User’s Guide

CaLan 3010H
Sweep/Ingress Analyzer

MAN-22021-US001

Part number: 85963A-M01
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Product maintenance agreements and other customer assistance agreements are available for Sunrise Telecom Broadband products.

For any assistance, contact your sales representative. If you are calling from North America, please call 1-800-701-5208, 408-360-2200 for international calls, or consult our website (www.sunrisetelecom.com).

Initial Inspection

Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, keep it until you have verified that the contents are complete and you have tested the instrument mechanically and electrically. If the instrument is damaged, immediately notify your nearest Sunrise Telecom Broadband Sales and Service office. See Chapter 15.

Cleaning

Clean the case using a damp cloth only.

WARNING: **To prevent electrical shock, disconnect the ac power cord from the mains before cleaning. Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally.**

Safety

This product has been designed and tested in accordance with IEC Publication 1010, Safety Requirements for Electronic Measuring Apparatus, and has been supplied in a safe condition. The instruction documentation contains information and warnings which must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

The following safety notes are used throughout this manual. Familiarize yourself with each of the notes and its meaning before operating this instrument.

WARNING: **Warning denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a warning note until the indicated conditions are fully understood and met.**

CAUTION: Caution denotes a hazard. It calls attention to a procedure that, if not correctly performed or adhered to, would result in damage to or destruction of the instrument. Do not proceed beyond a caution sign until the indicated conditions are fully understood and met.

General Safety Considerations

WARNING: **With the exception of the fuse, there are no operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock, do not remove covers.**

WARNING: **When using this product, it is a Safety Class 1 Product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the product is likely to make the product dangerous. Intentional interruption is prohibited.**

WARNING: **If this product is not used as specified, the protection provided by the equipment could be impaired. This product must be used in a normal condition (in which all means for protection are intact) only.**

WARNING: **For continued protection against fire hazard, replace line fuse only with same type and ratings (S 0.5A). The use of other fuses or materials is prohibited.**

WARNING: **If this product is to be energized via an external autotransformer for voltage reduction, make sure that its common terminal is connected to a neutral (earth pole) of the power supply.**

CAUTION: Always use the three-prong ac power cord supplied with this product. Failure to ensure adequate earth grounding by not using this cord may cause product damage.

CAUTION: This product is designed for use in Installation Category II and Pollution Degree 2 per IEC 1010 and 664 respectively.

CAUTION: Ventilation Requirements: When installing the product in a cabinet, the convection into and out of the product must not be restricted. The ambient temperature (outside the cabinet) must be less than the maximum operating temperature of the product by 4 °C for every 100 watts dissipated in the cabinet. If the total power dissipated in the cabinet is greater than 800 watts, then forced convection must be used.

Interpretation of Symbols

	The instruction manual symbol. The product is marked with this symbol when it is necessary for the user to refer to the instructions in the manual.
CE	The CE mark shows compliance with European Community. (If accompanied by a year, it is the year when the design was proven.)
ISM 1-A	This is a symbol of an Industrial Scientific and Medical Group 1 Class A product.
I	This symbol is used to mark the ON position of the power line switch.
O	This symbol is used to mark the OFF position of the power line switch.
~	This symbol indicates that the input power required is ac.
⏻	This symbol is used to mark the STANDBY position of the power line switch.
	This symbol is used to mark the OFF position of the power line switch.
	This symbol is used to mark the ON position of the power line switch.

Regulatory Information

SUNRISE TELECOM
INCORPORATED

DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name:	Sunrise Telecom Inc.
Manufacturer's Address:	Corporate Head Office 302 Enzo Drive San Jose, CA 95138 USA
Manufacturer's Telephone Number:	TEL: (408) 363-8000 FAX: (408) 363-8313
Equipment Type/Environment:	Measurement, Control and Laboratory Equipment
Trade Name/Model Number:	3010H Calan Sweep/Ingress Analyzer 85963A

Standard(s) to which Conformity is Declared:

Safety:	IEC 1010-1:1990+A1/EN 61010-1:1993 Can/CSA-C22.2 No. 1010.1-92
EMC:	CISPR 11:1990/EN 55011:1991 Group 1, Class A IEC 801-2:1984/EN 50082-1:1992 4kV CD, 8 kV AD IEC 801-3:1984/EN 50082-1:1992 3V/m, 27-500 MHz IEC 801-4:1988/EN 50082-1:1992 0.5kV Signal Lines, 1kV Power Lines IEC 1000-3-2:1995/EN 61000-3-2:1995 IEC 1000-3-3:1994/EN 61000-3-3:1995

Supplementary Information:

The product herewith complies with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carries the CE-marking accordingly.

I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive and Standards.

Declared By

Signature:

Full Name: Dennis Koo

Position: VP, Quality

Company:	Sunrise Telecom Inc.
Address:	302 Enzo Drive San Jose, CA 95138 USA
Telephone:	(408) 363-8000
Facsimile:	(408) 363-8313
Date:	13 August 2002

Radiated Immunity

When tested at 3 V/m according to IEC 801-3/1984, there may be signals up to +5 dBmV at frequencies identical to the immunity test signal frequency listed on the display.

Acoustic Noise Emissions Declaration

This is to declare that this instrument is in conformance with the German Regulation on Noise Declaration for Machines (Laermangabe nach der Maschinenlaermrerordnung –3. GSGV Deutschland).

Acoustic Noise Emission/Geraeuschemission	
LpA < 70 dB	LpA < 70 dB
Operator position	am Arbeitsplatz
normal operation	normaler Betrieb
Per ISO 7779	nach DIN 45635 T. 19

How to Use This Manual

The CaLan 3010 front panel features four softkeys located just below the display screen labeled **F1** through **F4**. These keys are used to execute a programmed function. The name of the function appears on the display directly above the corresponding softkey.

The following symbols are used to identify the various keys

Pwr/On	A function name in a keycap symbol corresponds to a labeled key on the instrument. This key is referred to as either a key or a hardkey.
F1	The physical softkeys labeled F1 through F4.
⏶ ⏷ ◀ ▶	The blue arrow keys which are used to select a function or move the marker.
Enter	Press this key to save any changes and return to the previous screen.
Print/Save	Press this key to recall and save information to or from the file server. You may access the file server from any of the measurement mode screens by pressing **Print/Save**.
Option	Press this key to enter the Option menu or functions related to the active mode or operation.

Quick Reference

Menu

▼

F3

The above example quickly identifies the steps to complete the activity. The example asks you to:

1. Press **Menu**
2. Press ▼ (down arrow)
3. Press **F3**

The activity described activates the Return Setup menu.

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Introduction and Menu Maps

Introduction and Menu Maps

Product Description

The CaLan 3010H is an integrated sweep receiver and signal level measurement system.

Standard Features

- Measures 165 channels in 3.6 seconds
- Automatic 24-hour measurements
- Differential level comparison
- Field replaceable type F input and output connector
- File server (90 files), graphic or tabular
- Measures scrambled channels accurately
- 8 preprogrammed frequency plans
- 4 user definable frequency plans
- 4 sweep setup tables
- 12 sweep reference files
- Instant review of system response
- Single Channel Measurement mode
- Four Channel Adjustment mode
- Channel Scan mode
- Spectrum Scan mode for distortion testing
- Auto Scan Transmitter Setup mode
- Normalized Sweep mode
- Raw Sweep mode
- Fast Sweep mode
- Screen printing of any screen

- Normalized mode
- Formalized reports
- Large format graphical LCD display
- Parallel printer interface
- RS-232 data printer interface
- Dual Aural Carrier function
- Burst counter measurement
- Average power measures
- Spectrum monitor measurement
- User-definable C/N bandwidth
- dBμV and dBmV switchable
- FCC pass/fail report writer including 24 hour report
- Return path ingress measurement
- Digital power measurement
- Return Path Controller function
- Instrument cloning

System Overview

The CaLan 3010H/3010R/3010B represents a unique concept in signal measurement devices adding return path measurements to the 3010 measurement system. The 3010H is in a rack mounted package for easy installation in any standard 19-inch headend equipment rack.

Return Path Measurements

The 3010H is the headend monitor for the signals returning to the headend. Utilizing a new and unique technique, the 3010H monitors the condition of the return path. If an ingress problem disables the return communications from the 3010R's, the 3010H will make a spectrum measurement of the return path and broadcast the data to all the 3010R's. By using the return spectrum and spectrum scan measurement, return problems can easily be located and repaired.

Headend Measurements

During the setup of the headend, the 3010H offers a full range of measurements to aid the technician with the installation and setup of the headend. Normal operation of the unit will be to monitor the return path measurements.

Digital Power Measurements

The Digital Power Measurements mode accurately measures the average power of a channel or frequency span containing a digitally-modulated carrier. By sampling the power at 150 kHz intervals multiple times across the channel or span, and integrating the average values, the average power of the channel or span can be measured. Digital power measurements are also made on digital channels in the Channel Scan, Four Channel, and Single Channel selections of the Level Measurements Mode.

The Digital Power Measurements mode also measures time division multiple access (TDMA) signals, the short-duration, pulsed signals that are typically found in the return path. In TDMA mode, the instrument detects signals exceeding a threshold within a given time interval. These measurements are repeated across the frequency span. Multiple samples are taken and averaged to yield the signal power. The threshold value, time interval and number of samples taken are all user-definable.

Ingress Measurements

The Ingress Monitoring Measurements include the burst counter, the wideband average power measurement, and the spectrum monitor measurement. These three measurements are used to monitor the performance of the return path.

- The burst counter measures the duration of signals at a given frequency over time. It is used to evaluate the nature of interfering signals.
- The wideband average power measurement continuously monitors the average power of a specific frequency spectrum over time. It attempts to measure the noise of the system, not TDMA carriers.
- The spectrum monitor measurement retains the maximum, minimum, average and current spectrum scan measurements over time.

Instrument Cloning

The instrument setup information may be copied (cloned) between instruments of the 2010B/3010B/3010R/3010H product family. The instrument cloning feature copies the setup from a source instrument to a destination instrument via an RS-232 cable connected between the serial ports of the two instruments. You have the choice of cloning all of the source instrument's configuration data, the sweep table data, or just the channel plan.

SLM Function

The CaLan 3010 measures a single channel using the Single Channel mode. In the Single Channel mode, the video, audio, and difference levels are displayed digitally and graphically, allowing the user to view the absolute level and the trend of movement of the carriers. The 3010 includes a new digital carrier power function. This function allows it to measure the level of a digital carrier. The audio information can be monitored by turning on the Speaker function. For systems with dual aural carriers, the 3010 will measure both levels on the same screen.

Spectrum Analysis and Distortion Testing

Broadband FM measurements are made with the 3010 using the Spectrum Scan mode. By setting the start frequency to 88 MHz and the stop frequency to 108 MHz, all FM carriers can be viewed at the same time. Specific carrier information at the marker is displayed at the top of the screen. Distortion measurements can also be done using the Spectrum Scan mode, including carrier-to-noise and beat distortions. The beat level, approximate frequency, and nature of the beat are measured using the Marker and the Speaker functions.

Forward Sweep Transmit Capability (Option 050 or Option 052)

The forward sweep transmit capability of the 1777 is integrated into the 3010H. This feature is integrated in two ways. First, as Option 050 where forward sweep transmit is a standalone replacement for the CaLan 1777. Second, as part of Option 052 where the Dual Path Mode integrates forward sweep transmit with the return path monitor. The forward sweep transmit of the 3010H can be set in either 1777 normal sweep operation or fast sweep operation. All existing 3010A/B/R units and all 1776 receivers operate with the integrated sweep transmitter when in the normal sweep mode. The fast mode operates with newer versions of the 3010B/R (Firmware version 4.0 and later).

Dual Path Capability (Option 052)

The dual path capability in the 3010H provides both forward sweep transmit and return path monitor. In dual path mode, a forward sweep is inserted into the return path monitor sequence prior to each new poll. Refer to "Forward Sweep Transmit Capability (Option 050 or Option 052)" for details.

Front Panel Feature Overview

1. **Display lens**: replaceable clear scratch resistant plastic.
2. **LCD display screen**: compact Super Twist 240 x 64 dot matrix.
3. **Softkey menu**: describes the function of the softkeys.
4. **Message line**: top line of screen is used for messages.
5. ▲ ▶ ▼ ◀ keys: used to scroll through menus and move markers.
6. **Carrying handles**: for easy grip.
7. **Enter**: used to save changes made with softkeys.
8. **Pwr On** and **Pwr Off**: turns the meter On and Off.
9. **Hardkeys**: **Shift**, **Menu**, **Scale**, **Option**, **Print/Save**, and **Light**. These keys activate the appropriate action menu, or turn on the screen backlight for working in darkened areas. **Menu** will always return you to the Main menu.
10. **Softkeys**: **F1**, **F2**, **F3**, and **F4**. These activate the corresponding function or subset menus displayed directly above them on the display.
11. **Serial interface port**.
12. **Parallel printer port**.
13. **Speaker**.

