

# Model Three Signal Level Meter

## Operation Manual



think ahead.

 TRILITHIC



## Trilithic Company Profile

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

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

Trilithic is comprised of three major divisions:

- **Broadband Instruments and Systems**  
Offers test, analysis, and quality management solutions for the major cable television systems worldwide.
- **RF Microwave Components**  
Provides components and custom subsystems for companies specializing in cellular, military, and other wireless applications.
- **Emergency Alert Systems**  
Leading supplier of government-mandated emergency alert systems used by broadcast TV, cable TV, IPTV, DBS, and radio stations.
- **XFTP**  
Offers a specialty line of field technical products for cable operators and technicians, as well as a line of products for installing electronics in the home of the future.

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# Chapter 1

## General Information

### Helpful Website

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

<http://www.trilithic.com>

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

### Where to Get Technical Support

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

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

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

## How this Manual is Organized

This manual is divided into the following chapters:

- Chapter 1, “General Information” provides Trilithic contact information and describes how this Operation Manual is structured.
- Chapter 2, “Introduction” introduces the equipment and features of the Model Three.
- Chapter 3, “Walkthrough” describes the components of the Model Three.
- Chapter 4, “Setup” describes the steps needed to perform the setup of the Model Three.
- Chapter 5, “Basic Operation” describes how to use the basic features of Model Three.
- Chapter 6, “Advanced Operation” describes how to use the advanced features of Model Three.
- Chapter 7, “Specifications” shows the technical specifications of the Model Three.

## Conventions Used in this Manual

This manual has several standard conventions for presenting information.

- Connections, menus, menu options, and user-entered text and commands appear in **bold**.
- Section names, Web, and e-mail addresses appear in *italics*.



A ***NOTE*** is information that will be of assistance to you related to the current step or procedure.



A ***CAUTION*** alerts you to any condition that could cause a mechanical failure or potential loss of data.



A ***WARNING*** alerts you to any condition that could cause personal injury.

## Precautions



***The battery **MUST** be charged with the AC to DC power adapter and battery charger provided with the Model Three. Using any other adapter/charger may damage the battery.***



***The maximum input voltage to the meter is 100 V (AC or DC). A larger voltage will damage the meter.***



***The accuracy of the meter may be affected when in a strong electromagnetic field.***



***Do not use the Model Three in any manner not recommended by the manufacturer.***

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### What is the Model Three?

Trilithic's **Model Three Signal Level Meter** is designed to provide you with optimal features for reduced cost.

Amplitude measurements are fast and efficient. Carrier amplitudes are displayed singly, as a group (up to 12 "favorites"), or as a full-span display. This product also features a single-channel Spectrum mode, which displays the presence of interfering beats in addition to the carrier amplitudes. The device lets you take the direct power measurement of QAM signals with Constellation diagram display (optional) and pre- and post-BER and MER readings, Hum measurements, data logging, and also supports a voltmeter function.

Four user-defined channel plans may be stored, and the Model Three can perform a complete test of all channels in the selected user channel plan to specified limits at the press of a single key. It can also be set to automatically perform QAM, Level, Spectrum, Tilt (Favorite), Hum, and Limit tests at programmed intervals, unattended.

The Model Three can save files for QAM, Level, Tilt, Spectrum, Scan, Limit test, Hum, and Auto test measurements. These files can be recalled to display the recorded data, or Scan, Spectrum, and Limit files can be viewed graphically. The Model Three also makes it easy to obtain a hard copy of installation data or documentation of a problem via the optional Model Three ToolBox software.

The device is the ideal signal level meter for HFC installations. It is durable, has many features, and is simple to use in a wide range of conditions. Its tough, plastic shell and protective jacket make the Model Three highly resistant to damage from shock and impact. When not in use, the instrument and its accessories are contained in a carrying case.

The Model Three is rugged and convenient to use. It weighs only 1.76 pounds and can be carried and operated with one hand. All measurement functions are accessible via a single keystroke, and, with the Fast Setup function, settings for each measurement mode can be accessed at the press of a single key without going through nested menus. Other functions are simplified through the combination of dedicated function keys and "soft keys."

## Features

### Tilt and Favorite Group Display

Press **TILT** to display a graph showing the amplitudes of up to twelve user-selected video carriers. This display also shows the calculated difference in amplitude (tilt) between the highest and lowest channels in the user-selected group. Press **TILT** again, and the Model Three displays a numeric list that shows the amplitudes of the carriers in the group.

### Single Channel Display

When tuned to a single channel, the Model Three displays bar graphs for the video and audio carriers or power of a digital channel. It also shows numeric readouts of the carrier amplitudes and V/A difference or digital power.

### Single Channel Spectrum

The Model Three can also provide a spectral display of the selected channel including intermodulation products or other undesired signals that may be present.

For a digital channel, this measurement shows the actual shape of the modulation “haystack” to determine if there are any problems with the digital transmission system. This feature provides you with a powerful tool for checking in-channel flatness or mismatches that might affect digital transmission quality.

### Scan Display

Press **SCAN** to display the full span of video and audio carriers in the selected user channel plan. This mode is useful to make a quick check of your system’s overall flatness and amplitude. Up to four user plans may be stored.

Amplitude limits can be imposed on the display. By using the Model Three’s frequency marker, you can zoom in on any suspect channel that appears in the display.

### Spectrum Display

Press **SPECT** to display the spectrum measurements with frequency spans from 2.5 MHz to 62.5 MHz or a full-spectrum scan.

### Hum Display

Press **HUM** to measure the Hum interference of the CATV transmission system.

## QAM Measurement

The Model Three is capable of measuring the channel power of QAM, QPSK, and COFDM signals. This function also enables the measurement of pre- and post-BER and MER for QAM modulated signals. The QAM measurement mode also features a single channel spectrum display and an optional Constellation diagram is available to enable users to find errors more quickly.

## Data Logging

You can select and save the test data of the QAM, Level, Tilt, Limit, Hum, Scan, and Frequency spectrum tests. The Model Three has the capability to store the amplitudes of all video and audio carriers (up to 170 channels). These data records can be captured in nonvolatile memory and later recalled or uploaded to your PC for record keeping.

Each record carries the time, date, and other Model Three information at the time the record is saved.

## Limit Test

The Model Three can perform a complete test of all analog channels in the selected user channel plan to specified limits at the touch of a single key. All channels are listed with Pass or Fail results, and the user may select any channel to review its individual test results. In addition, results for the entire channel plan, such as Maximum  $\Delta$  Video and Maximum  $\Delta$  Adjacent Channel, are seen on the test-result display.

## Auto Test Programs

The Model Three can be set to automatically perform QAM, Level, Spectrum, Tilt (Favorite), Hum, and Limit tests in user settable time increments. This makes the Model Three ideal for performing required 24-hour tests. The test result files can be viewed or uploaded to a PC later.

## Voltmeter

The Model Three is equipped with a built-in voltmeter that can be used for troubleshooting power supplies or power drops. The Model Three displays the voltage with a bar graph and numeric readout. It can accommodate AC or DC voltages up to 100 Volts.

## File Saving and Viewing

The Model Three can save records from QAM, Level, Tilt (Favorite channels group), Spectrum, Hum, Scan, or Limit test measurements either to individual files or all to one file. These files can be recalled to display the recorded data, and Scan, Spectrum, and Limit graphics can be viewed. All files may be uploaded to a PC with the Model Three ToolBox software for analysis, storage, and printing.

## Equipment Supplied with Your Model Three

The Model Three comes with the following:

- Model Three signal level meter
- Protective carrying case
- Strap for carrying case
- Orange rubber protective bumper
- 11.1 V / 1.4 AH Li-Ion battery
- AC to DC power adapter and battery charger
- Operation manual on CD

## Accessories and Replacement Parts for Your Model Three

The following accessories and replacement parts are available for the Model Three:

Part Number	Description
2130854000	Holster
2130856000	Protective sleeve
0930149000	Model Three ToolBox – includes USB data cable
2072084000	USB data cable
2131064000	Replacement protective carrying case
0320050000	Replacement strap for carrying case
2131253000	Replacement orange rubber protective bumper
0090055000	Replacement battery
2072036000	Replacement charger
0200579000	Replacement F-type connector

For more information, please contact Trilithic at [www.trilithic.com](http://www.trilithic.com) or 1-800-344-2412.

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# Chapter 3

## Walkthrough

Now that you have your Model Three out of its box, take a few moments to look it over and become familiar with its controls.



NOTE

***The thin protective film layer used to protect the display during shipping should be removed.***



NOTE

***Your Model Three's battery may need to be charged, see the Battery Charging Section later in this chapter.***

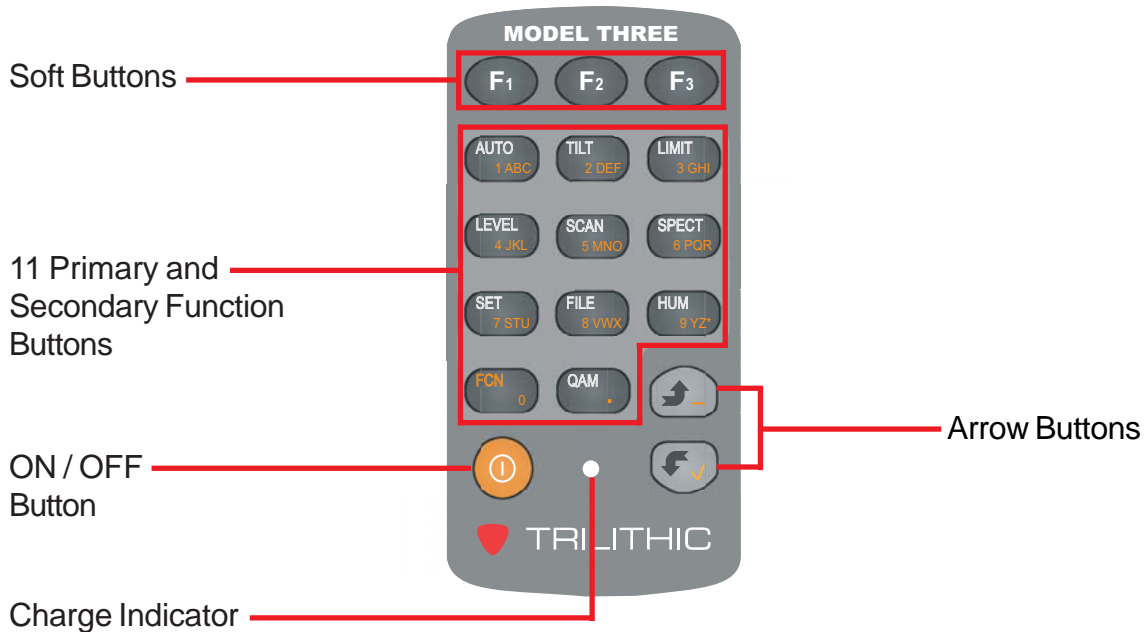
### Identify Components

The Model Three's function buttons and backlit LCD display are on the front panel. The device's charge socket and PC interface socket are on the bottom. The RF "F" connector is on the top of the device. The belt clip is located on the back of the device.



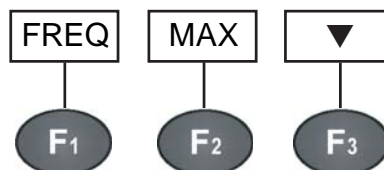
## Key Pad

The key pad consists of the various buttons to access the Model Three's functions. There are eleven function buttons, two arrow buttons (up and down), the power on/off button, and three "soft buttons" that enable you to perform functions shown on the display.














### Soft Buttons

The **F<sub>1</sub>**, **F<sub>2</sub>**, and **F<sub>3</sub>** keys are used to access various functions within the display menus. On specific displays, three boxes appear at the bottom of the display. These boxes correspond to the three soft keys and provide additional commands such as ENTER, EXIT, SCALE, REF, movement arrows, etc. (see the individual function displays for more information).



## Function Buttons

The following is a list of the function buttons:

Key	Function	#	Purpose
	AUTO	1	Enter Auto test mode
	TILT	2	Enter Tilt measurement mode
	LIMIT	3	Enter Limit test mode
	LEVEL	4	Enter single channel / frequency measurement mode
	SCAN	5	Enter Channel Scanning mode
	SPECT	6	Enter Frequency Spectrum scanning mode
	SET	7	Use for Fast Setup or Main Setup menu
	FILE	8	Save or recall measurement files
	HUM	9	Enter Hum measurement mode
	FCN	0	Put the key pad into alphanumeric mode for entering numbers or letters
	QAM	.	Enter QAM measurement mode



## *Power ON / OFF*



Use the **POWER ON / OFF**  key to turn the device on and off.

## *Arrow Buttons*


Use the  and  keys to change values within a function display.

## Navigating Functions


Several methods are used to navigate the Model Three's functions. For some procedures, use the  and  keys to make changes within a specific screen such as to increase or decrease values.

To scroll through a specific display's menu topics, you generally use the designated soft buttons (usually the  and  keys).



## *Entering Numeric Values*

Within several displays, you must enter numeric values. Press the  key to put the key pad in its secondary function mode, then press the number buttons to enter the desired value. For example, to enter the number 12:














Press  +  + 

Then press the  (*ENTER*) key to enter the value into the Model Three.

## *Entering Alphanumeric Characters*



Similarly, you must enter alphanumeric data on several screens, such as file names, Channel labels, and Auto test program names. As before, you press the  key to put the key pad into its secondary function mode, then press the buttons to enter the desired value. When you press a button in function mode, the first entry is the number associated with the button, after which you press the same button repeatedly to scroll through the letters associated with the button. To enter a second letter or number using a different button, you can go directly to the second button for entry. If you want to enter a second letter or number using the same button as the preceding character, you must press the  key to shift the Model Three control to a new number or letter.

For example, to enter “TEST” in the Name field, do the following:

1. Press  to switch to function mode.
2. Press  +  +  to enter “T” in the field.
3. Press  +  +  to enter “E” in the field.
4. Press  +  to enter “S” in the field
5. Press  to shift to a new entry with the same key.
6. Press  +  +  to enter “T” in the field.

