file. A screen will appear asking you to enter a name for the file. See the section on VIEW mode to find out how to access files that you have stored.

Tip
The results from the most recent installation check are stored automatically. If you have selected another mode and wish to return to viewing the installation results you can do so without having to repeat the measurement process. Simply press the SHIFT + ✓ keys and the results of the most recent installation check will appear.

⊥ LEVEL

Press the ⊥ key to select LEVEL mode or choose the ⊥ icon from the NAVIGATOR. Here you can measure the signal level of a specific channel or frequency. The level is indicated both numerically and on an analog meter.
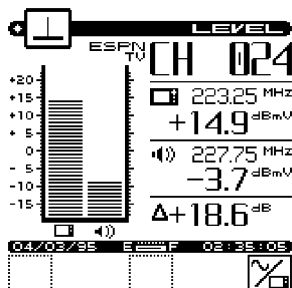
ADJUSTING THE REFERENCE LEVEL

You can adjust the reference level setting of the analog bar meter using the up and down arrows. When you press the SHIFT + ☰ keys, your CLI-1450 automatically sets the optimum reference level for you.

TUNING BY CHANNEL

When you are tuned to a channel, both the video and audio carriers of the channel are measured and displayed simultaneously. The difference between the video and audio carriers (DVA) is also shown. The channel number, type and label for the channel that you are currently tuned to appear in the upper right-hand portion of the screen. You can use the left or right arrows to tune to the previous or next enabled channel in the plan. You can also use the numeric entry keys to tune directly to the desired channel. Press the ▨ soft key to tune by frequency.

TUNING BY FREQUENCY

The ▨ soft key toggles between frequency and channel tuning. When you choose frequency tuning, CLI-1450 assumes a CW and readings are compensated as such.
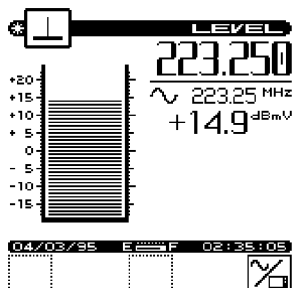
Use the left and right arrows to tune your CLI-1450. The frequency increments or decrements by the step size that you have specified in the Measurement configuration (see FREQUENCY TUNING STEP SIZE). You can also use the numeric entry keys to tune directly to the frequency desired.

MEASUREMENT HOLD

You can freeze the level measurement at any time by pressing the SHIFT + ⬚ keys. The measurement is retained even if the cable is disconnected from the input port. Notice that the mode icon in the upper left-hand portion of the screen flashes when the measurement is on hold. Press the SHIFT + ⬚ keys again to release the hold. The hold is also released when you tune to a different channel or frequency. The measurement is not retained when another mode is selected or the CLI-1450 is shut off.

PRINTING THE SCREEN

You can print the entire screen at any time by pressing the SHIFT + ⬚ keys. A bar graph appears indicating the status of the printout.

Tip
If you are using your CLI-1450 at a location where it is not convenient to connect to a printer (such as on a pole), you can put the measurement on hold until you are able to access the printer (see MEASUREMENT HOLD).

WARNING INDICATORS

If the current measurement is inaccurate due to an out-of-range condition or hardware failure, your CLI-1450 warns you by dimming the numeric measurement value and displaying one of the following warning indicators.

Over-range

The signal level is above the measurement range of the instrument.

223.25 MHz
+63.7 dBmV

Under-range

The signal level is below the measurement range of the instrument.

223.25 MHz
-43.1 dBmV

Error

A hardware problem exists. If this condition persists, the unit may need repair.

223.25 MHz
+14.9 dBmV ERR

FULL SCAN

Press the key to select the FULL SCAN mode or choose the icon from the NAVIGATOR. A spectral graph of all the carriers in the channel plan appears.
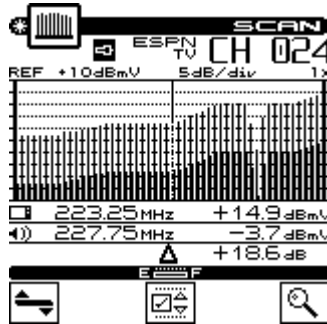
MOVING THE MARKER

A vertical marker appears over the currently selected channel.   The channel number, type and label appear in the upper right-hand portion of the screen. The frequency and level of the video and audio carriers for the selected channel can be seen directly beneath the graph. You can use the left or right arrows to select the previous or next channel. You can also use the numeric entry keys to tune directly to the desired channel.

ADJUSTING THE REFERENCE LEVEL

The reference level setting is displayed above the graph. This is the level at the very top line. You can adjust the reference level using the up and down arrows. When you press the SHIFT + ▤ keys, your CLI-1450 automatically sets the optimum reference level for you.

ADJUSTING THE SCALE

The scale setting is displayed above the graph. You can adjust the scale to provide the best view of the carrier levels by pressing the ▤ soft key. A new set of soft keys appear. Use the ▲ and ▼ soft keys to increment and decrement the scale value. Press the ▤ soft key when you have finished.

ZOOMING IN AND OUT

To zoom in on or out from the channel selected by the marker, press the 🔍 soft key. A new set of soft keys appear. Use the ⊕ soft key

to zoom in and the ⊖ soft key to zoom out. The magnification
factor is displayed above the graph. Press the 🔍 soft key when you
have finished.

CHECKING LIMITS
You can verify that the carrier levels are within limits. First, you need
to tell your CLI-1450 which test point you are at. This determines
which set of limits are used.

Press the ☑⇳ soft key to access the limits submenu. A new set of soft
keys appear.

Press the ⇳ soft key to sequence through the available test points.
The test point that you have selected is represented in the upper
portion of the screen by one of the following icons:

⊡	Subscriber Drop
⊥	Ground Block
⊤	Tap
⊟	User Defined

Note
Be sure that you have enabled all of the test points that you are
interested in using. The ⇳ soft key is only available if there is more
than one enabled test point. (see EDIT TEST POINTS).