Rear Panel Overview

1. Input connector.
2. Output connector.
3. Serial number tag.
4. Power switch/Line module.

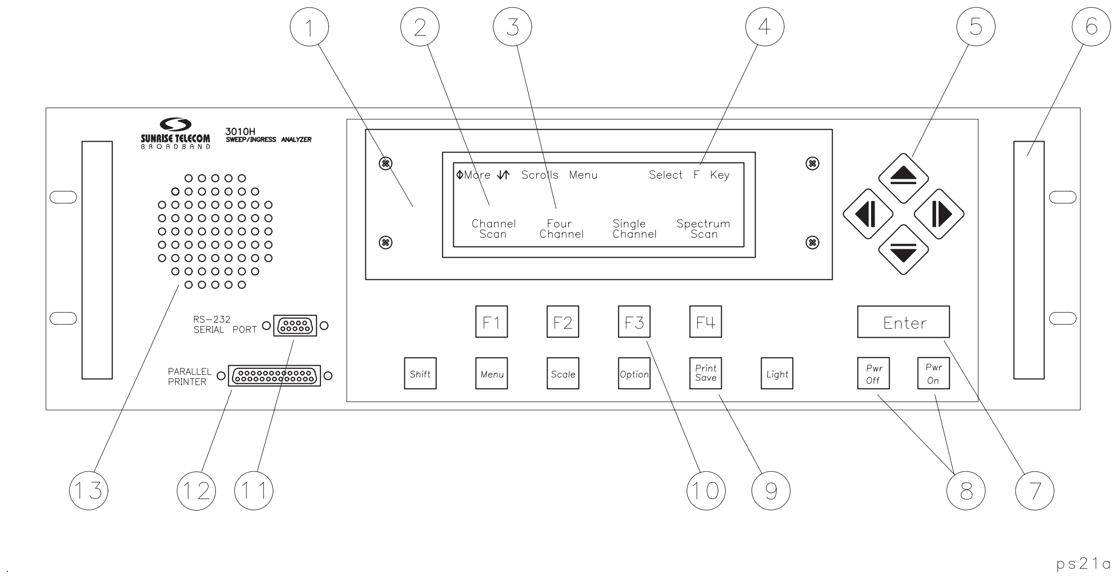

Figure 1-1 Front Panel Overview

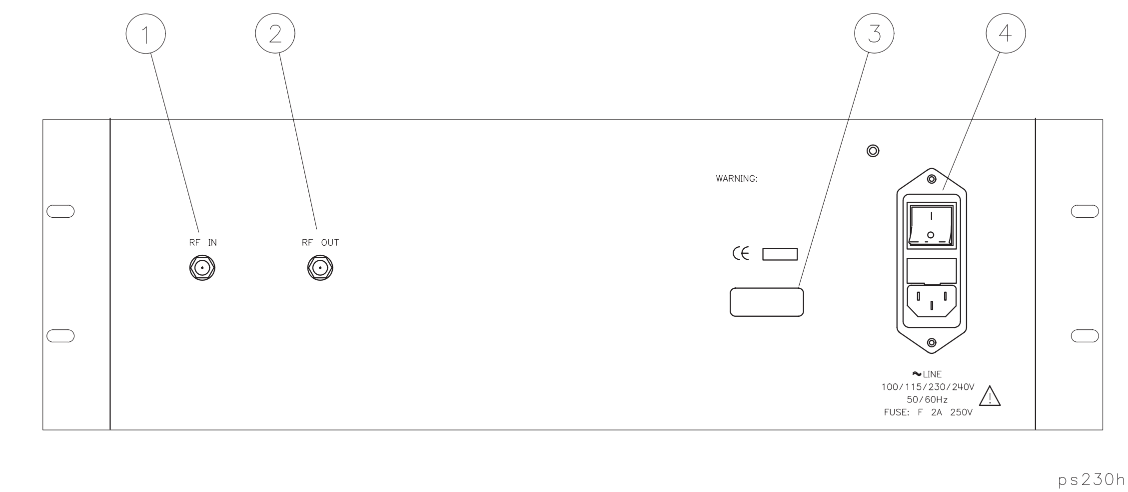

Figure 1-2 Rear Panel Overview

Menu Maps

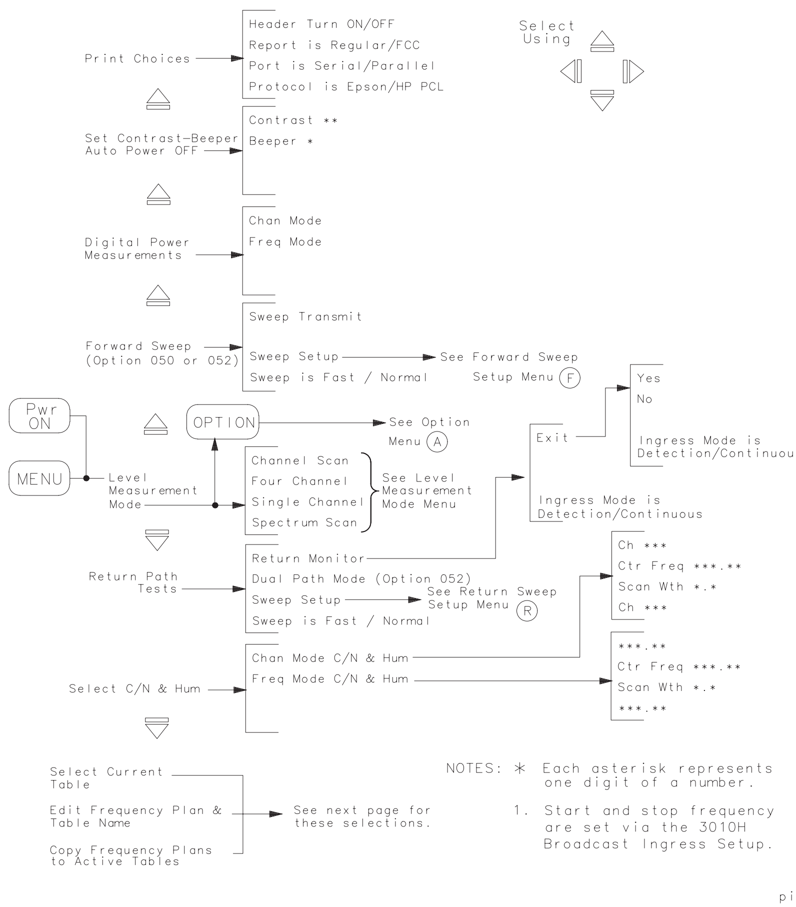

Figure 1-3 Main Menu

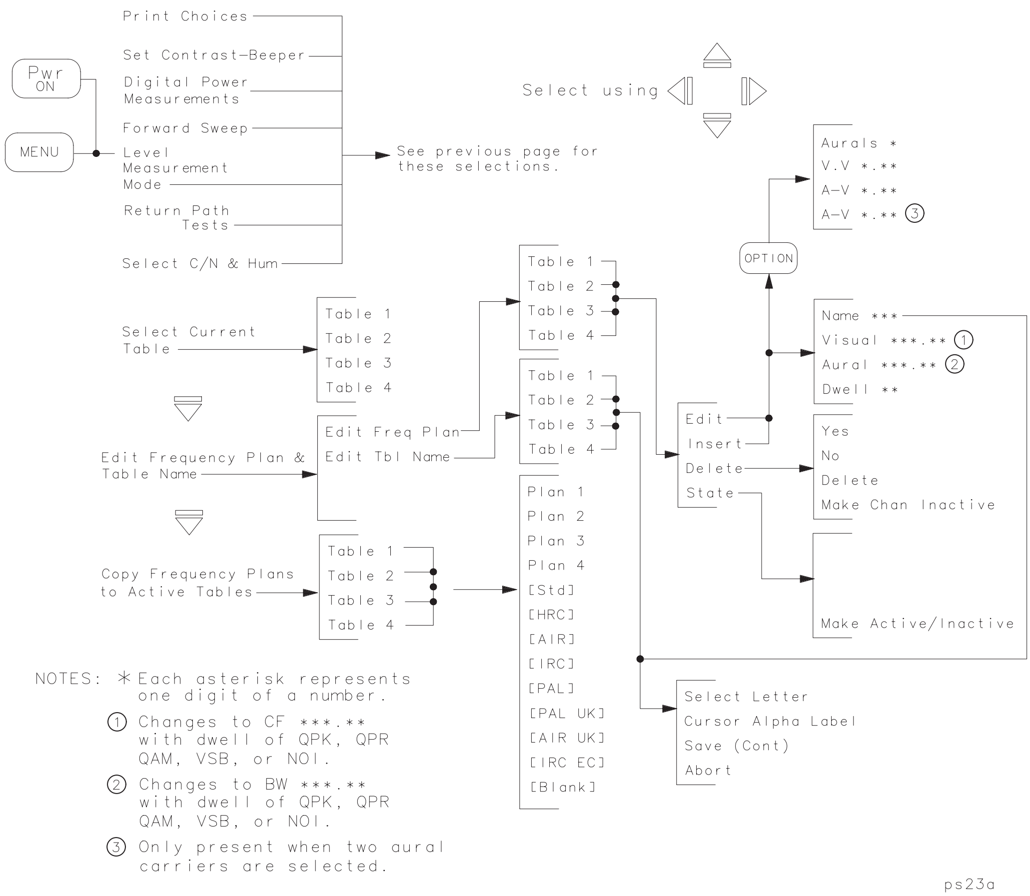

Figure 1-4 Main Menu

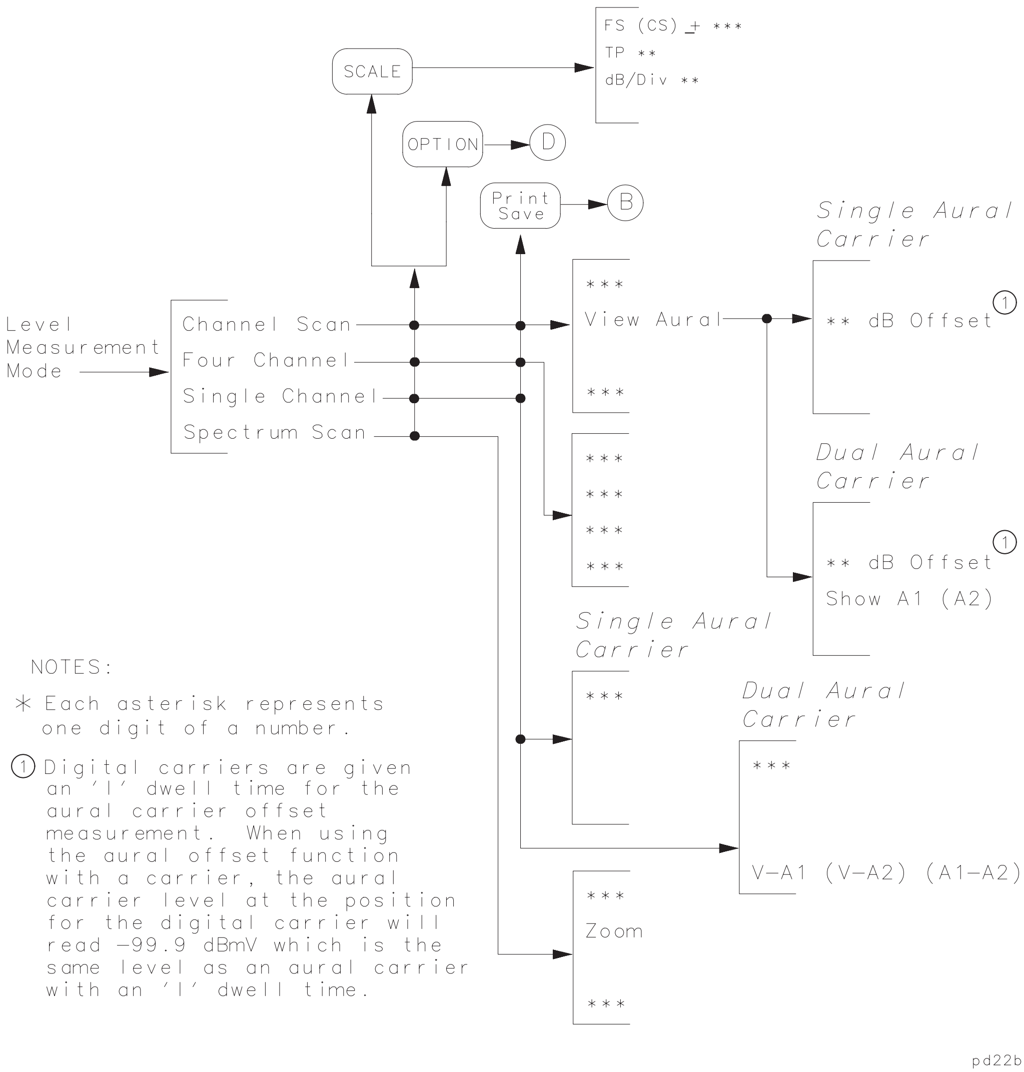

Figure 1-5 Level Measurement Mode Menu

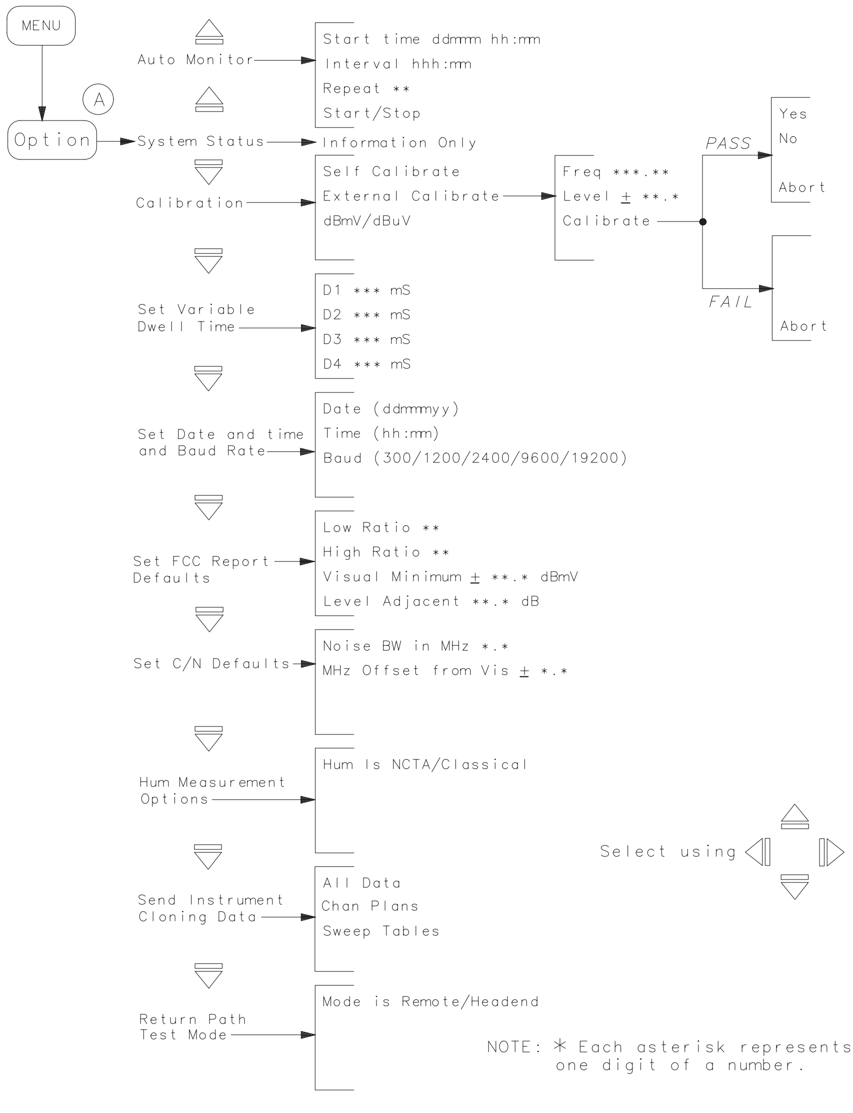

Figure 1-6 Main Options Menu

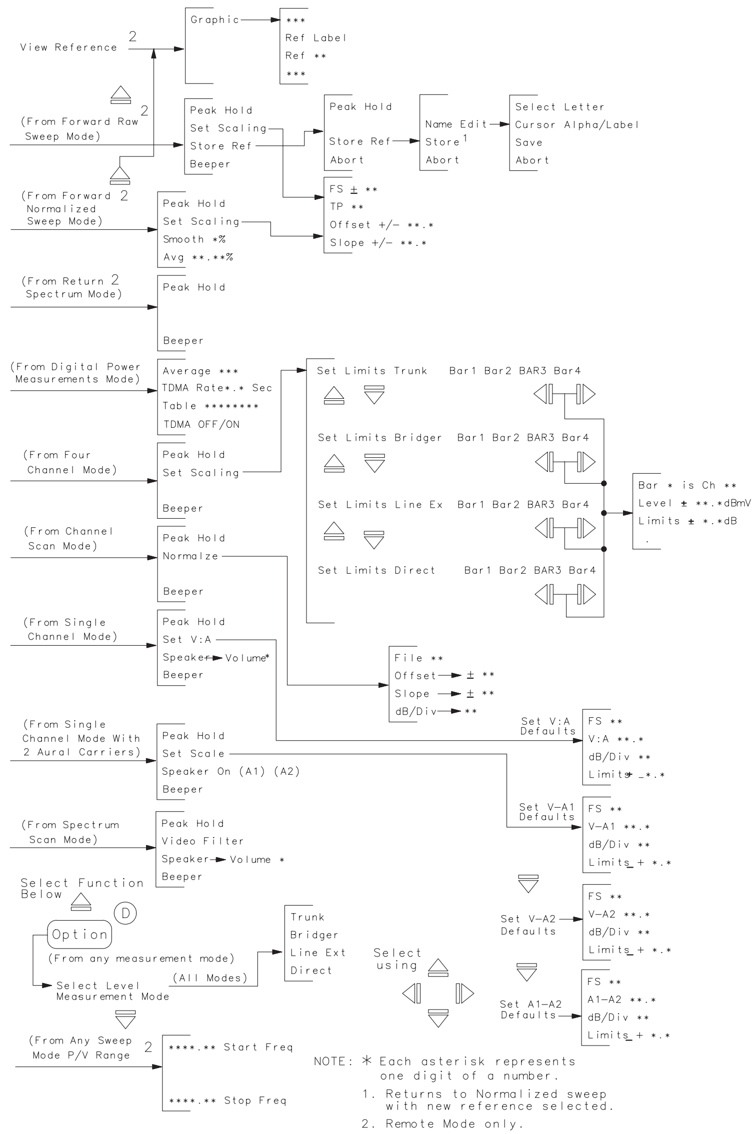

Figure 1-7 Measurement Options Menu

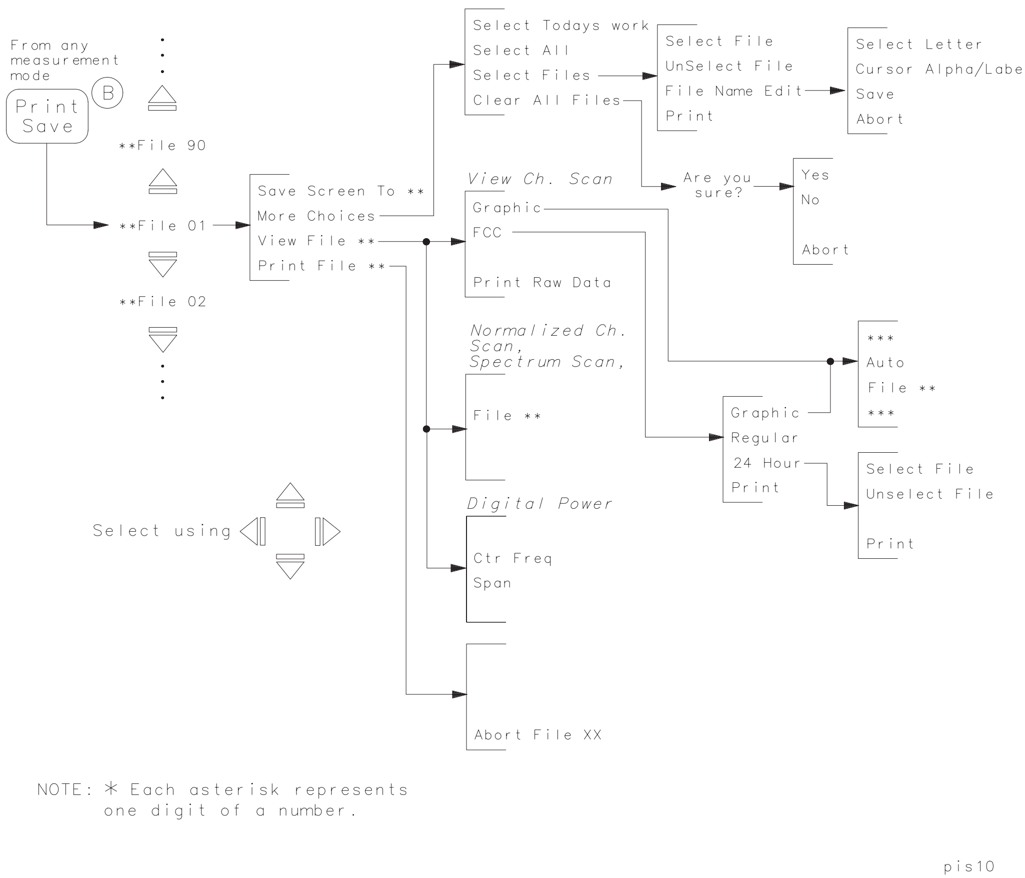

Figure 1-8   Print, Save and Scaling Menu

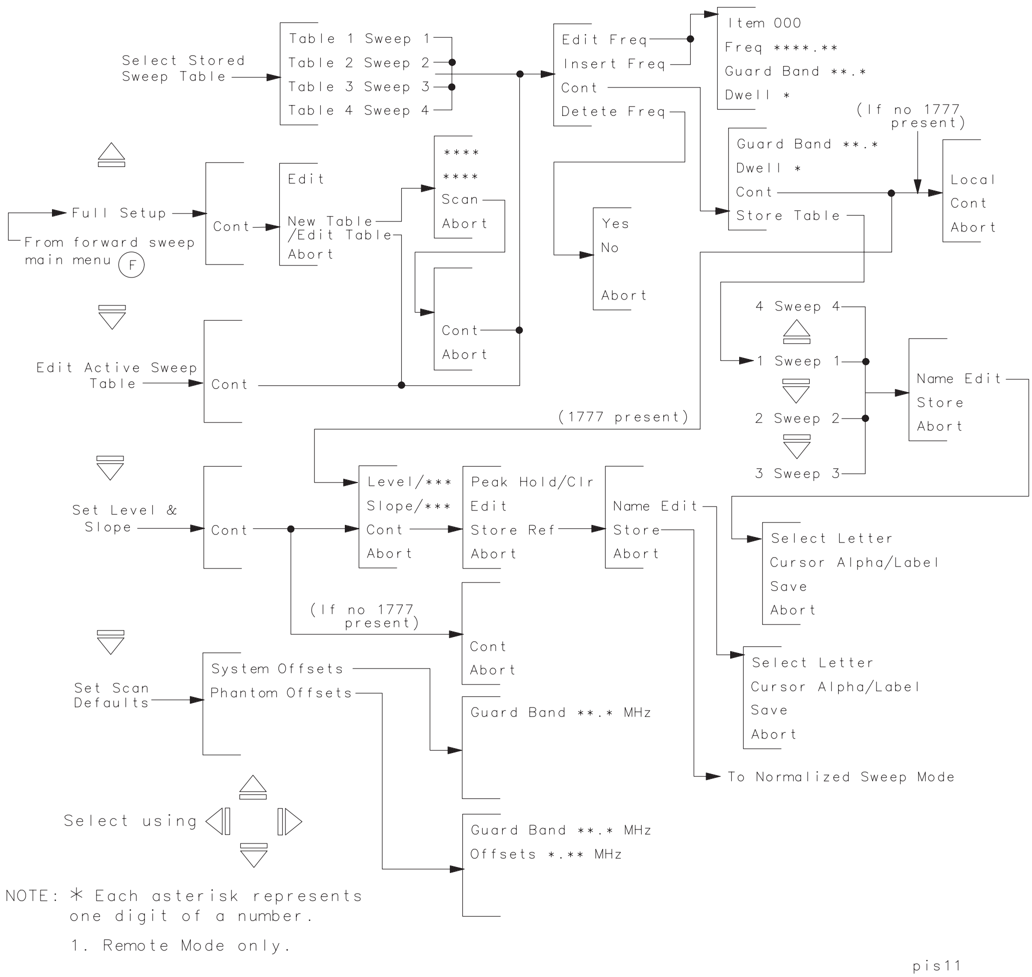

Figure 1-9 Forward Sweep Menu

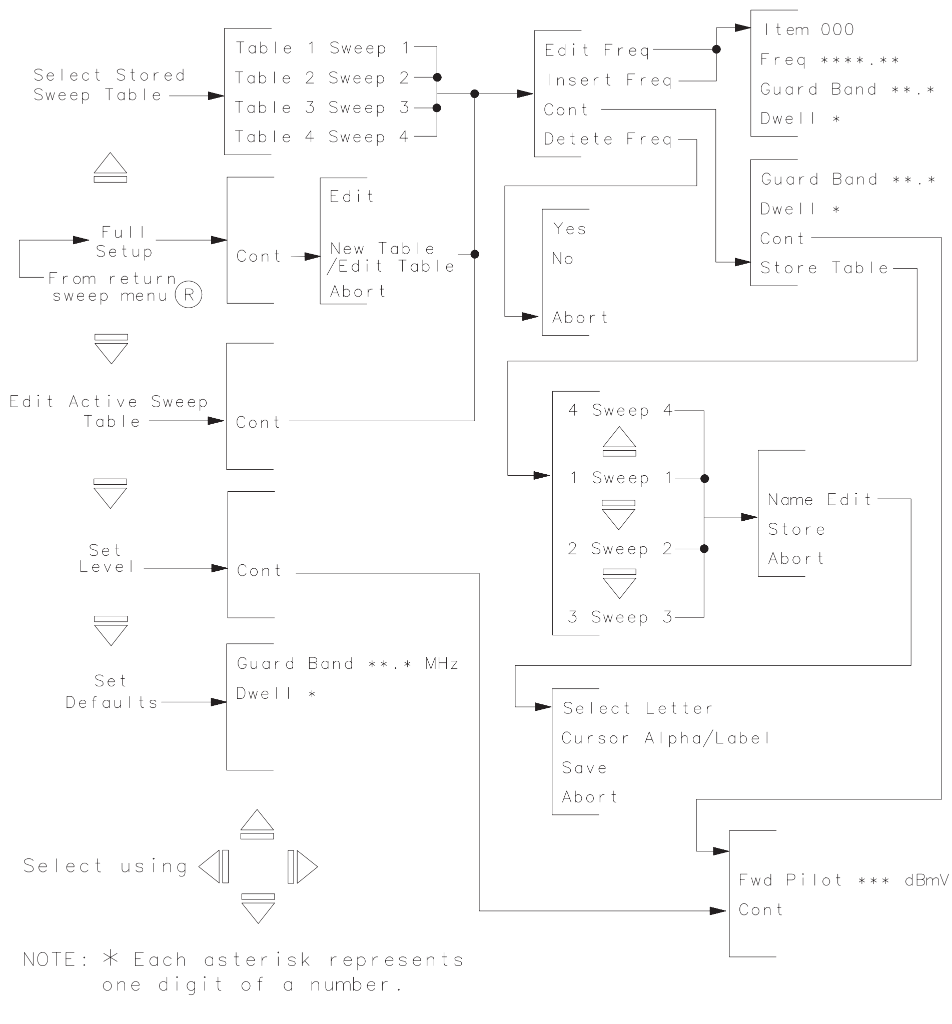

Figure 1-10 Return Sweep Menu

General Operation

The 3010H has two power switches. The switch on the rear panel 4, Figure 1-2, controls the 110/220 volt power supply. The front panel On/Off switches 8 controls the measurement circuits. See Figure 1-1. Turn on both switches of the 3010H.

The startup screen appears showing the software version number in use and indicates that the internal calibration is being performed. When calibration is complete, the Main menu screen appears.

NOTE: The function explanations in this manual will start from the opening menu called Main menu screen.

Main Menu

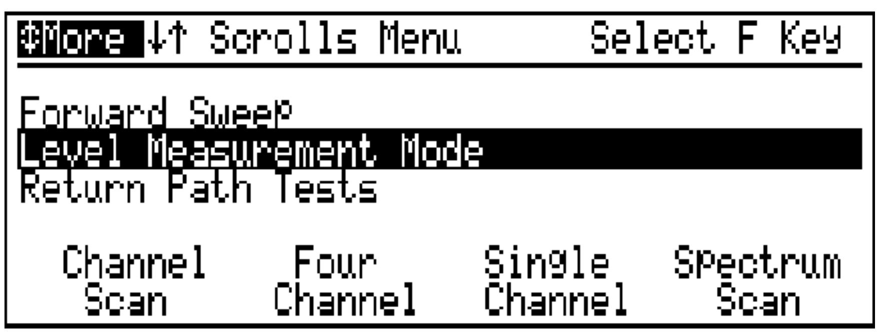

Figure 1-11 Main Menu

The Level Measurement mode displays four functions:

- Channel Scan
- Four Channel
- Single Channel
- Spectrum Scan

Any of these can be activated by pressing the appropriate **F1** through **F4** key. Press **Menu** to exit an option and return to the Main menu.

The channel scan, four channel, and single channel measurements are dependent on the selected channel plan. Chapter 2 explains selecting, copying, creating, and editing channel plans.

Menu Key

Pressing the **Menu** key will always return you to the Main menu.

Arrow Keys

▲ ▼ allow you to scroll through the menu providing additional functions and menu selections. ◀ ▶ allow you to select values and move the markers.

Option

Pressing the **Option** key from the Main menu displays the system status screen.

Use ▲ ▼ to scroll to additional option menu items. The **Option** key is used to access other menus in the Level Measurement mode.

Enter

When using **F1** through **F4**, pressing **Enter** will save any changes and take you back one screen.

Print/Save

Pressing **Shift**, then **Print/Save** gives you an instant hard copy of any screen at any time. Pressing **Print/Save** from any of the Measurement modes allows the user to store and recall a file in the file server.

Light

Pressing **Light** toggles the display backlight on and off.

Turning the Unit On

The 3010H has two power switches. The switch on the rear panel ④ (Figure 1-2) controls the 110/220 volt power supply. The front panel On/Off switch, which is controlled by the **Pwr On** and the **Pwr Off** keys, activates the measurement circuits. Turn on both switches of the 3010H.

Sleep Mode Operation

After the auto monitor is started, the unit will turn off and go to sleep. During this time the 3010 can be turned on by using the power on switch. When turned on, the 3010 will display **WARNING-AUTO MONITOR RUNNING** for about 12 seconds. By pressing the **Enter** key, the 3010 can be used to make measurements without waiting 12 seconds.

NOTE: Do not use the meter for measurements when the Auto Monitor function in activated.

If you change Measurement mode parameters or enter the file server and change the selected file, one of two things will occur: first, you may not have the correct data, or second, you will overwrite the selected file when the next auto measurement is taken.

Beeper Volume

The beeper volume is controlled from the same menu screen as the contrast control. To adjust the beeper volume, from the Main menu, press ▲ (3 times) then press **F2**.

Use the ▲ ▼ keys to set the value between 1 and 6. Press **Enter** to save the changes.

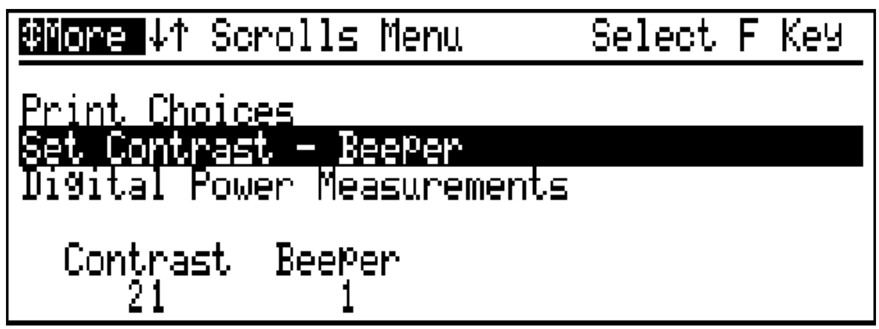

Figure 1-12 Beeper Volume

To turn off the beeper, from one of the measurement screens, press **Option** ▲ then **F4**. Please note that the beeper control is not available in the Normalized Sweep mode.

Contrast Control

The contrast on the display can be varied by adjusting the contrast control.

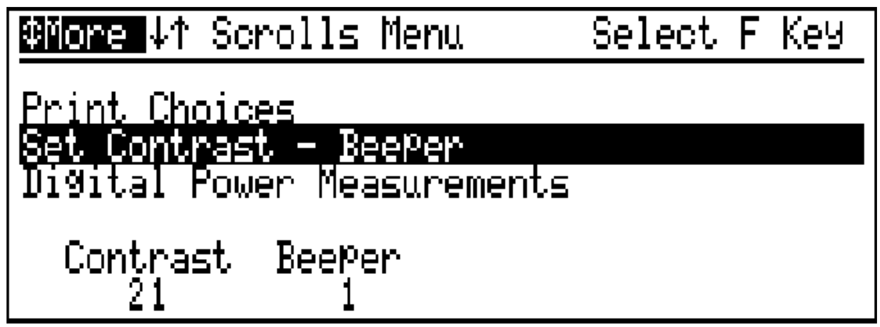

Figure 1-13 Contrast Control

To adjust the contrast, from the Main menu press ▲ (3 times) then press **F1**. Use ▲ ▼ to set the value. Press **Enter** to save the changes.

NOTE: Sometimes the contrast may change out of the viewable range due to extremes in temperature. To return the unit to operation, turn the unit on and wait for the calibration sequence to complete (approximately 30 seconds). Although you cannot see the screen, you will be in the Main menu.

Press ▲ 3 times and then press **F1** to activate the contrast control.

Press and hold the ▲ or ▼ until the menu is visible. If the beeper is turned on, you will hear the 3010 stepping through the settings. Press **Enter** and the unit will remember the new contrast setting for this temperature.

Contrast Control

2

Channel Plans

Channel Plans

The 3010H uses two tables during operation, the frequency plan table and the return sweep table. The frequency plan table lists the visual and aural frequencies for each channel. Each frequency has a dwell time associated with it. The dwell tells the 3010H how to measure the carrier. The frequency table is used in the Single Channel, Four Channel, and Channel Scan table. The return sweep table is a list of frequencies, guard bands, and dwell times used by the 3010H and the 3010R to create the return sweep display. The function of the dwell time in the sweep table is the same as in the frequency table. The guard band is used to protect the spectrum around the frequency from sweep energy.

Programming the 3010

There are nine frequency plans preprogrammed in the 3010. The nine frequency plans are:

- Standard NTSC plan (STD)
- Harmonic Related Carrier plan (HRC)
- NTSC off air plan (AIR)
- IRC plan (IRC)
- PAL plan (PAL)
- PAL-United Kingdom (PAL UK)
- Off Air plan for Europe (AIR UK)
- PAL IRC plan (IRC EC)
- A blank table

A listing of these plans can be found in Chapter 14.

The 3010 has four files available for active frequency plans. Any of the preprogrammed frequency plans can be copied into one of the four files and customized to meet the needs of the system under test (user definable).

This section will show you how to identify, select, code, and customize a frequency plan for your system.

System Status Screen

Quick Reference

Checking System Status
Menu
Option

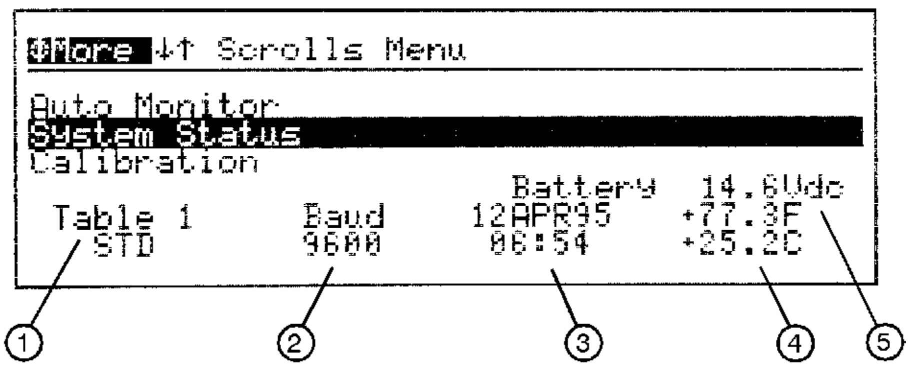

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Figure 2-1 System Status Screen

The system status screen tells you which plan is selected 1, the RS-232 baud rate 2, time and date 3, ambient temperature 4, and the battery voltage 5.

In the USA, the 3010 is shipped with a Standard NTSC plan programmed and selected in Table 1 in your unit as shown in Figure 2-1.

Selecting a Frequency Plan

To select a different plan, press **Menu** and then ▼ (4 times) to select current table. The four programmed table files are shown at the bottom of the screen with the active table highlighted.

Quick Reference

Selecting a Frequency Plan
Menu
▼ ▼ ▼ ▼
F1 F2 F3 or **F4**
Enter

Starting from the Main menu, press ▼ (4 times).

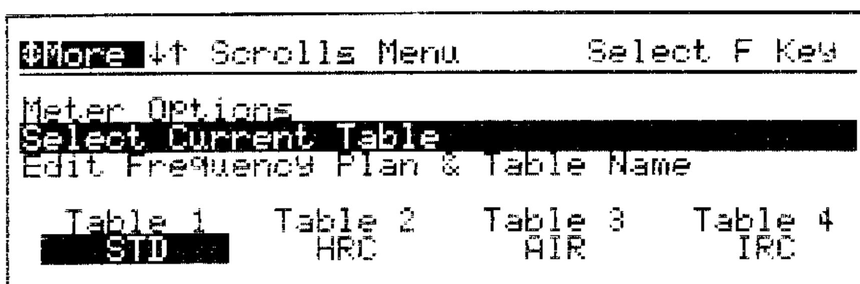

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Figure 2-2 Select New Table Screen

For example, to select Table 1, press **F1**. This action will highlight the label over **F1**. Press the **Enter** key to save the selection and exit to the Main menu. Table 1 has been selected and is ready to make measurements.

Copying a Frequency Plan

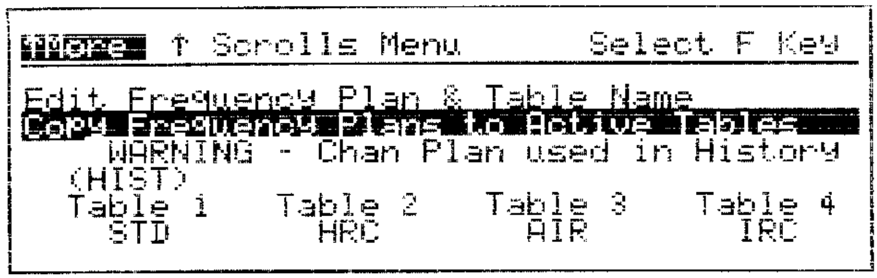
Quick Reference

Copying a frequency plan
Menu
▼ ▼ ▼ ▼ ▼ ▼
F1 F2 F3 or **F4**
Select plan using arrow keys
Enter

The 3010 has nine preprogrammed and four user-definable frequency plans stored in RAM. See Figure 2-4. The frequency plans shown in brackets are the preprogrammed plans and cannot be changed. The four user-programmable frequency plans on the left of the display are the changeable plans. Preprogrammed plans can be copied to any of the four active plans and then edited. The Copy function allows the user to duplicate any existing frequency plan into an active table. To copy a frequency plan to a table, from the Main menu, ▼ (6 times). Select one of the four tables where the frequency plan will be replaced by pressing the softkey under it. See Figure 2-3.

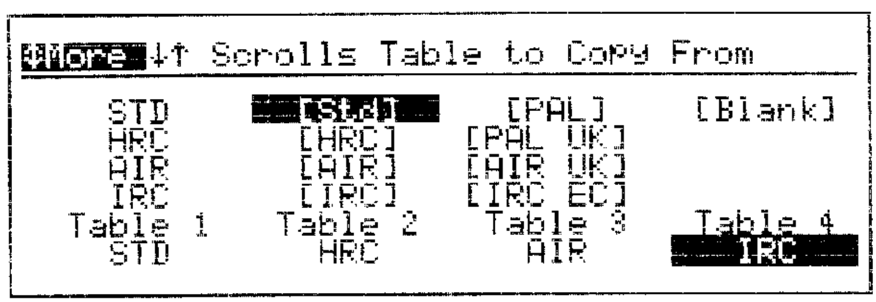
CAUTION: Whatever table is currently resident will be erased. The name of the file will remain the same.

NOTE: Level measurements stored in the file server are linked to the active table selected at the time the measurements were stored. It is important to remember that if a channel is deleted, added, or the state changed, stored data may be lost. Files with data stored against them are indicated with the warning message (HIST).



pi7120

Figure 2-3 Copy Frequency Plan Screen



pi7121

Figure 2-4 Frequency Selection Screen

For example, to copy a standard frequency plan to Table 4, press **F4**. The available frequency plan labels are listed on the screen and the selected table is highlighted at the bottom of the display. Use the arrow keys to highlight the frequency plan you would like to copy. See Figure 2-4. Press **Enter** to copy and select the file. The 3010 will copy the table and exit to the Copy Frequency Plan screen with the new table selected. Press **Menu** to return to the Main menu.

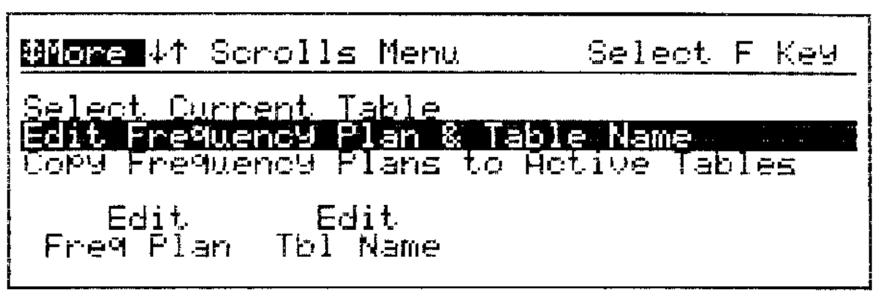
NOTE: The table name did not change, however, the table has been updated to the new plan. To change the table name, please continue.

Naming a Table or Frequency Plan

Quick Reference

Naming a table or frequency plan
Menu
▼ ▼ ▼ ▼ ▼
F2
Select the table to edit
Follow labeling instructions on next page

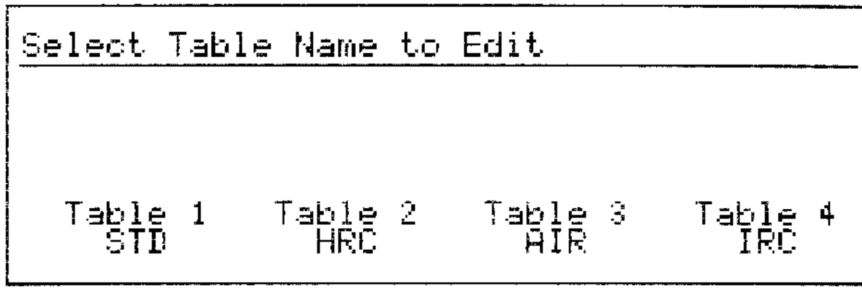
The 3010 table names are defined by the user. To change the name of a table, from the Main menu, press ▼ (5 times) to highlight the Edit Frequency Plan & Table Name function.



pi717

Figure 2-5 Edit Frequency Plan & Table Name Screen

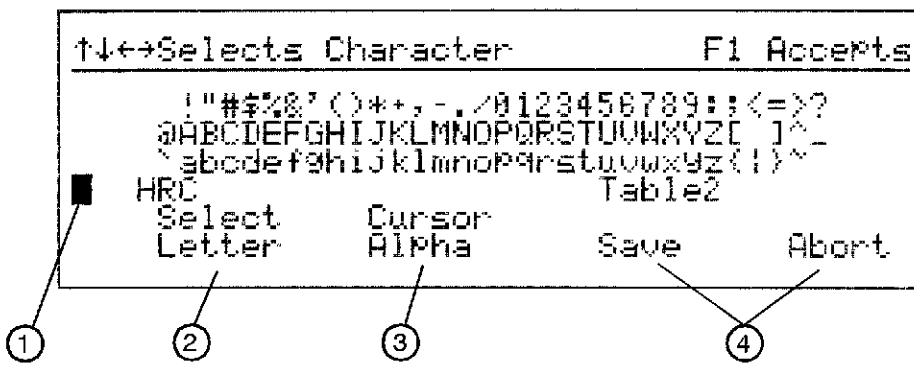
Press **F2** to edit the table name.



pi718

Figure 2-6 Table Selection Screen

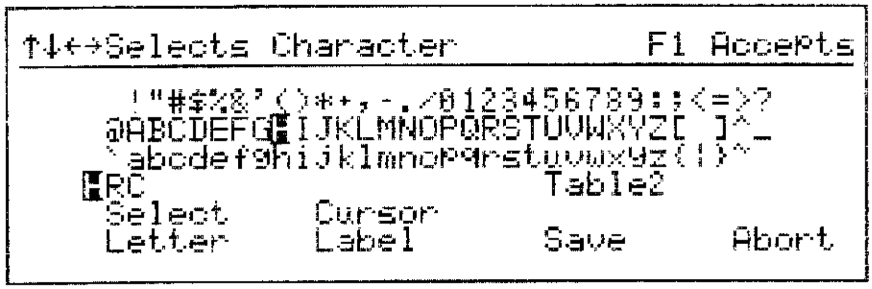
Press the appropriate softkey to select the table to change. For this example press **F2**.



pi719

Figure 2-7 Example of Character Screen

Figure 2-7 shows the character label screen for the 3010. Notice the cursor 1 is to the far left of the current name of the table to be changed. To move the cursor to the character selection area, press the **F2** 3 key.



pi720

Figure 2-8 Naming a Table or Frequency Plan

The cursor is now located on the character selection area of the display. Using the arrow keys, place the cursor on the first letter for your new name.