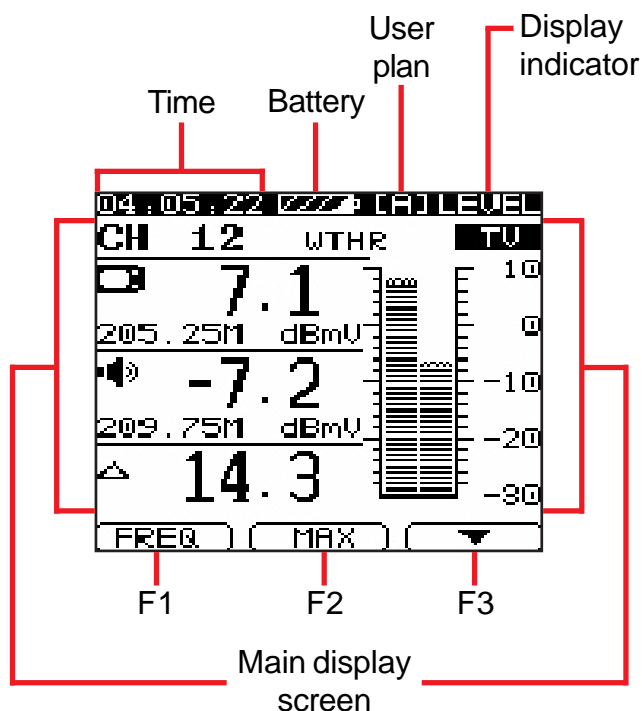


NOTE

***If you make an error when entering a number or a name, you can press the  key to go back and then re-enter it. Press the  key to escape from the operation.***

## Display Screen Description

Each display contains the following sections or features.



**Time** - Displays the device's time based on time set up parameter, see **Chapter 4: Setup, General, Date and Time**.

**Battery charge** - Shows the approximate percentage of remaining battery charge. Flashes when the charge drops below 10%.

**User Plan** - Indicates the selected user channel plan.

**Display Indicator** - Indicates which function is being used.

**Main Display Screen** - Displays the parameters and graphs of the selected function.

**F1, F2, F3** - Indicates the function of the soft buttons in the selected Model Three mode.



**The soft buttons vary from function to function on the meter; see the *Soft Buttons* section earlier in this chapter.**

**NOTE**

## Battery Charging

The Model Three has a built-in 11.1 V / 1.4 AH Li-Ion battery. When fully charged, it can be used for five hours. When the battery charge drops below 10%, the battery symbol flashes in the information line at the top of the display screen. If the charge drops below 5%, the Model Three shuts off automatically to protect the battery. You cannot turn the Model Three on again until you recharge the battery.

To charge the Model Three's battery, connect the battery charger to the charge socket on the bottom of the Model Three (see **Chapter 3: Walkthrough**, *Identify Components*) and plug the charger into an AC outlet.



***The battery MUST be charged with the Trilithic charge cube provided with the Model Three. Using any other charge cube may damage the battery.***


While charging, the charge indicator on the front panel of the Model Three will be RED. A full charge will be achieved in less than three hours, and will be indicated as such by a GREEN charge indicator.

The charging status may be observed by turning the Model Three ON and then OFF while the charger is connected. The charging display will be seen with a charging curve and an approximate percentage of charge, with the elapsed charging time.

The Model Three may be operated while the batteries are charging.

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### Overview

When you first press the  (POWER) key, the Model Three briefly displays the Start-Up screen, then displays the Level screen.



**The Model Three battery may need charging prior to first use, see Chapter 3: Walkthrough, Battery Charging.**





Before using the Model Three, you need to perform some setup procedures from the following areas:

- Information (general information about your Model Three and the status of user settings)
- General (backlight time, contrast, shutdown time, temperature units, and date and time)
- Measurement (signal level units, single frequency setup, limit setup, transmission, voltage)
- Channel plan (select, learn, and edit the user plan, channel number display, tilt/favorite list)





**Model Three ToolBox Software may also be used to set up the Model Three. See the Model Three ToolBox Operation Manual for more information.**

To enter the setup display, do the following:

1. Press the  key twice to display the main Setup menu.
2. Use the  and  keys to scroll through the main Setup menu.
3. When the desired command is highlighted, press the  (ENTER) key to select the display.

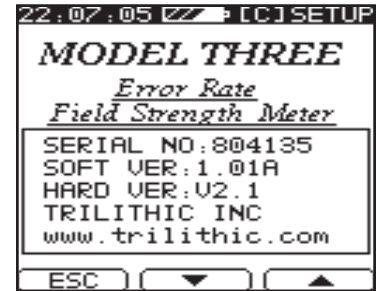


**Pressing the  key once activates the Fast Setup mode to display setup parameters for the current mode. Pressing the  key twice always displays the main Setup menu; see Chapter 5: Basic Operation, Fast Setup.**

## Information

The Information display windows contain useful information regarding your Model Three.

The first screen of information shows the device's serial number, firmware version, hardware version, and the company's web address. You can use the **F<sub>2</sub>** and **F<sub>3</sub>** keys to scroll through other information screens to see more information about the Model Three, including user settings. Press the **F<sub>1</sub>** (**ESCAPE**) key to return to the main Setup menu.





## General

Use the General menu screen to set the operational parameters of your device.

Use the **F<sub>2</sub>** and **F<sub>3</sub>** keys to scroll through the command choices to the desired parameter.





### Backlight

This selection determines the backlighting time on the Model Three display. Press the **F<sub>1</sub>** key (or use the  and  keys) to change the backlighting time. The selected time is displayed in the window near the bottom of the display screen. You can select **ON** (backlighting is always on), **OFF** (backlighting is always off), or **3, 5, 10, or 30** minutes (activates the backlight for the selected number of minutes, then turns it off to save power).






## LCD Contrast

This selection determines the LCD contrast on the Model Three display. Press the  key to darken the contrast and the  key to brighten.





**All signal levels below -40 dBmV (+20 dB $\mu$ V) are displayed with lighter shade digits in all measurement modes to indicate they are low signal levels.**

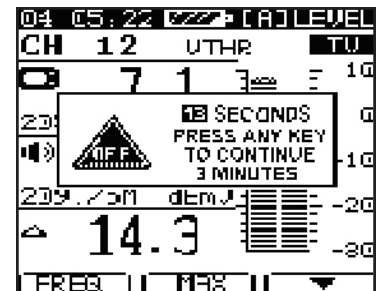
## Shutdown Time

This selection sets the automatic shutdown timer. Press the  key (or use the  and  keys) to change the shutdown time. The selected time is displayed in the window near the bottom of the display screen. You can select **ON** (always on until manually turned off), or **3, 5, 10, or 30** minutes (the Model Three shuts itself off when there has been no Model Three activity for the selected time interval).






A caution screen appears 20 seconds prior to automatic shutdown as shown below. This screen counts down the remaining time until shutdown and displays the shutdown time setting.

Press any key to reset the shutdown time to its current setting for continued operation, or press the  and  keys to change the shutdown time setting.




## Temperature Unit

This selection specifies the temperature units used by the Model Three. The selected temperature units are displayed in the window near the bottom of the display screen. Press the  key or press the  and  keys to select Fahrenheit or Centigrade.








## Date and Time





This selection sets the date and time. Press the  key to enter the date and time screen.



Do the following to enter the date and time:

1. Press the  key to perform alphanumeric entries. The current date disappears from the field. Enter the date in the date order displayed to the left of the field.
2. When you are satisfied with your entry, press the  key again to log the date in the Model Three's memory, then press the  key to switch to the time field.
3. Press the  key to switch the Model Three to the numeric function. The current time disappears from the field. Enter the time (in 24-hour format). If you make a mistake while entering the time, you can press the  key to back up.

Some tips for entering dates and times:

- The Model Three automatically assigns the first two digits of the year (20), so you only need to enter the last two digits of the year.
- You may change the order of the date between Y/M/D, D/M/Y, and M/D/Y by pressing the  and  keys from within the date field.
- If you make a mistake while entering a date or time, you can press the  key to back up or press the  key to restore the date or time in the field.



***The desired sequence for the Month, Day, and Year should be set before any files are saved in the Model Three. If the date sequence is changed after storing files, the date information for those files will not be correct.***

## LCD Test

This selection tests the LCD display. When you press the **F1** key repeatedly, the Model Three display advances through four patterns to test the LCD, then returns to the menu. The patterns are all black, all white, vertical stripes, and checkerboard. Each pattern remains on the screen until you press the **F1** key to go to the next pattern.

## Upgrade

Use this function to enter the authorization code to upgrade a Model Three to include the Constellation diagram feature.

Contact Trilithic to obtain an authorization code, then do the following:

1. Press the **SET** key twice to go to the main Setup menu.
2. Use the **F2** and **F3** keys to select GENERAL and press the **F1** key.
3. Use the **F2** and **F3** keys to select UPGRADE and press the **F1** key.
4. Press function for alpha/numeric entry and enter the 12-digit authorization code and press the **F1** key.

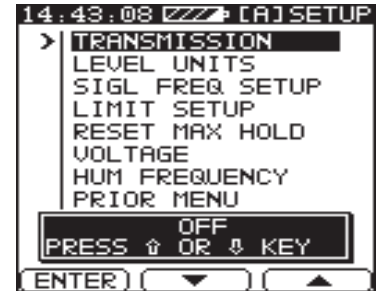
The Model Three will confirm correct entry of the code. Your Model Three now includes the Constellation diagram feature.

## Prior Menu

Press the **F1** key to return to the main Setup menu.



# Measurement

Use the Measurements menu screen to set the measurement parameters of your device. Use the **F<sub>2</sub>** and **F<sub>3</sub>** keys to scroll through the command choices.





## Transmission

Use this selection to enable the transmission mode.

Press the **F<sub>1</sub>** (**ENTER**) key, or press the  and  keys to enable the Transmission mode. The selected transmission state **ON** or **OFF** is displayed in the window near the bottom of the display screen. Use this parameter to test for transmission characteristics and loss of in-between connections in your CATV system (see **Chapter 6: Advanced Operation, *Transmission Characteristic Test***).



## Level Units

Use this selection to set the signal level units for the Model Three. The selected signal level units are displayed in the window near the bottom of the display screen. Press the **F<sub>1</sub>** key or press the  and  keys to switch between **dBmV**, **dBμV**, or **dBmW**.





## Single Frequency Setup

Press the **F1** key to enter the Single Frequency setup menu. Use this menu to set the frequency steps for the frequency display mode.

To select an item from the Single Frequency setup menu, use the **F2** and **F3** keys to scroll to the selection.



**FREQ TUNING STEP** - Select the meter's internal step values by pressing the **F1** key, or press the  and  keys. The steps can be either **10 MHz**, **1 MHz**, **100 kHz**, **10 kHz**, or by **Channel**.

**PRIOR MENU** - Press the **F1** key to return to the previous menu.

## Limit Setup

Press the **F1** key to enter the Scan setup menu. Use this menu to set Scan parameters, including test limits.

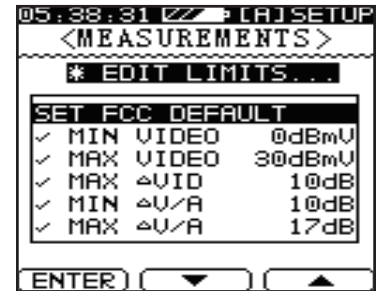
To select an item from the Scan setup menu, use the **F2** and **F3** keys to scroll to the selection.



**DISPLAY LIMITS** - Press the **F1** key, or press the **F2** and **F3** keys to select or deselect viewable Limits in Scan mode. When Display Limits is activated, the test limit settings for Minimum Video and Maximum Video can be seen on the display during channel scanning (see **Chapter 5: Basic Operation, Channel Spectrum Scanning**).

**EDIT LIMITS** - Press the **F1** key to enter the Edit Limits menu. All parameters used in a Limit test may be set in this menu (see **Chapter 5: Basic Operation, Limit Testing**).



Use the **F2** and **F3** keys to scroll to each limit parameter.

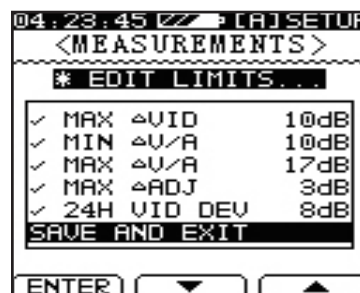


Select from the following:

Type	Limit
Minimum Video Level	-20 to 59 dBmV (40 to 119 dBμV)
Maximum Video Level	-19 to 60 dBmV (41 to 120 dBμV)
Maximum Δ Video	2 to 30 dB
Minimum Video / Audio Difference	0 to 15 dB
Maximum Video / Audio Difference	5 to 30 dB
Maximum Δ Adjacent	0 to 20 dB
24 Hour Video Deviation	0 to 20 dB



A check mark appears next to each enabled limit parameter. Press the **F1** (*ENTER*) key to enable or disable a limit parameter. Disabled limit parameters (indicated with an “X”) are not tested during a Limit test.

Press the  and  keys to change each limit value. You may also press the **FCN** key, enter numeric data, and then press the **F1** key to change a limit.



You may scroll to SET LIMIT DEFAULTS and press the **F1** key to return all limits to their standard settings.

Once you have set the levels for each parameter, scroll to SAVE AND EXIT and press the **F1** key to return to the previous screen.

**MARKER** - Use this selection to switch between channel and frequency indicators for markers in the Scan mode. Use the **F1** (*ENTER*) key, or press the  and  keys to change the marker.

**PRIOR MENU** - Press the **F1** key to return to the previous menu.

## Reset Max Hold

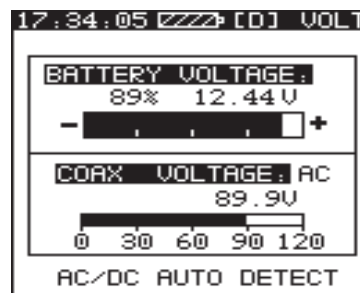
Use this selection to reset the maximum hold value when using Max hold in Spectrum mode. Press the **F1** (*ENTER*) key to reset the Spectrum mode data.

## Voltage

Press the **F1** key to enter the Voltage display. Use this function to view battery and trunk voltage measurements.

The Model Three is equipped with a built-in voltmeter that can be used to troubleshoot problems with power supplies or power drops. The Model Three accommodates AC or DC voltages up to 100 Volts.