When you have selected the limits submenu, the marker information below the graph is replaced by the overall limit check summary for channels **currently being displayed on the graph**. For each limit, the worst case actual value is displayed along with a pass/fail status. The results are updated upon the completion of each scan.

```
MIN VID LVL:     -17.7dBmV ✗
MAX △ VID LVLs:   27.9dB   ✗
MIN △ V/A:         0.7dB   ✗
MAX △ V/A:        28.2dB   ✗✗
MAX △ ADJ CHANS:  11.9dB   ✗
```

Important
The limit check results apply only to the channels currently being displayed on the graph — not the entire channel plan.

Note
Only the limits that are enabled in the selected test point appear on this screen.

Your CLI-1450 can indicate the minimum and maximum carrier level limits on the graph. The out-of-limit portions appears as diagonal "hash" areas. You can toggle the hash lines on and off by pressing the ⬚ key.

Note
The limit check results are updated with each scan. They are also updated immediately when you press the ⬚ or ⬚ soft keys.

When you are finished viewing the overall limit results, press the ⬚ soft key to return to the main menu.

CHECKING LIMITS ON AN INDIVIDUAL CHANNEL
Indicators appear in the marker information area when a channel is outside the limits of the currently selected test point.

```
◻    223.25MHz   ⌃+14.9dBmV
◀))  227.75MHz     -3.7dBmV
◀CHAN      △   ⌄+18.6dB
```

Up or down arrows to the left of the video level and DVA numeric
measurement tell you when the limits have been exceeded.

> ⌃ measurement too high
> ⌄ measurement too low

When an adjacent channel error occurs, one of the following indicators
will appear in the lower left-hand area of the marker information area:

> ◄ CHAN   lower adjacent channel level
> CHAN ►   upper adjacent channel level
> ◄ CHAN ► both upper and lower adjacent channel levels

MEASUREMENT HOLD
You can freeze the scan measurement at any time by pressing the
SHIFT + 📷 keys. The measurement is retained even if the cable is
disconnected from the input port. Notice that the mode icon in the
upper left-hand portion of the screen flashes when the measurement is
on hold. Press the SHIFT + 📷 keys again to release the hold. The
measurement is not retained when another mode is selected or the
CLI-1450 is shut off.

PRINTING THE SCREEN
You can print the entire screen at any time by pressing the SHIFT +
🖨 keys. A bar graph appears indicating the status of the printout.

STORING A SCAN FILE
Press the SHIFT + 📁 keys to store the current scan measurement into
a file. A screen will appear asking you to enter a name for the file.
Once stored, you will be able to recall the file at a later time and view
it on the Scan screen. You will be able to adjust the screen settings the
same as when you are viewing a "live" measurement. See the section
on VIEW mode to find out how to access files that you have stored.

WARNING INDICATORS
If the current measurement is inaccurate due to an out-of-range
condition or a hardware failure, your CLI-1450 warns you by

displaying one of the following warning indicators to the left of the numeric level measurement in the marker information area:

▨ **Over-range**
The signal level is above the measurement range of the instrument.

▨ **Under-range**
The signal level is below the measurement range of the instrument.

▨ **Error**
A hardware problem exists. If this condition persists, the unit may need repair.

◪   **TILT**

TILT mode simplifies the process of balancing an amplifier. TILT mode can only be accessed by choosing the ◪ icon from the NAVIGATOR. A spectral graph of the TILT carriers appears.
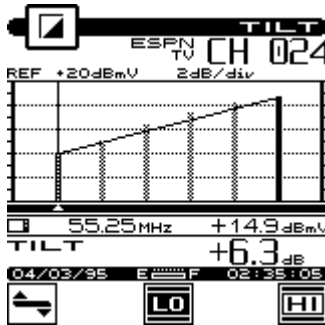
MOVING THE MARKER

You can view up to six carriers. A vertical marker appears over the
currently selected carrier. The channel number, type and label
appear in the upper right-hand portion of the screen. The frequency
and level of the selected carrier can be seen directly beneath the
graph. You can use the left or right arrows to select the previous or
next carrier.

SELECTING THE LOW AND HIGH CARRIERS

Notice that the bars representing the low and high pilots are solid and
all others are dim. You can select which carriers are used for the tilt
measurement. To select the low pilot carrier, move the cursor to the
desired carrier and press the [LO] soft key. To select the high pilot
carrier, move the cursor to the desired carrier and press the [HI] soft
key. The tilt measurement is calculated from the low and high pilot
carriers that you have selected.

ADJUSTING THE REFERENCE LEVEL

The reference level setting is displayed above the graph. This is the
level at the very top line. You can adjust the reference level using the
up and down arrows. When you press the SHIFT + [⯮] keys, your CLI-
1450 automatically sets the optimum reference level for you.

ADJUSTING THE SCALE

The scale setting is displayed above the graph. You can adjust the
scale to provide the best view of the carrier levels by pressing the [⇅]
soft key. A new set of soft keys appears. Use the [▲] and [▼] soft
keys to increment and decrement the scale value. Press the [⬇] soft
key when you have finished.

MEASUREMENT HOLD

You can freeze the tilt measurement at any time by pressing the SHIFT + 📷 keys. The measurement is retained even if the cable is disconnected from the input port. Notice that the mode icon in the upper left-hand portion of the screen flashes when the measurement is on hold. Press the SHIFT + 📷 keys again to release the hold. The measurement is not retained when another mode is selected or the CLI-1450 is shut off.

PRINTING THE SCREEN

You can print the entire screen at any time by pressing the SHIFT + 🖨 keys. A bar graph appears indicating the status of the printout.

STORING A TILT FILE

Press the SHIFT + 🗋 keys to store the current tilt measurement into a file. A screen will appear asking you to enter a name for the file. Once stored, you will be able to recall the file at a later time and view it on the Tilt screen. You will be able to adjust the screen settings the same as when you are viewing a "live" measurement. See the section on VIEW mode to find out how to access files that you have stored.

SCAN

The CLI-1450 includes an additional SCAN mode that can display up to six video carriers. You can access this mode by choosing the ▥ icon from the NAVIGATOR.
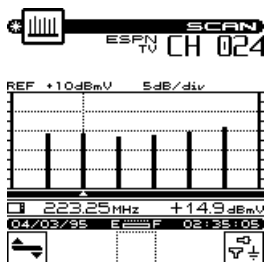
MOVING THE MARKER

A vertical marker appears over the currently selected carrier. The
channel number, type and label appear in the upper right-hand portion
of the screen. The frequency and level of the selected carrier can be
seen directly beneath the graph. You can use the left or right arrows to
select the previous or next carrier.