Press **F1** to select the character and move it to the name area. The cursor in the name area will move to the next position. Using the arrow keys, select the next character. Continue this procedure until the name is complete.

The table name can be 10 characters in length. File names in the file server can be 40 characters in length. A space can be entered by selecting the blank space in the character list using the arrow keys. Press **F1** to select the blank. **F2** toggles the cursor control between the Cursor Alpha 3 and the Cursor Label. See Figure 2-7 and Figure 2-8.

Press **F3** to save the new name, or press **F4** to abort the changes, and exit the character screen 4. You can select another table name to edit or press **Enter** to exit to the Main menu.

You now have a basic frequency plan copied to an active table with a name that relates to the system under test. Next, you will customize the table to meet the requirements of your system.

Editing a Table or Frequency Plan

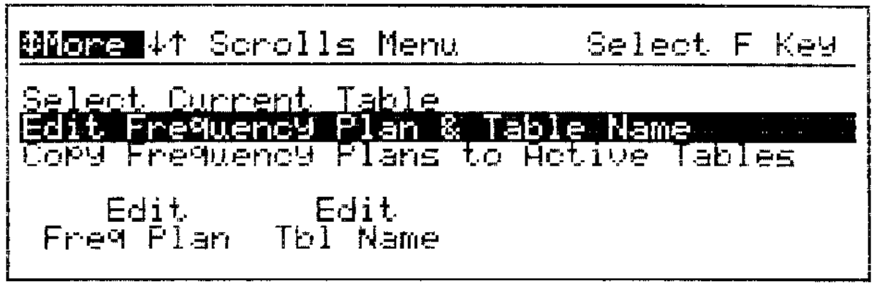
NOTE: Channel Scan measurements stored in the file server are linked to the active table selected at the time the measurements were stored. It is important to remember that if a channel is deleted, added, or the state changed, stored data may be lost. Files with data stored against them are indicated with the warning message (HIST).

Editing a Table

Quick Reference

Editing a table
Menu
⯯ ⯯ ⯯ ⯯ ⯯
F1
Select the table to edit
Follow the editing instructions

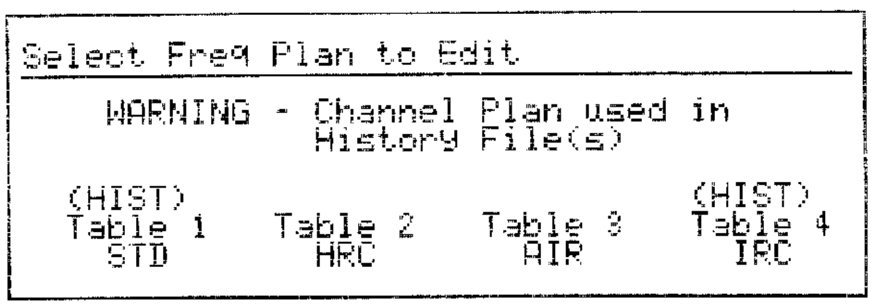
The Table Edit function is selected from **`Edit Frequency Plan & Table Name`** from the Main menu. If you exited the Table Name function by pressing the Enter key, you will see the Edit Frequency Plan & Table Name function highlighted on the display. If not, press **Menu** ⯯ (5 times).



pi717

Figure 2-9 Edit Frequency Plan Screen

To edit a frequency plan, press **F1**.

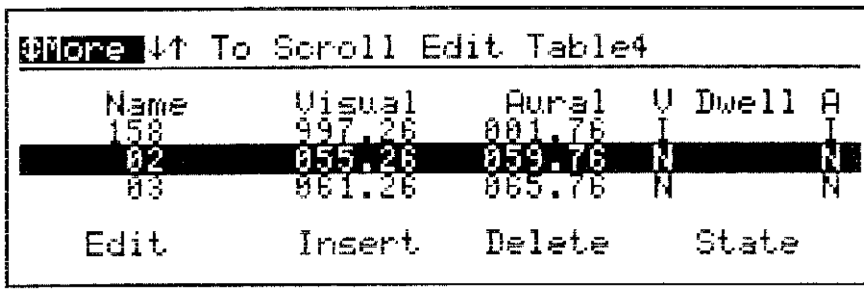


pi7122

Figure 2-10 Table Selection Screen

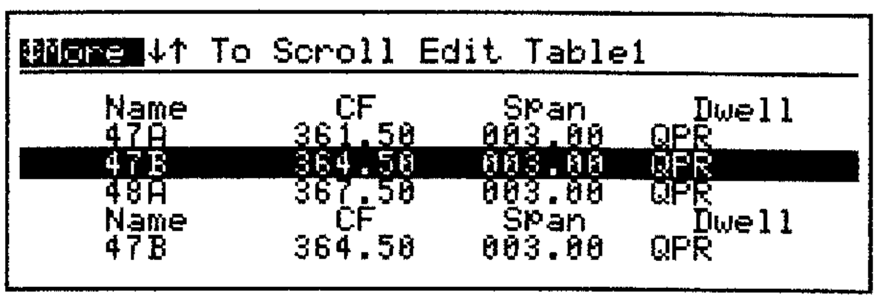
Press **F1, F2, F3** or **F4** to select the table to edit. For example, press **F4** to select Table 4.

NOTE: Level measurements stored in the file server are linked to the active table selected at the time the measurements were stored. It is important to remember that if a channel is deleted, added, or the state changed, stored data may be lost. Files with data stored against them are indicated with the warning message (HIST).



pi733

Figure 2-11 Components of the Frequency Plan



pd222b

Figure 2-12 Channel Plan With Digital Channel

Displayed on the screen are three of the channels in the table.

The following is a list of the components of the table:.

Label	Description
Name	The three-character channel name.
Visual/CF	The frequency of the visual carrier or center frequency for a digital channel.
Aural/Span	The frequency of the aural carrier or span for a digital channel
Dwell (V)	The visual dwell time is the amount of time the 3010 will look for the peak level of the visual carrier or it selects a digital carrier modulation. The actual dwell time is discussed later in this chapter.
Dwell (A)	The aural dwell time is the amount of time the 3010 will look for the peak level of the aural carrier. This is not available when a digital carrier is selected.

The 3010 is compatible with frequency plans containing dual aural carriers. If the Dual Aural function is turned on, the screen will show two aural frequencies and two aural dwell times. For instructions about dual aural carrier operation, refer to the “Setting the Dual Aural Carrier Frequencies” section in Chapter 12.

Some Facts About the Frequency Table

The STD table contains 165 channels, therefore, before inserting a new channel, edit one of the inactive channels already in the table.

If the visual frequency of a channel is edited, the position of that channel may change in the table as frequencies are sorted by the visual frequency.

Note the **`State`** over the **`F4`** key of the frequency table screen. The state of a channel is whether or not it is currently on the cable system (active vs. inactive). The state is indicated by the dwell time of the channel. An inactive channel will have a dwell time of **`I`**. See Figure 2-11. During all of the measurement and save functions, the 3010 will measure every active channel on the system. In the case of the Channel Scan mode, if the 3010 has a channel set to active in the middle of the channel plan (between active channels) and it is not on the system, the 3010 will display a channel discontinuity ① at that channel. See Figure 2-13.

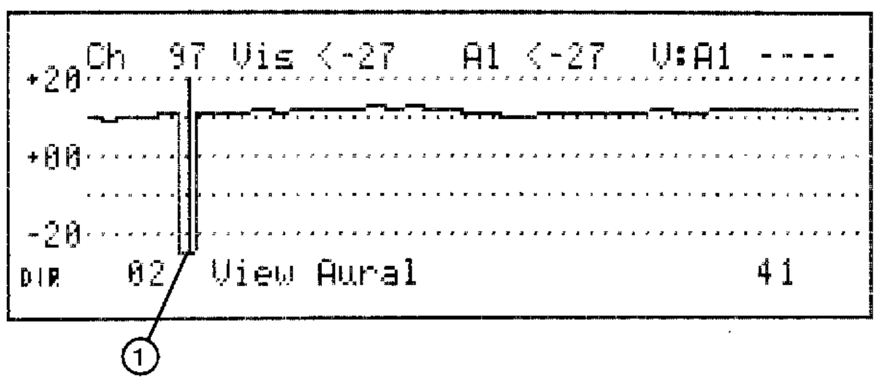
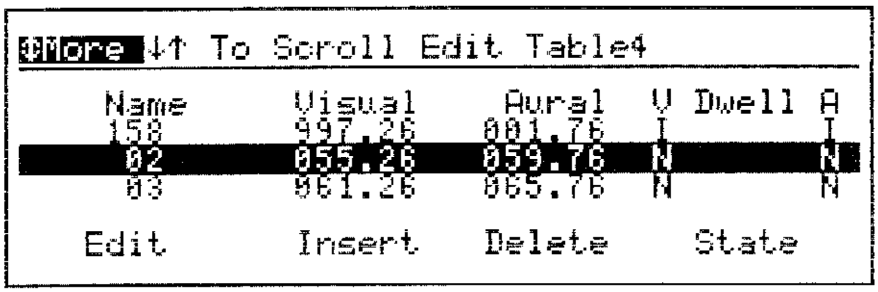


Figure 2-13 Channel Scan Screen

The state of a channel will also affect the FCC Performance Test function. The measurement of a channel not on the system would cause the FCC performance test to indicate a failure. The overall peak-to-valley specification is based on the frequency of the highest active channel in the frequency table.

Changing the State of a Channel

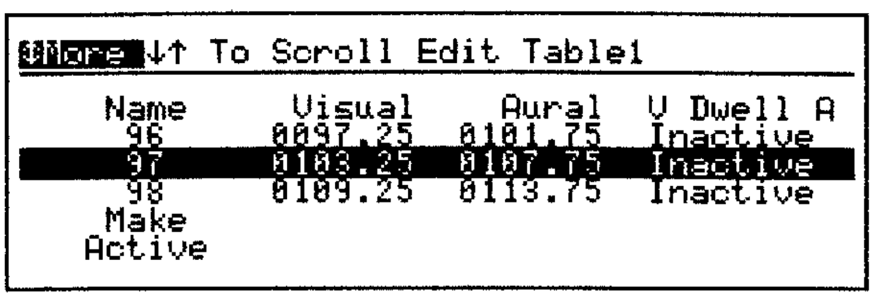
The state of a channel determines whether or not the 3010 will measure the channel.



pi733

Figure 2-14 Frequency Plan Components

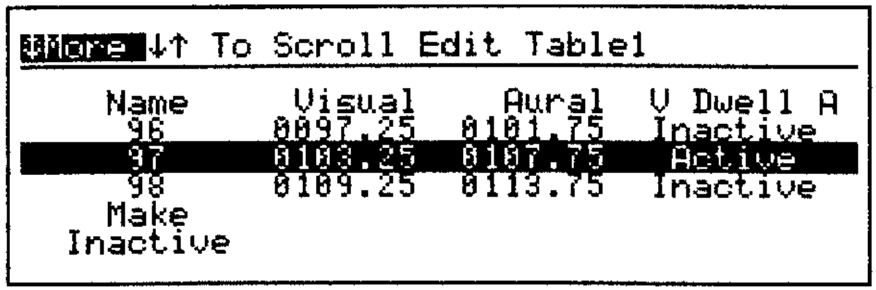
To edit the state of a channel, press **F4**. See Figure 2-14.



pd239b

Figure 2-15 Change of State Screen with Channel Inactive

The screen will display the channel with the current state. Use the ⏶ ⏷ keys to highlight the channel to be changed and press **F1** to change the state of the channel.



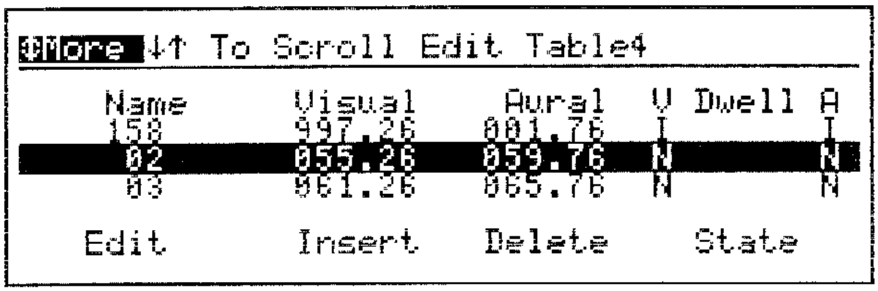
pd237b

Figure 2-16 Change of State Screen with Channel Active

The channel is now set to active. Press **F1** again. The channel will change back to inactive. By using the arrow keys, edit the state of all channels in the table to match your system. Press **Enter** to save the changes and return to the frequency table screen.

NOTE: The Dwell time of the channel indicates whether the channel is active or inactive. If the dwell time is **I**, the channel is inactive. Other dwell times indicate the length of time the 3010 will measure the peak level of the frequency or the type of channel.

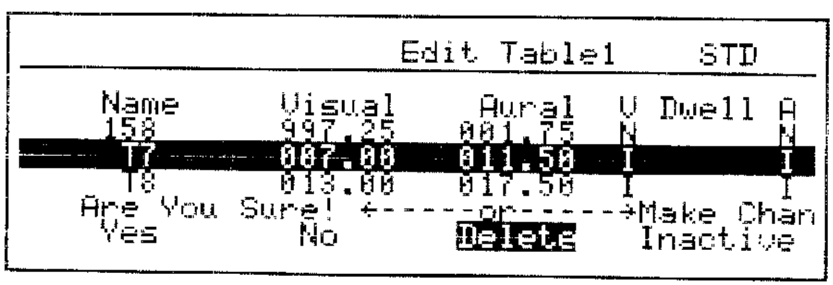
Deleting Channels from the Table



pi733

Figure 2-17 Components of the Frequency Plan

To delete a channel from the Table/Frequency plan, use the ▲ ▼ keys to highlight the channel to be deleted and press **F3**.



pi738

Figure 2-18 Channel Deletion Screen

The delete options are: to abort the action, vary the state of the channel or proceed with the deletion. To proceed with the deletion, press **F1**; to abort the action, press **F2**; to change the state, press **F4**. See Figure 2-18.

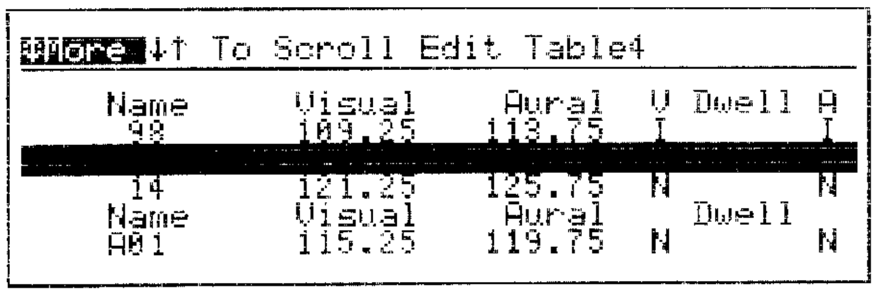
Inserting Channels into the Table

Quick Reference

Inserting a new channel
Menu
▼ ▼ ▼ ▼ ▼
F1
Select table to edit
F2
F1
Edit channel name
F3
F2
Edit visual carrier
Enter
Check aural carrier
Enter
Set visual dwell time
Enter
Set aural dwell time
Enter

NOTE: The frequency tables in the 3010 can contain a maximum of 165 channels. Many times it is better to edit an existing table entry instead of inserting a new channel.

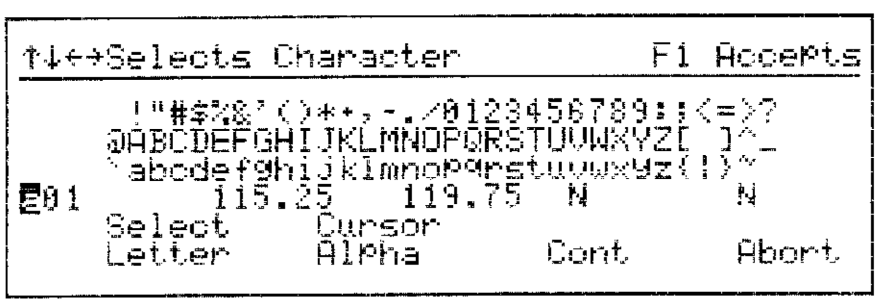
To insert a channel, press **F2**. See Figure 2-17.



pi7123

Figure 2-19 Channel Insertion Screen

The table displays a blank channel with the channel name assigned above the function key. The default channel name assigned is A01. To change the channel name, press **F1**. See Figure 2-20.

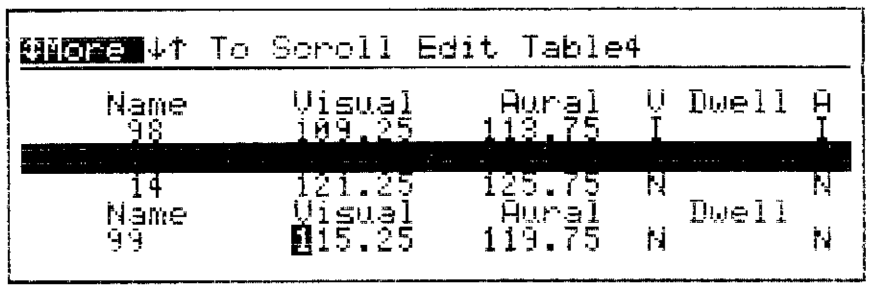


pi7124

Figure 2-20 Character Screen

The character screen is activated. Channel names can be up to three characters. Refer to the “Naming a Table or Frequency Plan” section in this chapter for information regarding entering names. After the new name has been entered, press **F3**.

The channel has the new name. The next operation is to enter the visual frequency for the new channel. Press **F2** to change the visual frequency.

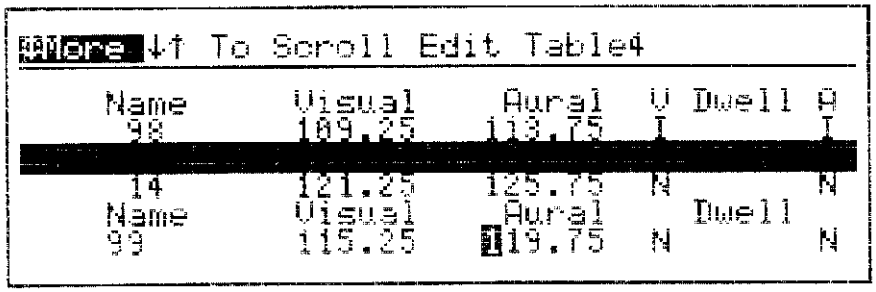


pi7204

Figure 2-21 Table Insertion Screen - Visual Frequency Edit

The cursor is now at the 100 MHz position of the visual frequency field. Use the ▲ ▼ keys to set the number for that position. Use the ◀ ▶ keys to select the position within the visual frequency field. Again, use the ▲ ▼ to select the number in the 10’s position of the visual frequency field. Repeat the preceding steps for the other positions.

Press **Enter** to save the changes.



pi7126

Figure 2-22 Table Insertion Screen - Aural Frequency Edit

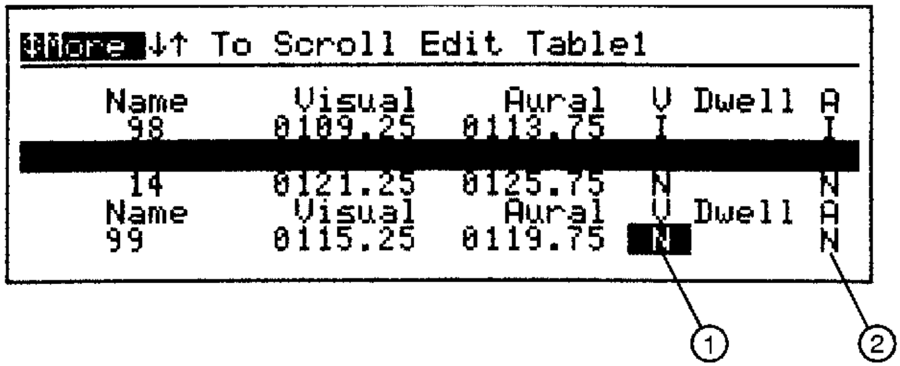
When the frequency of the visual carrier is changed, the aural frequency automatically changes by the visual to aural spread default. For an NTSC channel, the default spread is 4.5 MHz. The 3010 has the ability to measure dual aural carriers. For information on selecting the Dual Aural Carrier function and programming the spread defaults, please refer to the “Setting the Dual Aural Carrier Frequencies” section in Chapter 12 of this manual. The aural frequency can be edited using the same method described for the visual carrier. Refer to the edit instructions for the visual carrier. Press **Enter** to save changes.

The new aural frequency is now accepted and the cursor is on the dwell for the visual carrier. The following dwell selections are available:

Dwell	Description
N	Normal dwell time is 100 µs to use on a standard cable channel.
S	Scrambled dwell time is 24 ms, to use on a horizontal sync-suppressed scrambled channel.
I	Indicates inactive channel. (No measurement will be made.)
D1-D4	Programmable dwell times from 1 ms to 999 ms.
QPK	Digital carrier using QPSK (Quadrature Phase Shift Keyed modulation).
QPR	Digital carrier using QPR (Quadrature Partial Response modulation); used for DMX signals (Digital Cable Radio).
QAM	Digital carrier using QAM (Quadrature Amplitude modulation).
VSB	Digital carrier using VSB (Vestigial Sideband modulation).
NOI	Integrated average noise power measurement.

NOTE: Digital measurements take time to make, therefore, if your system has a number of digital channels, you may want to make a separate table. This will minimize the impact on the channel scan measurements. For additional information regarding digital power measurements, refer to Chapter 4.

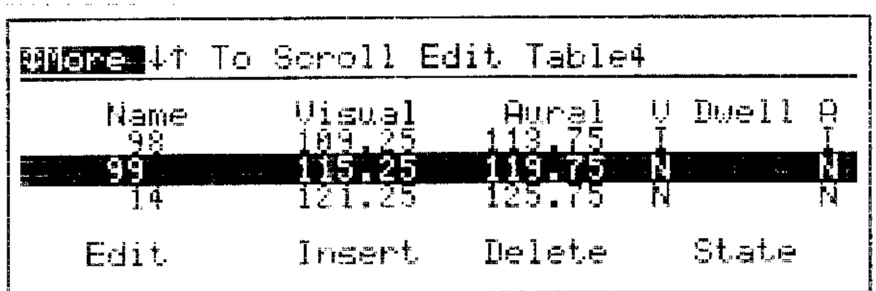
Refer to the "Programming Dwell Times" section of Chapter 12 for more information regarding setting dwell times. With the cursor on the visual dwell time ①, use the ▲ ▼ keys to select the correct dwell time. See Figure 2-23.



pd238b

Figure 2-23 Table Insertion Screen with Dwell Time Edit

Next, use the |▶ key to move the cursor to the aural dwell time ②. Select the dwell time for the aural frequency using the ▲ ▼ keys in the same manner used to select the visual dwell time. Press **Enter** to accept the entry and exit the Insert Channel function.



pi7128

Figure 2-24 Edit Frequency Plan Screen

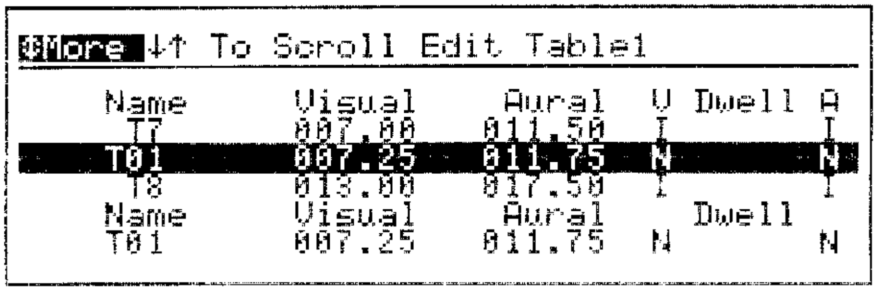
Notice the location of the new channel in the table. The table is sorted by the visual frequency. See Figure 2-24.

Editing Channels in the Table

Quick Reference

Editing a channel in the table
Menu
▼ ▼ ▼ ▼ ▼
F1
Select table
F1
F1
Edit name
F2
Edit visual frequency
F3
Check aural frequency
F4
Edit dwell time
Enter
Enter
Enter

To edit a channel in the table, select the channel using the ▲ ▼ keys and press **F1**.



pi744

Figure 2-25 Table Edit Screen

Figure 2-25 shows an example of a table edit screen. The selected channel is displayed in the highlighted bar and at the bottom of the screen.

To edit the channel name:

1. Press **F1**.
2. The character screen is selected with the cursor on the first character of the channel name. Refer to Figure 2-20.
3. Press **F3** to save the changes and return to the table edit screen.

To edit the visual frequency:

1. Press **F2**.
2. Select the position within the field using the ◀ ▶ keys.
3. Use the ▲ ▼ keys to select the digit.
4. Press **Enter** to save the changes.

To edit the aural frequency:

1. Press **F3**.
2. Select the position within the field using the ◀ ▶ keys.
3. Use the ▲ ▼ keys to select the digit.

4. Press **Enter** to save the changes.

To edit the dwell:

1. Press **F4**.

2. Use the ◀| |▶ keys to select the visual or aural dwell.

3. Use the ⏶ ⏷ keys to select the state.

4. Press **Enter** to save the changes.

Press **Enter** twice to exit the table edit screen and save changes.

Basic Measurements

Basic Measurements

Level Measurement Modes

The 3010 provides immediate access to the Level Measurement mode when powered on or when the **Menu** key is pressed. The Level Measurement modes are:

Mode	Description
Channel scan	The Channel Scan mode graphically displays the measured levels of the channels. By using the Normalized function in the Channel Scan mode, the 3010 will display the difference between the input signal and a reference.
Four channel	The Four Channel mode displays four user-definable channels at the same time. Target level limit lines can be displayed for each channel.
Single channel	The Single Channel mode displays the visual, aural and the visual-aural difference level. Rapid changes in levels are detected on the bar graph while accurate signal levels are viewed digitally at the top of the display.
Spectrum scan	The Spectrum Scan mode allows you to scan a span of frequencies with 25 kHz of resolution. FM carriers, digital carriers, and interfering beats can be measured in this mode. The Spectrum Scan mode is also used to set the full scale parameter for the Return Path measurement.

Some functions are used in every one of the measurement modes. In this chapter, we will first view the basic level measurement functions and then the functions specific to a mode of operation. Each time the 3010 is turned on, the unit will calibrate and go to the Main menu screen as shown in Figure 3-1. During the operation of the unit, to return to this screen at any time, press **Menu**.

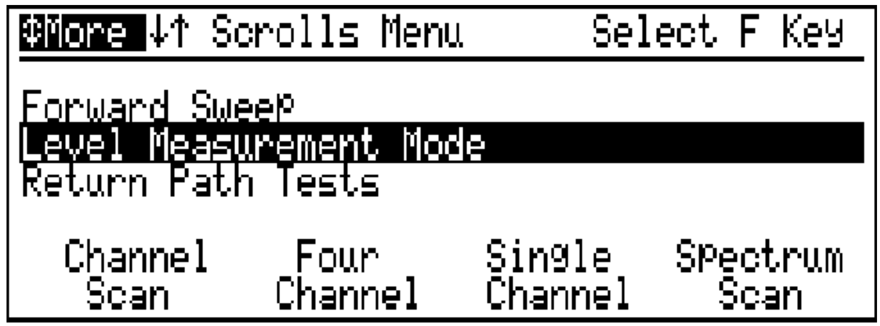


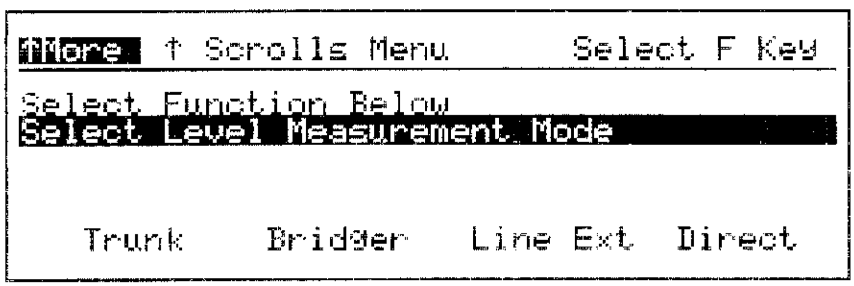
Figure 3-1 Main Menu

Options

The **Option** key gives you access to functions specific to the selected mode of operation. See Figure 3-2. For example, when you press the **Option** key from the Main menu, you view the status screen of the 3010. By using the arrow keys, you can access other operational and setup functions.