The Voltage screen displays two bar graphs.



The top bar graph indicates the battery charge of your Model Three. This approximate charge level and the battery voltage are also displayed numerically. As you use the device, you can access this screen to check the remaining battery power.

When the battery charge drops below 10%, the battery symbol *flashes* in the information line at the top of the display screen. If the charge drops below 5%, the Model Three shuts off automatically to protect the battery (see **Chapter 3: Walkthrough, Battery Charging**).



The lower bar graph indicates the AC or DC voltage of the system's trunk.

The Model Three automatically detects the presence of an AC or DC voltage and displays the measurement graphically and numerically.

The voltmeter specifications are:

Type	Specification
Input Range	10 to 100 VDC, 10 to 100 VAC
Resolution	0.1 V
Accuracy	± 2.0 V

## Hum Frequency

Use this selection to set the Band Pass Filter frequencies used during the Hum measurement. Press the **F<sub>1</sub>** key, or press the  and  keys to switch between 50 Hz and 60 Hz. The selected frequency is shown in the window near the bottom of the display screen.

When 50 Hz is selected, 50 and 100 Hz Band Pass Filters are enabled in Hum measurement. When 60 Hz is selected, 60 and 120 Hz Band Pass Filters are enabled in Hum measurement.





## Prior Menu

Press the **F<sub>1</sub>** key to return to the main Setup menu.

## Channel Plan



Use the Channel Plan menu screen to select, learn, and edit up to four channel plans for the device. Use the **F2** and **F3** keys to scroll through the command choices.

### Select User Plan

Use this selection to set the active user plan. You can have up to four user-defined channel plans (A-D) on the Model Three. Use the **F1** (**ENTER**) key, or press the  and  keys to change the selected user plan.



### Channel Numbers

Use this selection to choose the channel identifier in the Model Three. Use the **F1** (**ENTER**) key, or press the  and  keys to select between Standard or EIA channel numbering.



### Learn User Plan

Use this selection to learn a channel plan (for the selected user plan) from your cable system.

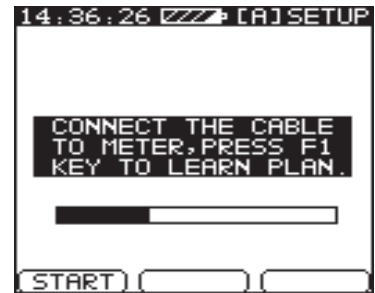


**Whenever you learn a new Channel Plan, the previously edited parameters are overwritten by the new plan, and all files and Auto test programs that were saved for the previous plan are deleted.**

Press the **F1** key to learn a channel plan.



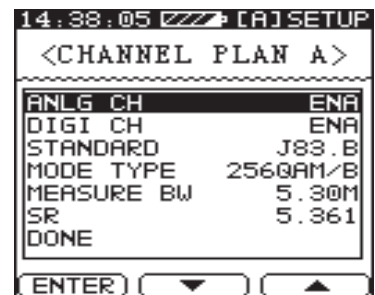
A prompt appears to instruct you to connect the CATV cable to the Model Three.




A list of eight base Channel Plans is displayed. Use the **F2** and **F3** keys to scroll through the list to the desired base plan. With the CATV cable connected, press the **F1** key.



The learn channel plan settings are displayed. Use the **F2** and **F3** keys to scroll through the settings. Use the **F1** (**ENTER**) key, or press the **Left Arrow** and **Right Arrow** keys to change the channel plan settings.



If Digital Channels are enabled for learning the user plan, all active digital channels will be set to the parameters selected on the list.

 ***If a Channel Plan is learned with less than 15 active channels found (or the cable is not connected to the Model Three), all channels in the plan are enabled.***

NOTE

Once you have completed making changes to the channel plan settings, highlight **DONE** and use the **F1** key to search for all active channels in your system. A progress bar at the bottom of the screen indicates search progress.



Once the search is completed, the Model Three displays a prompt indicating the new Channel Plan is being saved. This learned Channel Plan (for the selected User Plan) has all active channels enabled. Analog channels with levels less than -10 dBmV (50 dBμV) and Digital Channels with levels less than -17 dBmV (43 dBμV) are not enabled.

After learning a Channel Plan, the Model Three returns to the Level measurement mode. You may then modify the various parameters in the plan.

To return to the Channel Plan Setup menu to edit your User Plan, press the **SET** key twice to return to the main Setup menu, use the **F2** and **F3** keys to scroll to the Channel Plan selection, press the **F1** (**ENTER**) key to display the Channel Plan menu and then use the **F2** and **F3** keys to scroll to Edit User Plan.

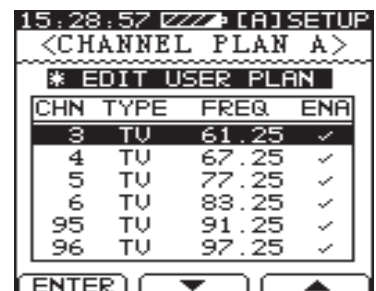
## Edit User Plan

Once you have learned a Channel Plan, you can edit the plan.

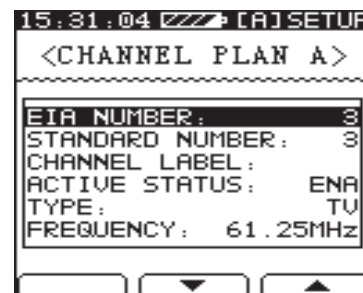


**CAUTION** *Whenever you edit a Channel Plan, all files and Auto test programs that were saved for the User Plan prior to editing are deleted.*

Press the **F1** key to display the selected User plan for editing.



Within the Edit User Plan display, use the **F<sub>2</sub>** and **F<sub>3</sub>** keys to scroll through the list of channels. All enabled channels have a check mark under ENA. When the channel you wish to modify is highlighted, press the **F<sub>1</sub>** (**ENTER**) key. The selected Channel Setup screen appears.



To select the channel's parameters, use the **F<sub>2</sub>** and **F<sub>3</sub>** keys to scroll up and down the list. There are different methods for modifying each parameter.



NOTE

**When using FCN to make an alphanumeric entry, remember to press the **F<sub>1</sub>** (**ENTER**) key after you have made an entry to store the new data (see *Entering Alphanumeric Characters in Chapter 3: Walkthrough, Identify Components, Navigating Functions*).**

**EIA Number** - Press the **FCN** key to switch to alphanumeric entry mode, then enter the desired EIA number for the channel. When you are satisfied with your entry, press the **F<sub>1</sub>** (**ENTER**) key to store the change.

**Standard Number** - Press the **FCN** key to switch to alphanumeric entry mode, then enter the desired standard number for the channel. Press the **F<sub>1</sub>** (**ENTER**) key to store the change.

**Channel Label** - Press the **FCN** key to switch to alphanumeric entry mode, then enter the desired label (up to 5 characters) for this channel. Press the **F<sub>1</sub>** (**ENTER**) key to store the channel label.

**Active Status** - Press the **F<sub>1</sub>** key to switch between **ENA** (enabled) and **DIS** (disabled). Enabling a channel adds it to the selected User Channel Plan. Disabling a channel removes it from the User Plan.

**Type** - Use the **F<sub>1</sub>** key to toggle between the channel types; **TV**, **SIGL** or **DIGI**.





NOTE

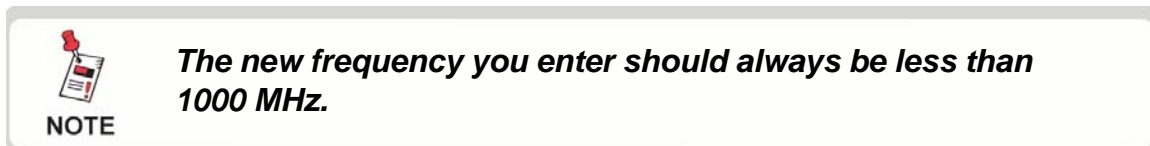
**The rest of the parameters in the edit list are affected by which type of channel is selected.**



**TV** - Audio and Video carriers (parameters: Frequency (Video), Audio Offset)



**SIGL** - Single Frequency Channels (parameters: Center Frequency, Measure BW)


**DIGI** - Digital Channels (parameters: Center Frequency, Measure BW)



**Frequency** - Press the  key to switch to Numeric Entry mode and enter the desired frequency (Video Frequency for TV type channels or Center Frequency for DIGI and SIGL type channels). Once the desired modification is made, press the  key to store the change.





**Aud Offset** - Press the  key to switch to Numeric Entry mode and enter the positive offset of the audio frequency from the video carrier. Press the  (*ENTER*) key to store the change (this parameter appears for TV type only).


**Measure BW** - Press the  key to switch to Numeric Entry mode and enter the measurement bandwidth for this channel. Press the  (*ENTER*) key to store the change (this parameter appears for DIGI and SIGL types only).

**Mode Type** - Press the  (*ENTER*) key to select the modulation type (this parameter appears for DIGI type only).


**SR** - Press the  key to switch to Numeric Entry mode and enter the Symbol Rate (MS/s) for the channel. Press the  (*ENTER*) key to store the change (this parameter appears for DIGI type only).


When you are satisfied with your entries, highlight **SAVE AND EXIT** and press the  (**ENTER**) key to return to the Edit User Plan screen.

**Adding a Channel:** A channel may be added while in the Edit User Plan list of channels by pressing the  key. A Channel Edit screen appears for the new channel with the next available channel number assigned. This channel number may be changed, but an existing number in the plan (enabled or not) may not be used. Other parameters on the new Channel Edit screen should be set, including frequency, which has a default setting of 55.25 MHz.

When finished, select **SAVE AND EXIT** and press the  (**ENTER**) key to return to the Edit User Plan screen.

All channels, including a new channel, appear in the Channel Plan according to frequency—not channel number.

**Deleting a Channel:** A channel may be entirely deleted while in the Edit User Plan list of channels by pressing the  key. If a channel is deleted, it will not be available to enable later, and it will not be scanned in the Full Spectrum Scan mode. It is recommended that a channel be disabled instead of deleted from the plan.

When you have completed your changes to all channels that require edit in the User Plan, press the  key to save the modifications and return to the main Setup menu.



***All edits are temporarily stored until you exit the Edit User Plan screen. Do not turn off the Model Three before exiting the Edit User Plan screen, or the changes will not be saved.***

## Tilt/Level List

This feature lets you select up to twelve favorite channels. These channels are also used when making the Tilt measurement.



NOTE

**You must select at least four channels to make the Tilt measurement. The Model Three uses the highest and lowest frequencies when making the measurement.**

Press the **F1** (**ENTER**) key from the Tilt/Level List selection on the Channel Plan Setup menu to enter the Tilt Setup screen.

CHN	NAME	FREQ	TILT
34	A*E	283.25	
35	TNT	289.25	✓
36	ESPN	295.25	
37	GOLF	301.25	
38	CNN	307.25	
39	USA	313.25	

1	8	2	26	3	35	4	50
5	62	6	67	7	110	8	116
9	10			11			12

ENTER [DOWN] [UP]

To add a channel to the Favorites list, use the **F2** and **F3** keys to scroll the list of channels in the selected User Plan. When the desired channel is highlighted, press the **F1** key. A check mark appears next to the channel under the Tilt column, and the channel number is placed in the Favorites column at the bottom of the display. As you add channels, the Favorites list arranges them in order of their frequency. For example, even if you selected Channel 14 first, as you add Channels 4 and 6, these channels go to the top of the list.




NOTE

**Use the **F2** and **F3** keys to scroll through the User Plan list one page (6 channels) at a time.**


To delete a Tilt/Favorite channel, scroll to the channel and press the **F1** key. The channel is removed from the list.

Once you have selected from four to twelve favorite channels, press the **SET** (**F5**) key to save the information and return to the main Setup menu.

## Load Defaults

Press the  (*ENTER*) key to load the factory default settings for the Model Three and then display the Level screen. This will not change the User Channel plan.

## Prior Menu

Press the  (*ENTER*) key to return to the main Setup menu.

# Chapter 5

## Basic Operation

Once you have set up the Model Three's parameters, you are ready to operate the device.


There are a number of tests you can perform with the Model Three:

- Single channel level tests
- Frequency mode
- Channel scans
- Limit tests
- Frequency scanning (spectrum)
- Hum measurement
- QAM measurement
- Tilt and favorite channel levels



***The Model Three displays readings down to -50 dBmV (+10 dB $\mu$ V). All signal levels that are below -40 dBmV (+20 dB $\mu$ V) are displayed with lighter shade digits in all measurement modes to indicate they are low signal levels.***

### Fast Setup


The Model Three features a Fast Setup function for each measurement mode. The specific setup menu for each mode can be accessed directly by pressing the  key once while in the Measurement mode. This makes it unnecessary to go back to the main Setup menu and look for nested sub-menus. This allows the operator to quickly make changes in the settings and return to Measurement mode with no wasted time.



***Pressing the  key twice always displays the main Setup menu.***

## Single Channel Level Testing

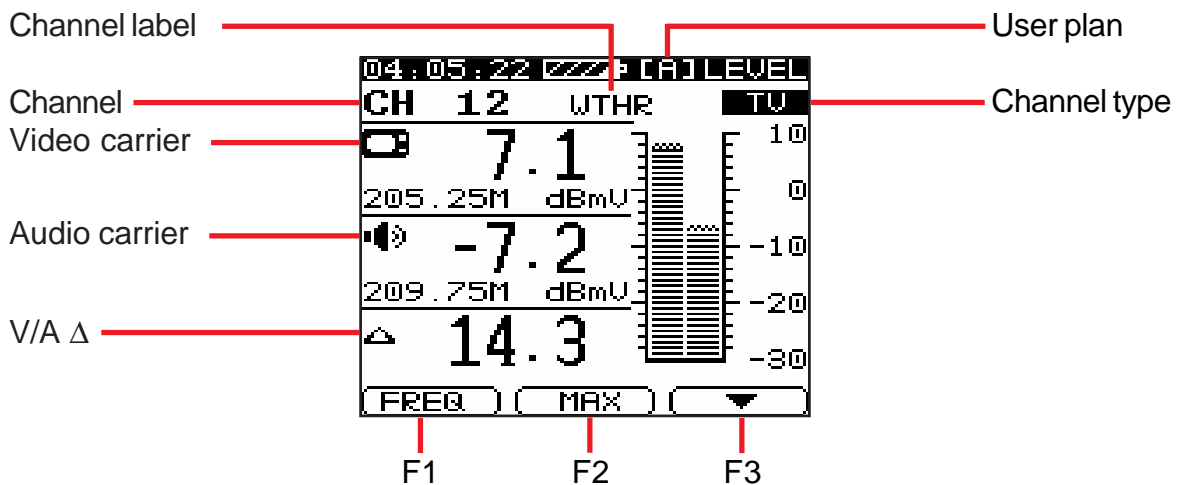
When set to the single channel level test, the Model Three displays bar graphs of the video and audio carriers as well as numeric readouts of the carrier amplitudes and V/A difference. The Model Three can also display a spectrum scan of the selected channel showing the amplitudes of the video and audio carriers and undesired signals that may be present, such as intermodulation.