ADJUSTING THE REFERENCE LEVEL

The reference level setting is displayed above the graph. This is the
level at the very top line. You can adjust the reference level
using the up and down arrows. When you press the SHIFT + ⬓ keys,
your CLI-1450 automatically sets the optimum reference level for
you.

ADJUSTING THE SCALE

The scale setting is displayed above the graph. You can adjust the
scale to provide the best view of the carrier levels by pressing the ⬓
soft key. A new set of soft keys appears. Use the ▲ and ▼ soft
keys to increment and decrement the scale value. Press the ▬ soft
key when you have finished.

CHECKING LIMITS

You can verify that the carrier levels are within limits. First, you need
to tell your CLI-1450 which test point you are at. This determines
which set of limits are used. Press the ⬓ soft key to sequence
through the available test points. The test point that you have
selected is represented in the upper portion of the screen by one of
the following icons:

⬓	Subscriber Drop
⬓	Ground Block
⬓	Tap
⬓	Custom (User Defined)

Note
Be sure that you have enabled all of the test points that you are interested in using. The ⟨key⟩ soft key is only available if there is more than one enabled test point. (see EDIT TEST POINTS).

When you have selected the limits submenu. the marker information below the graph is replaced by the overall limit check summary for channels **currently being displayed on the graph.** For each limit, the worst case actual value is displayed along with a pass/fail status. The results are updated upon completion of each scan. When the cursor is on an analog channel, all the analog limits are displayed. When the cursor is on a digital channel, the digital limits are displayed as shown below.

Cursor on Analog Channel   Cursor on Digital Channel

```
MIN VID LVL:    -17.7dBmV ✗          MIN DIG LVL:    -4.3dBmV
MAX Δ VID LVLs:  27.9dB   ✗          MAX DIG LVL:    +8.4dBmV
MIN Δ V/A:        0.7dB   ✗
MAX Δ V/A:       28.2dB   ✗✗
MAX Δ ADJ CHANS: 11.9dB   ✗
```
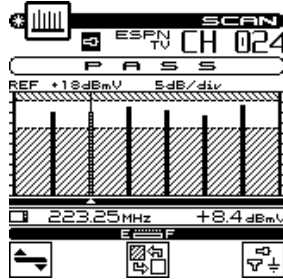

You can quickly check to see if all SCAN carriers are within limits by looking at the PASS/FAIL indicator above the graph.

MEASUREMENT HOLD
You can freeze the scan measurement at any time by pressing the SHIFT + 📷 keys. The measurement is retained even if the cable is disconnected from the input port. Notice that the mode icon in the upper left-hand portion of the screen flashes when the measurement is on hold. Press the SHIFT + 📷 keys again to release the hold. The measurement is not retained when another mode is selected or the CLI-1450 is shut off.

PRINTING THE SCREEN

You can print the entire screen at any time by pressing the SHIFT + ![icon] keys. A bar graph appears indicating the status of the printout.

STORING A SCAN FILE

Press the SHIFT + ![icon] keys to store the current scan measurement into a file. A screen will appear asking you to enter a name for the file. Once stored, you will be able to recall the file at a later time and view it on the Scan screen. You will be able to adjust the screen settings the same as when you are viewing a "live" measurement. See the section on VIEW mode to find out how to access files that you have stored.

![icon] AUTO TEST

Your CLI-1450 is capable of performing unattended, automated level measurement sequences. The sequences can be programmed to repeat over a period of time. Measurement data is stored into a file that can be viewed, printed or uploaded to StealthWare. See the section on VIEW mode to find out how to access files from Auto Tests that you have performed.

Important
When performing an Auto Test, only the channels enabled in the currently selected channel plan are measured.

CONFIGURING AN AUTO TEST

Choose the ![icon] icon from the NAVIGATOR to configure an automated test sequence. Your CLI-1450 will guide you step by step.

![icon] Choose Location

If desired, you can log information about the location at which you are performing the test. The information will be stored in the Auto Test file along with the measurement data. It will be available when viewing and printing the Auto Test results. This first screen presents you with a list of available locations. To create a new location, press the ![icon] soft key.

Press ![icon] soft key to delete the location highlighted in the

list. Press the ⌧ soft key to select the highlighted location and continue to the next step.

Tip
You can rename the location highlighted in the directory by pressing the SHIFT + ⌧ keys. A screen will appear asking you to enter a new name.

New/Edit Location

This screen is where you enter the information for a new or existing location. Use the up and down arrows to select the item to be edited. The items that appear in the list depend on the type of location you have selected. If you regularly perform tests at this location, you can save it for future use so that you only need to enter the information once. To do this, press the ⌧ soft key and enter a name for the location.

When you are done editing, press ⌧ to continue configuring the Auto Test.

Note
Your CLI-1450 will remind you when you have not stored the location. You should only do this, however, if you think you will return for another test.

Choose Probe Point

Some location types have multiple points at which you can make test measurements. If you have selected such a type, this screen will appear. Use the up and down arrows to choose the appropriate probe point from the list and then press the ⌧ soft key.

⊕   Measure Voltage

You can log voltage measurements that you make using your multimeter. These will appear when viewing or printing the results of the Auto Test. When you have finished entering the measurements, press the [OK] soft key.

✎   Compensation

Compensation is added directly to the signal level measurements. You can use this to compensate for losses associated with probe points found on certain amplifiers. The default is the Probe Compensation value specified in Configure. Enter a different value if necessary. Press the [OK] soft key to continue.

▧   Results File Name

Enter the name you want to use for the results file that is created. Your CLI-1450 will let you know if there is already a results file with the name that you enter. If desired, you can overwrite an existing file of the same name. When you are ready for the next step, press the [OK] soft key.

▧   Type of Test

Tests can be executed immediately or scheduled over a period of time. Use the up and down arrows to select the type of test you want and then press the [OK] soft key.

◷   Set Schedule

This screen will appear only if you have selected a scheduled test. The default schedule will perform four intervals over a twenty-four hour period beginning at the present time and date. If you require a different schedule, use the up and down arrows to edit the schedule and then press the [OK] soft key.