By pressing the **Option** key from one of the Level Measurement modes, you have access to functions specific to that mode of operation. The following explanations will address the functions that are similar in all of the operational modes.

If you press **Option** from any of the Measurement modes, you can select one of the four scaling options: trunk, bridger, line extender, and direct. See Figure 3-2.



pi7110

Figure 3-2 Measurement Mode Options Screen

The Scaling function allows you to select the scaling values for a particular system test point. For example, if your trunk levels are 32 dBmV with a 20 dB test point, bridger levels are 42 dBmV with a 20 dB test point, line extender levels are 45 dBmV with a 30 dB test point, and the levels at the customers set are 3 dBmV, you would set full scale at the following values:

- For the trunk: 35 dBmV with a 20 dB test point.
- For the bridger: 45 dBmV with a 20 dB test point.
- For the line extender: 50 dBmV with a 30 dB test point.
- For direct: 10 dBmV with 0 dB test point.

When checking the level of the trunk, bridger, line extender, and direct (such as customer service drop), you can select the scaling by pressing **Option** and the appropriate softkey.

Example of Scale Settings

Options	Scale Settings			
	For these Levels		Use these Settings	
	Levels	Test Point	Full Scale	Test Point
Trunk	32 dBmV	20 dB	35 dBmV	20 dB
Bridger	42 dBmV	20 dB	45 dBmV	20 dB
Line Extender	45 dBmV	30 dB	50 dBmV	30 dB
Direct	3 dBmV	0 dB	10 dBmV	0 dB

By pressing the ⏏ key to highlight the “Select Function Below” selection, a set of functions specific to the Measurement mode options is available. The specific options available for each measurement mode are listed in the following table.

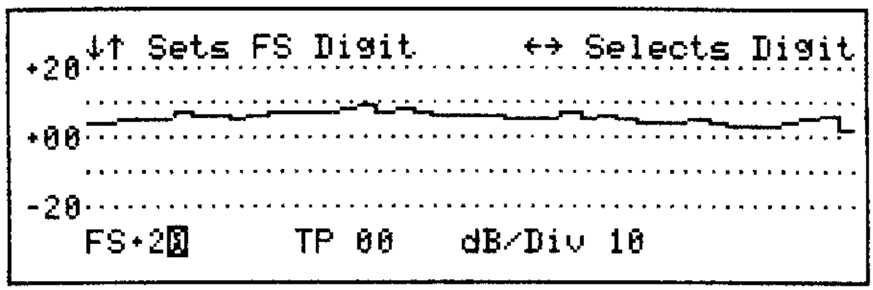
Options

Options Available	Channel Scan	Four Channel	Single Channel	Spectrum Scan
Peak Hold	✓	✓	✓	✓
Normalize	✓			
Set Scaling		✓		
Set V:A			✓	
Video Filter				✓
Speaker			✓	✓
Beeper	✓	✓	✓	✓

Explanations of these functions are described in the following pages as they apply to the particular measurement mode.

Scaling

From any of the Level Measurement modes, the user may press **Scale** and set full scale value, test point, and dB/Div. See Figure 3-3.



pd211b

Figure 3-3 Channel Scan Screen

To change the full scale value, press **F1**. Use ◀ ▶ to change the digit and ▲ ▼ to change the value.

To change the test point value, press **F2**. Use ◀ ▶ to change the digit and ▲ ▼ to change the value.

To change the dB/Div, press **F3**. Use ▲ ▼ to change the value.

Press **Enter** to save the entry and return to the measurement screen.

Preset Scaling Functions

The preset scaling of trunk, bridger, line extender, and direct are programmed by setting the scaling of a Level Measurement mode with that specific test point selected. The selected preset is shown in the bottom left (8) of the display. See Figure 3-4. By toggling between the four presets: trunk, bridger, line extender and direct, the number of key presses needed to reset the scaling values is reduced.

To select one of these functions, from any of the Measurement modes, press **Option**. Press **F1** to select **`Trunk`**, press **F2** to select **`Bridger`**, press **F3** to select **`Line Ext`**, and press **F4** to select **`Direct`**.

To set the values of the selected function, press **Scale** and set the values of the full scale, dB/DIV, and test point as described above. Press **Enter** to save the changes. See the “Four Channel Mode” section of this chapter for more information on programming scaling values specific to this mode.

Channel Scan Mode

The Channel Scan mode provides a view of all active carriers at one time. Figure 3-4 shows the channel number 1, visual level 2, aural level 3, visual to aural difference 4 at the marker. Figure 3-4 also shows the test point 5, stop channel 6, start channel 7, and Scaling mode 8. All carriers are displayed in graphical form with channel name and digital value displayed at the marker location.

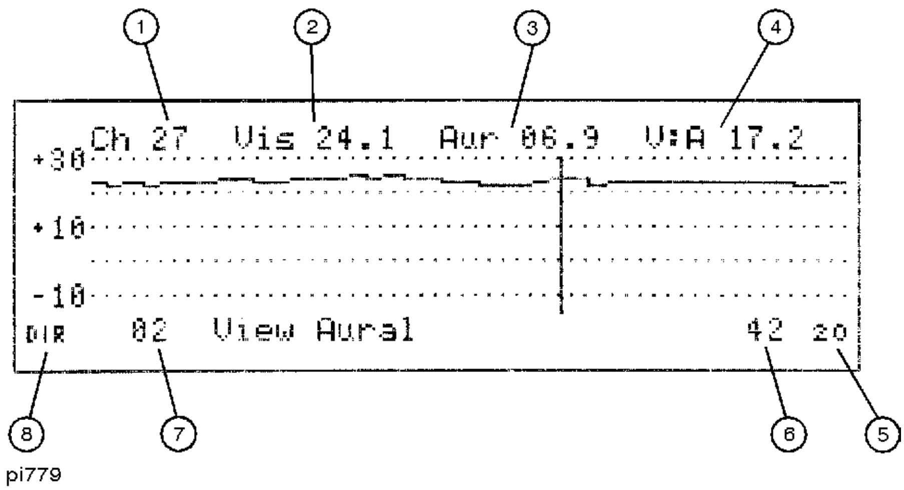
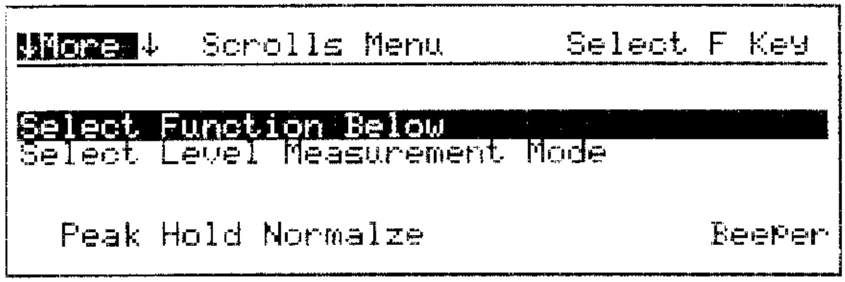


Figure 3-4 Annotations for Channel Scan Mode



pi780

Figure 3-5 Option Annotations in the Channel Scan Mode

Select Channel Scan Mode

Quick Reference

Select Channel Scan mode
Menu
F1

From the Main menu, press **F1** to enter the mode.

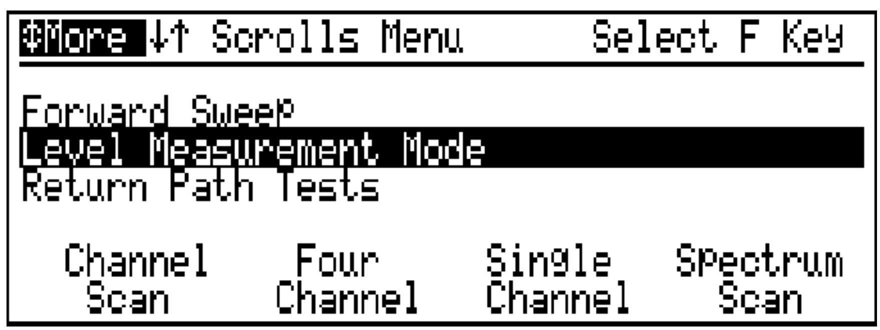


Figure 3-6 Main Menu

The factory set defaults are:

Start= Channel 2

Stop = Channel 36

20 dBmV full scale, and 10 dB/Div

Test Point compensation is 00 dB

Scaling

You will see a trace of channels 2 through 36. See Figure 3-4. If no trace is displayed, you must reset the full scale value using the following steps:

Press **Scale** then **F1** to activate the Full Scale function.

Press ⏶ ⏷ until the trace is positioned near the top of the display. To change the dB/div, press **F3** and use the ⏶ ⏷ keys to change the value.

Press **Enter** to save the change and return to the channel scan screen.

Changing the Start and Stop Channels

Factory default settings allow you to view a trace from channels 2 through 36. Individual cable TV systems may extend beyond channel 36.

Press **F1** to highlight the start channel. Use ⏶ ⏷ to select the channel.

Press **Enter** to save the selection.

NOTE: Holding down ⏶ ⏷ accelerates the selection.

Press **F4** to highlight the stop channel. Use ⏶ ⏷ to select the channel.

Press **Enter** to save the selection.

Channel Marker

The channel marker is used to select a single channel to be measured. To move the channel marker, press ◀| |▶.

Numeric values are displayed on the message line located across the top of the screen. See Figure 3-4.

NOTE: A single press moves the marker one pixel. Holding down the key accelerates this movement.

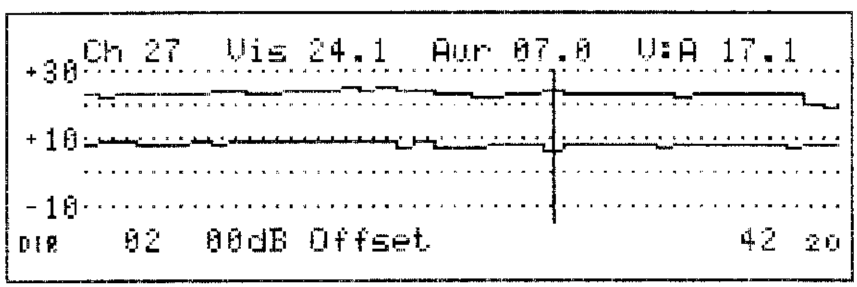
The message line indicates channel name, visual level in dBmV, aural level in dBmV, and the difference between the visual and aural readings in dB, where dBmV is the default value.

View Aural Levels

To simultaneously view a trace of the visual and aural signals, press **F2**. See Figure 3-7.

The offset default is 0 dB. Typical aural levels will appear 10 to 17 dB lower than visual levels. The offset is changed by pressing **F2** and using ▲ ▼. The offset is referenced to the visual carrier level so the separation can be easily noted. To return to the normal operating screen, press **Enter**. The new settings will become the default.

If there is a digital frequency in the frequency table, the aural level will appear as a carrier having an I dwell time. Refer to Chapter 12 for more information on dual aural carrier operation.



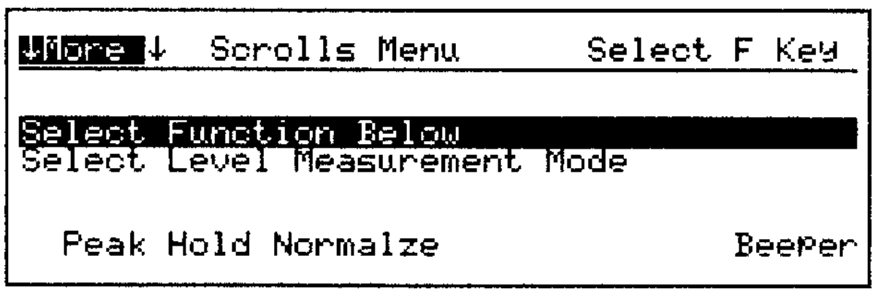
pi782

Figure 3-7 Viewing Aural Separation from the Channel Scan Mode

Channel Scan Mode Options

Pressing **Option** displays additional menu choices for the Channel Scan mode and direct access to the trunk, bridger, line extender and direct scaling options. See Figure 3-2.

The ⏏ key provides additional option selections. See Figure 3-8.



pi7202

Figure 3-8 Option Screen

Peak Hold

Quick Reference

Peak hold

Option

⏏

F1

From the **`Select Function Below`** option press F1. The 3010 will measure and hold the peak signal level. The word **`PEAK`** is displayed in the upper left on the message line.

Use ◀▌ ▐▶ to move the channel marker to display numeric peak values for each channel.

Press **Option** ⏏ **F1** to turn off the Peak Hold function.

Normalized Channel Scan

The Normalization function allows you to view level changes between locations and/or over a period of time. The normalization process is simply the mathematical comparison between real time measurements and stored measurements. The Normalization function of the channel scan measurement is the same as normalization of the sweep measurement. Using the Normalization function with a recently stored file at the same test point will result in a line across the center of the display indicating no difference between the measurements. By selecting a file with measurements stored at the first amplifier while monitoring the fifth amplifier in the system, the level variations between the two tests points are displayed on the screen. Also, by making measurements at the same test point but at a different time, changes in the system can be seen.

Normalization Procedure

To use the Normalization function, measurement data must be stored in memory and used as the reference. To store a file, refer to Chapter 10 for further details.

NOTE: In the Channel Scan mode, measurements can be normalized to any stored set of Channel Scan measurements. **`DIF`** will appear in the upper left corner of the display if the channel plans are different.

Quick Reference

Storing a file
Option
⏏
F2

From the Channel Scan mode, press **Option** ⏶ and **F2** to turn on the Normalization function. Figure 3-9 shows the marker channel ①, marker level ②, offset ③, slope offset ④, peak-to-valley ⑤, and reference file ⑥.

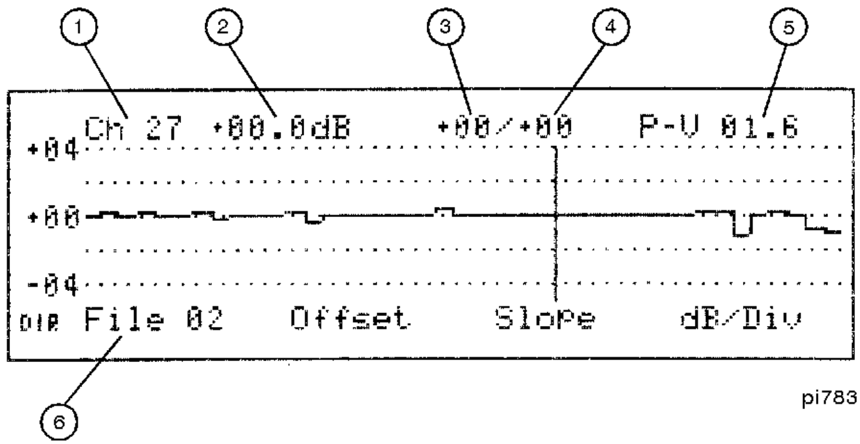


Figure 3-9 Annotations for Normalized Channel Scan Screen

The scaling indicators on the left side of the display show a zero center scale.

Notice that the range indications on the left side of the display and the marker level. The levels are now listed as relative measurement values and not as absolute values. Levels are relative to the value selected as the reference.

To change the reference file, press **F1**. Use ⏶ ⏷ to select the reference file.

To offset the level of the selected reference, press **F2**. Use ⏶ ⏷ to select the offset level. Notice that the offset level value is indicated at the top of the display. See Figure 3-9.

To offset the slope of the selected reference, press **F3**. Use ⏶ ⏷ to select the offset slope value. Notice that the offset slope value is indicated at the top of the display.

NOTE: The offset level and slope controls are used to test a device whose recommended levels are different from the test point where the reference file was stored. This feature is useful when setting the level of a bridger amplifier using a reference file stored with trunk levels.

To change the dB/Div, press **F4**. Use ⏶ ⏷ to select the new value.

Beeper

From the Select Function Below option, press **F4** to toggle the beeper on and off. The 3010 automatically returns to Channel Scan. The beeper volume can be adjusted from the Main menu. See “Beeper Volume” in Chapter 1.

Four Channel Mode

The Four Channel mode is used to rough balance the cable plant. Typically, the system pilot and two channels at the extremes of the spectrum are selected. Limit lines ① may be individually set on all four channels for easy viewing. See Figure 3-10. The “Changing the Default Settings” section in this chapter describes how to set the limit lines.

To select the Four Channel mode from the Main menu, press **F2**.

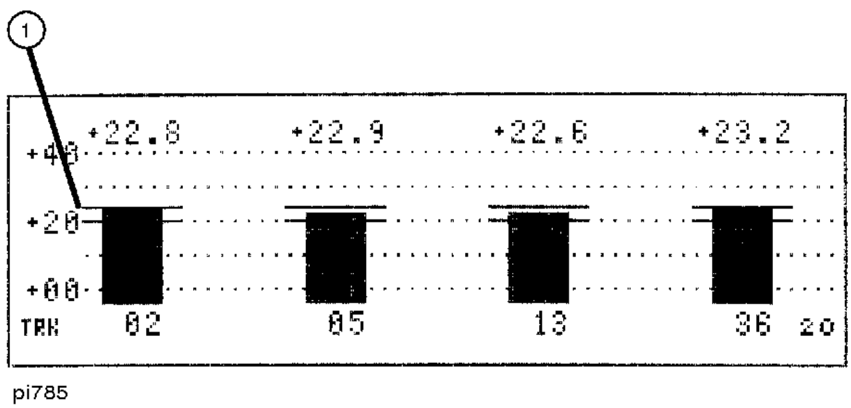
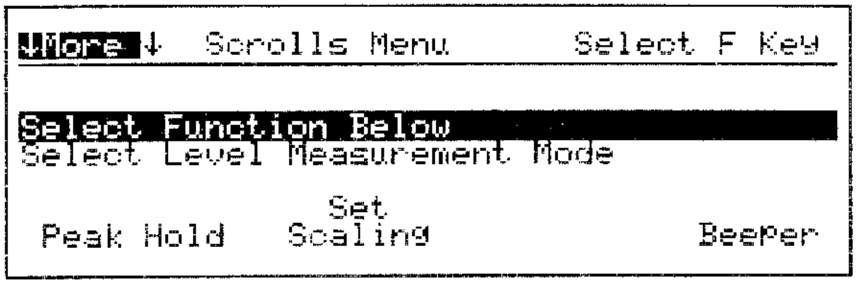


Figure 3-10 Annotations for the Four Channel Mode



pi786

Figure 3-11 Options Available for the Four Channel Mode

Changing Channels

The selected channels can be changed during a session, but the channels will revert to the programmed values when you exit the Four Channel mode. The exception is that channel changes made in the Direct mode will be retained. To change the channels during a session:

- Press **F1** and press ▲ ▼ to change the first channel.
- Press **F2** and press ▲ ▼ to change the second channel.
- Press **F3** and press ▲ ▼ to change the third channel.
- Press **F4** and press ▲ ▼ to change the fourth channel.

Press Enter to save the changes.

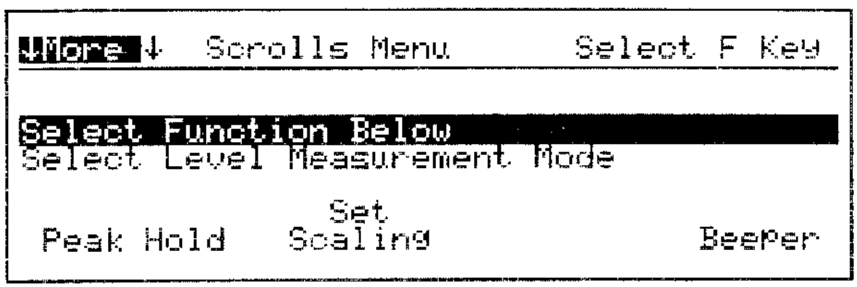
Some systems use a pilot carrier other than a standard cable channel. In this case, modify the frequency/table plan to include the frequency carrier. See Chapter 2 for details on how to insert a frequency into the table plan.

CAUTION: If a channel for selected test point is not programmed, perform the steps in "Changing the Default Settings".

The channels programmed in the Four Channel mode are dependent on the selected table and are not retained in memory. If you change the selected table or select a different table, the channels programmed in the Four Channel mode will change.

Four Channel Mode Options

Press **Option** and ⏏ to display additional choices for the Four Channel mode.



pi786

Figure 3-12 Option Menu for the Four Channel Mode

Beeper

From the Select Function Below option, press **F4** to toggle the beeper on and off. The 3010 automatically returns to the Four Channel mode. The beeper volume can be adjusted from the Main menu.

Peak Hold

From the Select Function Below option, press **F1**. The 3010 will measure and hold the peak signal level. The word **PEAK** is displayed in the upper left on the message line. See Figure 3-14.

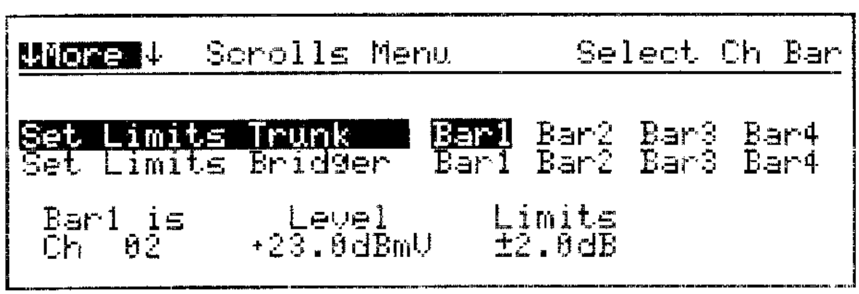
Press **Option** ⏏ **F1** to turn off the Peak Hold function.

Changing the Default Settings

Press **Option** ▲ to enter the **`Select Function Below`** option.

1. Press **F2** to set up or change the scale values and channels for the trunk, bridger, or line extender presets (or direct presets). See Figure 3-13.
2. Press ▲ ▼ to select Trunk, Bridger, Line Extender, or Direct mode.
3. Press ◀ ▶ to select the bar to be changed.
4. Press **F1** and press ▲ ▼ to select the channel for that bar.
5. Press **F2** to preset the target channel level for the selected channel. Press ◀ ▶ to select the digit and ▲ ▼ to change the value.
6. Press **F3** to set the limit lines around the expected level. Press ▲ ▼ to set a value from 0 to 9.9 dB.

NOTE: The target level and the limit lines are used as quick reference guides for setting amplifier levels. The limit line value should represent the maximum signal level variation allowable for your system.



pi787

Figure 3-13 Bar Limit Setup Screen for Four Channel Mode

Single Channel Mode

The Single Channel mode is generally used when an independent level adjustment of the visual and aural carriers is required, such as at the headend or hub. This mode displays the visual 1, aural 2, visual-minus-aural 3, and channel 5, in bar graph and digital format. See Figure 3-14. The limit lines at the aural down bar 4 are user-definable. Default limit lines are factory preset to 10 and 17 dB down from the visual level in accordance with FCC regulations. Note the selected mode is displayed in the lower left; for example, trunk or bridger.

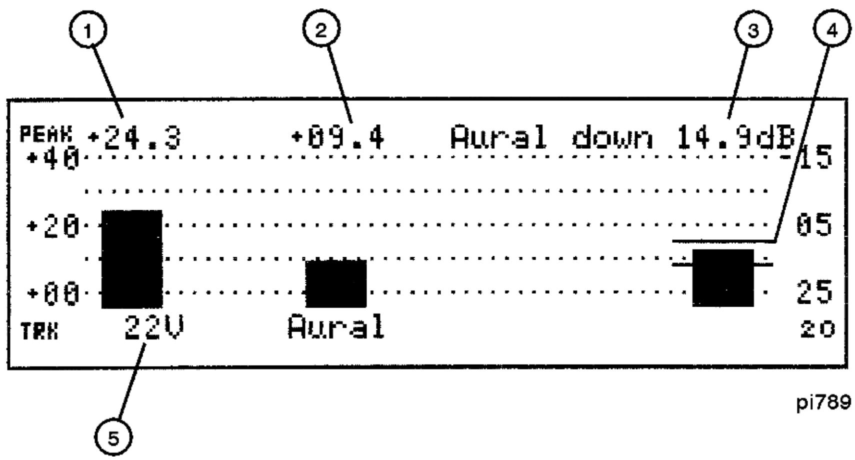
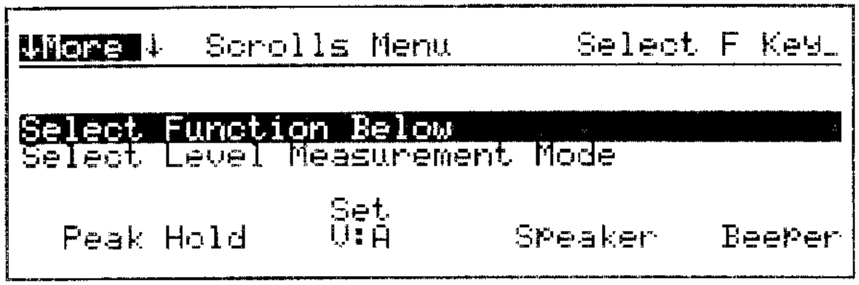


Figure 3-14 Annotations for Single Channel Mode



pi790

Figure 3-15 Options Menu for the Single Channel Mode

Selecting Single Channel Mode

Press **F3** from the Main menu to select Single Channel mode. The receiver will be in the last selected mode: for example, trunk or bridger. Select direct mode from the option screen with channel 2 displayed. The channel 2 visual and aural carrier graphic appears on the left. The difference in dB appears on the right. The message line displays the numeric values of the visual carrier, aural carrier, and their relative difference. See Figure 3-14.

Single Channel Mode Options

Pressing **Option** displays the Option menu, giving additional menu choices and direct access to the trunk, bridger, line-extender, and direct preset scaling.

NOTE: The 3010 contains the Second Aural Carrier function. This function allows the user to measure channels with two aural carriers. With the second aural option selected, the user can view both aural carriers and the visual carrier at the same time. For more information on this feature, please refer to Chapter 12.

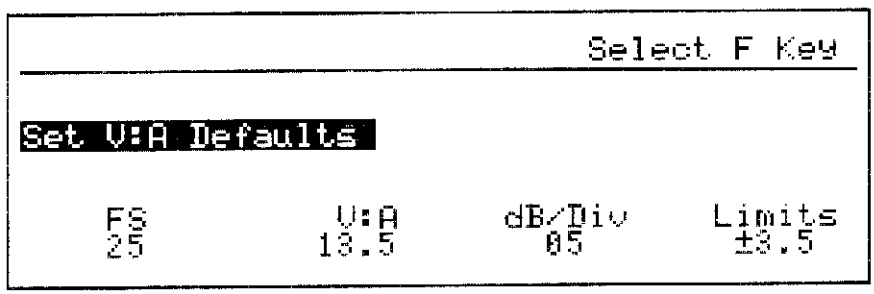
Peak Hold

Pressing **F1** causes the 3010 to measure and hold the peak signal. The word **PEAK** is displayed in the upper left on the message line. See Figure 3-14.

Press **Option** ⏏ **F1** to turn off the Peak Hold function.

Set V-A (Visual minus Aural)

Press **Option** ⏏ **F2**. `Set V:A Defaults` is highlighted. See Figure 3-16.



pi7205

Figure 3-16 Set Visual to Aural Defaults Screen

Quick Reference

Set Visual–Aural
Option
⏏
F2

Factory defaults are:

FS (full scale): 25 dB (bottom of the screen)

V:A 13.5 dB

dB/Div: 05 dB

Limits: ±3.5 dB

To change defaults, press the appropriate function key. Use ◀| |▶ to select a digit and ▲ ▼ to change the value.

Press **Enter** (2 times) to return to the Single Channel screen.

Speaker

Pressing **Option** ▲ **F3** activates the speaker to monitor the aural carrier of the selected channel. The volume is controlled by pressing **F3** and adjusting the level with ▲ ▼. When activated, **SPK** appears on the upper right of the message line. Pressing **Option** turns the speaker off and returns to the Option menu.

Beeper

Pressing **Option** ▲ **F4** toggles the beeper on and off. The 3010 automatically returns to the Single Channel screen. The beeper volume can be adjusted from the Main menu.

Preset Scaling Function Selection

Press **Option** to select trunk, bridger, line extender or direct. The selected function is displayed in the lower left of screen as **`TRK, BRG, LEx`**, or **`DIR`**. See Figure 3-14.

Scaling

1. Press **Scale** then one of the following selections:

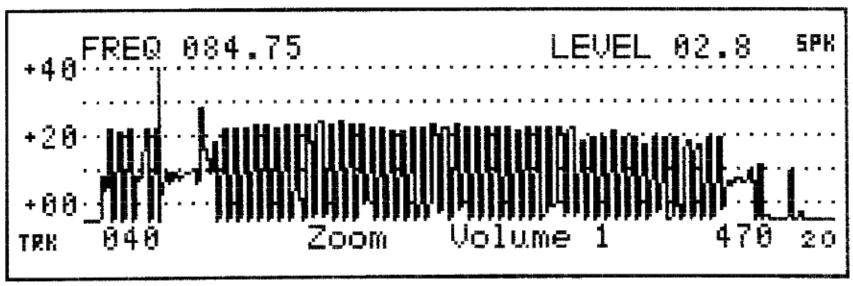
- Press **F1** to adjust full scale.
- Press **F2** to adjust test point value.
- Press **F3** to adjust dB per division.