To access the Level screen, press the  key.





The Model Three displays the Level screen for the last channel it was on before being turned off.

### TV Channels

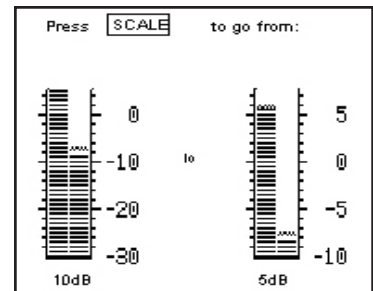
When measuring a TV type channel with audio and video carriers (see **Chapter 4: Setup, Channel Plan, Edit User Plan**), the left column of the bar graph represents the video carrier while the right column displays the audio carrier. The V/A  $\Delta$  is displayed below the video and audio carriers.



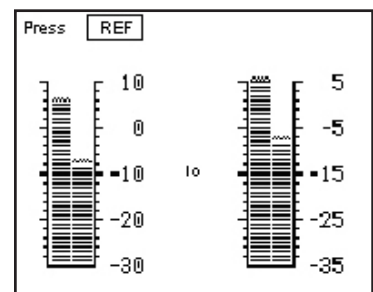
To change the channel, use the  and  keys or press the  key, enter the desired channel number, and press the  (*ENTER*) key.

The Level screen displays a scale that you can adjust by pressing the  (*DOWN*) key so that the functions of the  and  keys become **SCALE** and **REF**. Press the  (*SCALE*) key to vary the graduation of the scale according to a **1**, **2**, **5**, and **10** dB per division scale.


For example, to change the display graph from a **10 dB** scale to a **5 dB** scale, press the **F<sub>1</sub>** key three times to cycle through the steps.



You may also change the reference level of the graph. Press the **F<sub>2</sub>** (**REF**) key and then press the and keys to increase or decrease the reference by one digit at a time.



Press the **F<sub>3</sub>** (**UP**) key to return to the original Level screen so that the functions of the **F<sub>2</sub>** and **F<sub>3</sub>** keys become **FREQ** and **MAX**.



**NOTE**

*The amplitude of the graph changes as you change the scale and reference so that it continues to indicate the correct level.*

*You must press the **F<sub>3</sub>** (**UP**) key to return to the original Level screen for the and keys to change channels (instead of reference) again.*

The Model Two digital readout can be set to display a **LIVE**, **MAX**, or **Δ P-P** signal level as an aid to troubleshooting. Press the **F<sub>2</sub>** key to select the desired display mode as described below:

- **LIVE** is the normal operating mode whereby the digital display indicates the current value of the input signal.
- In the **MAX** mode, the digital display indicates the maximum level of the input signal. In this mode, an **M** is displayed after the digital reading.
- In the **Δ P-P** mode, the digital display indicates the variation in the input signal level. In this mode, a **Δ** is displayed after the digital reading.

The analog bar graphs for Audio and Video continue to indicate the **LIVE** level in all modes, while the wavy line at the top of each bar indicates the maximum level of the Audio and Video signals.

## Single Channel Spectrum

The Model Three can scan the spectrum of the designated channel automatically. This function is particularly useful for CATV measurements. To scan the channel spectrum, press the **LEVEL** key again. The Model Three displays the spectrum screen and scans the channel for data, which it then graphs on the screen.

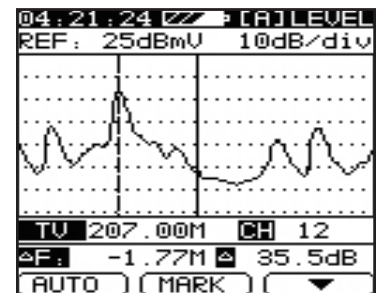
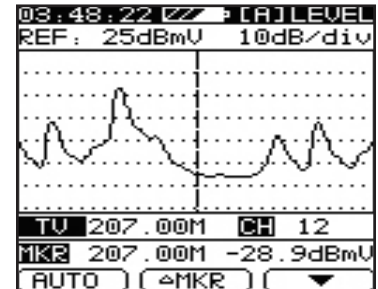
The Center Frequency and Channel Number are displayed, along with the Marker Frequency and Level. Use the **←** and **→** keys to move the Marker Frequency to any position in the channel spectrum.

A  $\Delta$  Marker function can also be used to check the distance (in MHz) and amplitude difference between any 2 points in the displayed spectrum. First, use the **←** and **→** keys to move the marker to a reference position, then press the **F<sub>2</sub>** ( $\Delta$  MKR) key.

The **←** and **→** keys now move the second marker from the reference position, and the  $\Delta$  Frequency and  $\Delta$  Level are displayed. Press the **F<sub>2</sub>** (MARK) key to return to the normal single-marker spectrum display.

Use the **F<sub>1</sub>** (AUTO) key to automatically set a scale and reference for the displayed spectrum graph. You may set the Scale and Reference manually by pressing the **F<sub>3</sub>** (DOWN) key and using the **F<sub>2</sub>** and **F<sub>3</sub>** keys for Scale and Reference as described for the preceding Level display mode.

The spectrum display can also use an Average detector instead of Peak detector by pressing the **F<sub>3</sub>** (DOWN) key and using the **F<sub>1</sub>** key to select AVG. This is most useful for digital channels to see a quick scan of the average power for frequencies across the channel bandwidth.



## Single Frequency Channels

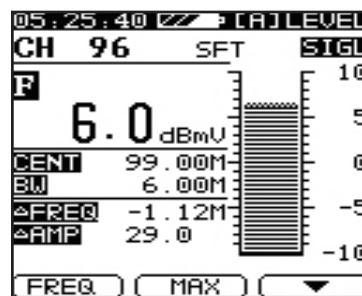
You can use the Model Three to measure a Single Frequency level over a specified bandwidth. To do this, first set the Model Three's channel type to **SIGL** or single frequency channel (see **Chapter 4: Setup**, *Channel Plan*, *Edit User Plan*).



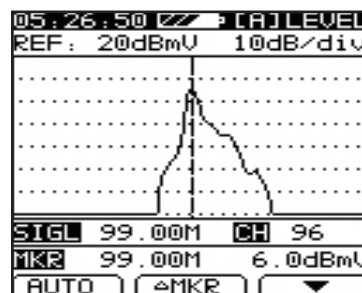
NOTE

**While in Level mode, you can use Fast Setup to go directly to the setup parameters for the current channel.**

The level for the signal is displayed along with an **F** to indicate Single Frequency mode. Also displayed are  $\Delta$  **FREQ** and  $\Delta$  **AMP** to indicate the distance and amplitude difference between the center frequency and the highest peak of the signal in the bandwidth.



To scan the channel spectrum, press the  key again.



NOTE

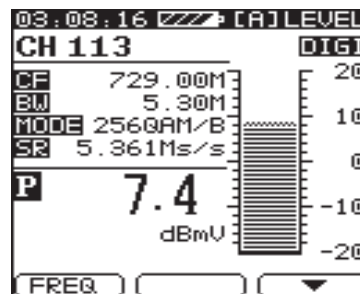
**With a Single Frequency Channel, the Level (Live, Max,  $\Delta$  p-p), Scale, Reference, Auto, Marker,  $\Delta$  Marker, and Average may be used as described for TV Channels.**

## Digital Channels

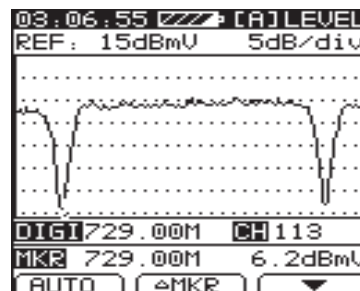
You can use the Model Three to measure the average power of a digital channel (QAM, QPSK, or COFDM) according to the configured bandwidth. To do this, first set the Model Three's channel type to DIGI (see **Chapter 4: Setup, Channel Plan, Edit User Plan**).

The level for the signal is displayed, along with a P to indicate the power level over the specified bandwidth for DIGI mode.


Channel parameters are also displayed, including Center Frequency, Bandwidth, Modulation Type, and Symbol Rate.




To scan the channel spectrum, press the  key again.



**With a Digital Channel, the Scale, Reference, Auto, Marker,  $\Delta$  Marker, and Average may be used as described for TV Channels.**

The Marker level indicated for a DIGI signal in the channel spectrum mode is only the level at the marker frequency and not the total power for the channel bandwidth. You can return to the single-channel level mode (press the  key again) to read the total power of the set bandwidth.

## Frequency Mode

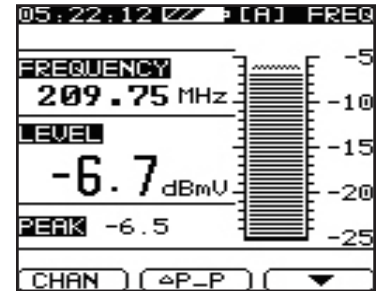
When set to the Frequency Mode, the Model Three displays the frequency and level for the desired channel. To access this screen, press the  key.


The Single Channel Level screen is displayed.



Now, press the  (*FREQ*) key.

This toggles the Model Three so that it displays the Frequency screen for the channel designated in the Single Channel Level screen.


If the channel is a **TV** type channel with audio and video carriers, the Model Three is tuned to the audio frequency. If the channel is a **DIGI** type channel, the Model Three is tuned to the center frequency. The signal level and peak level are displayed.











**While in Frequency mode, you can use Fast Setup (press the  key once) to go directly to the Single Frequency Setup frequency steps.**




To change the frequency that is being measured, press the  and  keys. The frequency moves in increments set in the Single Frequency Setup menu.



**By pressing FCN, you can enter the desired frequency. To finish, press the  (*ENTER*) key.**

The level display can be set to display a **LIVE** or **Δ P-P** (variation) signal level by pressing the  key.


The Scale and Reference shown on the Frequency screen can be adjusted by pressing the  (*DOWN*) key so that the functions of the  and  keys become **SCALE** and **REF**. Press the  (*SCALE*) key to vary the graduation of the scale by **1**, **2**, **5**, and **10** dB per division. Press the  (*REF*) key and then press the  and  keys to increase or decrease the reference.

Press the  (*UP*) key to return to the original soft key functions of **CHAN** and **Δ P-P** so the  and  keys change frequency (instead of reference).

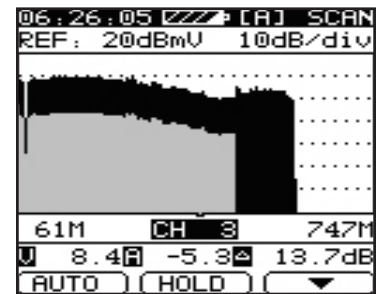
## Channel Scanning

The Model Three is designed to display the full span of all channels including video and audio carriers, or digital channels in your system. This function provides a quick check of your system's overall flatness and amplitude.

The Model Three can also be set to display the channels at reduced frequency spans. Amplitude limits can be imposed on the display, while a convenient Marker enables you to *zoom* in on any suspect channels.





To enter the Channel Scanning screen, press the  key. The currently selected User Channel Plan measurement data is displayed in a graph with a viewing range of 126 channels (this can be extended to 170 by adjusting the Scan Marker).

The Audio levels are shown graphically with a light shade, while Video levels are shown darker. Digital channels (DIGI) and Single Frequency channels (SNGL) that do not have separate audio and video components are shown as all dark.






The Model Three also displays the marker (by channel or frequency) and its video, audio, and V/A  $\Delta$  levels along with the Low (starting) and High (ending) frequencies.

When entering Scan mode, the marker is positioned on the last channel used in Level mode. This makes it easy to quickly view a selected channel within the channel plan.


To change the marker channel, press the  and  keys. You can also press the  key and enter the channel (or frequency if selected), then press the  key to move the marker to the desired location.

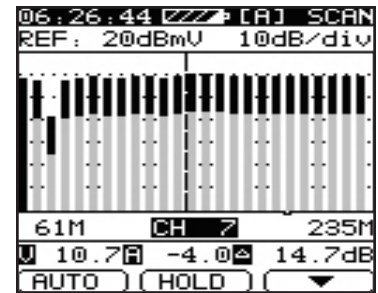




**The marker may be changed from channel number to frequency: Press the  key once for Fast Setup, select Marker, and press the  key to change the marker indication.**


You can zoom in on the marker position by pressing the  key. The Model Three supports 5 levels of magnification (1x, 2x, 3x, 4x, and 5x), or scan of the full channel plan.









The minimum span (5x) shows 25 channels of data.

To return to the original zoom level, keep pressing the  key to cycle through the zoom magnifications.



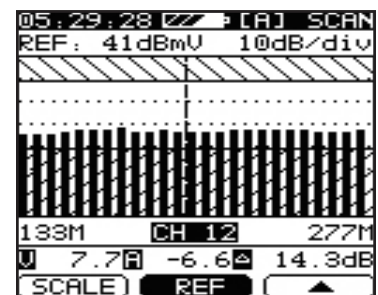
You can stop the scanning process so you can study the graph without losing the current data. In the Channel Scan screen, simply press the  (*HOLD*) key. The scanning marker stops moving. To resume scanning, press the  (*TRIG*) key.


To set the reference level and the scale automatically, press the  (*AUTO*) key. The Model Three selects the optimal scope for your system.