☷ **Temperature**

The ambient temperature at which the test is performed is recorded. Your CLI-1450 contains an internal temperature sensor for this purpose. If you prefer to use your own thermometer, you can manually enter the temperature here.

Important
For scheduled tests, the manual temperature entry is used for the first interval only. Subsequent intervals will record the temperature as measured by the internal sensor. For accurate measurements, your CLI-1450 reads the internal temperature sensor immediately upon power-up.

When you are ready to begin the test, press the ⌷OK soft key.

PERFORMING AN AUTO TEST

The following screen appears when your CLI-1450 is performing Auto Test measurements:
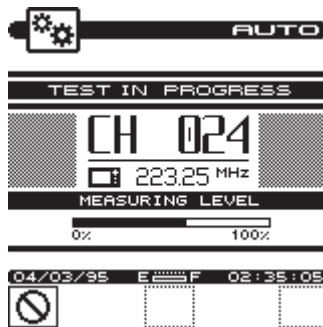
The number, type and carrier frequency of the channel currently being measured is displayed. The bar graph indicates the percentage of channels measured.

If you are performing a scheduled test, the time remaining until the next interval will appear upon completion of the measurements.
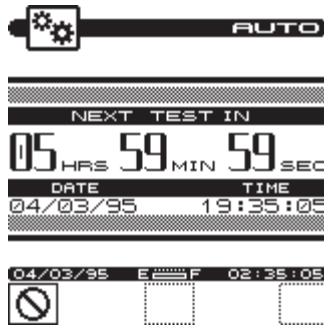
When the auto test is complete, your CLI-1450 will display a list of Auto Test files that are available for viewing and printing.

CANCELING AN AUTO TEST
While performing an Auto Test, you will not be able to select other modes without first canceling the test in progress. Doing this will result in an incomplete test — you will not be able to resume the previously configured test.

Press the ⊘ soft key to cancel the Auto Test. Your CLI-1450 will display a warning message and ask you to confirm your request.

 VIEW

To access measurement files that you have stored in your CLI-1450, choose the icon from the NAVIGATOR. Files are categorized into Installations, Scans (including Tilt measurements), and Auto Tests.
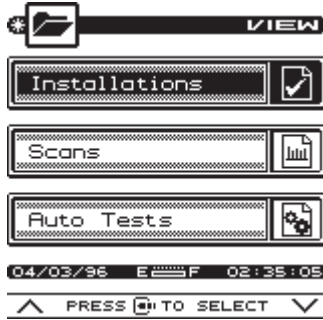
Use the up and down arrows to select the type of file that you want to view from the main menu and then press the key.

THE FILE DIRECTORY

Upon selecting the file category from the VIEW main menu, you are presented with a directory of existing files. For example, below is the directory of Scan files:
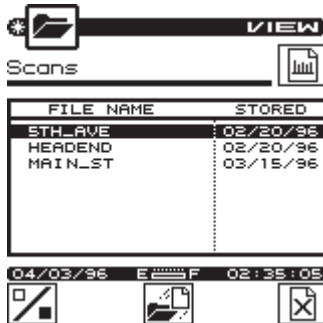
To view a file, use the up and down arrows to highlight the name of the file that you want to view and then press either the ⬚ soft key or the ◀▥ key.

To delete the highlighted file, press the ⊠ soft key. You can delete more than one file at a time by selecting multiple files using the ▨ soft key. Each press of this soft key alternately selects and deselects the file that you have highlighted. An indicator appears in the left-hand column to show that you have selected the file. Select all the files that you want to delete before pressing the ⊠ soft key.

Tip
You can print Installation and Auto Test files from the directory. To print an Installation or Auto Test file, use the up and down arrows to highlight the name of the file that you want to print and then press SHIFT + ▤. You can print multiple file by first selecting them using the ▨ soft key and then press SHIFT + ▤. If a scheduled type Auto Test is highlighted, all intervals contained in the file will be printed. You must view Scan files in order to print them.

Tip
You can rename the file highlighted in the directory by pressing the SHIFT + ▭ keys. A screen will appear asking you to enter a new name.

VIEWING INSTALLATION FILES
You view Installation files using the Installation results screens described earlier in this manual. When viewing a file, you can print a comprehensive report of the installation results by pressing the SHIFT + ▤ keys.
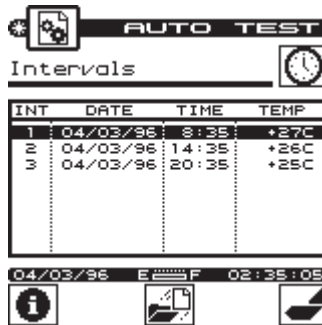
Note
When viewing an Installation file, the date and time that the file was stored appears in the status bar and the file name appears at the top of the screen above the title bar.

VIEWING SCAN FILES

There are three types of scans that you can store and view — full
scans, six-channel scans and tilt measurements. The type of scan
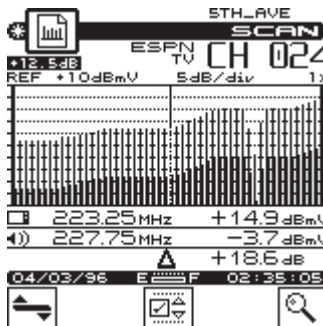depends on which screen you are in when you store the file. Once the
scan is stored, you cannot change its type.

You view Scan files using the same screen in which the file was stored.
For example, the following screen is used to view full scan files:

VIEWING AUTO TEST FILES

Upon selecting the desired Auto Test file, you are presented with a list of intervals that are contained within the file. The list includes the interval number, date, time and temperature when the interval was recorded.

Press the [ⓘ] soft key to view information about the Auto Test file. This displays the information that was logged when you configured the test. The items presented depend upon the location type that you selected.

Note
To print a 24-hour format report, use the up and down arrows to highlight the first interval that you want included in the report and then press SHIFT + [📄]. The report will include the highlighted interval plus the following three for a total of (up to) four intervals.