The digits are changed with the ◀| |▶ keys, the values with the ▲ ▼ keys.

2. Press **Enter** to activate and save the new values.

Spectrum Scan Mode

The Spectrum Scan mode allows viewing of the system carriers from a start frequency to a stop frequency in a spectrum display with a 45 dB viewing range. It is useful for: interfering carrier analysis, tuning of filters, and providing an alternative method for carrier-to-noise (C/N) measurements. From the Main menu, press **F4**, Spectrum Scan.



pi792

Figure 3-17 Annotations for Spectrum Scan Mode

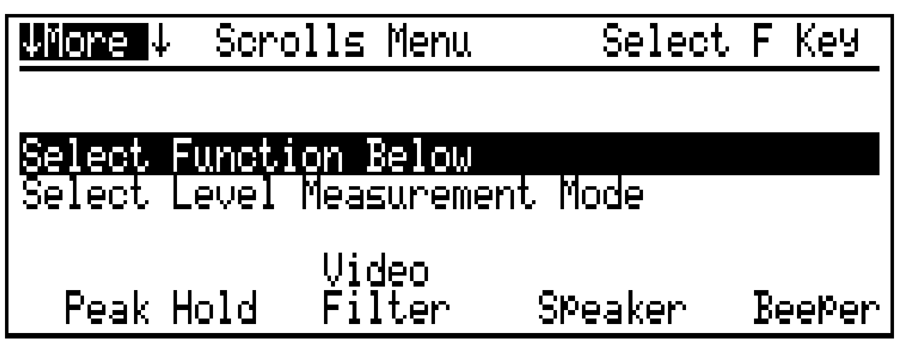


Figure 3-18 Options Available for the Spectrum Scan Mode

Zoom

This allows the user to easily zoom in on a particular frequency.

Pressing **F2** activates the zoom feature.

Use the ◀ ▶ keys to select the center frequency with the vertical marker.

The ▲ key is used to zoom out by a factor of 2.

The ▼ key is used to zoom in by a factor of 2.

Holding the ▲ key or the ▼ key will repeatedly zoom until full spectrum or zero span is reached.

When 0 span is reached, the user is reading the level at the frequency indicated on **F1** – **F4** ±10 kHz.

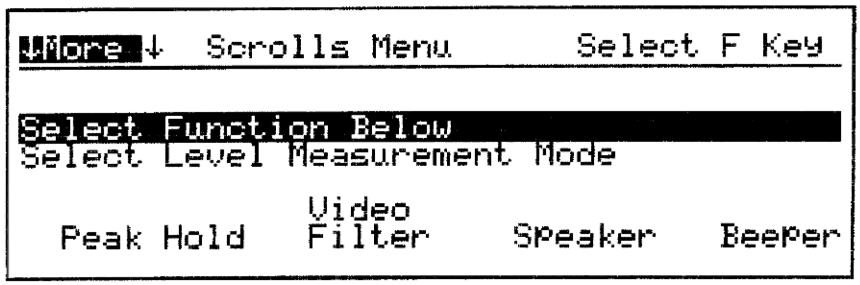
Setting Frequency Span

Press **F1** to set the start frequency. Press **F4** to set the stop frequency.

To change the values, press ▲ ▼. Holding an arrow key will accelerate the changes.

Spectrum Scan Mode Options

Press **Option** to display the Option menu. This gives the user additional menu choices for the Spectrum Scan mode and direct access to the trunk, bridger, line-extender, and direct preset scaling. Refer to the section on setting the scaling presets for more information.



pi793

Figure 3-19 Option Menu Specific to the Spectrum Scan Mode

Peak Hold

Press **F1** to measure and hold the peak signal. The word **PEAK** is displayed in the upper left on the message line.

Use ◀| |▶ to move the channel marker to display numeric peak values for each frequency. Press **Option** ▲ **F1** to turn off the Peak Hold function.

Speaker

Press **F3** to activate the speaker and return to the spectrum screen. See Figure 3-17. This allows the user to listen to the demodulated signal at the frequency marker. The volume is controlled by pressing **F3** and ▲ ▼. When activated, **SPK** appears in the upper right of the message line. To deactivate, press **Option Enter**.

NOTE: With the speaker activated, the 3010 is only measuring the frequency selected by the marker. The remainder of the screen will freeze.

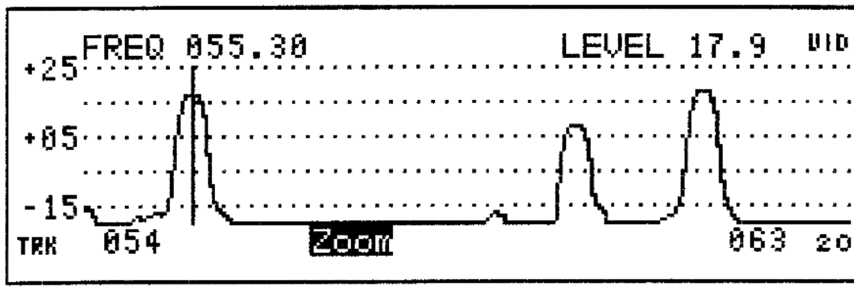
Beeper

Press **F4** to toggle the beeper on and off. The 3010 automatically returns to the spectrum scan screen. The beeper volume can be adjusted from the Main menu.

Video Filter

The Video Filter function in the Spectrum Scan mode provides a 10 Hz video filter, and is used to make carrier-to-noise measurements and other distortion measurements in the Spectrum Scan mode. The video filter should only be used with narrow span measurements because it does slow down the update rate of the screen.

To activate the video filter from the Spectrum Scan mode, press **Option** ⏶ **F2**.



pi794

Figure 3-20 Spectrum Scan Display with the Video Filter Activated

The **VID** indicator is displayed in the upper right corner of the display when the video filter is activated. To deactivate the video filter, press **Option** ⏶ **F2**.

NOTE: The Video Filter will slow the scan rate of the trace when activated. Normally it is only used for spans 10 MHz or less.

Procedures for performing distortion measurements are found in Chapter 9.

Scaling

1. Press **Scale** and one of the following selections:

- Press **F1** to adjust full scale.
- Press **F2** to adjust test point value.
- Press **F3** to adjust dB per division.

The digits are selected with ◀| |▶ keys. The values are changed with the ⏶ ⏷ keys.

2. Press **Enter** to save the new values.

4

Digital Power Measurements

Digital Power Measurements

The Digital Power Measurements mode allows measurement of the total power in a channel containing a digitally-modulated carrier. By using a sampling technique, this mode enables comparison of the power level of signals with different types of digital modulation.

The instrument samples the power at 150 kHz intervals across the selected channel or frequency span. One to 100 samples (user-selected) are taken at each point and then averaged to yield a specific power level at that frequency. These average values are integrated to obtain the total power in the channel, which is then displayed by the instrument.

Measuring the power of a digital carrier this way gives a more accurate result than measuring the peak of a carrier with a spectrum analyzer.

The Digital Power Measurements mode also allows measurement of Time Division Multiple Access (TDMA) signals. TDMA signals are short-duration, pulsed signals and are typically found in the return path, where several data transmitters in the field take turns communicating with the headend.

In TDMA mode, the instrument looks for a signal during a specified, user-selected, time interval. If a detected signal exceeds a user-defined threshold within the time interval, the sample is accepted. Otherwise, the last sample is used. Multiple samples are taken (user-selected) and averaged to yield a value for the signal power at that frequency point. The instrument then repeats the process at the next frequency point. Bursts greater than 50 μs in duration with a repetition rate of less than 1.5 s are required by the instrument to provide accurate results.

Digital power measurements are made on digital channels in the Channel Scan, Four Channel, and Single Channel selections of the Level Measurements Mode. However, the TDMA mode is not available when making these measurements. Refer to Chapter 3.

Making Digital Power Measurements

To make digital power measurements, enter the digital power measurements mode by pressing **Menu** ⏏ ⏏.

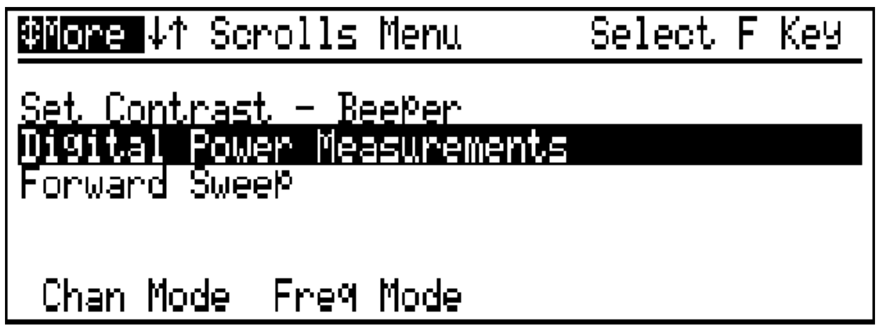


Figure 4-1 Digital Power Measurements in the Main Menu

Selecting the Mode

Two digital power measurement modes can be accessed by pressing either **F1** or **F2**.

F1 **Channel Mode**

performs the digital power measurement on any channel in a frequency plan with a digital dwell.

F2 **Frequency Mode**

performs the digital power measurement on a center frequency and span that you specify. This mode must be used if the span is greater than 8 MHz.

- Press **F1** to select the channel mode or press **F2** to select the frequency mode.

Setting the Options

There are four options that you can select when you are making digital power measurements. You can:

- Set the number of measurements to be averaged.
- Select the active channel plan table if the measurement is being made in the channel mode.
- Turn TDMA measurement on or off.
- Set the TDMA rate. (TDMA measurements only).

To access the following Option menu from the Digital Power Measurements mode, press **Option** ⏏ .

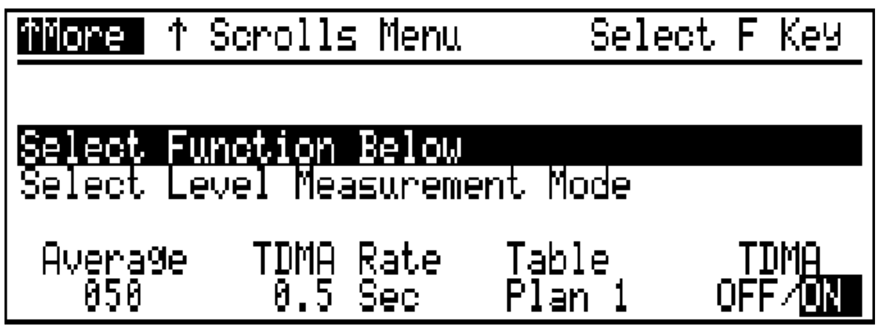


Figure 4-2 Digital Power Measurements Option Menu

Set the Average Value

F1 Average sets the number of measurements that are taken across the span. All of these measurements are averaged before they are integrated and the power value is displayed. The number of averages can be set from 1 to 100. A larger average number yields a more stable reading but slows the measurement. A smaller average number speeds the measurement but tends to yield a less stable reading. The default number of averages is 50. The measurement results will not be displayed until the specified number of measurements (the average value) is complete.

1. With the instrument displaying the Option menu, press **F1**.

2. Use ◀ ▶ to select a digit and ▲ ▼ to change the value.

Set the average value to a low number initially (5 as an example) and then increase the value until the measurement stability is acceptable.

Select the Table (Channel Mode Only)

F3 Table changes the channel plan that is currently being used. This is used to select a channel plan different from the other level measurements. This function is not displayed when the instrument is set for the frequency measurement mode.

1. With the instrument displaying the Option menu, press **F3**.
2. Use ▲ ▼ to select a table.

Turn the TDMA Mode On or Off

F4 TDMA OFF/ON toggles the TDMA selection between OFF and ON.

- With the instrument displaying the Option menu, press **F4** TDMA OFF/ON until the desired state is highlighted.

Set the TDMA Rate

TDMA Rate is only used when the TDMA mode is on.
F2 TDMA Rate sets the maximum amount of time that the measurement attempts to find a sample above the threshold level. The TDMA rate values vary from 0.1 s to 1.5 s. The TDMA Rate should be set to a value slightly longer (0.1 – 0.2 s) than the anticipated digital carrier burst rate.

1. With the instrument displaying the Option menu and **F4** TDMA OFF/ON set in the ON state, press **F2**.
2. Use ◀ ▶ to select a digit and ▲ ▼ to change the value.

Save the Option Settings

Once the Option settings are correct, press **Enter** to save the settings and return to the measurement display.

Setting the Scale Settings

There are three Scale values that you can change when you are making digital power measurements. You can change the:

- Full scale value
- Threshold value (TDMA measurements only)
- Test point value

When you press **Scale**, a spectrum scan measurement is displayed. The displayed scan has a start frequency and a stop frequency based on the center frequency and span of the current channel or frequencies.

Press **Scale** to set the full scale, threshold, and test point values.

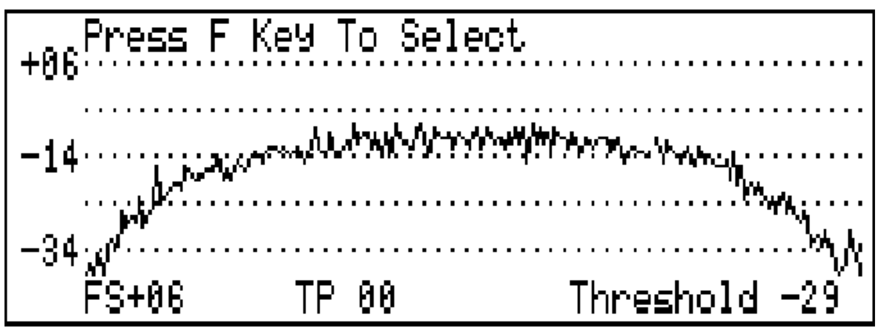


Figure 4-3 Digital Power Measurements Scale Menu

Set the Full Scale Value

F1 FS (Full Scale) sets the top of display reference value in dBmV or doμV.

1. With the instrument displaying the Scale menu, press **F1**.
2. Use to select a digit and to change the value.

Best measurement accuracy is achieved when the FS value is set so that the average displayed carrier level is displayed above the center of the screen. The average displayed carrier level is mid point of the peak of the signal shown in Figure 4-3. If you place the digital carrier in the top division of the screen, your analog carriers may overload the input.

Set the Threshold Level

Threshold level is only used when the TDMA mode is on.
F4 Threshold sets the threshold value, in dBmV or dBµV, for the instrument in TDMA mode. The instrument samples the measurement point until it measures a signal level that exceeds the threshold value before it moves to measure the next frequency sample point. If the instrument does not measure a signal at this level before the TDMA rate is reached, the last measurement value is used as the power measured for the frequency point. The threshold value should be set at least 20 dB below the average displayed carrier level for best measurement accuracy.

If the full scale (FS) value is changed, the threshold value will also change to maintain the same difference between values. As an example, if the FS value is +30 dBmV and the threshold value is 0 dBmV, the difference is 30 dB. Now, if the FS value is reduced to 25 dBmV, the threshold value will change to –5 dB to maintain the 30 dB difference between the FS value and the threshold value.

1. With the instrument displaying the Scale menu, press **F4**.
2. Use ◀ ▶ to select a digit and ▲ ▼ to change the value.

Set the Test Point Value

F1 TP (Test Point) sets the compensation value.

1. With the instrument displaying the Scale menu, press **F2**.
2. Use ◀ ▶ to select a digit and ▲ ▼ to change the value.

Save the Scale Settings

Press **Enter** to save the entries and return to the measurement screen.

After the entries are saved and the instrument returns to the measurement screen, the full scale reading is displayed in the top right portion of the display and the test point value (if other than zero) is displayed in the lower right portion of the screen. See Figure 4-4.

Identifying the Channel Or Frequency

If you are making measurements in the channel mode, continue with "Select the Channel (Channel Mode Only)". If you are making measurements in the frequency mode, continue with "Select the Center Frequency and Span (Frequency Mode Only)".

Select the Channel (Channel Mode Only)

The first channel in the active table that is set with a digital dwell is displayed above **F1**. The instrument starts making the digital power measurement on that channel.

To change the channel, press **F1**, then press ▲ or ▼ to display the new channel above **F1**.

NOTE: If the channel does not appear to change after pressing **F1** and ▲ or ▼, make sure that you have more than one channel set to a digital dwell in the channel plan.

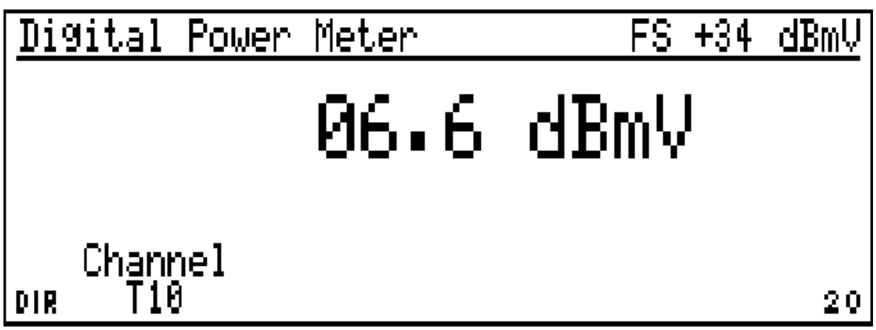


Figure 4-4 Digital Power Measurements Channel Mode Screen

If there are no channels in the channel plan that are set to a digital dwell, the channel selection above **F1** displays ---. Channels set to digital dwells display one of the following codes in the visual dwell column of the channel plan: **QPK**, **QPR**, **QAM**, **VSB**, and **NOI**.

NOTE: To set channels in a channel plan for digital dwells, refer to the “Editing a Channel in the Table” procedure in Chapter 2.

When you press **Enter**, spans greater than 8 MHz automatically change to 8 MHz, the largest span allowed in the channel plan. Larger spans slow down the measurement. If a span greater than 8 MHz is required, make the digital power measurement in the Frequency mode.

Select the Center Frequency and Span (Frequency Mode Only)

Press **F2** to select the frequency mode. The center frequency is displayed above **F2** and the frequency span is displayed above **F3**. The instrument starts making the digital power measurement on that frequency span.

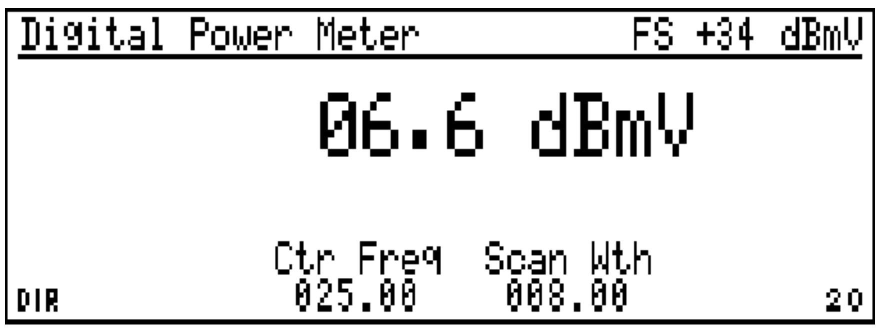


Figure 4-5 Digital Power Measurements Frequency Mode Screen

To change the center frequency:

1. Press **F2** to highlight a numeral in the center frequency.
2. Press ◀ or ▶ to highlight the numeral that you want to change.
3. Press ▲ or ▼ to change the value of the highlighted numeral.
4. Repeat steps 2 and 3 until the displayed numeral is the correct center frequency (in MHz).
5. Press **Enter**.

To change the frequency span:

1. Press **F3** to highlight the frequency span.
2. Press ◀ or ▶ to highlight the numeral that you want to change.
3. Press ▲ or ▼ to change the value of the highlighted numeral.
4. Repeat steps 2 and 3 until the displayed numeral is the correct span (in MHz).
5. Press **Enter**.

NOTE: A maximum span of 200 MHz is allowed in the frequency mode. Spans greater than 8 MHz slow the measurement considerably.

5

Forward Sweep Setup

Forward Sweep Setup

The 3010H with Option 050 or Option 052 can be used as a forward sweep transmitter. Option 052 contains the additional capability of being both the forward sweep transmitter and the return path monitor at the same time.

Sweep Installation

The 3010H contains three types of tables: frequency plan, forward sweep, and return sweep.

Frequency plan table	relates visual and aural frequencies to channels and is used to make level measurements and to increase the forward sweep table.
Forward sweep table	is made up of frequencies, guard bands, and dwell times and is used by the receiver and the 3010H transmitter to produce the sweep response.
Return sweep table	is downloaded from the 3010H and is used to produce the return-sweep response.

Frequencies in the sweep tables may be carriers on the system, or they may be used for positioning sweep points in the spectrum. The guard band tells the transmitter where not to put sweep energy and the dwell tells the receiver when and how long to measure the carrier.

NOTE: When the term sweep table is referred to in this chapter, it refers to the **forward sweep table**. When the term **3010H** transmitter is referred to in this chapter, it refers to the **3010H in the forward sweep transmit mode**.

This procedure takes you through the following steps:

- Installing the 3010H transmitter and the 3010B/R receiver.
- Creating a sweep table using the selected frequency table.
- Setting the output level and slope of the 3010H transmitter.
- Evaluating the response for stability.
- Editing the set up parameters for sweep stability.
- Storing the reference.

There are two methods that can be used to create and set up forward sweep tables. Both methods accomplish the same result.

- The first method, described in this chapter, uses the 3010H transmitter to create the forward sweep table, and then downloads the table to the 3010B/R receiver in the field using the forward sweep pilot frequency.
- The second method, described in the 3010B and 3010R user's guides, creates the forward sweep table in the 3010B/R receiver, and then uploads the table to the 3010H transmitter using an RS-232 cable.

NOTE: If your 3010H transmitter is already setup, you can download your sweep tables to the 3010B or 3010R receivers in the field. Refer to "Downloading the Sweep Table" for the 3010B/R receiver setup information and then on the 3010H, press **Menu ⏏ F1 F4** to download the sweep table to the receivers.

3010H Transmitter Installation

The 3010H transmitter is typically installed at the headend or hub site. Depending on your particular configuration, the connections may be different. Normally, the insertion point is placed in or after the last channel combiner. If you do not have a sweep input on your combiner, a high-quality directional coupler can be used for combining the sweep signal with the channels on the system.

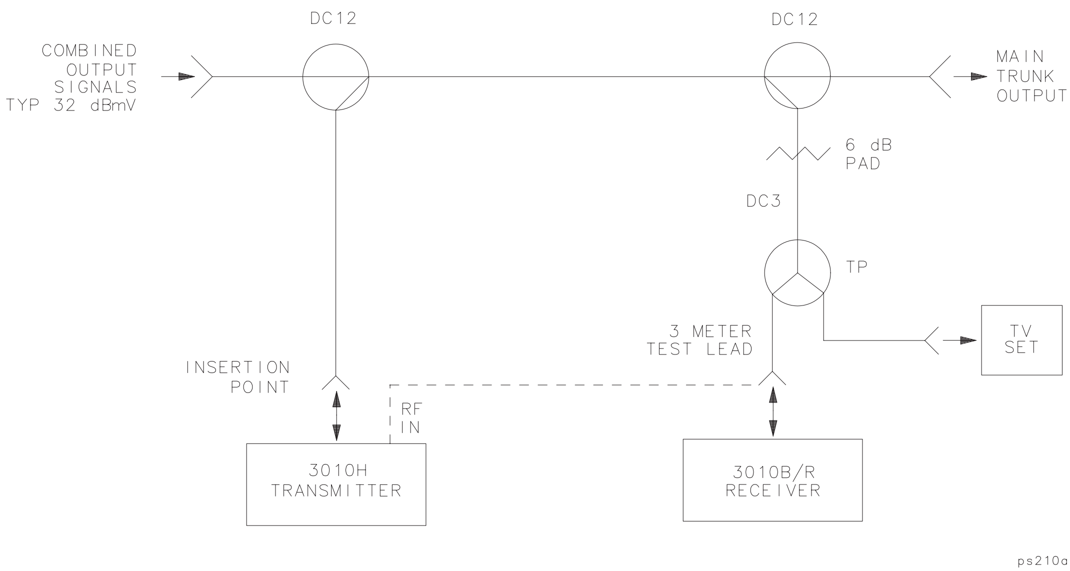


Figure 5-1 The Directional Couplers Used as Combiners

The test point monitored by the 3010B or the 3010R receiver must be located beyond the point where the channels and the 3010H transmitter are combined. In some system configurations, the first amplifier in the system is located at the headend. The output test point of this amplifier is a good setup test point because the levels will represent the output levels of the other amplifiers in the system. In hybrid fiber coax (HFC) systems you may use the output test point for the drive amplifier for the forward path laser.

Locate the sweep insertion point for the 3010H transmitter and the monitor test point for the 3010B/R receiver in your system.

NOTE: To avoid any interference to the channels on the system, do not put your 3010H in the forward sweep transmit mode until you are finished setting it up.

Viewing Existing Sweep Setup Parameters

Quick Reference

Menu

⏏

F3

The Measurement mode screen is the normal start up screen for the 3010H transmitter unless it was turned off in the Sweep Transmit, Return Monitor, or the Dual Path mode. If the 3010H is in the Sweep Transmit, Return Monitor, or the Dual Path mode, first press **F1** twice to return to the Main menu.

To enter the Forward Sweep Setup mode, from any screen, press **Menu** ⏏ **F3**.

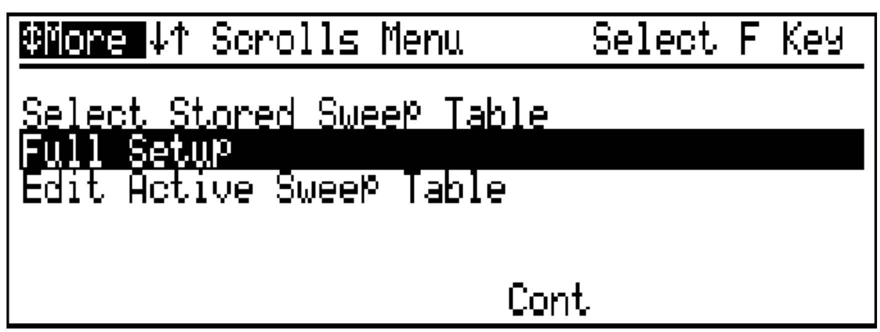


Figure 5-2 Sweep Setup Menu

The Sweep Setup menu allows you to recall a previously stored sweep table, edit an existing sweep table, set the output level and slope, set scan parameters, or perform the full setup procedure. The default scan parameters are set for a 6 MHz NTSC channel. If you are scanning a PAL, SECAM, or other channel format with a different bandwidth, you should change the scan parameters. Procedures for changing the scan defaults are found in Chapter 12.

To perform a full setup on the 3010H transmitter, select `Full Setup` then press **F3**.

Setting Sweep Parameter Control

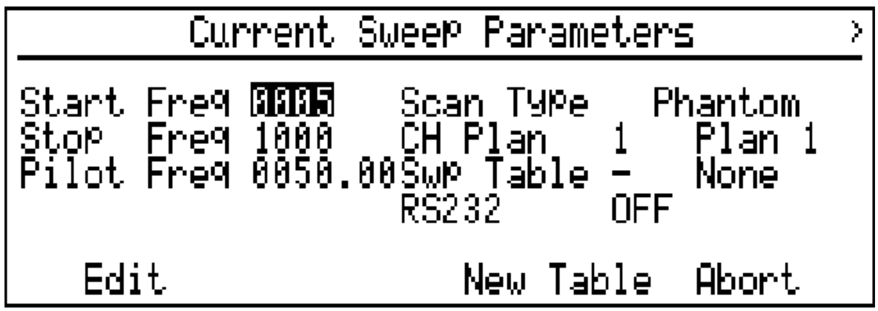


Figure 5-3 Sweep Parameter Control Screen

NOTE: Since the sweep system does not have “Detector Scan Loss,” the total sweep width you select is a matter of personal preference. However, as a first-time user, we suggest you sweep from 15 MHz below the lowest visual carrier to 20 MHz above the highest aural carrier so you will be able to observe the band edge of your system.

To calculate the start frequency for testing your system, subtract 15 MHz from the lowest visual carrier frequency on your system. Example: channel 2 visual carrier in an NTSC system is 55.25 MHz. 55.25–15= 40.25. Round off to 40 and record your start frequency.

To change the start frequency, press **F1** on the 3010H transmitter. Use the keys to select the digit and the keys to set the value. Press **F1** to save the changes and move to the stop frequency.

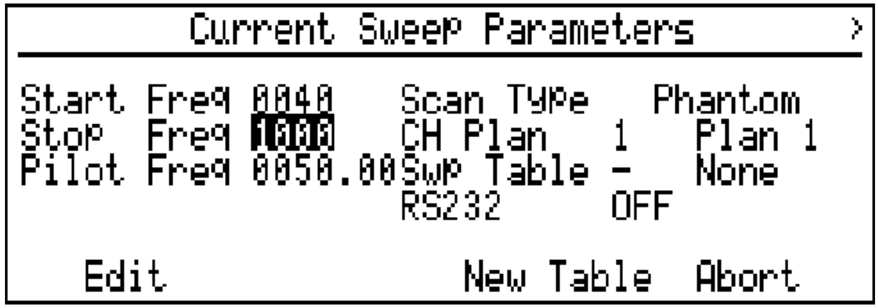


Figure 5-4 Current Sweep Parameters

To calculate the stop frequency for your system, add 20 MHz to the highest carrier frequency on your system. Example: channel 62 aural carrier is 455.75 MHz in an NTSC system. 455.75 + 20= 475.75. Round down to 470 and record your stop frequency.