The Scale and Reference shown on the Channel Scan screen can also be adjusted manually by pressing the  (*DOWN*) keys so that the functions of the  and  keys become Scale and Ref. Press the  (*SCALE*) key to vary the graduation of the scale by 1, 2, 5, and 10 dB per division. Press the  (*REF*) key, then press the  and  keys to increase or decrease the reference. Press the  (*UP*) key to return to the original soft key functions of Auto and Hold.


## Display Limits

When Display Limits is set to Yes in the Scan Setup menu (see **Chapter 4: Setup, Measurement, Limit Setup**), the Channel Scan display shows the limit lines for the specified Minimum Video level and Maximum Video level.



**While in the Channel Scan mode, you can use Fast Setup (press the  key once) to go directly to the Scan Setup parameters, including Marker type, Display Limits, and the Edit Limits screen.**

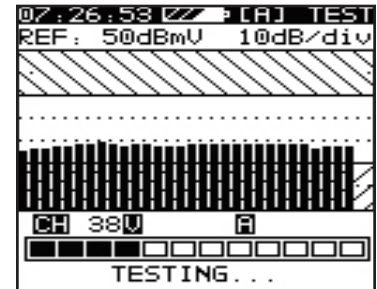
## Limit Testing

The Model Three can quickly perform a test of all analog channels in the cable system to specified test limits with a single key press. The selected User Channel Plan is tested to all enabled limit parameters as set in the Edit Limits display from the Limit Setup menu (see **Chapter 4: Setup, Measurement, Limit Setup**). To perform the Limit test, press the  key.

Channels are displayed momentarily as each channel is scanned. In addition, a progress bar indicates the scan status.



When the Limit test is complete, a Test Result summary screen appears to indicate the Pass or Fail status for each test parameter. Each test that has passed has a check mark next to that parameter.

Each test that has failed has an **X** next to that parameter.



MIN VIDEO	×
MAX VIDEO	✓
MAX ΔVID	×
MIN ΔV/A	✓
MAX ΔV/A	×
MAX ΔADJ	×

The Maximum Δ Video and Maximum Δ Adjacent channel status are determined by the results of the overall channel plan measurements.

Press the  and  keys to view the Minimum and Maximum Video channels and levels. Also, if a failure has occurred for the Maximum Δ Adjacent channel test, the adjacent channels with the greatest variation are listed.

MAX VIDEO		
7	10.5	
MIN VIDEO		
116	-2.1	
MAX ΔADJ		
39	7.1	
40	10.5	



NOTE

***A digital (DIGI) type channel is measured during the Limit test but is not used to determine Pass or Fail for any of the tests.***

The Minimum Video, Maximum Video, Minimum Δ V/A, and Maximum Δ V/A are tested for all channels in the User Plan. If any channel fails one of these tests, the Test Result summary indicates a failure **X** for that test. If all channels pass one of these tests, the Test Result summary indicates a pass (check mark) for that test.

The results for each channel from the individual channel tests can be viewed by pressing the **F1** (*LIST*) key. The total number of failed channels is shown at the top of the display, and each channel is listed with the channel type, signal level (Video level if TV), and a pass or fail indication. Each channel that has passed all four individual channel tests displays a check mark. Each channel that has failed any of the 4 individual channel tests displays an **X**.

CHN	TYPE	LVL	P/F
@4:42:31 [A] TEST			
FAILED: 6			
4	TU	-1.2	X
5	TU	1.2	✓
6	TU	1.2	✓
95	DIGI	1.9	-
96	DIGI	1.7	-
97	DIGI	1.9	-
98	TU	3.7	✓
99	TU	3.7	✓

You can use the **F2** and **F3** keys to scroll through the list of channels one at a time, or use the and keys to scroll one page (8 channels) at a time.

ITEM	LIMIT	P/F
@4:44:39 [A] TEST		
CHAN: 4 TYPE: TU		
VIDEO: -1.2dBmV		
AUDIO: -11.6dBmV		
ΔV/A: 10.4dB		
ITEM	LIMIT	P/F
MIN VIDEO	0dBmV	X
MAX VIDEO	30dBmV	✓
MIN ΔV/A	10dB	✓
MAX ΔV/A	17dB	✓

Press the **F1** key to look at the Limit test information for a specific channel.

The Video level, Audio level, and  $\Delta V/A$  for the selected channel are shown at the top of the individual channel information screen. The Limit test setup for the channel test parameters is displayed at the bottom of the screen with a Pass or Fail indication for each parameter.

## Frequency Spectrum Scanning

The Model Three can be set to display spectrum measurements with spans ranging from 2.5 to 62.5 MHz. It can also be set for a full spectrum scan of the base channel plan with sampling at each video carrier frequency or center frequency of digital channels.



**The Model Three can show spectrum data with absolute measurements, or it can store data for comparative tests using the TRANSMISSION feature.**



**TRANSMISSION mode is set up in the Measurement menu. Since the following data is for normal (absolute) spectrum scanning, TRANSMISSION should be set to OFF in the MEASUREMENT menu (see Chapter 4: Setup, Measurement, Transmission).**



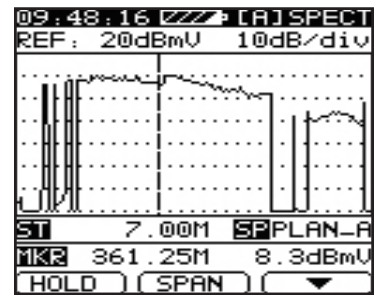
**While in the Spectrum mode, you can use Fast Setup (Press the **SET** key once) to go directly to the Measurement Setup parameters including Transmission.**

For further information on Transmission operation, see **Chapter 6: Advanced Operation, Transmission Characteristic Test**.

The following information is for normal (absolute) spectrum scanning.

To enter the Frequency Spectrum Scanning screen, press the **SPECT** key.

When the Full Spectrum scan is displayed, the Span indicator (SP) is displayed as PLAN\_A-D (full span of selected user base plan). The starting frequency (ST) is shown along with the marker frequency and level.

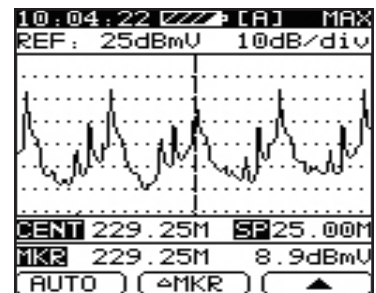


**With Full Spectrum scan, all video carrier frequencies or center frequency of digital channels in the selected Base Channel Plan (including those disabled for Channel Scan) are scanned.**

To move the marker frequency, press the **←** and **→** keys.


To change the spectrum bandwidth, press the **F2** (**SPAN**) key. The span cycles through 2.50M, 6.25M, 12.50M, 25.00M, 62.50M and PLAN\_A-D (full span).

When a span other than full span (PLAN\_A-D) is selected, the display shows the center frequency.





To change the center frequency, press the **FCN** key to place the keypad in its numeric function. Enter the desired new center frequency and press the **F1** (**ENTER**) key. If you enter an incorrect digit, do not press the **F1** key. Instead, press the **F2** (**BACK**) key. You can exit the procedure by pressing the **F3** (**ESC**) key to return to the original center frequency.

The Spectrum mode can be set to hold the maximum (peak) spectrum data for display. Each time the **SPECT** key is pressed, the Model Three switches between Live and Max modes. **MAX** appears in the upper-right corner of the display when this mode is used. The Max hold data is retained as long as the Model Three is on. To reset the Max hold data in Spectrum mode, you must select **RESET MAX HOLD** in the Measurements Setup menu.

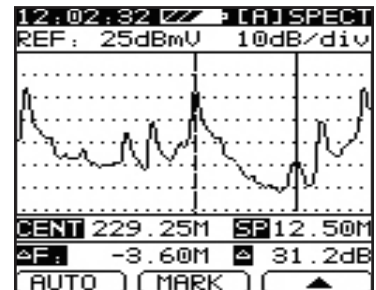
 **NOTE** *While in the Spectrum mode, you can use Fast Setup (press SET once) to go directly to the Measurement Setup parameters, including Reset Max Hold.*

You may wish to stop the scanning process so you can study the graph. In the Spectrum screen, simply press the **F1 (HOLD)** key. The scan marker stops moving. To resume scanning, press the **F1 (TRIG)** key.





Other functions are available by using the **F3** key to change the function of the **F1** and **F2** keys.

Press the **F3** key to change the function of the **F1** and **F2** keys to Scale and Ref. Change the display scale by pressing soft key the **F1 (SCALE)** key. Change the reference level by pressing soft key **F2 (REF)** and using the  and  keys to change the reference.

Press the **F3** key to change the function of the **F1** and **F2** keys to Auto and  $\Delta$ Mkr. To set the reference level and the scale automatically, press the **F1 (AUTO)** key. The Model Three selects the optimal scope for your system.



A  $\Delta$  Marker function can be used to check the distance (in MHz) and amplitude difference between any 2 points in the displayed spectrum.


First, use the  and  keys to move the marker to a reference position, then press the **F2 ( $\Delta$ MKR)** key. The  and  keys now move the second marker from the reference position, and the  $\Delta$  Frequency and  $\Delta$  Level are displayed.

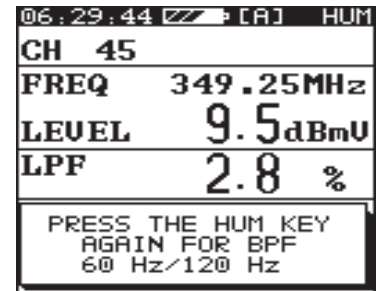
Press the **F2 (MARK)** key to return to the normal single-marker Spectrum display.



Press the **F3** key to change the function of the **F1** key to AVG. This permits the Spectrum function to use an Average mode instead of a Peak detector. This is most useful for digital channels to see a quick scan of average power for frequencies within the selected span.

## Hum Measurement


The Hum measurement function is used to troubleshoot interference that may result from a defective power supply or faulty or overloaded power inserters. This mode includes a Low Pass Filter and 60 Hz and 120 Hz (or 50 Hz and 100 Hz) Band Pass Filter measurements.

To enter the Hum Measurement screen, press the  key. The currently selected (or nearest) analog channel Hum measurement is displayed for the LPF (Low Pass Filter).





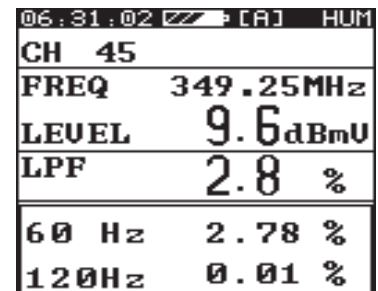
The measured channel may be changed using the  and  keys.

The Low Pass Filter will measure the level of frequencies from 1 to 400 Hz.

Press the  key again to view the 60 Hz and 120 Hz Band Pass Filter measurements.

The Band Pass Filter frequencies can be changed from 60 Hz and 120 Hz to 50 Hz and 100 Hz in the Measurements Setup menu.

The measured channel may be changed using the  and  keys.





## QAM Measurement

The Model Three is able to measure MER, and pre- and post-BER. It takes an average of one second to perform the QAM measurements.

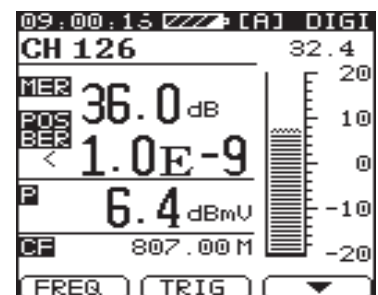
### QAM Channel Measurement

To enter the QAM Measurement screen, press the  key.

Press the  key to input the channel number or use the 

and  keys. During testing, press the  (*TRIG*) key to execute the power testing once. MER and BER testing will execute after power testing.

When the meter is locked on a digital channel, the Interleave Depth standard of the signal will appear in the upper-right corner of the display.



Press the **F3** (*DOWN*) key to use **F1** and **F2** keys to set the Scale and Reference for the display.

Press the **F3** (*DOWN*) key to use the **F1** key to switch the display between pre-BER and post-BER measurements.

In this mode, press the **SET** key to view the settings for the current channel. You can setup center frequency, bandwidth, modulation mode, symbol rate, and other digital channel settings.

## QAM Frequency Mode

The Model Three provides a frequency mode to easily view and setup the key measurement parameters for QAM testing. Press the **F1** (*FREQ*) key to display the frequency mode.


To change the measurement frequency, press the **FCN** key and enter the new measurement frequency.

The table shown on the following page describes the menu structure of the QAM frequency mode and the options available by pressing the **F3** key.

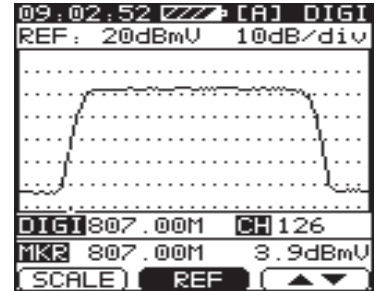
09:07:29	[A]	DIGI
CF	807.00 MHz	32.4
MER	36.0 dB	16QAM
POS		32QAM
BER	1.0E-9	64QAM
P	6.7 dBmV	128QAM
SR	5.057 Ms/s	256QAM
CHAN	RENEW	▼

<b>Menu Number</b>	<b>Display</b>	<b>Key</b>	<b>Function</b>
1	<b>CHAN</b>	<b>F1</b>	Back to channel test mode.
	<b>RENEW</b>	<b>F2</b>	Refresh the measurement.
	<b>DOWN</b>	<b>F3</b>	Turn to Menu number 2.
2	<b>MODE</b>	<b>F1</b>	Choose Modulation mode (16 ~ 256 QAM)
	<b>RATE</b>	<b>F2</b>	Choose Symbol Rate (1.000 ~ 7.000 Ms / sec)
	<b>UP / DOWN</b>	<b>F3</b>	Turn to Menu number 3.
3	<b>PRE / POST</b>	<b>F1</b>	Switch between Pre-BER and Post-BER.
	<b>STEP</b>	<b>F2</b>	Set the Frequency step.
	<b>UP / DOWN</b>	<b>F3</b>	Turn to Menu number 4.
4	<b>STD</b>	<b>F1</b>	Choose Modulation Standard (J-83A / J83-B / J83-C)
	<b>NONE</b>	<b>F2</b>	None
	<b>UP</b>	<b>F3</b>	Back to Menu number 1.