To view the measurement data from an interval, use the up and down arrows to highlight the desired interval then press either the [📁] soft key or the [◀▥] key. There are three screens in which the data is presented:
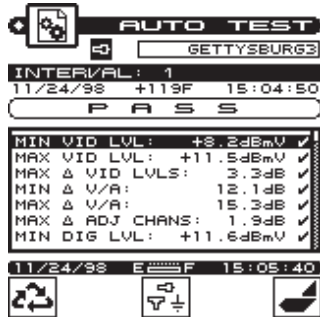
The first screen that will appear is a tabular list that includes the video and audio carrier levels along with the delta V/A for each channel. Use the up and down arrows to scroll through the list. Indicators appear within the list to flag out-of-limit conditions. The following table relates each indicator with its meaning:

> * adjacent channel limit violation (does not apply to digital channels)
> ↑ over limit violation
> ↓ under limit violation
> \> over range measurement error
> < under range measurement error
> E unlocked measurement error

To view the data for the channel highlighted in the list press the ![soft key] soft key or the ![key] key. Use the PASS/FAIL indicator to quickly determine whether the channel has passed the limits check. If the channel failed, you can identify the reason(s) for the failure by looking at the symbols that appear in this indicator.

Press the ![soft key] soft key or the ![key] key again to scroll to the limit check summary. To quickly determine the status of the overall limit check, look at the PASS/FAIL indicator located in the upper portion of the screen. This indicates FAIL if any channel is not within the required limits. For each limit, the worst case value is displayed along with a pass/fail status. You may have to scroll down the list to see all the limits results.

Press the ⬚ soft key to sequence through the available test points. The test point that you have selected is represented in the upper portion of the screen by one of the following icons:

⬚	Subscriber Drop
⬚	Ground Block
⬚	Tap
⬚	User Defined

Note
Be sure that you have enabled all of the test points that you are interested in using. The ⬚ soft key is only available if there is more than one enabled test point. (see EDIT TEST POINTS).

Only the limits that are enabled in the selected test point will be checked.

Note
When viewing the data from an interval, you can print a comprehensive report by pressing SHIFT + ⬚.

⬚ INGRESS SCAN

You can access the INGRESS SCAN mode by choosing the ⬚ icon from the NAVIGATOR.
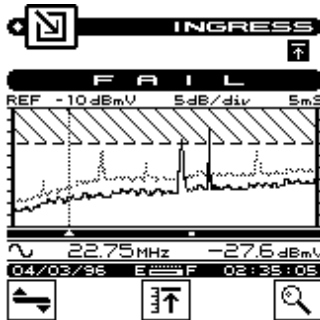
MOVING THE MARKER

A vertical marker appears over the currently selected ingress frequency. The frequency and level of the ingress for the selected frequency can be seen directly beneath the graph. You can use the left or right arrows to select the previous or next frequency.

ADJUSTING THE REFERENCE LEVEL

The reference level setting is displayed above the graph. This is the level at the very top line. You can adjust the reference level using the up and down arrows. When you press the SHIFT + keys, your CLI-1450 automatically sets the optimum reference level for you.

ADJUSTING THE SCALE

The scale setting is displayed above the graph. You can adjust the scale to provide the best view of the ingress level by pressing the soft key. A new set of soft keys appear. Use the and soft keys to increment and decrement the scale value. Press the soft key when you have finished.

ZOOMING IN AND OUT

To zoom in on or out from the ingress frequency selected by the marker, press the soft key. A new set of soft keys appear. Use the soft key to zoom in and the soft key to zoom out. The magnification factor is displayed above the graph. Press the soft key when you have finished.

PEAK MEASUREMENT HOLD

You can catch transient ingress at any time by pressing the soft key. Notice the icon in the upper-right portion of the screen is displayed when the peak measurement hold feature is on. The peak ingress scan is represented on the display as a dimmed scan. When the peak hold function is active the marker identifies the peak ingress frequency and level. Press the soft key again to release the peak hold function.

THE PASS/FAIL INDICATOR

Use the PASS/FAIL indicator located directly above the ingress scan to quickly determine whether the ingress scan has passed the limit check. If the scan failed, you can identify the reason(s) for the failure by looking at the ingress scan and moving the marker to identify the frequencies at which it failed.

MEASUREMENT HOLD

You can freeze the ingress scan measurement at any time by pressing the SHIFT + ![icon] keys. The measurement is retained even if the cable is disconnected from the input port. Notice that the mode icon in the upper left-hand portion of the screen flashes when the measurement is on hold. Press the SHIFT + ![icon] keys again to release the hold. The measurement is not retained when another mode is selected or the CLI-1450 is shut off.

PRINTING THE SCREEN

You can print the entire screen at any time by pressing the SHIFT + ![icon] keys. A bar graph appears indicating the status of the printout.

STORING A INGRESS SCAN FILE

Press the SHIFT + ![icon] keys to store the current ingress scan measurement into a file. A screen will appear asking you to enter a name for the file. Once stored, you will be able to recall the file at a later time and view it on the ingress scan screen. You will be able to adjust the screen settings the same as when you are viewing a "live" measurement. See the section on VIEW mode to find out how to access files that you have stored. You will also be able to print (later) and upload to StealthWare 3.0 to keep on record, or for further analysis (comparison with other traces).

MODEL CLI-1450

3Reference

USING THE REFERENCE SECTION

This section provides additional information concerning the use of the CLI-1450. Items include; Help, Information, and Technical Support.

? HELP

The HELP mode provides on-line user assistance by means of context-sensitive help screens. During normal operations, soft key icons appear at the bottom of the display. Each help screen describes the condition of the soft key icons at the time HELP was pressed.

Press the SHIFT + ? key to select the HELP mode.
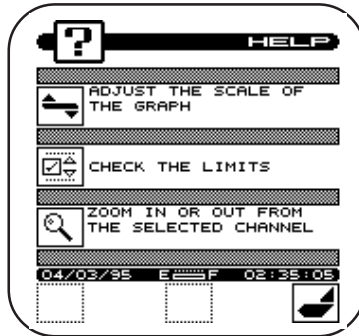
Example of HELP Screen

Next to the icon is a brief description of the function that the soft key performs. If an icon is currently inactive "feature not available" is displayed.