To change the stop frequency, press **F1**. Use the ◀ ▶ keys to select the digit and the ▲ ▼ keys to set the value. Press **F1** to save the changes and move to the forward sweep pilot frequency.

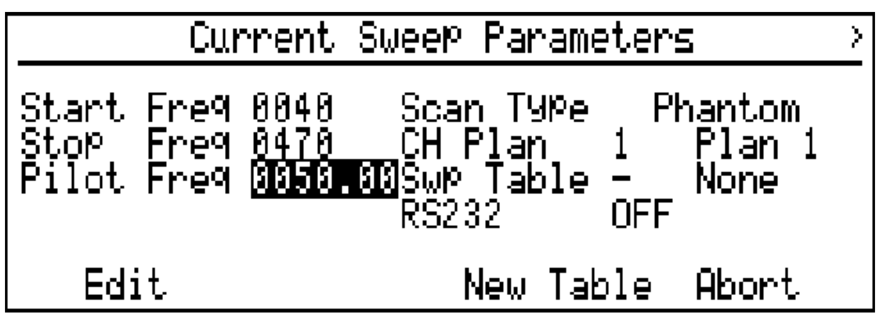


Figure 5-5 Current Sweep Parameters

The forward sweep pilot is the frequency which the 3010H uses to communicate with the instruments in the field. For this reason, the forward sweep pilot frequency set in the 3010B/R receivers in the field must match the forward sweep pilot frequency programmed in the 3010H transmitter at the headend. These units are normally shipped with the forward sweep pilot set for 50 MHz.

To change the forward sweep pilot frequency programmed in the 3010H, press **F1**. Use the ◀ ▶ keys to select the digit and use the ▲ ▼ keys to change the value. Press **F1** to save the change and highlight the scan type.

NOTE:

Reminder
If you change the forward sweep pilot frequency in the 3010H transmitter, remember to change the forward sweep pilot frequency in the 3010B/R receivers.

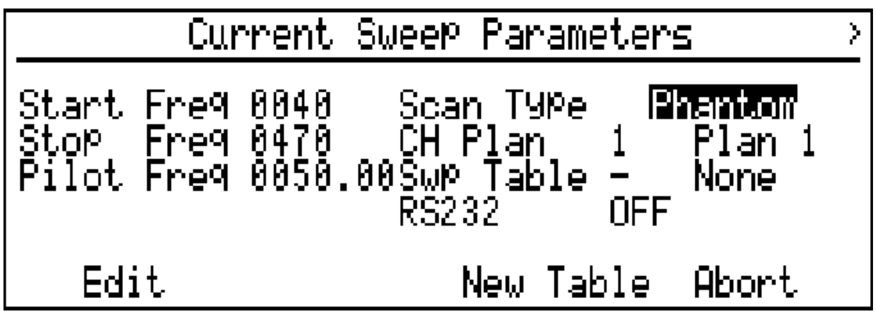


Figure 5-6 Current Sweep Parameters

The next sweep parameter is scan type. There are two scan types available in 3010 instruments: Standard Scan and Phantom Scan. With the Standard Scan selected, the 3010 will scan the RF input using the selected channel plan. If a channel is present on the system, it will add the visual and aural frequencies to the sweep table. Each frequency is given a dwell of 1 and the standard guard band programmed in the Set Scan Parameters screen. This value should be 2.2 MHz for an NTSC system with 4.5 MHz spacing between the visual and aural carriers.

When the Phantom Scan function is selected, the 3010B/R receiver scans the RF input using the selected frequency plan. If a channel is present on the system, the 3010 will add the phantom offset frequency, programmed in the Set Scan Parameters screen, to the visual carrier and add the resultant frequency to the sweep table. Each frequency is given a dwell of 0 and the phantom guard band, which is programmed in the Set Scan Parameters screen. For an NTSC system, the phantom carrier offset frequency is typically 1.95 MHz and the phantom carrier guard band is 2.9 MHz.

NOTE: The standard scan guard band, phantom scan guard band frequency, and the frequency offset are programmed in the Set Scan Defaults screen found in the Setup menu. For programming instructions, please refer to “Setting the Forward Sweep Scan Defaults” in Chapter 12. Forward sweep scan defaults are not used for digital channels.

For the next portion of the setup, the screens shown reflect a phantom scan setup. The key strokes are the same for a standard setup, although the screen will look different during the setup. The advantage of the phantom setup is faster sweep, no system interference, and a more stable sweep response. The disadvantage is reduced sweep resolution. Sweep resolution for a standard setup is 2.2 MHz and sweep resolution for a phantom setup is 6 MHz for NTSC systems. Considering the nature of a broadband network, 6 MHz resolution is adequate to test the response of the system.

To select the scan type, with **Scan Type** highlighted, press **F1**. Use the ▲ ▼ keys to select the scan type. Press **F1** to save the changes.

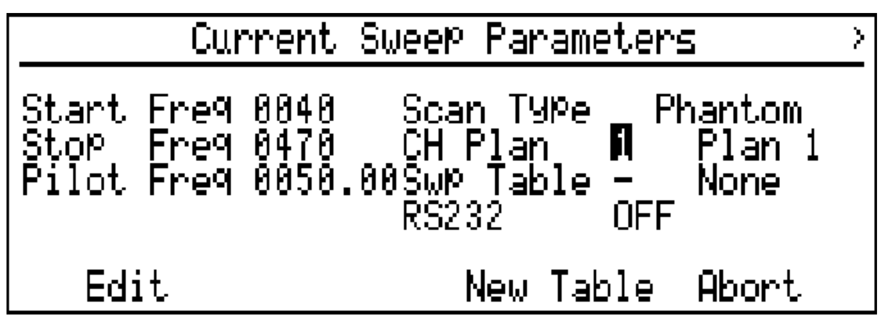


Figure 5-7 Current Sweep Parameters

The 3010 has four programmable frequency plans, as described in Chapter 3. The active channel plan is displayed on the screen and should be the channel plan created for the system to be tested. For this example, the plan is Plan 1 created in Chapter 2. To change the sweep table, use the arrow keys to highlight the selected channel plan. Press **F1** and use the ▲ ▼ keys to select the new sweep table. Press **F1** to save the changes and highlight the sweep table selection.

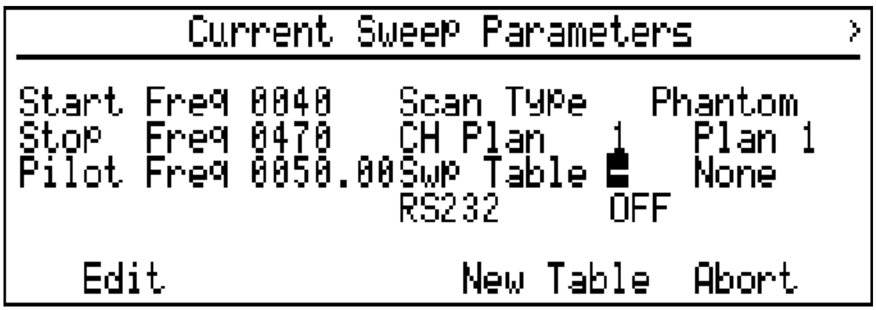


Figure 5-8 Current Sweep Parameters

The 3010 instruments have four files available for sweep tables.

NOTE: Sweep tables stored in the 3010 include the start and stop frequencies. If you select a previously stored sweep table, the start and stop frequency will change to the values stored in the file. To change the frequencies stored in the file, you must select the table, change the start and stop frequencies and press **F3** to edit the table. To keep the new start and stop frequencies in the stored table, you must store the table again. If you would like to create a new table, set the sweep table to “None”.

After you have the parameters set, press **F3** to continue to the Start, Stop, Scan screen. Connect the 3010H input to the output test point of the headend.

Scanning and Creating a Sweep Table

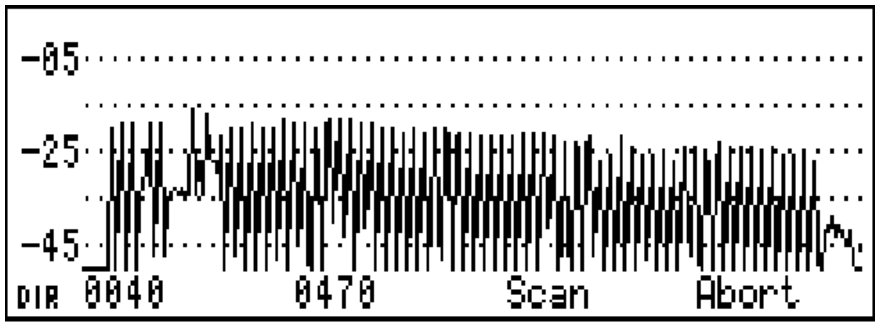


Figure 5-9 The Start, Stop, Scan Screen

NOTE: If the stored sweep table has been selected, this screen will be skipped. Set the stored sweep table to None to create a new table.

The Start, Stop, Scan screen allows another chance to change the start and the stop frequency. This screen displays the spectrum of the system. All of the channels present on the system are in the sweep passband. To change the start or the stop frequency, press **F1** or **F2** respectively and use ⏶ ⏷ ◀| |▶ to change the values. Notice that the display changes to show the new value. Press **Enter** to save the change.

In order to insure that the 3010H transmitter will detect all of the carriers present on the system, set full-scale level so that all of the carriers appear in the upper portion of the display, without going off the display.

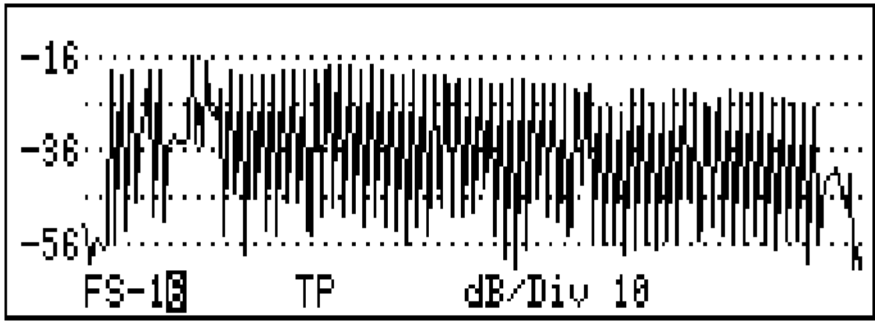


Figure 5-10 Sweep Parameter Sweep

To change the full scale setting, press **Scale** then **F1** and use the arrow keys to change the value. To change the dB/Div, press **F3** and use the arrow keys to select 10 dB/div. Press **Enter** to save the change.

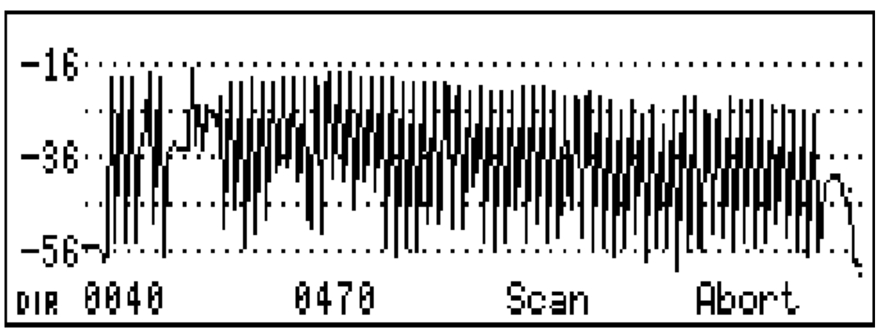


Figure 5-11 Start Stop Scan Screen

You are now ready to scan the system. Press **F3** on the 3010H transmitter to create the sweep table.

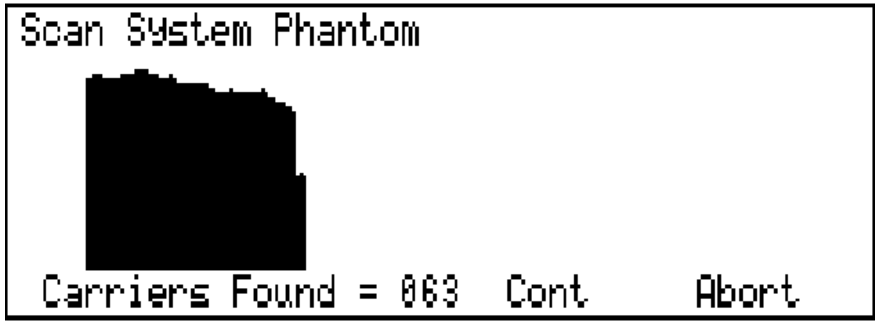


Figure 5-12 Scan Screen

The Scan screen displays the number of carriers entered into the sweep table. When using the Phantom Scan function, the number of carriers will equal the number of channels on the system. When using the Standard Scan function, the number will be 2 times the number of channels on the system. Press **F3** on the 3010H transmitter to enter the Review Sweep Table screen.

Editing the Sweep Table

This section describes the procedures for editing the sweep table, such as inserting and deleting frequencies, setting guard bands, and changing dwell times.

The basic sweep table shown in the following screens is a phantom table. Therefore, the frequencies entered during the scan operation are offset from the actual visual carriers in the system. Also, all of the guard bands are set to 2.9 MHz and all of the dwells are set to zero. Refer to "Sweep Table Tips" for more information about editing your sweep table.

Editing a Frequency in the Sweep Table

To edit a frequency in the sweep table, use the ▲ ▼ keys to highlight the frequency and press **F1**.

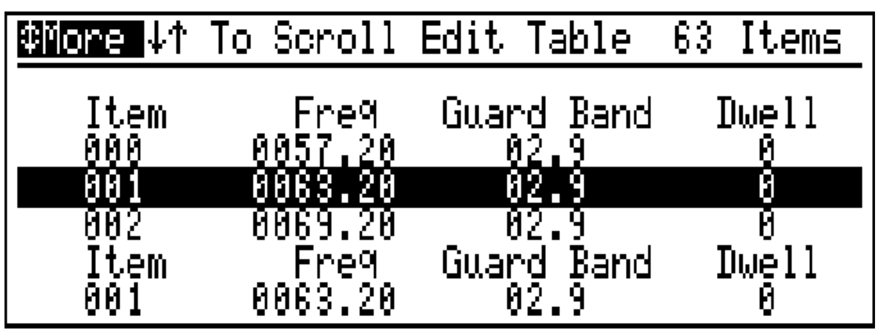


Figure 5-13 Edit Sweep Frequency Screen

The item number is automatically set by the 3010H. To change the frequency, press **F2** and use the ◀ ▶ keys to select the digit and the ▲ ▼ keys to change the value.

To change the guard band, press **F3** and use the ◀ ▶ keys to select the digit and the ▲ ▼ keys to change the value.

To change the dwell, press **F4** and use the ▲ ▼ keys to change the value.

Press **Enter** twice to save the changes and return to the Review Sweep Table screen.

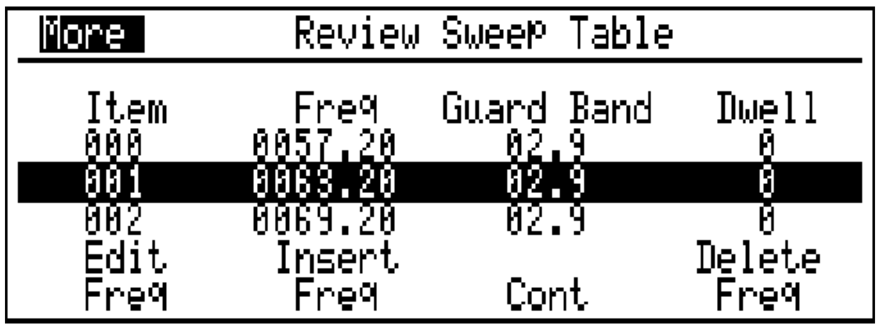


Figure 5-14 Review Sweep Table Screen

Inserting a New Frequency

To insert a new frequency into the sweep table, press **F2**.

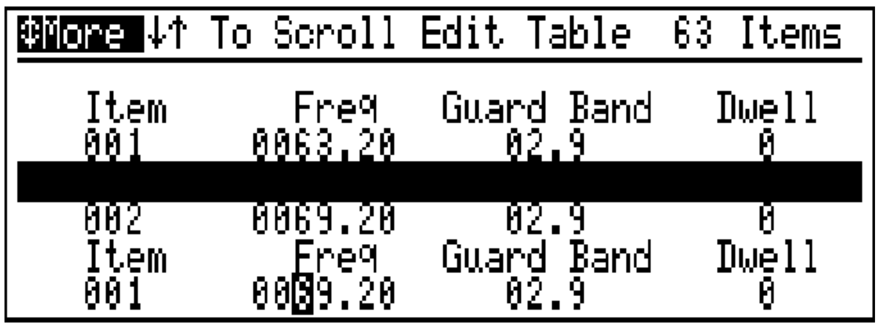


Figure 5-15 Frequency Screen

The cursor is highlighted on the frequency value.
Use the ▲ ▼ ◀ ▶ keys to set the new frequency to be inserted into the sweep table. Press **Enter** to save the frequency and move the cursor to the guard band value.

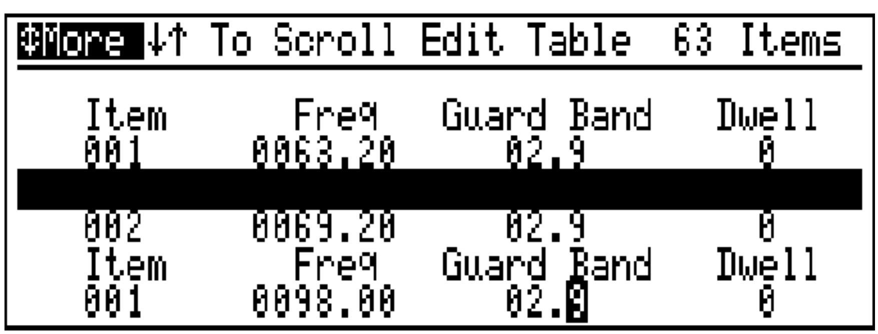


Figure 5-16 Setting the guard band

NOTE: It is recommended that you use guard bands to insure sweep stability. However, if you sweep through a spectrum that prevents the use of guard bands, the sweep pulse will not interfere with any digital signals in the spectrum.

Use the ▲ ▼ ◀ ▶ keys to set the value of the guard band and press **Enter** to save the change and move to the dwell value.

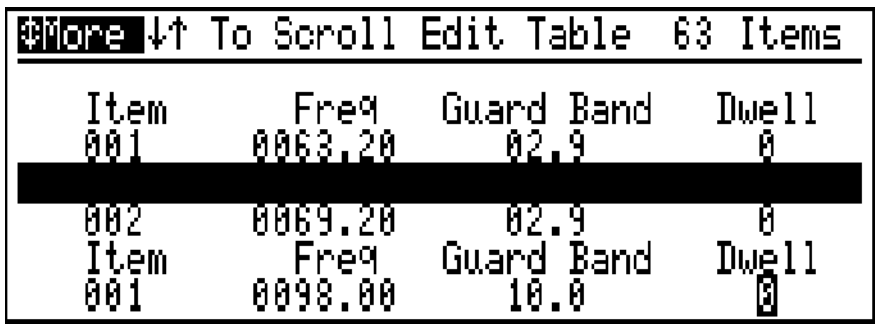


Figure 5-17 Setting the Dwell

Use the ▲ ▼ keys to set the dwell. Press **Enter** to insert the new frequency in the sweep table and return to the Review Sweep Table screen. The new frequency is assigned an item number and inserted into the sweep table based on the frequency. The frequencies are arranged in the sweep table in ascending order.

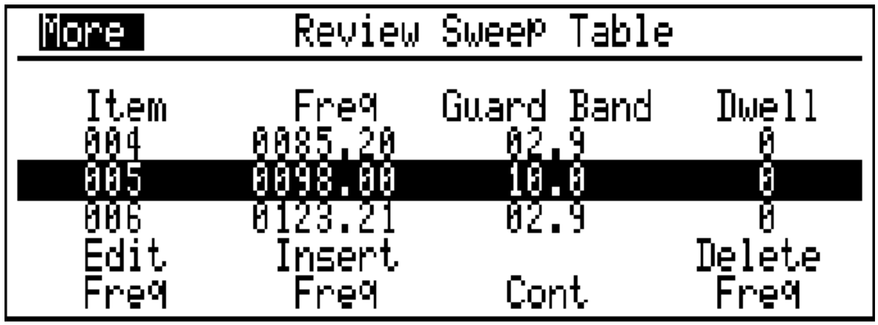


Figure 5-18 Review Sweep Table Screen with New Frequency

Deleting a Frequency in the Sweep Table

Frequencies can be deleted from the sweep table in the same way as they are deleted from the frequency plan table. To delete a frequency from the table, use the ▲ ▼ keys to select the frequency and press **F4**.

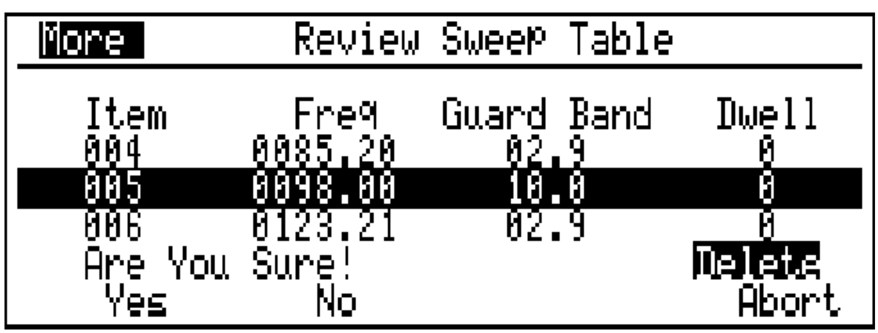


Figure 5-19 Deleting a Frequency from the Sweep Table

Press **F1** to delete the frequency or press **F2** or **F4** to abort the action and return to the Review Sweep Table screen.

Sweep Table Tips

The instrument displays, in ascending order, the list of frequencies found by the scan of your system. Each frequency has a guard band and dwell associated with it. The guard band defines the area around the carrier to be kept free of sweep energy. The guard band protects both the high side and the low side of the frequency by the amount entered. The dwell time is the duration of the carrier level measurement. Table 5-1 lists dwell times for several applications.

Table 5-1 Dwells, Times, and Applications

Dwell	Time	Application
0	NO READ	Phantom and unstable carriers
1	100 μs	Normal visual carriers
2	4 ms	FM carriers
3	24 ms	Scrambled carriers

For a phantom setup, a dwell of 0 is used to tell the 3010B/R receiver not to read the carrier level and to display the area on the trace at the level of the last measured point.

Although phantom scan was used to create the basic sweep table, any frequency using any dwell from 0 to 3, or guard band up to 20 MHz, can be added to the table. The following is a list of many of the carriers present on systems today, along with the recommended programming information. Check each of the items and edit your table if needed. If you need to change the table, you can return to the Edit Table screen from the Sweep menu after you have completed the setup. Follow the steps in the following quick reference block.

Quick Reference

Edit Sweep Table
Menu
⏶
F3
⏷
F3

FM Band

The FM radio band is 88 MHz to 108 MHz. Some systems use a wide-band antenna network for reception of these signals and some systems use FM processors. To eliminate interference to the FM stations, insert a frequency of 98 MHz into the sweep table. Give it a 10 MHz guard band and a dwell of 0.

Frequency	Guard Band	Dwell
98 MHz	10 MHz	0 (NO READ)

Control Data Carriers, Sniffers, and Coo-Coo's

Many systems use data carriers to control devices in the system, such as converters, active customer taps, status, and performance monitors. Systems may also use Sniffers or Coo-Coo's for monitoring signal leakage. To protect these carriers from interference, insert their carrier frequency into the sweep table. Give them a 1 MHz guard band and a 0 dwell.

Frequency	Guard Band	Dwell
Carrier Frequency	1 MHz	0 (NO READ)

DMX Channels

The DMX Channels are digitally encoded aural channels. DMX channels may be included in the frequency plan along with other digital channels. If this is done, they will be inserted into the sweep table with a zero dwell and an appropriate guard band as part of the scan process. If the DMX channels are not included in the frequency plan, they should be protected manually. Typically, they are made up of two carriers, placed 1.5 MHz inside the band edges of a 6 MHz channel. For example, the DMX carriers for the NTSC channel 23 would be 217.5 MHz and 220.5 MHz. To protect DMX carriers, insert the lower and the upper carriers into the table for each of the DMX channels. Give them a 1.4 MHz guard band and a 0 dwell.

Frequency	Guard Band	Dwell
Lower Carrier	1.4 MHz	0 (NO READ)
Upper Carrier	1.4 MHz	0 (NO READ)

NOTE:

When Scanning Your System

If the standard channel was not deleted and replaced with the digital channel in the frequency plan, the receiver may see the lower DMX carrier during the scan and add the phantom carrier to the table. You should delete this frequency from the table before continuing.

System Amplifier Pilot Channels

The 3010 instruments have the ability to measure and display the absolute levels of your system amplifier pilots during the Sweep and Normalize Sweep displays. System amplifier pilot frequencies are measured to set the window of operation for the amplifiers installed in the system. In the 3010, if you insert the visual carriers of the system amplifier pilot channels in the sweep table with a dwell of 1, the carrier levels are displayed over **F3** during normalized sweep. To program the 3010B/R receiver to make these measurements, the system amplifier pilot carrier frequencies or the visual carrier frequencies for your system amplifier pilots must be added to the sweep table with a dwell of 1, 2, or 3.

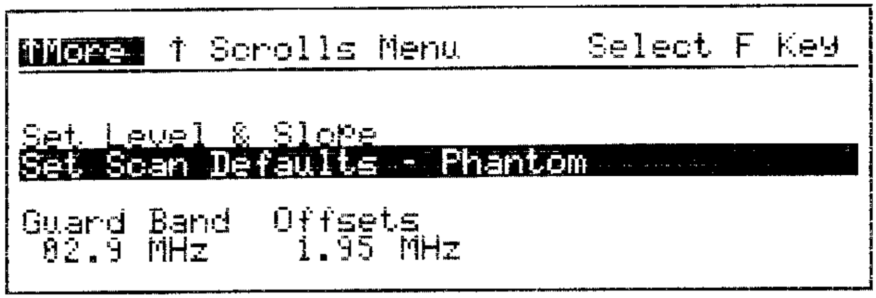
Frequency	Guard Band	Dwell
Lower System Amplifier Pilot Carrier	2.2 MHz	1
Upper System Amplifier Pilot Carrier	2.2 MHz	1

For example, if your system uses channel 4 and channel 36 as the system amplifier pilot frequencies, you would insert 67.25 MHz and 295.25 MHz and assign them a 2.2 MHz guard band and a dwell of 1.

NOTE: Do *not* delete the phantom carriers when adding the system amplifier pilot channels. The phantom carrier is needed to protect the aural carrier.

Inserting New or Missed Phantom Carriers

As channels are added to the cable system, frequencies must be added to the sweep table. The frequency of a phantom carrier is calculated by adding the offset frequency, programmed in the Scan Offset screen, to the visual carrier frequency of the new channel. See Figure 5-20.



pi7142

Figure 5-20 Inserting Phantom Carriers

The phantom carrier frequency can be calculated and inserted into the sweep table and given the same guard band programmed into the Scan Offset screen with a dwell of zero. If your system uses the NTSC format, the offset frequency equals 1.95 MHz and the guard band equals 2.9 MHz. For systems with channels wider than 6 MHz, the offset and the guard bands will increase.

Scrambled Channels and Phantom Carriers

Scrambled channels can cause several problems for the sweep technician and the system. If you are using the phantom setup, the sweep point injected in the vestigial sideband of the upper adjacent channel will sometimes interfere with the data stream modulated on the aural carrier for the scrambled channel. The interference will be seen on the scrambled channel. To eliminate the interference, insert the aural carrier frequency for the scrambled channel into the sweep table. Give it a 2.2 MHz guard band and a dwell of 3. This will eliminate the sweep point and the 3010B/R receiver will measure the level of the aural carrier instead of the sweep point.

Standard Setup Configurations

The Standard Setup configuration for the sweep system produces maximum resolution. For this type setup, the sweep response is made up of measurements from the visual carrier, the aural carrier and a sweep measurement point injected by the 3010H transmitter in the center of the channel. The standard setup inserts the visual carrier and the aural carrier into the sweep table. Each carrier is given the guard band programmed in the Scan Parameters screen. For an NTSC channel, the guard band is 2.2 MHz.

Scrambled Channels and Standard Setup Configurations

A Standard Setup tells the 3010H transmitter to place a sweep point between the visual and aural carriers. For some scrambling systems, the injected sweep point will cause excessive interference. To eliminate the sweep point and the interference, increase the guard band to 2.3 MHz. The 2.3 MHz guard band on the visual and aural carriers in a 6 MHz channel will overlap and eliminate the sweep point in the channel. For channel bandwidths larger than 6 MHz, the guard band must be larger.

To read the peak level of a sync-suppressed scrambled channel, the 3010B/R receiver must wait longer than the 100 µs set by a dwell of 1. A dwell of 3 allows the receiver 24 ms, which is enough time to read the peak level of these carriers. A dwell of 3 is the same as an *S* dwell in the frequency plan table.