## Spectrum Analyzer Display

Pressing the  key a second time will display the spectrum analyzer screen for the selected channel.




See Chapter 5: Basic Operation, Single Channel Level Testing for complete instructions.





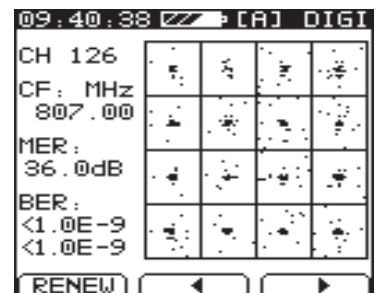
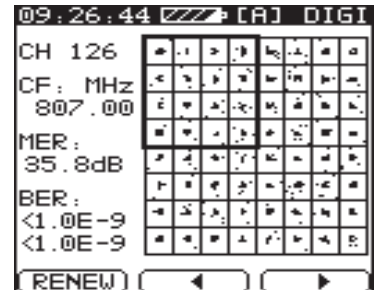
## QAM Constellation Display (Optional)

Pressing the  key a third time will display the Constellation display for digital channels. In order to view the QAM Constellation diagram you must have this option enabled.

The QAM Constellation display allows for a more intuitive measurement of a digital channel's faults.


Press the  and  keys to choose a quadrant to view and press the  key to refresh the constellation.

Each quadrant can be observed individually by pressing the  key to zoom in. To zoom out, press the  key.




## Tilt and Favorite Channel

When installing and maintaining your CATV system, you may want to concentrate on the level of only a few channels and the gain distribution of the transmission line.

You can use the Tilt and Favorite Channel function to display and adjust the level and work status of your system. You may have up to 12 favorite channels for each User Plan. To enter the Tilt and Favorite Channel screen, press the  key.











**You must have at least four channels selected for the Tilt/Favorite display to operate.**


The Tilt Setup display can be accessed directly by pressing the  (*SETUP*) key. See the Tilt/Level List Setup section of the Channel Plan Setup menu (see **Chapter 4: Setup**, *Channel Plan*, *Tilt/Level List*).

When 4 to 12 channels have been selected for Tilt/Favorite channels, the Tilt screen can be displayed with a graph of the Video levels for each channel.

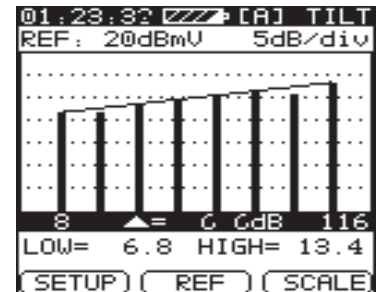
The measured levels of the LOWEST and HIGHEST frequencies listed in the Tilt/Favorite list are used to calculate tilt. These levels and the tilt calculation ( $\Delta$ ) are displayed.

To adjust the reference level, press the  (*REF*) key, then press the  and  keys. To change the scale, press the  (*SCALE*) key.

Press  (*SETUP*) to set the tilt channels. Use the  and  keys to highlight the channels to be used in the tilt measurement and press the  (*ENTER*) key to select or deselect the channel. The enabled channels display a check mark.

To bring up the list of favorite channels, press the  key again.

The Model Three displays the list of favorite channels with their Video Carrier Levels or digital power levels and the tilt calculation.



01:28:58 [A] SETUP

CHN	NAME	FREQ	TILT
111		717.00	
112		723.00	
113		729.00	
114		735.00	
115		741.00	
116		747.00	✓

1	8	2	26	3	35	4	50
5	62	6	67	7	110	8	116
9	10	11	12				

ENTER

01:24:23 [A] LIST

8	6.6	26	7.0
35	8.8	50	9.4
62	10.2	67	11.0
110	11.0	116	13.3

$\Delta = 6.5 \text{ dB}$

# Chapter 6

## Advanced Operation

Once you have a general understanding of the Model Three's basic features, you can try the advanced features, such as testing for transmission characteristics, auto-testing, and saving data.

### Transmission Characteristic Test

The Model Three enables you to test the transmission characteristics (gain and tilt) of your CATV distribution system. Maintaining proper gain and tilt is a necessary step in ensuring the quality of signals delivered to your customers.

The Model Three enables you to do this by setting a reference at a known good test point such as the headend's output test point or a node's output test point. This reference can then be compared to the transmission response at other places in the distribution system to allow proper gain and tilt adjustments of the distribution system.

To test the transmission characteristics, you first need to enable the Transmission option.

From Spectrum mode, the Measurements Setup menu, including Transmission, can be accessed quickly with Fast Setup by pressing the **SET** key once. With Transmission selected, press the **F1** key to switch from **OFF** to **ON**.

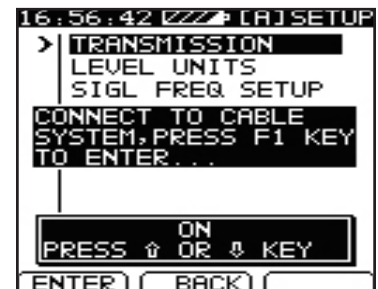
The Model Three asks if you want to replace the zero reference data.

To replace the zero reference data, press the **F1** (YES) key. To use the existing Zero Reference level, press the **F2** (NO) key. You can exit this screen by pressing the **F3** (ESC) key.



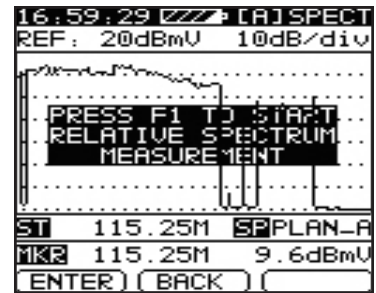
**The first time you use the Model Three, you should press the **F1** key to replace the initial Zero Reference data.**

When you press the **F1** key to replace the Zero Reference data, the Model Three prompts you to connect the device to the cable system.



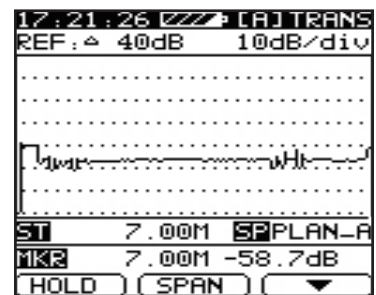
After you have connected the CATV source to the Model Three, press the **F1** (*ENTER*) key. The Model Three scans all video carrier frequencies in the selected Base Channel Plan, including those disabled for channel scan (see **Chapter 4: Setup, Channel Plan**).


When the Model Three has completed the new Zero Reference scan, a prompt appears to press the **F1** key to start a Relative Spectrum measurement.





Press the **F1** (*ENTER*) key to start the Relative Spectrum measurement.


The Model Three displays the transmission measurement. The reference level indicates  $\Delta$  dB to show the difference between the current Scan Level and the Zero Reference scan. In the example to the right, a 6 dB loss is seen with the transmission measurement.



 **NOTE** *Channels in the Base Channel Plan that are not active on your system have a transmission indication near 0 dB, because there was no signal to be changed. A User Plan can be configured with only active channels by deleting the unused channels (see **Chapter 4: Setup, Channel Plan, Edit User Plan.**) This provides a transmission scan with all active data.*

The new Zero Reference remains in the Model Three's nonvolatile memory even when the Model Three is turned off. This enables you to measure the level's relative change at a later time. To perform a new Transmission test at any time, confirm that **TRANSMISSION** is set to **ON** in the Measurement Setup menu and then press the **SPECT** key. The Model Three performs a Spectrum Scan and compares it to the reference data.



Press the  and  keys to move the marker frequency.

 **NOTE** *The Span function does NOT operate when the Model Three is in the TRANSMISSION mode. For normal (absolute value) Spectrum Measurements, set the TRANSMISSION selection to OFF.*





You may wish to stop the scanning process so you can study the transmission graph. Simply press the **F1** (*HOLD*) key. The scan marker stops moving. To resume scanning, press the **F1** (*TRIG*) key.

As in Spectrum mode (absolute), other functions are available by using the **F3** key to change the function of the **F1** and **F2** keys.

Press the **F3** key to change the function of the **F1** and **F2** keys to **SCALE** and **REF**.


Change the display scale by pressing the **F1** (*SCALE*) key. Change the reference level by pressing soft key the **F2** (*REF*) key and using the  and  keys to change the reference.

Press the **F3** key to change the function of the **F1** and **F2** keys to **Auto** and **ΔMkr**. To set the reference level and the scale automatically, press the **F1** (*AUTO*) key.

A **Δ MARKER** function can be used to check the distance (in MHz) and amplitude difference between any two points in the displayed transmission spectrum. First, use the  and  keys to move the marker to a reference position, then press the **F2** (*ΔMkr*) key. The  and  keys now move the second marker from the reference position, and the **Δ Frequency** and **Δ Level** are displayed.

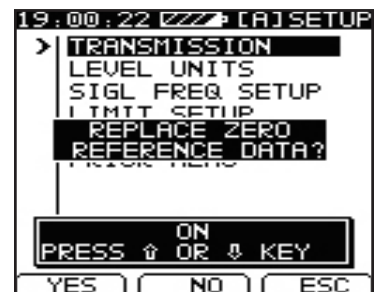
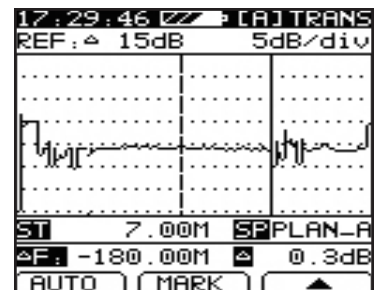
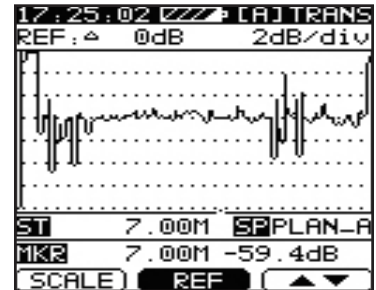
Press the **F2** (*MARK*) key to return to the normal single-marker Transmission display.

Press the **F3** key to change the function of the **F1** key to **AVG** to enable an average level reading instead of a Peak Detector reading in the spectrum scan.

The new Zero Reference scan remains in the Model Three so you can measure the relative change at a later time. To perform another Transmission test at any time, confirm that Transmission is set to **ON** and press the **SPECT**  key. The Model Three performs a Spectrum scan and compares it to the reference data.


If Transmission has been turned off for absolute Spectrum measurements, you can turn it on and press the **F2** (*NO*) key when asked to replace the Zero Reference data.


The Model Three then prompts you to select the **F1** key to start a relative Spectrum measurement with the old Zero Reference data.



## Auto Test


The Model Three can accept user-defined testing programs to automatically perform Level, Spectrum, Tilt (Favorite), Hum, QAM, and Limit tests in specified time increments. The Model Three can store up to seven user programs for recall when needed. The test results are stored to a file automatically after measurement and they can be viewed or uploaded to a PC later.

To run or set up an Auto test, press the  key. The Auto test program directory appears.


To create a new Auto test, press the  key until a blank selection is highlighted. If the directory has no programs, the blank selection appears automatically.

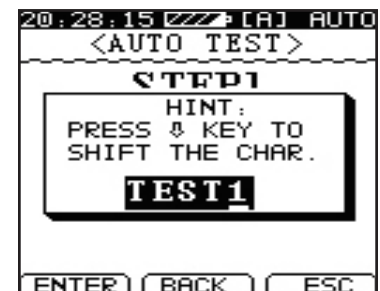
Press the  (*NEW*) key.



The Auto test screen for **STEP 1** appears. Press the  (*NAME*) key for the alphanumeric entry window to appear.



Enter up to five alphanumeric characters for the program name and press the  (*ENTER*) key (see Entering Alphanumeric Characters in **Chapter 3: Walkthrough**, *Identify Components*, *Navigating Functions*).





The new program name appears on the screen for **STEP 1**. Press the **F<sub>2</sub>** (*NEXT*) key to continue.



The Auto test screen for **STEP 2** appears.



Six types of tests may be performed in a program: Level, Spectrum, Limit, Hum, QAM, and Tilt. Each enabled test has a check mark next to it.

Use the  and  keys to highlight any test, then press the **F<sub>1</sub>** (*ENTER*) key to enable or disable the test.



When only the desired tests are enabled with a check mark, press the **F<sub>2</sub>** (*NEXT*) key to continue.



The Auto test screen for **STEP 3** appears.

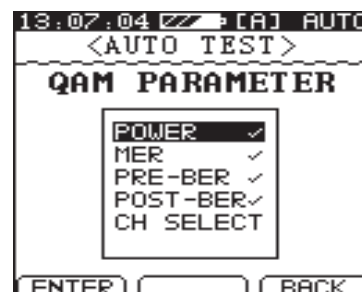
You can change the parameters for each of the selected tests by using the  and  keys to highlight the test, then press the **F<sub>1</sub>** (*ENTER*) key.

The Auto test parameter displays are described in the following section.



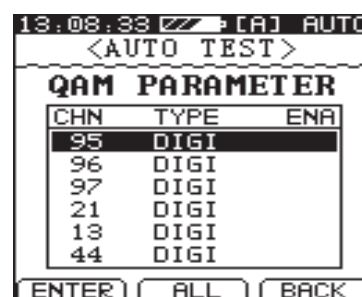
## QAM Parameters



Use the  and  keys to highlight any QAM measurement parameter and press the **F1** (**ENTER**) key to enable the highlighted parameter. The enabled parameters for testing are indicated by a check mark.



Next, select the QAM channels to test. Highlight the **CH SELECT** item and press the **F1** (**ENTER**) key to display all of the digital channels that are listed in the current user plan.

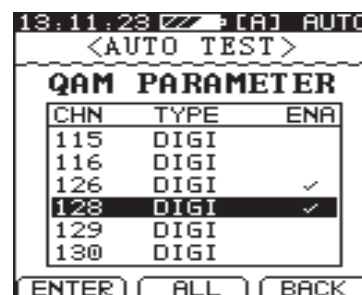
Press the **F2** (**ALL**) key to select all of the channels in the user plan for testing. Press the **F2** (**CLEAR**) key to deselect all of the channels in the user plan.