 INFORMATION

Choose the icon from the NAVIGATOR. Here you can view information concerning your CLI-1450. The type of information includes; model, frequency range, serial #, firmware version, calibration date, channel plan, memory used, and current temperature.
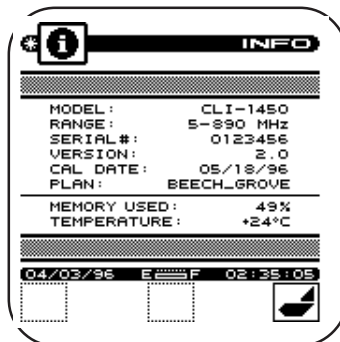
Example of INFOrmation Screen

TECHNICAL SUPPORT

Wavetek Wandel Goltermann has worked hard to make the CLI-1450 as easy-to-use as possible. However, if you have a problem using your unit you can contact WWG's Technical Support for help. You can reach WWG's Technical Support, Monday through Friday between 8 am and 5 pm EST. at **(800) 622-5515 ext. 8350**. For International Customers, the number to call is **(317) 788-9351**. Questions may be e-mailed to Technical Support Specialists at: catvsupport@wavetek.com

If you received your unit and found it to be damaged or incomplete in any way, phone WWG immediately. Save the shipping carton and packing material in the event that you have to return it.

FOR CUSTOMER SERVICE call WWG at (**800**) **851-1198** (inside US). For International Customers, the number to call is **(317) 788-9351**.

MODEL CLI-1450

Appendix A: Specifications

SPECIFICATIONS

Frequency

Range:	45 to 559 MHz; 5 to 890 MHz (optional); sub band option (5 to 80 MHz)
Accuracy:	20 ppm
Tuning Resolution:	25 kHz

Level Measurement

Range:	-20 to +50 dBmV
Resolution:	0.1 dB
Accuracy[1]:	$\pm$0.75 dB Flatness; $\pm$0.75 dB Linearity at 25°C (77°F)
Digital Average Power: (Optional)	$\pm$2 .0 dB (typical)

Scan Mode

Number of Channels:	120
Scan Rate:	Approximately 6 carriers / second

Leakage Mode

Level Measurement	**Input Sensitivity** (LD-3, VMA-3) Video Detection: From 1.0 µV with LT1000 Leakage Tagger activated (121 to 133.2625 MHz)

CW Detection: From 0.5 µV (typical) with LT1000 Leakage Tagger activated (121 to 133.2625 MHz)
Measurement: From 1.4 µV (115 to 140 MHz)

Range: 0.5 to 2,000 µV (at input connector)

Measure Mode
Accuracy: $\pm$1.5 dB @ 25°C (77°F)

Find and Fix Mode
Accuracy: $\pm$2.25 dB @ 25°C (77°F)

Tuning
Tunes to video carrier frequencies in the 115 to 140 MHz range
Accuracy: 20 ppm
Resolution: 25 kHz

General
Dimensions: 4.25" (W) x 10.5" (H) x 3" (D)
Weight: 1.36 kg (3 lb.)
Operating Temp. Range:-10 to +50°C (14 to 122°F)
Water Resistance: Meets or exceeds MIL-STD-810D (Method 506.2)

Powering
Battery Life: 2.25 hours continuous (backlight off), replaceable battery cartridge
Charge Time: 16 hours max. with unit off

Standard Accessories
4010-00-0114:   AC/DC charger/adapter
1019-00-0479:   Battery cartridge for CLI-1450
1019-00-1275:   HD-1 Dipole Antenna
6510-00-0416:   Operation Manual, Model CLI-1450

Options
LT1000 Leakage Tagger Option
1450DIG: For measuring the average power of digital signals
MSUHF: Frequency extension to cover range: 45 to 890 MHz
MSSUB: Frequency extension to include 5 to 80 MHz, and reverse ingress scan mode
1019-00-0476: CLI-1450 Soft Carrying Case
DS-1: Vehicle mount "Docking Station"

VMA-3: Magnetic mount 1/4 λ whip antenna
1019-00-0470: Cloning Cable (RS232 Interconnect cable)
1019-00-0558: Charger/Adapter universal input, 12VDC output
4010-00-0119: Charger/Adapter 120VAC to 12 VDC
4010-00-0143: MBC-4 Battery Charger
1019-00-0554: European Charger/Adapter
1019-00-0479: Field replaceable battery cartridge
1019-00-0557: Cigarette Lighter Power Adaptor
MSCLI Printer: Portable serial thermal fusion printer kit
1019-00-0468: P-Stealth printer cable
1019-00-0467: Generic serial printer cable - 25 pin male connector
1019-00-0469: CLI-1450 and microStealth to PC Cable
1019-00-0460: Replacement input Connectors, F/BNC & F/F
3010-16-0025: Flexible Rubber Antenna
1019-00-1275: HD-1 Dipole Antenna
3010-16-0028: HD-1 Antenna Elements
1019-00-1276: HD-1 Pole

Precision F-Connector (MSUHF Option only)
This instrument is designed to perform accurate level measurements
at frequencies greater than 550 MHz. In order to achieve the desired
accuracy at higher frequencies, a precision F-connector (2110-06-
1029) is installed, and a spare is provided. Replace this connector *only*
with a WWG approved precision F-connector.

The life of the F-connector will be extended by keeping a test lead
attached to the instrument at all times. Avoid using "quick F"
connectors or "push-ons" as these are likely to damage the connec-
tor. Measurement accuracy at these frequencies is enhanced by
using aprobes prescribed by mplifier manufacturer . When a probe
is not available, a 6 dB pad with good response characteristics
throughout the measurement frequency range is recommended at
the test point.

For more information about testing at higher frequencies, please refer
to WWG's application note, "Considerations in Testing 750 MHz
Amplifiers", call 1-800-622-5515, or e-mail to:
catvsupport@wavetek.com.

[1]Sub band option - 0 dBmV minimum

MODEL CLI-1450

B Appendix B: Power Management and Battery

Battery Pack Location and Installation

The CLI-1450 battery pack (1019-00-0479) is located on the back of the unit. To remove or replace the battery pack, pull the notched tab downward, and lift the battery pack.

To install the battery pack, insert the bottom of the pack into the groove and press down on the battery pack until it clicks into place.