Global Edit Screen

After you have completed editing the sweep table, press **F3** to proceed to the Global Edit screen.

Figure 5-21 Global Edit Screen

The Global Edit screen allows you to change all of the guard bands or dwell times with minimal key strokes. Since we have edited individual frequencies in the sweep table, these functions will not be used at this time. However, you should be aware of their function when creating custom tables. To change all of the guard bands, press **F1**; to change all of the dwell times, press **F2** and use the arrow keys to change the value. The guard band range is from 0.1 to 20 MHz and the dwell range is 0 to 3. Press **Enter** to save the changes.

Storing a Sweep Table

The 3010 can store four sweep tables. The storage file contains all the frequencies, guard bands, and dwell times in the table plus the start and stop frequencies. To store the sweep table to the file server, press **F4**.

Figure 5-22 Sweep Table File Selection Screen

Use the ▲ ▼ keys to select one of the four files. To edit the name of the file, press **F2** and refer to the “Naming a Table or Frequency Plan” section of Chapter 2. Press **F3** to store the table to the selected file and return to the Global Edit screen.

Downloading the Sweep Table

The sweep table can be downloaded from the 3010H transmitter to 3010B and 3010R receivers in the field via the forward sweep pilot.

Preparing the 3010B/R Receiver for the Download

The following procedure sets the 3010B/R receiver so that it will accept the sweep table download from the 3010H transmitter.

1. With a 3010B or 3010R acting as a receiver and not connected to the system:

a. Press **Menu** ⏶ **F3 F3** to highlight Start Frequency.

b. Press **F1** to edit the start frequency and then ⏶ ⏷ to change the start frequency to a frequency *less than* the forward sweep pilot frequency.

The receiver start frequency must *not* be set to a frequency equal to the start frequency of the 3010H.

c. Press **F1** to save the start frequency and highlight the stop frequency.

d. Press **F1** again to edit the stop frequency and then ⏶ ⏷ to change the stop frequency to a frequency *greater than* the forward sweep pilot frequency.

The receiver stop frequency must *not* be set to a frequency equal to the stop frequency of the 3010H. The span between start and stop frequencies should be less than 200 MHz.

e. Press **F1** to save the stop frequency and highlight the forward sweep pilot frequency.

f. Press **F1** to change the forward sweep pilot frequency.

g. If the forward sweep pilot frequency is not the same frequency as forward sweep pilot frequency set in the 3010H (see "Setting Sweep Parameter Control"), change forward sweep pilot frequency using ⏶ ⏷ .

h. Press **F1** to save the forward sweep pilot frequency and highlight channel plan.

i. If the sweep table is not set to “None”, use ⏶ ⏷ to highlight Sweep Table. Press **F1** and use ⏶ ⏷ to set the sweep table to “None”.

j. Press **F1** to save the selection and press **F3** to create a new table.

k. Press **F3** to scan the input. This results in no carriers being found because it is not connected to the system.

l. Press **F3 F3** to continue to the Global Edit screen.

m. Press **F3** to continue.

A message is displayed advising that the receiver is unable to communicate.

n. Press **F2** to save blank table to local and return to main menu.

2. Connect the 3010B or 3010R receiver to a test point at the headend.

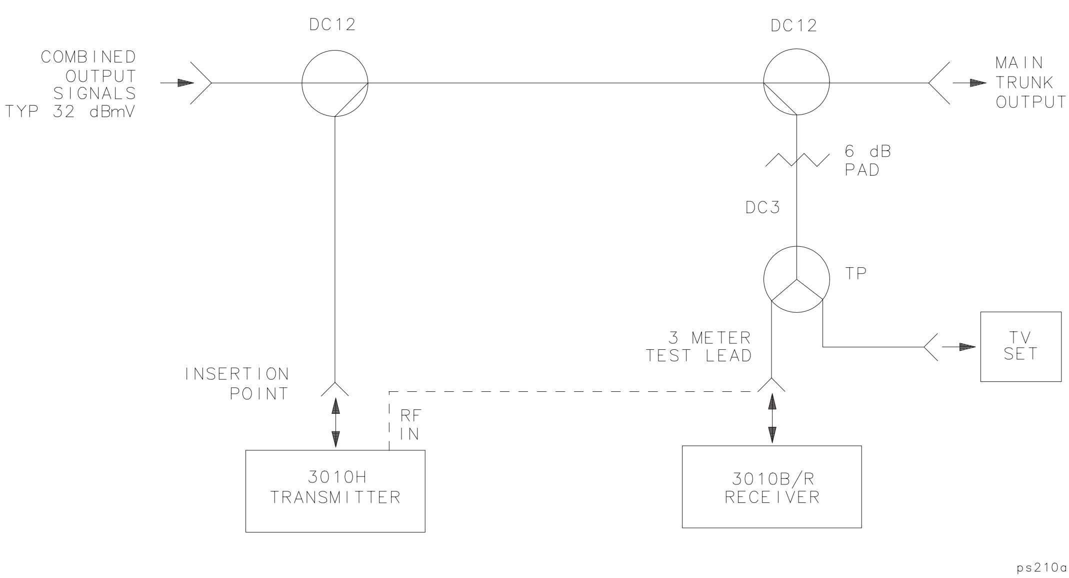


Figure 5-23 Sweep Insertion Setup

3. On the 3010B or 3010R receiver:

a. Press **F1** to put the receiver in channel scan mode.

b. Press **Option F4** for the Direct mode.

c. Press **Scale F1**. Press the ▲ ▼ to set the full scale (FS) so that the carriers are in the upper division of display.

d. Note the FS and TP values.

e. Press enter to save changes.

f. Set the 3010B/R to the forward sweep mode by pressing **Menu** ▲ **F1**.

g. Make sure the receiver is set to the raw sweep mode by verifying that the **F2** label is “Select Ref”.

h. If “Select Ref” is not the **F2** label, press **F2** until the **F2** label is “Select Ref”.

i. Press **Option F4** for the Direct mode.

j. Press **Scale** to verify that FS and TP are the same values previously noted.

k. Press **Enter**.

Downloading the Sweep Table from Setup Mode in the 3010H

- On the 3010H transmitter, from the Global Edit Screen, press **F3**.

Pressing **F3** downloads the sweep table via the RF to the 3010B/R receiver. The 3010H transmitter and the receiver should start sweeping. If not, wait until the next download is indicated on the 3010H display.

After the data is transferred from the 3010H transmitter to the 3010B or 3010R receiver, the receiver will begin to sweep. Refer to Figure 5-25.

The flashing “>” in the upper right corner of the screen of the 3010B/R receiver indicates the presence of the forward sweep pilot information from the 3010H. If the “>” sweep indicator is not flashing, you may not have the forward sweep pilot frequency matched between the 3010H and the receiver. Older models and some 3010B receivers have a flashing “*” in the upper right corner of the screen, indicating sweep operation.

Setting the Level and Slope of the Sweep

After completion of the sweep table transfer, Figure 5-24 is displayed on the 3010H transmitter. Using this screen, the output level and slope of the transmitter sweep is set, while monitoring the sweep as displayed on the 3010B/R receiver (see Figure 5-25).

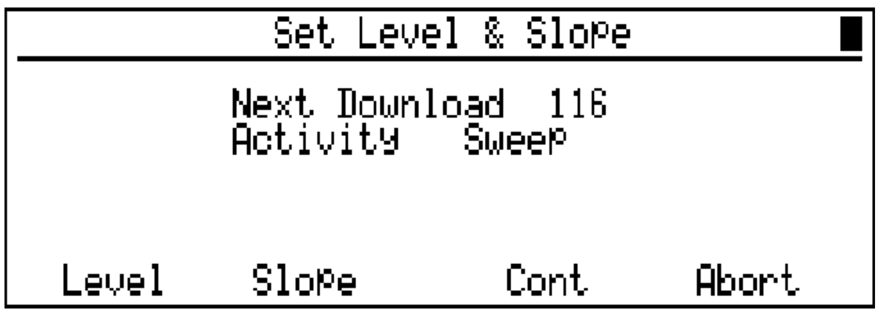


Figure 5-24 3010H Transmitter Level and Slope Screen

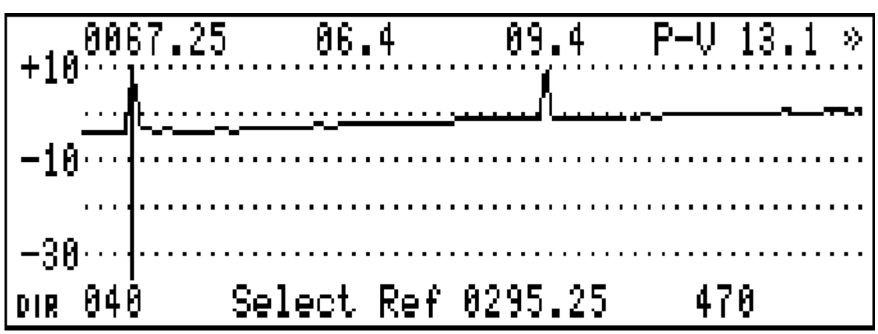


Figure 5-25 Raw Sweep Display with Marker on Lower System Amplifier Pilot Channel

Figure 5-25 shows a phantom carrier sweep response screen with the visual carrier frequency of two system amplifier pilot carriers added. The lower system amplifier pilot is channel 4 and the upper system amplifier pilot is channel 36. Using the arrow keys, move the marker to the block on the left side of the screen as shown in Figure 5-25. Note the frequency and the level displayed at the top of the screen. This is the level of the lower system amplifier pilot channel. Move the marker to the sweep points above the lower system amplifier pilot channel, as shown in Figure 5-26.

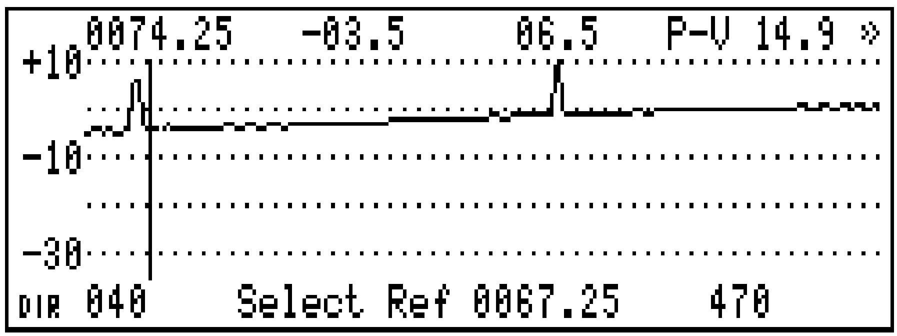


Figure 5-26 Sweep Display With Marker Next to the Lower System Amplifier Pilot Channel

With the marker in this position, you are reading the absolute level of the sweep points produced from the 3010H transmitter. Note the level of the sweep points. They should be approximately 10 dB below the level of the lower system amplifier pilot channel.

The 3010H in the forward sweep mode has an output range between +10 dBmV and +50 dBmV. The slope has a range of 10 dB but still must remain within the output level limits of +10 to +50 dBmV. The slope control varies the level of the high frequency with respect to the low frequency. For example, if the 3010H is set for +45 dBmV, you can set the high frequency 5 dB higher in level using the slope adjustment. If the 3010H is set for +17 dBmV, you can set the high frequency 7 dB lower in level using the slope adjustment. The output level of the 3010H transmitter can be changed by pressing **F1** and using its ⏶ ⏷ keys. When changing the output level of the 3010H, note the change on the screen of the 3010B/R receiver. Also, note the level shown at the marker frequency changes. The marker will read the frequency and the level of the measurement point represented on the screen.

Setting the Level and Slope of the Sweep

The 3010H slope adjustment is similar to the transmitter level adjustment. The slope adjustment controls the level at the highest frequency with respect to the lowest frequency displayed on the 3010B/R receiver screen. The adjustment is easily made by observing the relationship between the upper system amplifier pilot carrier level and the sweep points. As in the output level adjustment, you can measure the absolute level of the upper system amplifier pilot carrier and the sweep point next to it using the receiver. Adjust the slope of the 3010H transmitter until a difference of approximately 10 dB is achieved.

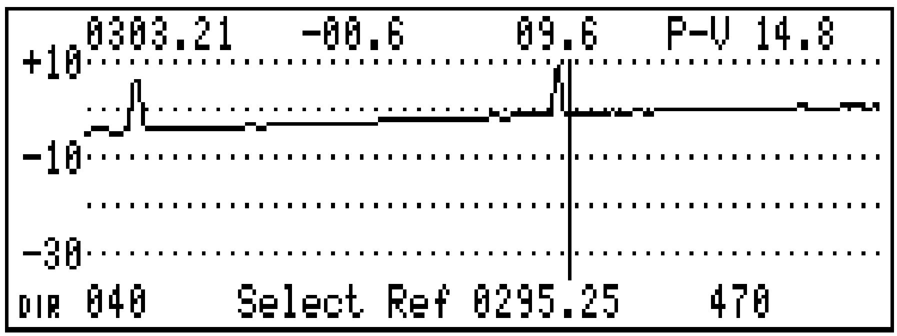


Figure 5-27 Sweep Display with Marker Next to Higher System Amplifier Pilot Channel

It is important to remember that the value entered as a slope value is at the stop frequency of the sweep. Therefore, the slope value required at the stop frequency is probably greater than the slope value that would be required at the frequency of the upper system amplifier pilot channel.

When adjusting the 3010H transmitter output level and slope, it may be necessary to use external pads between the 3010H and the sweep insertion point to set the operating range for proper slope adjustment. Pads should be placed on the RF output port of the 3010H transmitter to insure a correct impedance match.

The 3010H transmitter level should be set so that the sweep points are between 10 and 15 dB below the channels on the system and so that the slope of the sweep is approximately the same as the slope of the carriers on the system. After the slope is set, press **Enter** on the 3010H transmitter to save the change. Press **F3** on the 3010H to enter the forward sweep transmit mode.

Verifying Sweep Response Stability

The stability of the sweep response is based on the placement of the sweep points and the nature of carriers with dwells greater than 0. The placement of the sweep points is dependent on the frequencies and the guard bands in the sweep table.

The stability of the response is viewed in the Store Reference screen in the 3010B or 3010R. The Store Reference screen is accessed from the Raw Sweep screen. With the 3010B or 3010R is in the Raw Sweep screen, press **Option ⏏ F3**.

Notice the **`Ref. Avg. in Process....`** message that is displayed on the 3010B/R receiver. The dots to the right of the message are indicators used to give a measure of the stability of the response to be stored as the reference.

If there is less than 2 dB change between any two consecutive sweeps, one of the dots will disappear.

One dot will disappear with each consecutive stable sweep. If the response is stable, all dots and the message will eventually disappear.

If the dots do not disappear, you may need to modify your table.

Some common problems include:

- Dwell time too short on some carriers
- Sweep and carriers “beating”
- Sweep in FM band or positive trap carriers
- Varying levels
- Portion of the response is at the noise floor

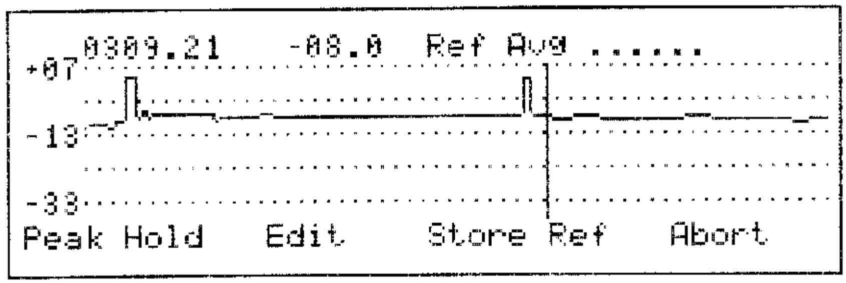


Figure 5-28 3010B/R Receiver Edit and Store Reference Screen

If the **`Ref. Avg. in Process`** message disappears, you have a stable response. Store the reference file in the 3010B/R receiver by pressing:

1. **F3** to access the Reference Selection screen from the Reference Average screen.
2. ▲ ▼ keys to select the file.
3. **F3** to store the reference file in the 3010B/R receiver and exit to the Center Normalized mode with the reference file selected.

If the **`Ref. Avg. in Process`** message does not disappear, you do not have a stable response. Perform the following steps:

1. Store the reference file in the 3010B/R receiver by pressing:
   a. **F3** to access the Store Reference screen.
   b. ▲ ▼ keys to select the file.
   c. **F3** to store the reference file in the 3010B/R receiver and exit to the Center Normalized mode with the reference file selected.
2. Change the dB/Div scale to 2 dB per division by pressing:
   a. **Scale F3** to access the Scale screen and activate the dB/Div selection.
   b. ▲ ▼ keys to change the dB/Div to 2.
   c. **Enter** to save the setting.
3. Engage the Peak Hold function by pressing **Option** ▲ **F1**.
4. Find channels that vary by greater than 2 dB by:

a. Reviewing the sweep with Peak Hold enabled.

b. Using ◀‖ ‖▶ to move the marker to any variations in the sweep response that are greater than 1 division (2 dB)

c. Recording the frequency of the variation.

d. Repeating this process until the frequency of all variations are recorded.

5. Return to the Edit screen on the 3010H transmitter by pressing.

   a. **F1 F1** to exit to the main menu.

   b. ⏏ **F3** ⏷ **F3** to access the Edit screen.

6. Using the instructions in the "Editing the Sweep Table" section of this chapter, make the required changes to the frequencies that varied greater than 2 dB.

7. Repeat the process of downloading the edited sweep table from the 3010H transmitter to the 3010B/R receiver.

Downloading to Remote 3010B/R Instruments

In many cases, this procedure is automatic. However, you can force the receivers to update the sweep table. The sweep table in the receivers must be the same as the sweep table in the transmitter for the system to work.

Once the 3010H transmitter is set up in the forward sweep mode, its sweep table should be downloaded to the 3010B and 3010R receivers throughout the system. This section describes the process for setting up the receivers so they will accept the download from the 3010H.

The forward sweep pilot frequency set in the 3010H transmitter and the 3010B and 3010R receivers is the communication link to synchronize the transmitter and the receivers for the forward sweep measurement. Every 121 sweeps, the 3010H transmitter sends the entire setup table, the start frequency, the stop frequency and a check sum value. When a receiver detects the download information, it checks the value of the check sum sent by the 3010H transmitter against the check sum of the active sweep table in memory. If the check sum values are the same, the receiver ignores the download and continues to sweep. However, if the check sum is different, the receiver will download the new table from the 3010H transmitter, reset, and begin sweeping with the new table.

The check sum is changed whenever the start, stop, or sweep table is altered. Therefore, to force the receiver to accept the downloaded sweep table, you must change one of these parameters. This changes the checksum to a different value.

Changing the Start and Stop Frequency

Quick Reference

Changing Start/Stop
Menu
⏏
F3
F3

To force a change in the check sum, the 3010B/R receiver's start and stop frequencies must be different than the start and stop frequencies programmed in the 3010H transmitter. The receiver's start and stop frequencies are changed from the receiver's Sweep Parameters screen. To enter the Sweep Parameter screen, from the main menu, press ⏏ **F3** (2 times).

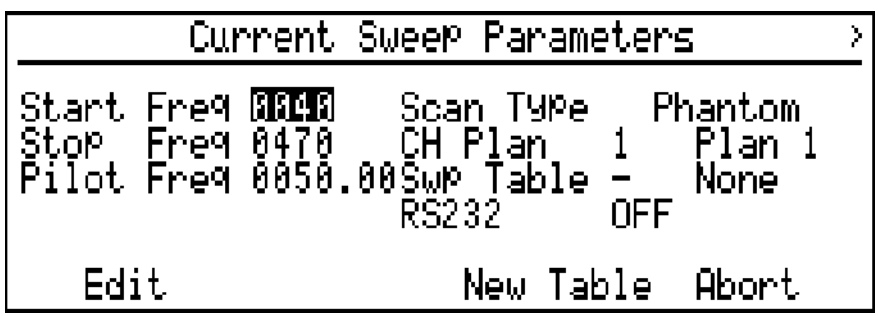


Figure 5-29 3010B/R Receiver's Current Sweep Parameters Screen

Changing the Start and Stop Frequency

With the start frequency highlighted, press **F1** to edit the frequency. Use the ◀ ▶ keys to select the digit. Then use the ▲ ▼ keys to set the value. The start frequency should be set to a frequency different from the start frequency set in the 3010H transmitter. Press **F1** to save the change and highlight the 3010B/R receiver's stop frequency.

Next, set the stop frequency to a frequency different from the stop frequency programmed in the 3010H transmitter.

NOTE: Use frequencies close to the forward sweep pilot frequency as the start and stop frequencies. When selecting the stop frequency, choose a stop frequency that would result in a span of less than 200 MHz. For example, if you are using a forward sweep pilot frequency of 50 MHz, you could use a start frequency of 20 MHz and a stop frequency of 100 MHz.

With the stop frequency highlighted, press **F1** to edit the frequency. Use the ◀ ▶ keys to select the digit. Then use the ▲ ▼ keys to set the value. Press **F1** to save the change.

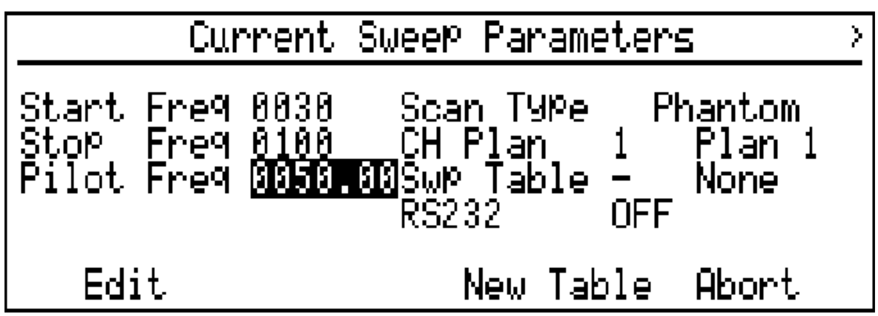


Figure 5-30 3010B/R Receiver's Current Sweep Parameters Screen

Check the forward sweep pilot frequency. This frequency must be set to the same frequency as the transmitter forward sweep pilot frequency. To change the pilot frequency, with the pilot frequency highlighted, press **F1** and use the ◀❙ ❙▶ keys to select the digit. Then use the ▲ ▼ keys to set the value. Press **F1** to save the change. See Figure 5-31.

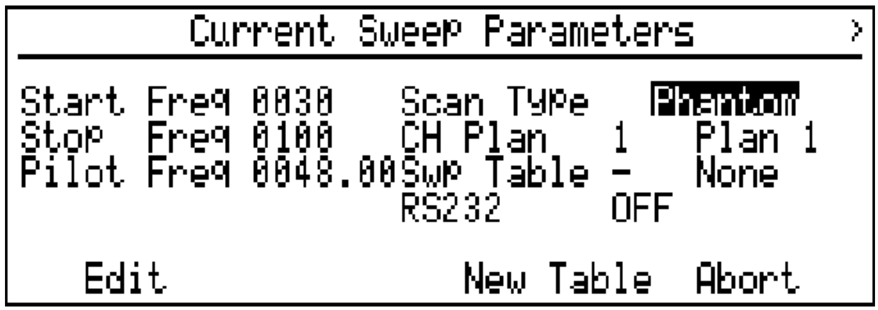
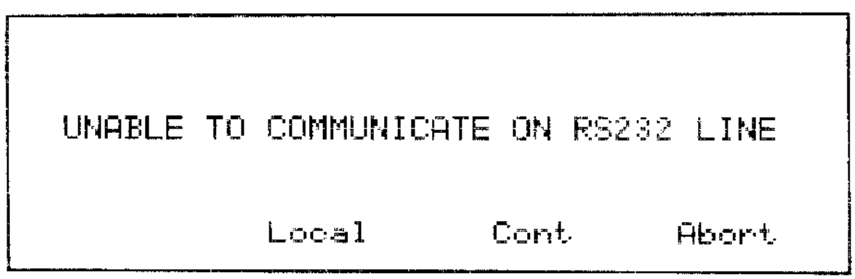


Figure 5-31 3010B/R Receiver’s Current Sweep Parameters Screen

Disconnect the RF input from the 3010B/R receiver. Press **F3** (5 times) on the receiver until the error message shown in Figure 5-32 is displayed on the receiver.



pi759

Figure 5-32 RS-232 Warning on the 3010B/R Receiver

Press **F2** to change the check sum and exit the Sweep Setup mode.

Connect the 3010B/R receiver to a test point which provides the forward sweep pilot frequency from the transmitter present. Press ⏏ **F1** on the receiver to enter the Sweep mode.

The 3010B/R receiver must be set to the Raw Sweep mode. When the Label function of **F2** is **`Select Ref`**, the receiver is in the Raw Sweep mode. If the label shows a reference file name, change it to the Raw Sweep mode by pressing **F2** until the label is “Select Ref” as shown in Figure 5-33.

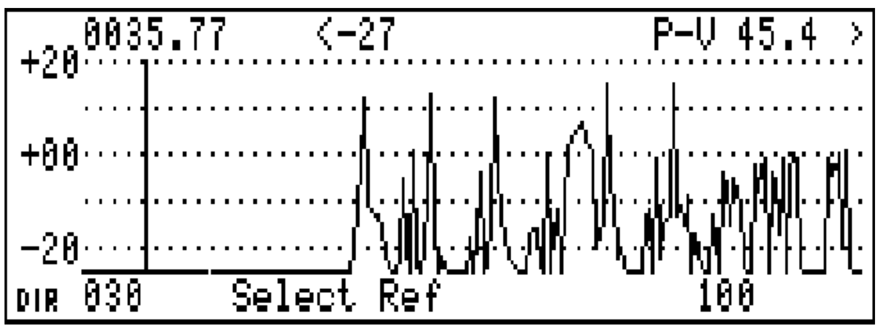
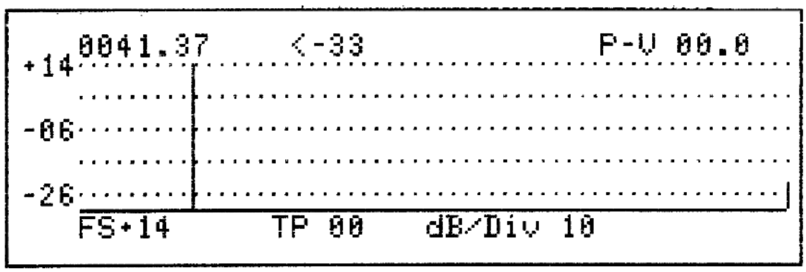


Figure 5-33 3010B/R Receiver’s Raw Sweep with Different Table

Make sure the level of the signal into the 3010B/R receiver is not too high or too low. To check the scaling, press **Scale** on the receiver.



pi7146

Figure 5-34 Setting the 3010B/R Receiver's Scaling

The full scale value should be set so that all of the carriers on the system are in the upper division of the 3010B/R receiver's display. Depending on the difference in the tables in the 3010H transmitter and the receiver, the display may not show the carriers on the system at their correct level. If you are not sure of the levels of the visual carriers on the system at this test point, refer to Chapter 3 for information on how to measure their levels. To change the full scale value, press **F1** and use the ◀ ▶ keys to select the digit and the ▲ ▼ keys to select the value. The test point value is reflected in the full scale value.

To edit the test point value, press **F2** and use the ◀ ▶ keys to select the digit and the ▲ ▼ keys to select the value.

Set the maximum viewing range on the 3010B/R receiver's display so you can see the raw sweep trace. To change the receiver's dB/Div value to 10 dB, press **F3** and use the ▲ ▼ keys to change the value to 10 dB.

Press **Enter** to save the 3010B/R receiver changes and return to the raw sweep display. It may take up to 5 minutes to download the table from the 3010H transmitter. When the receiver sees a difference in the check sum, the receiver display stops updating, the receiver downloads the new table, resets itself, and begins sweeping. The raw sweep response then appears on the receiver's display.

NOTE:

Headend Tip
If you are at the 3010H location (the headend), you can force an *immediate* download to the 3010B/R receiver. Press **F4** on the 3010H transmitter to force the immediate download. The receiver will update the trace and begin to sweep once the table is downloaded.

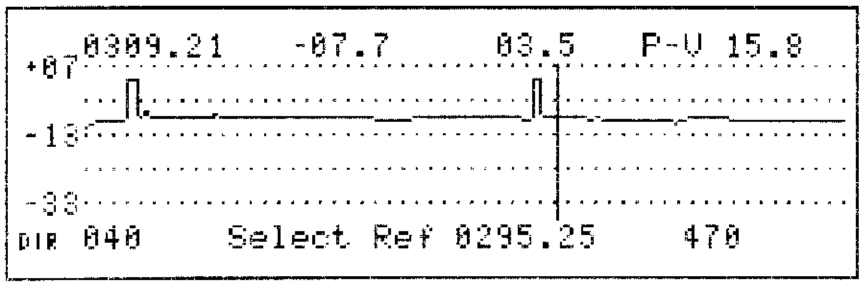


Figure 5-35 3010B/R Receiver's Raw Sweep Screen after the Download

Once the 3010B/R receiver receives the table and begins sweeping, you must store a reference to use the Normalized Sweep mode. To store a reference at this test point, press **Option** ⏏ **F3** on the receiver.