Use the  and  keys to highlight the channels to test and press the **F1** (**ENTER**) key to enable the highlighted channel. The enabled channels for testing are indicated by a check mark.



When all desired QAM channels have been enabled, press the **F3** (**BACK**) key to return to the QAM parameter menu.

When the desired QAM measurement parameters have been enabled, press the **F3** (**BACK**) key to return to the Auto test screen for **STEP 3**.

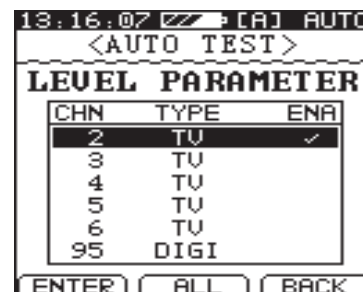


**To perform QAM measurements, you must first have digital channels included in the current user plan.**

## Level Parameters

Use the  and  keys to highlight any channel in the selected user plan, then press the **F1** (**ENTER**) key to enable or disable the channel for the Level test. An enabled channel displays a check mark next to it.

When all desired channels are enabled, press the **F3** (**BACK**) key to return to the Auto test screen for **STEP 3**.



CHN	TYPE	ENA
2	TU	✓
3	TU	
4	TU	
5	TU	
6	TU	
95	DIGI	



At the bottom of the screen are buttons for **ENTER**, **ALL**, and **BACK**.



***There are no default channels enabled for the Level test parameter. If Level test is selected for the Auto test program, you must enable one or more channels.***

## Spectrum Parameters

Press the **F1** (**ENTER**) key to change the highlighted Spectrum test bandwidth to 2.50 MHz, 6.25 MHz, 12.50 MHz, 25.00 MHz, 62.50 MHz, or a full-spectrum scan of the User Plan Base Channel Plan.

Use the  and  keys to highlight the center frequency selection for the Spectrum test. Press the **FCN** key, enter the center frequency numerically in MHz, and press the **F1** (**ENTER**) key. This parameter is not used if the full-span bandwidth is selected.



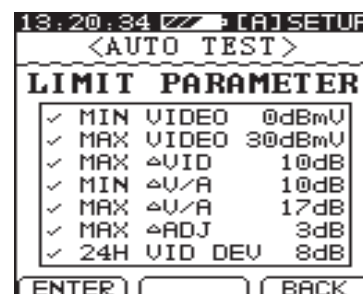
BANDWIDTH:	2.50M
CENTFREQ :	650.00M

At the bottom of the screen are buttons for **ENTER** and **BACK**.

When the desired frequency and bandwidth have been set, press the **F3** (**BACK**) key to return to the Auto test screen for **STEP 3**.

## Limit Parameters

The status of all Limit test parameters are displayed (except the 24 HR Deviation limit parameter for 24 HR tests). The enabled limits for testing are also indicated by a check mark. If the current settings are acceptable, you can press the **F<sub>3</sub>** (**BACK**) key to return to the Auto test screen for **STEP 3**.



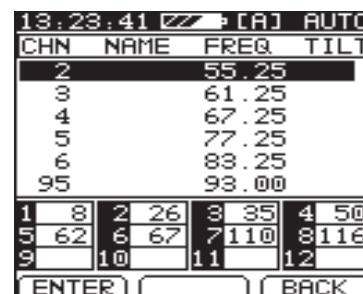
If you wish to change or (disable) any Limit parameter, you can press the **F<sub>1</sub>** (**ENTER**) key to display the Edit Limits screen. All Limit parameters may be changed as described in Model Three Setup for the Edit Limits display (see **Chapter 4: Setup, Measurement, Limit Setup**). When the desired changes have been made in the Edit Limits screen, select **SAVE AND EXIT** to return to the Auto Test Limit Parameter screen.

If the settings displayed on the Limit Parameter screen are correct, press the **F<sub>3</sub>** (**BACK**) key to return to the Auto test screen for **STEP 3**.

## Tilt Parameters




The Tilt Parameter screen for Auto test is the same as the standard Tilt Setup screen. All Tilt channels already selected for the User Plan are enabled here.

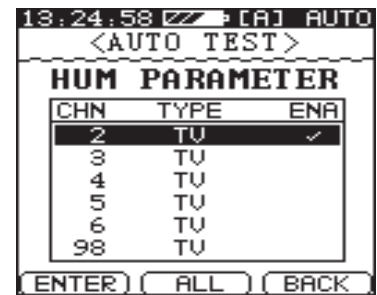
You can use the **F<sub>2</sub>** and **F<sub>4</sub>** keys to highlight any channel in the selected User Plan, then press the **F<sub>1</sub>** (**ENTER**) key to enable or disable the channel for the Tilt test. An enabled channel displays a check mark next to it and will be listed in the Tilt Channel boxes at the bottom of the display. At least four of the 12 maximum number of Tilt channels must be selected for Tilt to operate.




When the desired TILT channels have been selected, press the **F<sub>3</sub>** (**BACK**) key to return to the Auto test screen for **STEP 3**.


## Hum Parameters



Use the  and  keys to highlight any of the analog channels listed in the user plan. Press the  (*ENTER*) key to enable or disable any channels for the Hum test.

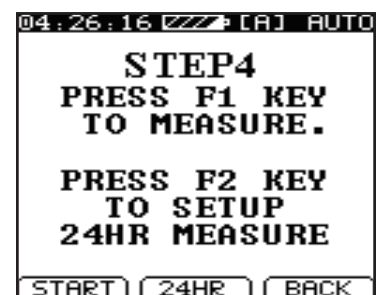


When the desired Hum channels have been selected, press the  (*BACK*) key to return to the Auto test screen for **STEP 3**.




When the parameters for all selected tests have been verified or changed, press the  (*NEXT*) key to continue. The Auto test screen for **STEP 4** appears.

If you wish this Auto test program to perform its test sequence only once each time it is started, you can press the  (*START*) key to immediately begin execution of the testing program. If the  key is selected to start the program, the Model Three performs the selected tests and then shuts off.



A file containing all test records is created and automatically saved. The file name is the Auto test program name followed by an asterisk (\*) to indicate that it is a single Auto test file. This is displayed in the Model Three file directory along with the date and time (see *File Saving and Viewing* later in this chapter).

If you wish to save the Auto test program for later use without running the entire program now, you can start the test and then press the  key to exit.



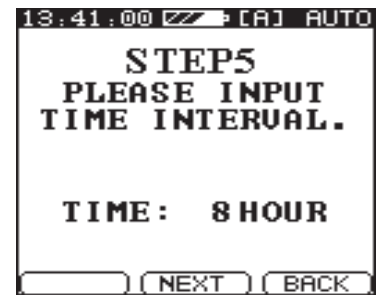
***A new Auto test program that is started as a single test sequence (no 24 HR test) has default settings for 24 HR operation (8 hours, 4 tests) stored with the program. When this program is executed again, it can run as a single test sequence or as a 24 HR test with the default settings.***

If you wish the Auto test program to perform its test sequence in programmed time intervals, press the **F<sub>2</sub>** key to setup the 24 HR measurement routine.

The Auto test screen for **STEP 5** appears.

A default time interval of 8 hours between test times is displayed.


To change the time interval, press the **FCN** key, enter a new number from 1 to 23 (hours), and press the **F<sub>1</sub>** key to enter.



Press the **F<sub>2</sub>** (**NEXT**) key to continue. The Auto test screen for **STEP 6** appears.

A default number of four test times is displayed. To change the number of test times, press the **FCN** key, enter a new number from one to 10 (times), and press the **F<sub>1</sub>** key to enter.

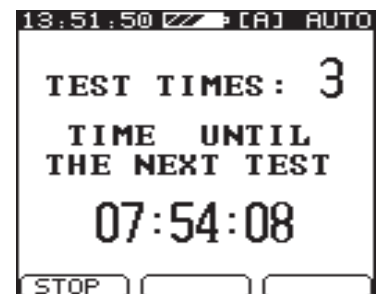


 **NOTE** *Since the first Auto test time is always performed immediately upon starting the program, the 4 default test times provides a 24 Hour span from first test to last test, with a 8-hour default time interval between test sequences.*

Press the **F<sub>1</sub>** (**START**) key to begin execution of the testing program. The Model Three immediately performs the first sequence of tests. After each test time sequence is complete, an Auto test program status screen appears for a short time, then the Model Three shuts off.

If the Model Three is turned on during an Auto test program, the program status screen appears to indicate the Auto test status.

The program may be stopped by pressing the **F<sub>1</sub>** (**STOP**) key.



A file containing all test records is created for each test time and automatically saved. The file name is the Auto test program name followed by an alphabetical assignment (beginning with A) for each test time file to indicate they are 24 HR Auto test files. This is displayed in the Model Three file directory along with the date and time (See *File Saving and Viewing* later in this chapter).



**If a Limit test is part of a 24 HR Auto test program, a 24 Hour Video Deviation report (Rep\_24) is also created and saved after the last test sequence. This data record lists the maximum video deviation over all time tests for each channel along with a Pass (P) or Fail (F) indication for the channel based on the Limit test parameter setup at the time the Auto test was performed.**

If you wish to save the Auto test program for later use without running the entire program now, you can start the test and then press the **F1** key to exit.

The new Auto test program is added to the Auto test directory with the program name entered in **STEP 1**.

Up to seven Auto test programs may be created and saved.

From the Auto test directory, a program may be deleted by using

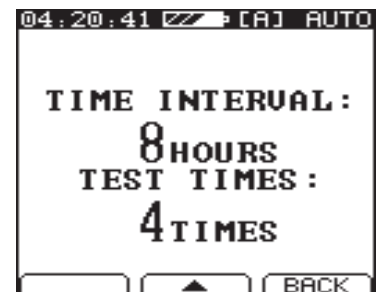
the and keys to highlight the program name and pressing the **F2** (*DEL*) key.

Also, information about an existing file may be obtained by using

the and keys to highlight the program name and pressing the **F3** (*INFO*) key.



Parameters for each test may be viewed by using the and keys to highlight the test and pressing the **F1** (*ENTER*) key to view the setup parameters. Also, the status of the 24 HR setup can be seen by pressing the **F2** key to view the test times and time intervals.




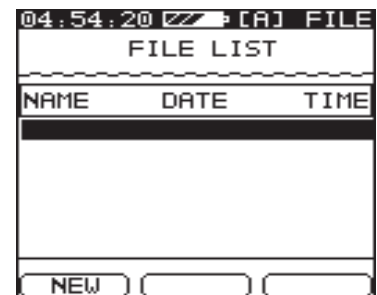
## File Saving and Viewing


The Model Three can save records from QAM, Level, Tilt (Favorite Channels group), Spectrum, Hum, Scan, or Limit test measurements either to individual files or all to one file. Auto test files are automatically saved. These files can be recalled to display the recorded data and Scan, Spectrum, and Limit graphics can be viewed. All files may also be uploaded to a PC.

### Saving a Test Record to a File

Before saving a record, be sure the time, date, and date sequence (M/D/Y) has been set (see **Chapter 4: Setup, *General, Date and Time***). If the date sequence is changed after storing files, the date information for those files will not be correct.

To save a test record, press the  key. The Model Three File directory appears with the file name, date, and time of all existing files.







Press the  (**NEW**) key to create a new file. A **SAVE CONTENT** screen appears with a list of test records that are available to be saved.

A test must be performed by the Model Three before it can be saved from the file list.

If a test has not been performed by the Model Three, it is not displayed on the **SAVE CONTENT** screen.

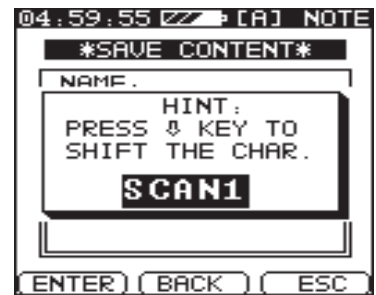


Use the  and  keys to scroll to any listed test selection, then use the  and  keys to turn **ON** or **OFF** the records that will be saved to the file. Any or all of the listed records may be saved to one file.

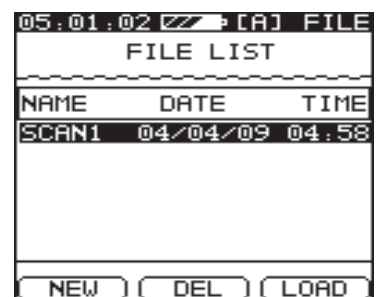
When only the desired test records are enabled (ON), press the  (**OK**) key to continue.

The alphanumeric entry window appears to enter the desired file name.

Enter up to 5 alphanumeric characters for the file name and press the **F1** (**ENTER**) key. (See Entering Alphanumeric Characters in **Chapter 3: Walkthrough, Identify Components, Navigating Functions.**)



The File directory is displayed with the new file name at the end of the file list.

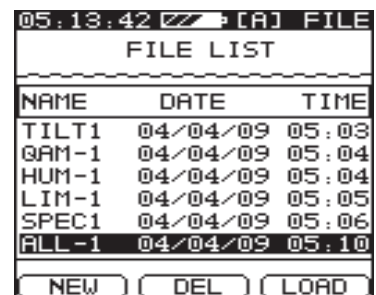


## Viewing File Records

To recall (load) a test record file, press the **FILE** key.

The Model Three File directory appears with the file name, date, and time of all existing files.

Use the **↑** and **↓** keys to scroll to the file name of the file you wish to view, then press the **F3** (**LOAD**) key.



The **FILE CONTENT** screen appears with the file name, User Plan, and a list of all test records in the file.

Use the **↑** and **↓** keys to scroll to the test record that you wish to list the data record, or view graphically (Limit, Spectrum, and Scan records only).

To **LIST** the data for a test record, press the **F1** (**LIST**) key:



**Limit Test** - This data record is listed with the number of channels

failed for individual Channel test parameters displayed at the top of the screen. Use the **F2** and **F3** keys to scroll to any channel to see the Video level and Pass (check mark) or Fail (X) indication.



NOTE

**The Pass or Fail indication for the Limit test is based on the Limit test parameter setup at the time the Limit test was performed. A digital (DIGI) type Channel measurement during the Limit test is shown but is not used to determine Pass or Fail for any of the tests.**

**Tilt Test** - This data record is listed with the Tilt Level displayed at the top of the screen. Use the **F2** and **F3** keys to scroll to any Tilt/Favorite channel to see the Video level.