WARNING: The CLI and microStealth battery packs are NOT interchangeable. Use only the battery pack specified for use with the CLI-1450.

Charging the Battery Pack

To recharge the battery pack, plug the AC adapter into the unit. The unit will be fully charged in 16 hours with unit off, and 30 hours with unit operating. **Use only the AC adapter supplied with the unit or obtained from Wavetek. Use of any other adapter could damage the unit.**

Battery Tips

The CLI-1450 is shipped from the factory only with a light charge. You should recharge the battery upon receipt of your unit to ensure a full charge.

To maximize battery life, set Auto Shutoff to 1 minute and Back-light Shutoff to "always off". These items are described in the Global Configuration section.

MODEL CLI-1450

C
Appendix C:
Interface Port

CONNECTOR

The CLI-1450 has a serial interface with RS232 drive, using a 3-pin
stereo connector. The serial interface has a driver built in for RS232
serial binary data interchange. The connector is located on the
bottom of the unit behind a water-resistent cover.

Pin Assignments for Interface Port

Signal	Pin	Description
TXD	1	Transmitted Data
RXD	2	Received Data
GND	3	Ground

1	(STEREO—Outer Tip)
2	(STEREO—Middle)
3	(GND—Case)
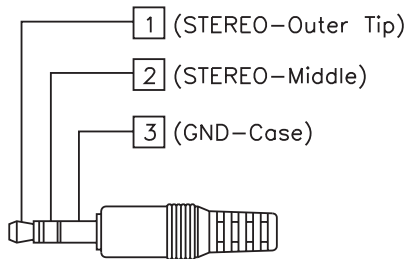
STEREO PLUG DETAIL

CABLE SPECIFICATIONS

CLI-1450 TO PC (1019-00-0469)

STEREO PLUG, LOCATION A   DB9, LOCATION B

```
1 -------- 3
2 -------- 2
3 -------- 5
   NC --- 1
          4
          6
          7
          8
   NC --- 9
```

5   9
1   6
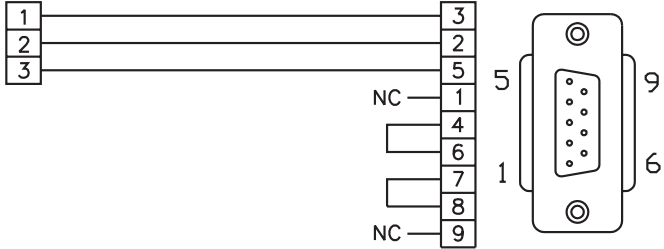
CLI-1450 TO PRINTER (STANDARD) (1019-00-0468)

STEREO PLUG, LOCATION A   DB25, LOCATION B

```
1 -------- 2
2 -------- 3
3 -------- 7
          4
          5
          6
          8
          20
```

Pin 25

Pin 1   Pin 14
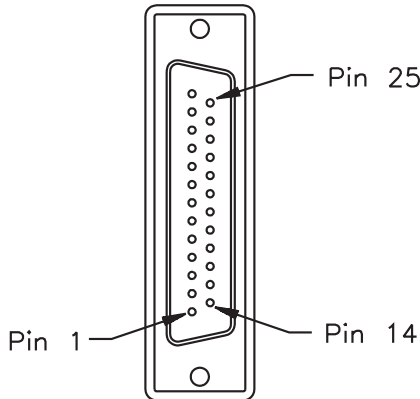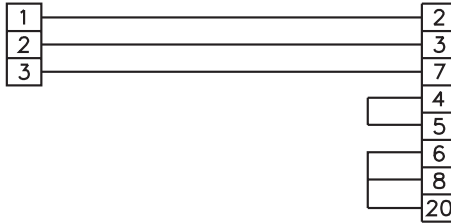
CLI-1450 TO CLI-1450 (1019-00-0470)

STEREO PLUG, LOCATION A   STEREO PLUG, LOCATION B

```
 1 ─────────────────────── 2
 2 ─────────────────────── 1
 3 ─────────────────────── 3
```
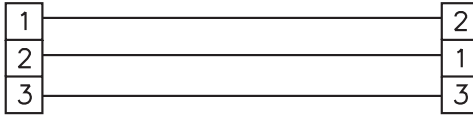
CLI-1450 TO PRINTER (CITIZEN) (1019-00-0467)

STEREO PLUG, LOCATION A   26 PIN, LOCATION B

```
 1 ─────────────────────── 14
 2 ─────────────────────── 15
 3 ─────────────────────── 1
                            2
```

Pin 1 marker ───────▷ W

Pin 1

Pin 26

Pin 2

WIRE SIDE
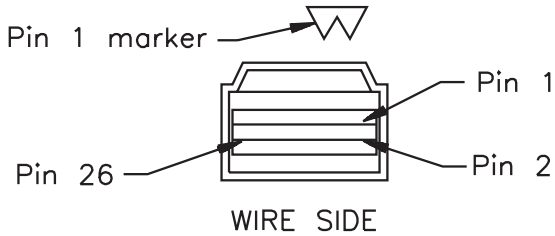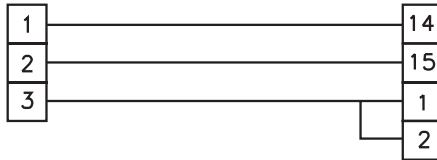
MODEL CLI-1450

D Appendix D: Setting Up A Calibrated Leak Field

INTRODUCTION

Regardless of the type of vehicle-mounted antenna used, several variables come into play that could cause a change in measured field strength. The position of the antenna on the truck will affect the ground plane and, therefore, the pattern of the antenna. There may be reflections from other devices mounted on the vehicle (ladder racks, etc.). Even the length of the lead from the antenna to the meter will have an effect on the measurement. For these reasons we recommend using a calibrated leak to correlate each vehicle's measurement system.

It is sometimes desirable to use a vehicle-mounted monopole (VMA-3) or dipole antenna for monitoring and measuring relative leak intensity. If you're using some other antenna other than the VMA-3, you should set up a calibrated leak for verification of accuracy and calibration of the system, which includes the CLI-1450 and whatever antenna and configuration you choose to use. The following procedure describes a setup for this method.