**Spectrum Test** - This data record lists the frequency and signal level for each data point in the Spectrum test. Use the **F2** and **F3** keys to scroll to any listed frequency in the Spectrum scan.

**Scan Test** - This data record lists all Video and Audio levels for each channel in the Scan test. Use the **F2** and **F3** keys to scroll to any channel.

**Level Test** - This data record lists all Video and Audio levels for each channel in the Level test. Use the **F2** and **F3** keys to scroll to any channel.










NOTE










**On any listed record, you can use the  and  keys to scroll through the channel list (data points for Spectrum test) by one page (eight channels) at a time.**








While displaying a list of any data record, you can press the **F1** (**BACK**) key to return to the **FILE CONTENT** screen.



To **VIEW** the Limit, Spectrum, or Scan test record graphically from the **FILE CONTENT** screen, press the **F2** (**VIEW**) key.





**Limit Test** - A view of the Limit test scan is displayed. The display may be controlled like a Live Channel Scan. The  and  keys move the marker. The  (*AUTO*) key automatically sets the Scale and Reference. The  (*TRIG*) key changes the display to a Live Channel scan instead of the file record display. You can also press the  key to change the soft key functions of the  and  keys to set the Scale and Reference manually.

**Spectrum Test** - A view of the Spectrum scan is displayed. The display may be controlled like a Live Spectrum Scan. The  and  keys move the marker. The  (*TRIG*) key changes the display to a Live Spectrum scan instead of the file record display. The  (*SPAN*) key does not operate with the Spectrum record file. If the  key is used to trigger a Live Spectrum scan, then the  (*SPAN*) key may be used. You can also press the  key to change the soft key functions of the  and  keys to set the Scale and Reference manually or use the Auto scale and Reference or the Δ Marker function.

**Scan Test** - A view of the Channel Scan test is displayed. The display may be controlled like a Live Channel Scan. The  and  keys move the marker. The  (*AUTO*) key automatically sets the Scale and Reference. The  (*TRIG*) key changes the display to a Live Channel scan instead of the file record display. You can also press the  key to change the soft key functions of the  and  keys to set the Scale and Reference manually.

 **NOTE** *The view of file records  operates with Limit, Spectrum, and Scan records only. The View function does not operate with Level, Tilt, Hum, and QAM records.*

While viewing a data record, you can press the  key to return to the **FILE CONTENT** screen. Pressing the  key again will return you to the File Directory.



## Auto Test Records

Auto test records are stored automatically (see **Chapter 6: Advanced Operation, *Auto Test***). These records also appear in the File directory. A file containing all test records for an immediate Auto test (not 24 HR test) is created and automatically saved. The file name is the Auto test program name followed by an asterisk (\*) to indicate that it is a single Auto test file. This is shown in the image to the right for an Auto test program named *TEST 1*. The suffix (\*) for this file was added automatically.

06:24:21 [A] FILE

FILE LIST

NAME	DATE	TIME
HUM-1	04/04/09	05:04
LIM-1	04/04/09	05:05
SPEC1	04/04/09	05:06
ALL-1	04/04/09	05:10
TEST1*	04/04/09	05:29
TEST1A	04/04/09	05:33

NEW DEL LOAD

A file for 24 HR Auto test records is created for each Auto test time. The file name is the Auto test program name followed by an alphabetical assignment (beginning with A) for each test time file to indicate they are 24 HR Auto test files. This is shown in the image to the right for an Auto test program named *TEST 1*. The suffix A-D for each test time file was added automatically.

06:25:42 [A] FILE

FILE LIST

NAME	DATE	TIME
HUM-1	04/04/09	05:04
LIM-1	04/04/09	05:05
SPEC1	04/04/09	05:06
ALL-1	04/04/09	05:10
TEST1*	04/04/09	05:29
TEST1A	04/04/09	05:33

NEW DEL LOAD



***If a Limit test is part of a 24 HR Auto test program, a 24 Hour Video Deviation report (Rep\_24) is also created and saved after the last test sequence. This data record lists the maximum Video deviation over all time tests for each channel along with a Pass (P) or Fail (F) indication for the channel based on the Limit test parameter setup at the time the Auto test was performed.***

Auto test files may contain QAM, Level, Tilt, Spectrum, Hum, or Limit test records. These files may be listed or viewed.

Use the and keys to scroll to the file name of the file you wish to view and then press the (LOAD) key.

The FILE CONTENT screen appears with the file name, user plan, and measurement items which have been executed.



06:27:34 [A] LOAD



\*FILE CONTENT\*

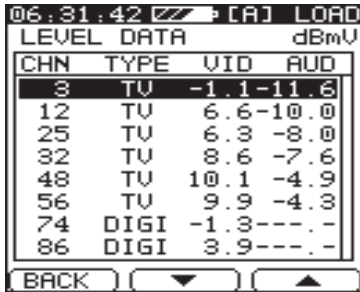
NAME: TEST1A  
USER PLAN: USER-A

QAM	LIMIT
TILT	SPECT
LEVEL	HUM

LIST VIEW

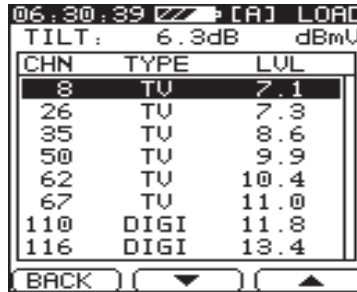
You can select the desired measurement item by pressing the  and  keys.

Press the  (*LIST*) key to study the measurement data or press the  (*VIEW*) key to view the spectrum measurement or limit test.



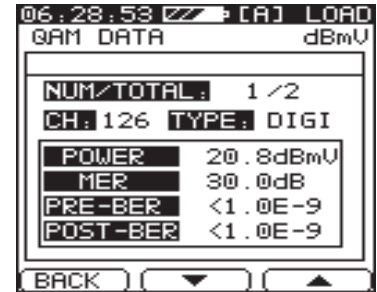
CHN	TYPE	UID	AUD
3	TU	-1.1	-11.6
12	TU	6.6	-10.0
25	TU	6.3	-8.0
32	TU	8.6	-7.6
48	TU	10.1	-4.9
56	TU	9.9	-4.3
74	DIGI	-1.3	---
86	DIGI	3.9	---

Level measurement data



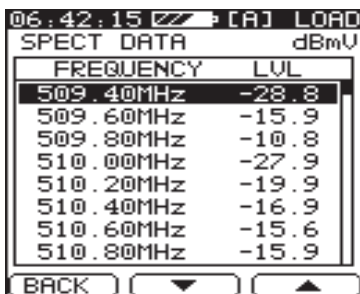
CHN	TYPE	LVL
8	TU	7.1
26	TU	7.3
35	TU	8.6
50	TU	9.9
62	TU	10.4
67	TU	11.0
110	DIGI	11.8
116	DIGI	13.4

Tilt measurement results



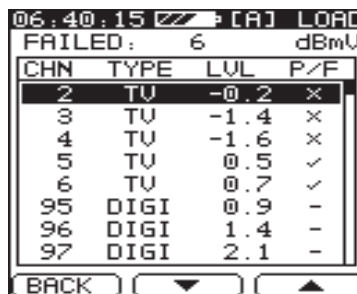
NUM/TOTAL:	1 / 2
CH: 126	TYPE: DIGI
POWER	20.8dBmV
MER	30.0dB
PRE-BER	<1.0E-9
POST-BER	<1.0E-9

QAM measurement results



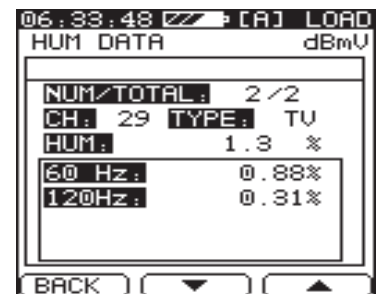
FREQUENCY	LVL
509.40MHz	-28.8
509.60MHz	-15.9
509.80MHz	-10.8
510.00MHz	-27.9
510.20MHz	-19.9
510.40MHz	-16.9
510.60MHz	-15.6
510.80MHz	-15.9

Spectrum measurement data



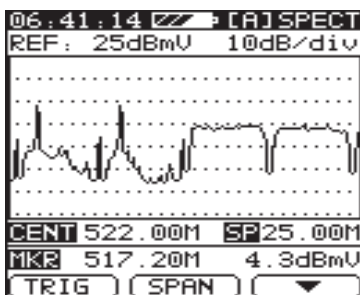
CHN	TYPE	LVL	P/F
2	TU	-0.2	x
3	TU	-1.4	x
4	TU	-1.6	x
5	TU	0.5	✓
6	TU	0.7	✓
95	DIGI	0.9	-
96	DIGI	1.4	-
97	DIGI	2.1	-

Limit measurement results

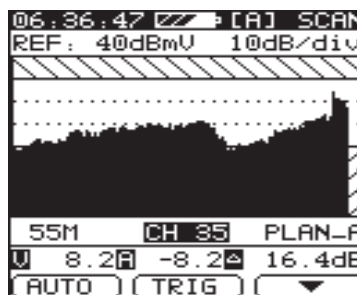


NUM/TOTAL:	2 / 2
CH: 29	TYPE: TU
HUM:	1.3 %
60 Hz:	0.88%
120Hz:	0.31%

Hum measurement data



Spectrum measurement graph



Limit measurement graph

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# Chapter 7

## Specifications

### Frequency:

Range: 5 MHz to 1 GHz  
Accuracy:  $\pm 50$  ppm @ 20° C  $\pm 5^\circ$  (68° F  $\pm 9^\circ$ )  
Resolution: 10 kHz

### Channel Type:

Analog TV: TV  
Digital TV: 16/32/64/128/256 QAM, QPSK, COFDM  
FM channel: Single frequency

### Analog Level Measurement:

Range: 5 MHz to 65 MHz  
(-42 dBmV to +60 dBmV)  
65 MHz to 1 GHz  
(-35 dBmV to +60 dBmV)  
Accuracy: > -25 dBmV:  
 $\pm 1.5$  dB @ 10° to 30° C (50° to 86° F)  
 $\pm 3.0$  dB @ -10° to +40° C (14° to 104° F)  
Resolution: 0.1 dB  
Input impedance: 75  $\Omega$  (unbalanced, BNC or F-type connector)

### Hum:

Range: 2 to 5% LPF, BPF  
Accuracy:  $\pm 0.5\%$  (BPF)

### Channel Scan:

Number of channels: 170 (max)  
Scanning speed: 3 channels per second  
Scale: 1, 2, 5, 10 dB/div  
Zoom: 1x, 2x, 3x, 4x, 5x; five levels of magnification or full channel plan scan

### Frequency Spectrum:

Bandwidth: 2.5 MHz, 6.25 MHz, 12.5 MHz, 25 MHz, 62.5 MHz, and full span  
Scale: 1, 2, 5, 10 dB/div

### Digital Channel:

Demodulation type: ITU-T J.83 Annex A/B/C standard  
Support: 16/32/64/128/256 QAM, QPSK, COFDM  
Symbol rate: 4 to 7 MS/sec  
Bandwidth: 0.28 to 9.99 MHz  
MER: To 36 dB or greater (QAM)  
Accuracy:  $\pm 2.0$  dB  
BER:  $1E^{-3}$  to  $1E^{-9}$  before and after R-S decoding (QAM)  
Power measure type: QAM, QPSK, COFDM

**Digital Channel Power (Average):**

Level range: -25 to +55 dBmV  
Accuracy:  $\pm 2.0$  dB @ 10° to 30° C (50° to 86° F)  
 $\pm 3.0$  dB @ -10° to +40° C (14° to 104° F)  
Resolution: 0.1 dB

**Constellation (Optional):**

Display Size: 64 and 256 QAM  
Constellation with zoom capability

**Tilt Measurement:**

Number of channels: 4 to 12  
Resolution: 0.1 dB

**Limit Test Parameters:**

Any of the following may be enabled:  
Min video: 40 to 119 dB $\mu$ V (-20 to +59 dBmV)  
Max video: 41 to 120 dB $\mu$ V (-19 to +60 dBmV)  
Max  $\Delta$  video: 2 to 30 dB  
Min  $\Delta$  V/A: 0 to 15 dB  
Max  $\Delta$  V/A: 5 to 30 dB  
Max  $\Delta$  ADJ: 0 to 20 dB  
24-hour video dev.: 0 to 20 dB

**Auto Test:**

Number of programs: 7 (max)  
Tests: Level, Tilt, Spectrum, QAM, Hum, and Limit (any or all tests may be used in an auto-test program)  
Time intervals: 1 to 23 hours  
Test times: 1 to 10 times

**Trunk Voltage Measurement:**

Input range: 10 to 100 VAC or VDC  
Accuracy:  $\pm 2.0$  V  
Resolution: 0.1 V

**Power:**

11.1 V / 1.4 AH Li-Ion battery  
Provides 5 hours of continuous operation  
Charger: 100 to 240 VAC, 50/60 Hz, 15 VDC , 2 A (max)  
Charge time: Less than three hours

**Display:** 128 x 128 backlit LCD

**Communication Port:** RS-232C (Converts to USB with data cable)

**Storage:** 32 Kb of memory  
Up to 30 complete scan files (170 channels, max) or 22 complete limit test files (170 channels, max); less if other files (level, tilt, QAM, Hum, spectrum) are saved

**Weight:** 1.76 lbs (800 g)

**Dimensions (H x W x D):** 8.52" x 3.74" x 1.93"  
(218mm x 95mm x 49mm)  
(dimensions do not include belt clip)

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## Warranty Information

Trilithic, Inc. warrants that each part of this product will be free from defects in materials and workmanship, under normal use, operating conditions and service for a period of two (2) years from date of delivery. Trilithic, Inc.'s obligation under this Warranty shall be limited, at Trilithic, Inc.'s sole option, to replacing the product, or to replacing or repairing any defective part, F.O.B. Indianapolis, Indiana; provided that the Buyer shall give Trilithic, Inc. written notice.

Batteries are not included or covered by this Warranty.

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

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

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