SETUP

The frequency and level of the predictable "leak" should be given careful consideration, to avoid interfering with any off-air service or allowing an off-air service to affect the measurement. This leak should be generating a signal only during calibration and disconnected at all other times.

A bandpass cable drop may be used as the leak signal, with a calibrated dipole as the source antenna. (A fixed dipole or a WWG HD-1 may be used as the source antenna.) Be sure the dipole is set to the proper length for the chosen monitoring frequency, and that the antenna is mounted with the proper polarization to correspond with the monitoring antenna to be used. Ideally, the calibration antenna should be mounted on a wooden post at the same level as the vehicle-mounted antenna. If a vertical monopole antenna is to be used, the source dipole should also be vertical. The drop should be fed through a bandpass filter and an attenuator for adjusting the leak to the correct calibration level.

Set the leak as follows:

Using a CLI-1450 or other calibrated receiver and a dipole (1/2 λ), stand at least 10 feet from the leak reference source. With the antenna 10 feet off the ground and oriented with the proper polarization to the source antenna, adjust the drop attenuator until the level on the calibrated receiver matches the desired calibration reference level. (It may be desirable to set the calibration higher than 20 μV/m, if the calibrated reference receiver is not sensitive enough to read a 20 μV/m leak).

NOTE:
The calibration area should be as free from obstructions and conductive reflecting surfaces as possible.

1. The following considerations should be taken into account when establishing a reference leak source:

    a. Potential reference leak source: system signals fed through a source frequency bandpass filter and attenuator.

b. Source antenna should be carefully located to isolate it from sources of reflection.

c. Source antenna should be properly polarized (vertical, if vertical receiving antenna is used).

2. The following considerations should be taken into account when taking measurements using a reference leak source:

a. Use a half-wave dipole when taking measurements.

b. Place dipole 10 feet from the source antenna and 10 feet from ground, oriented with same polarization as source antenna.

CALIBRATION

When a known field is established, the vehicle may be driven through the field and calibrated using the Compensation feature in LEAKAGE mode. (A significant amount of compensation may be required when using vehicle mounted antennas).

While in the LEAKAGE mode, press the [✎] soft key to adjust compensation. A new set of soft keys will appear. Use the [▲] and [▼] soft keys to increment and decrement the compensation value. You can find the compensation value in the upper right-hand portion of the screen directly below the measurement distance. Adjust the compensation so that the leakage measurement value displayed on the CLI-1450 matches the calibrated reference field. Press the [✎] soft key when you have finished.

Tip
You can quickly clear out the compensation value by pressing the SHIFT + [✖] keys.

Important
Your CLI-1450 stores a separate compensation value for each antenna type. The value automatically becomes effective when you select the antenna. If you are using a calibrated leak field, be sure to make the adjustment for each type of antenna that you want to use.

MODEL CLI-1450

E Appendix E: Technical Note - VMA-3

INTRODUCTION

The VMA-3 Quarterwave Antenna is a field tunable antenna designed to perform leakage measurements when used with the WWG Model CLI-1450 leakage meters. The field tunable 1/4 λ antenna can be cut to any frequency in the 115-140 MHz range.

INSTALLATION

The VMA-3 is easy to install. To adjust the VMA-3 antenna to the desired frequency:

1. Using the cutting chart, locate the desired frequency on the horizontal axis.

2. Draw a vertical straight line to the point of intersection with the sloping line for the antenna to be tuned.

3. Draw a horizontal straight line to the point of intersection with the vertical axis.

4. Read the approximate length "L" (in inches) of the antenna element from the vertical axis.

It is highly recommended that the element be cut long and trimmed down to the exact frequency desired.

5. Cutting the element may be easier by using the edge of a file or grinding wheel to score the rod around its circumference. Then snap it off with a pair of pliers. **Always cut from the bottom of the element.**

6. Insert the element all of the way into the base assembly and tighten with a 3/32" hexagon screw key.

Antenna Cutting Curve
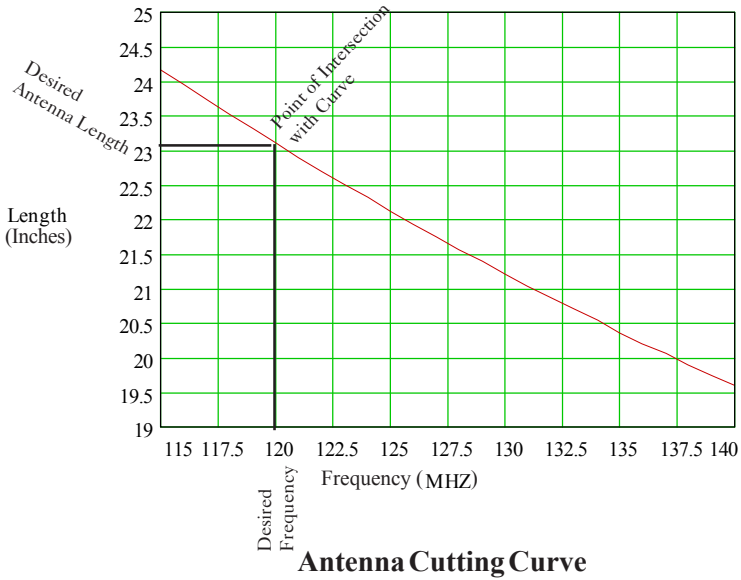
Example of Antenna Cutting

Desired Frequency = 120 MHz
Vertical line intersects the Antenna Cutting Curve at a Length of 23.1 inch.

E-2

OPERATION

For normal measurements, connect the connector on the antenna assembly directly to the antenna connection on the Model CLI-1450 leakage meter or to the DS-1 Docking Station.

The antenna used in leakage detection is also referred to as a quarter-wave antenna because it is equal in length to one-quarter the measured wavelength in free space.

An antenna's response (receiving or radiation) pattern is determined by its ability to receive or radiate signals better when tuned or pointed in one direction. If pointed or tuned elsewhere, the antenna's ability to receive is diminished. Maximum performance will be attained by locating the antenna at the center of the vehicle roof. However, satisfactory results can be attained in other locations, such as rear fender or the trunk lid.

CARE AND MAINTENANCE

In order to maximize both the performance and appearance of your antenna, periodic cleaning is recommended.