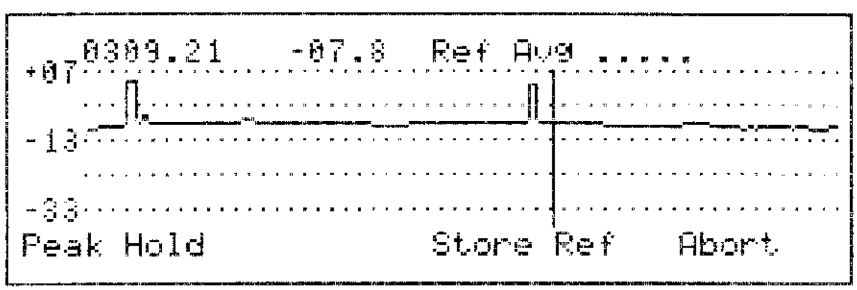
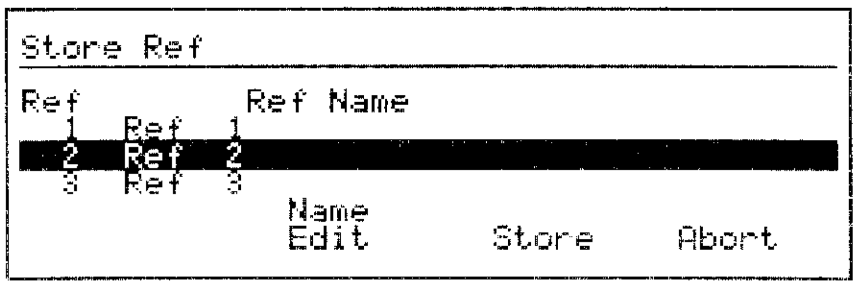


Figure 5-36 3010B/R Receiver's Reference Averaging Screen

The Reference Average message is displayed in the upper right hand corner to indicate the stability of the response. The 3010B/R receiver averages consecutive sweep responses. If the level does not change more than 2 dB, the receiver removes one dot at a time from the display until the message has disappeared. After the message has disappeared, or when you are satisfied the reference is usable, press **F3** on the receiver to enter the receiver's Reference File Selection screen (Figure 5-37).

NOTE: If you are storing a reference when a portion of the response is rolled off into the noise floor, the dots may not disappear. You can still store the reference and use the stable portion of the response to check the system.



pi778

Figure 5-37 3010B/R Receiver's Reference File Selection Screen

Use the ▲ ▼ keys on the 3010B/R receiver to select the reference file. The name of the file can be changed by pressing **F2** and following the instructions in the "Naming a Table or Frequency Plan" section of Chapter 2.

To store the reference to the highlighted file in the 3010B/R receiver, press **F3**. The receiver will store the reference to the selected file, exit the file server, and enter the Normalized mode with the new reference selected. The reference label will appear over **F2** on the receiver's screen.

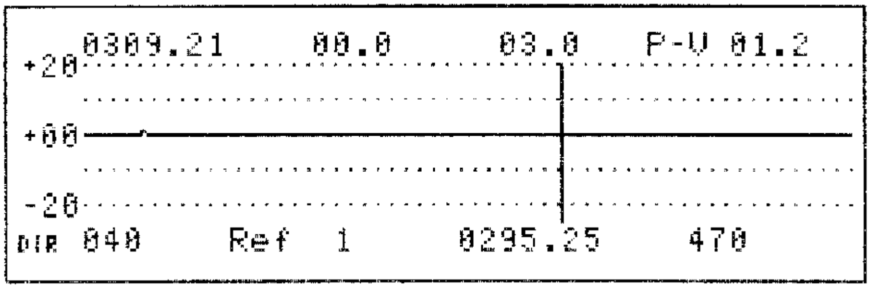


Figure 5-38 3010B/R Receiver's Normalized Sweep Screen

6

Forward Sweep Measurements

Forward Sweep Measurements

The 3010H with Option 050 or Option 052 can be used as a forward sweep transmitter. Option 052 contains the additional capability of being both the forward sweep transmitter and the return path monitor at the same time.

Sweep Speed

The 3010H has two sweep speed modes, “Normal” and “Fast”. The normal sweep mode is compatible with all of the Calan 3010 sweep receivers. Using the 3010H with Option 050 or Option 052 in the normal mode is a direct replacement for the 1777 transmitter.

The fast sweep mode is only available with firmware version 4.0 or higher. When the 3010 is initially powered up, the installed version of the firmware is displayed on the upper line of the startup screen.

The fast sweep mode optimizes performance by minimizing delays within the sweep algorithm. The actual change in the sweep speed is dependent on the number of frequencies in the table and the size of the guard bands. Increasing the number of frequencies and their associated guard bands decreases the number of measurement points and increases the sweep speed.

Setting the Sweep Speed in the 3010H

To change the sweep speed for forward sweep, press **Menu ⏏**.

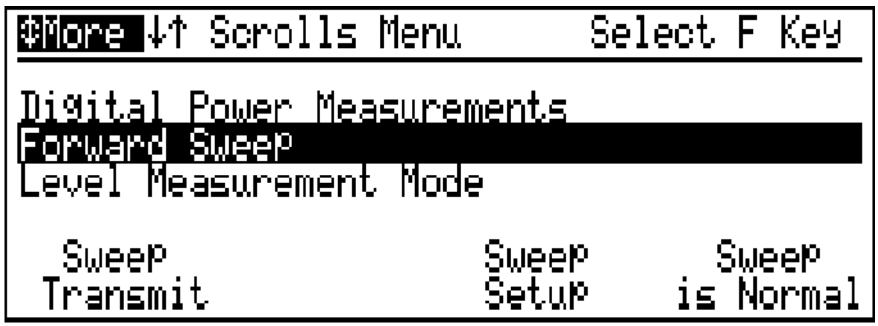


Figure 6-1 Forward Sweep Screen

Press **F4** to toggle the sweep speed between the normal and fast modes.

Press **F1** to enter the forward sweep mode. During startup, the 3010H downloads the sweep speed selection as the sweep tables are downloaded.

NOTE: The sweep speed function is available in firmware version 4.0 or higher. For older versions of firmware, selecting fast sweep mode will download the new table, but the sweep will be distorted due to timing differences.

Communication Status Indicators in the 3010B and 3010R

The operation of the 3010H in the Forward Sweep measurement requires a communications link between the 3010H and the 3010 receiver. The status of the communication is indicated by a flashing indicator in the upper right corner of the 3010 receiver's display. The following is a list of the communication indicators and possible problems that they indicate:

Flashing >	Normal forward sweep - Communication is working in both directions; display should be updating.
Flashing >>	Fast forward sweep - Communication is working in both directions; display should be updating.
No Flashing Indicator or Solid Rectangle	Not receiving the Forward Pilot.
Large Flashing Rectangle	Receiving the Forward Pilot, no return communication.

7

Return Path Setup

Return Path Setup

The gain of the amplifiers in the forward path of a cable network compensates for the loss of the previous cable and the passive devices. Each forward amplifier is set to the same output level. The return amplifier compensates for the loss of the same length of cable. Because signals in the return path are merging, the return amplifiers are typically set for a constant input level. When setting the return amplifier, the output pad and equalizer are adjusted for a specific input level at the next amplifier and subsequently a level at the headend. In the past, system operators placed a measurement device at the headend with a camera focused on the display. The video output of the camera was connected to a modulator and the modulator output was combined in the forward cable system. In the field, the technician could insert a known signal into the return path and adjust the amplifier while viewing the levels measured at the headend using a portable television set. This approach has limitations. Typically, only a two or four-channel signal generator is used in the field, limiting the resolution. This scheme also uses 6 MHz of the forward spectrum which could be a revenue channel.

The combination of the 3010H and 3010R provide the technician with a means to align both the forward and return paths simultaneously, with minimal use of forward spectrum.

The 3010H can communicate with up to ten 3010R receivers simultaneously.

A major problem in the return path of the network is the ingress of unwanted signals into the system. If the ingress signals are high enough, they will disrupt the operation of the return path and the communication between the 3010R and the 3010H. The 3010H monitors the return telemetry frequency, measuring the noise floor. If ingress or return impairments rise above a threshold, the 3010H will broadcast an alert and a return spectrum measurement to all receivers in the field on the forward pilot. By using the return spectrum and spectrum scan measurement mode, the technician can troubleshoot the source of the ingress problem. The ingress measurement can be set to send a return spectrum measurement each time the 3010H polls the system. By using the 3010H in the continuous ingress mode, the 3010B and the 2010B with the return path option can also be used to monitor the return path.

Installing the 3010H

Considering the system organization, the 3010H is the master, or controller, and the 3010R the slave. The return sweep table with the appropriate start and stop frequencies is programmed in the 3010H and that information is sent to the remote instrument each time it makes contact. This insures the appropriate protection and parameters are met for each return path automatically.

NOTE: The 3010R can also function as a 3010H in the field. Refer to Chapter 12 in the 3010R manual for the procedure to select between the remote and the headend mode.

Connecting the 3010H to the Network

The 3010H has two RF connectors on the back of the instrument, an RF Output 2 connector and an RF Input 1 connector. See Figure 7-1.

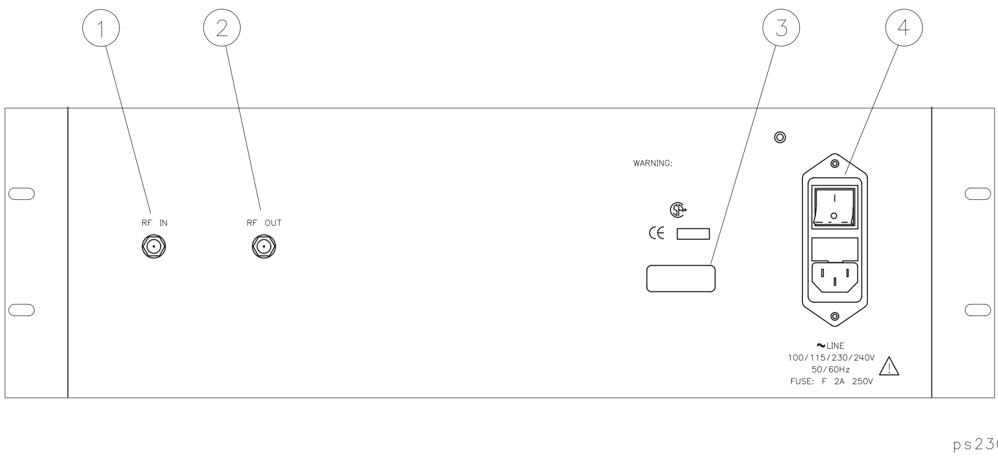


Figure 7-1 Rear Panel

The RF Output connector 2, Figure 7-1, provides the forward pilot and is connected to the forward path combiner. The forward pilot is used to poll and send the display data to the 3010R instruments in the field.

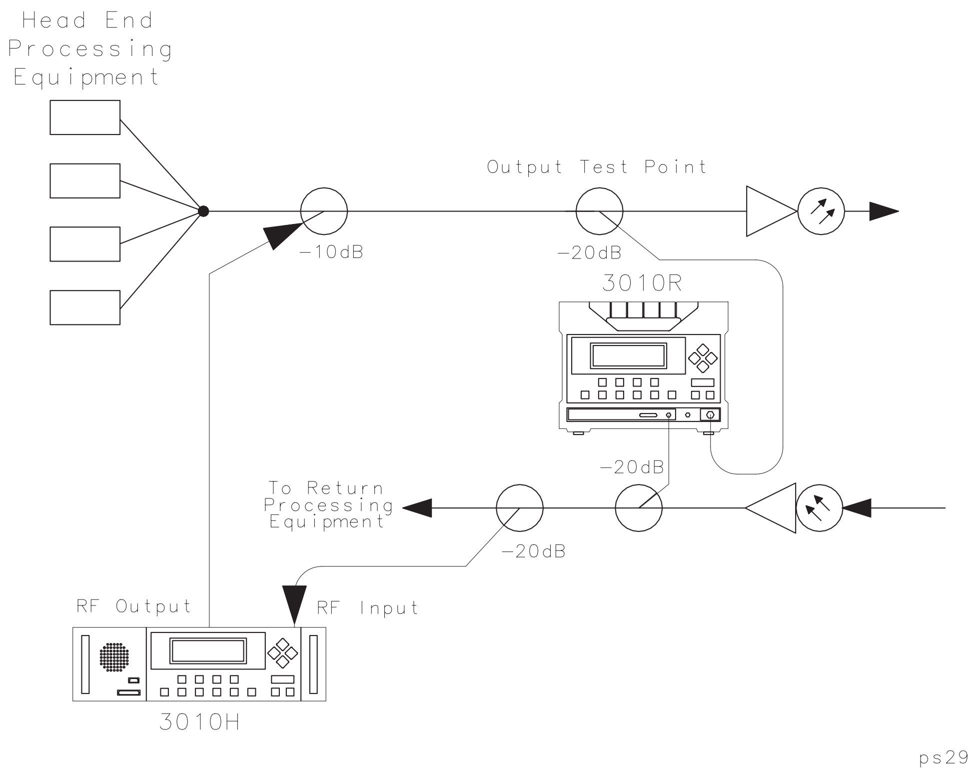


Figure 7-2 Headend Connection Diagram

The RF Input connector (1), Figure 7-1, is used to monitor the return path test point and receive the sweep signal from the 3010R in the field. The RF Input is connected to the return path output at the headend. In the case of fiber systems, more than one fiber node may be connected together and the combined output connected to the 3010H.

The pilot in the 3010H can be set to any frequency between 5 MHz and 1 GHz.

Setting the Input Level

Set the input attenuator so that there is enough dynamic range to make measurements on the return path without overload. The input sensitivity used in the Return Monitor mode for the 3010H is set by the full-scale selected in the Spectrum Scan mode.

The 3010H has two power switches. The switch on the rear panel 4 (Figure 7-1) controls the 110/220 volt power supply. The front panel On/Off switch controls the measurement circuits. Turn on both switches.

The instrument will calibrate itself and display the Main menu. See Figure 7-3. Pressing the **Menu** key also selects the same screen.

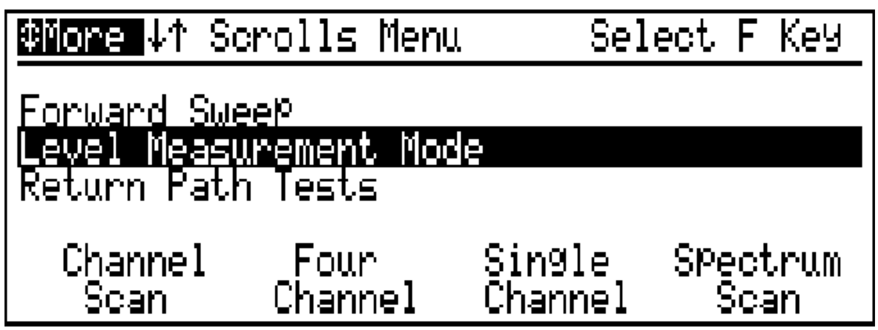
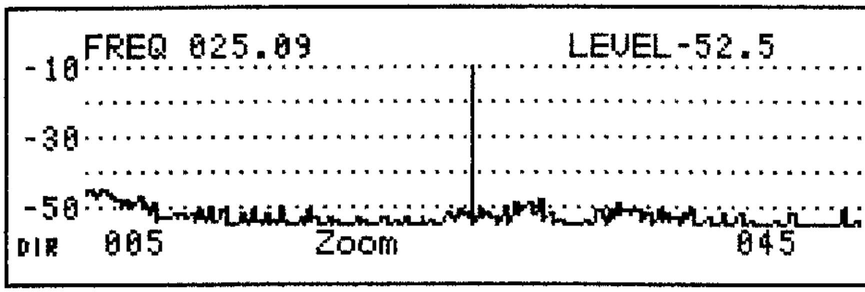


Figure 7-3 Main Menu

To enter the Spectrum Scan mode, press **F4**.



ps22h

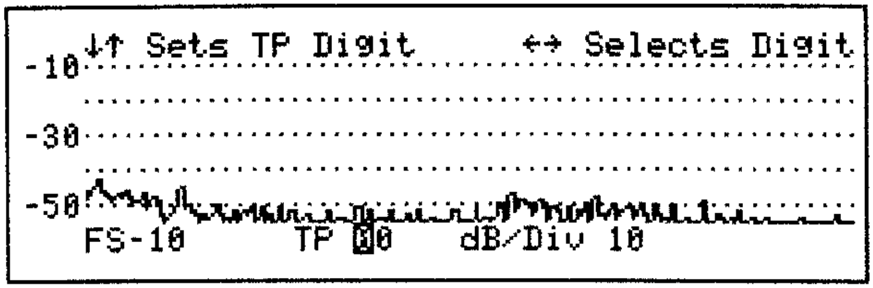
Figure 7-4 Spectrum Scan Mode

For monitoring a sub-low return, press **F1** and set the start frequency to 5 MHz. Press **F4** and set the stop frequency to 45 MHz.

In some systems, there may be no consistent signals. For these networks, you will set the Full Scale (FS) a few dB above the expected signal levels at the monitor point.

In Figure 7-2, the 3010H RF input is connected to a return path test point, 20 dB down from the actual input to the return equipment. If the expected input to the return equipment is 18 dBmV, the resultant level measured at the input to the 3010H will be –2 dBmV. Therefore, the FS (full scale) value should be set to 0 dBmV.

To adjust the full scale setting, press **SCALE F1**. Use the ◀| |▶ keys to select the digit and use the ▲ ▼ keys to set the value.

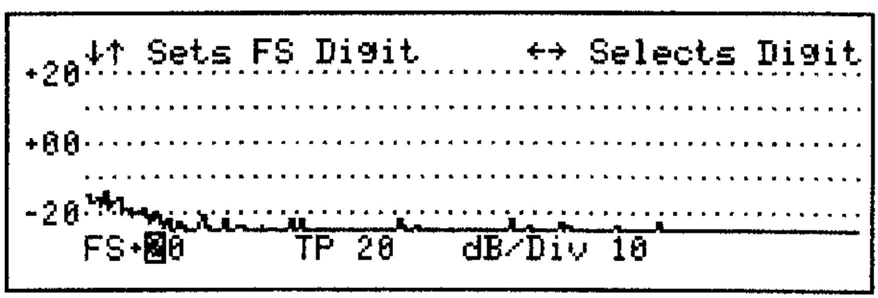


ps24h

Figure 7-5 Setting the Test Point

Measurements are normally related to the levels at the input or output of a device, and not to the absolute levels measured after the test point. The 3010H allows you to correct the measurements for the test point loss. In Figure 7-4, the RF input of the 3010H is connected through a 20dB test point. By setting the value of TP (test point) to 20 dB, the levels measured by the 3010H will reflect the level values as if they were measured at the actual output of the equipment or combiner.

To change the TP, press **F2**. Use the ◀| |▶ keys to select the digit and use the ▲ ▼ keys to set the value. When the TP value is changed, the FS will automatically change to reflect the offset.



ps23h

Figure 7-6 Setting Full Scale

A system that has not yet been aligned may have high ingress. High levels of ingress can affect the performance of the return sweep. The 3010H will make and broadcast ingress measurements to help the technician troubleshoot the problem when ingress is high or if the “Ingress Mode” is set to “Continuous”.

If your network has a high level of ingress, you can use the Return Spectrum mode, the Ingress mode, and Spectrum Scan mode to troubleshoot and repair the network. At this point, it is important to insure that the 3010H is not overloaded and has the proper dynamic range to make the return measurements.

To continue the setup of the 3010H, set the full scale levels, set the start and stop frequency to the correct value, then press **Menu** to display the Main menu.

NOTE: Setting the full scale and the start and stop frequencies will define the “broadcast” measurements.

Entering the Setup Mode

To enter the Return Path Tests menu, press **Menu** ▼.

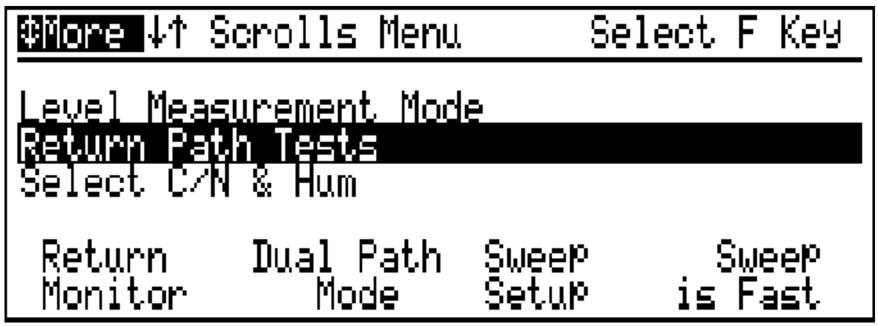


Figure 7-7 Return Path Test Menu

To enter the Return Path Setup mode, press **F3**.

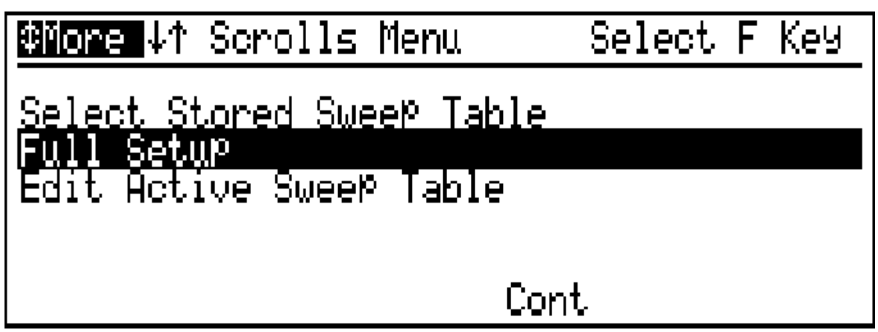


Figure 7-8 Return Setup Menu

Press **F3** to select full setup and enter the return path parameters screen.

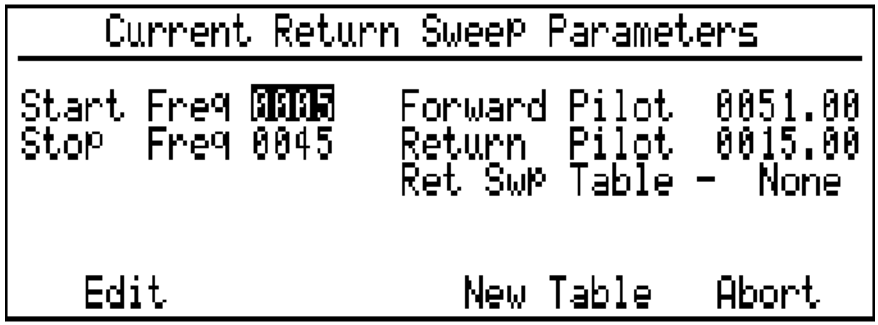


Figure 7-9 Return Path Parameters Start Frequency

The 3010H and 3010R are capable of sweeping any portion of the spectrum between 5 MHz and 1 GHz. If your system uses the sub-band return spectrum between 5 MHz and 40 MHz, you should set the start and the stop frequencies accordingly. For this example, we will assume the return spectrum is 5 MHz to 45 MHz.

To change the start frequency, use the arrow keys to highlight the start frequency if it is not highlighted, then press **F1**. Use the ◀ ▶ keys to select the digit and the ▲ ▼ keys to set the value. Press **Enter** to save the changes and move to the stop frequency.

If the start frequency is correct, use the arrow keys to select the stop frequency.

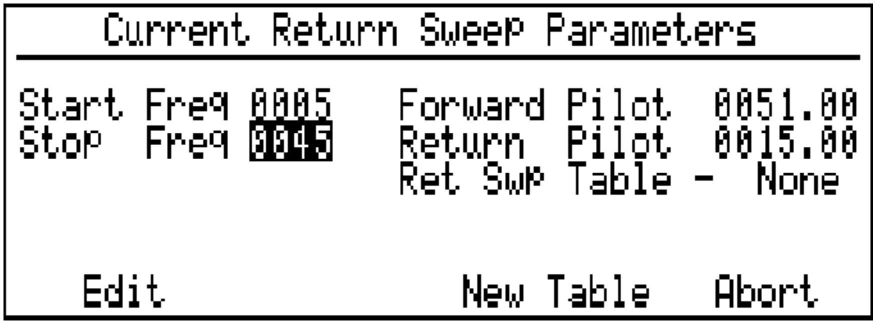


Figure 7-10 Return Path Parameters Stop Frequency

As in the forward sweep setup, in the return sweep you may view the response of the diplex filters. In this example, we set the stop frequency to 45 MHz, which is 5 MHz above the upper limit of the return diplex filters.

To change the stop frequency, press **F1**. Use the ◀ ▶ keys to select the digit and the ▲ ▼ keys to set the value. Press **Enter** to save the changes and move to the forward pilot frequency.

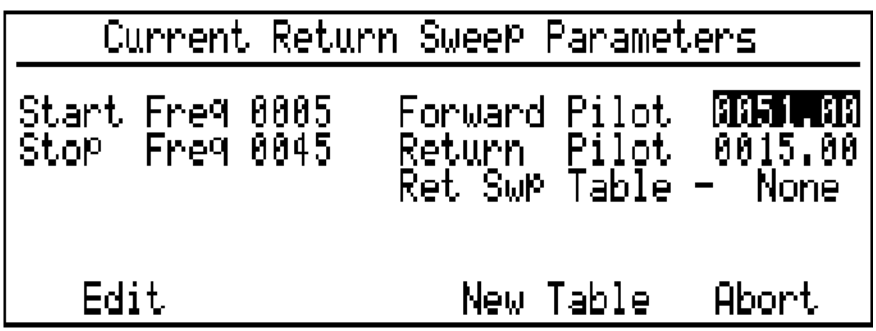


Figure 7-11 Return Path Parameters Forward Pilot

The forward pilot is used to communicate, or poll, and to transmit the measurement display data to the remote instruments in the field. The forward pilot frequency can be set to any frequency between 5 MHz and 1 GHz. However, it must be within the passband of the forward path of the system and away from other carriers on the system. It should be more than 300 kHz away from a CW carrier at the same level. If the adjacent carrier is modulated, a larger spacing may be required. It is important to select a frequency that will not interfere with any other carriers already installed on the system. For this example, we have chosen 51 MHz, 1 MHz above the standard 50 MHz pilot used for the forward sweep. If you are using the 3010H with Option 052 in the dual path mode, you can set the forward pilot for the return path and the forward sweep to the same frequency.

To change the forward pilot frequency, press **F1**. Use the ◀| |▶ keys to select the digit and the ▲ ▼ keys to set the value. Press **Enter** to save the changes and move to the return pilot frequency.

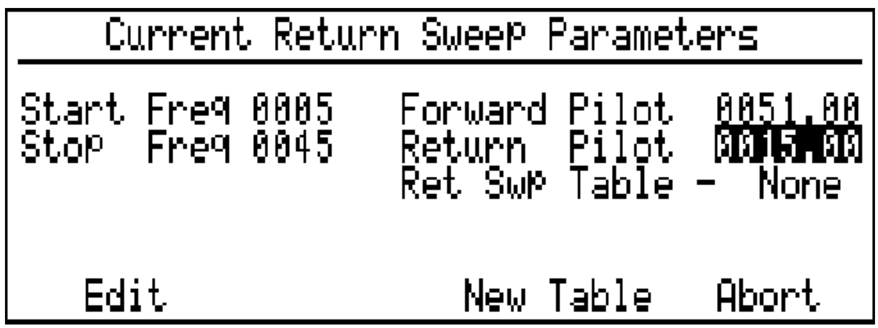


Figure 7-12 Return Path Parameters, Return Pilot

The return pilot provides communication from the remote instruments (3010Rs) in the field to the headend instrument (3010H). Therefore, it must be within the passband of the return path of the system under test. For this example, we have chosen a frequency of 15 MHz.

NOTE: The return pilot also requires the space between adjacent carriers to be greater than 300 kHz for a CW carrier. For modulated adjacent carriers, this value should be increased. The return pilot also requires a C/N ratio of greater than 25 dB and should be placed in a portion of the return path where this is possible. This is the frequency at which the 3010H will monitor ingress for the broadcast alert.

To change the return pilot frequency, press **F1**. Use the ◀ ▶ keys to select the digit and the ▲ ▼ keys to set the value. Press **Enter** to save the changes and move to the return sweep table.

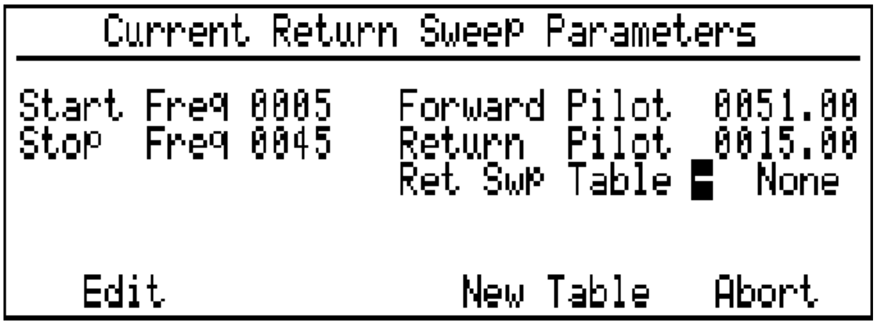


Figure 7-13 Return Sweep Table

If you are creating a new sweep, this item should be set to **None** as shown in Figure 7-13. To change the Return Sweep Table selection, press **F1**. Use the ▲ ▼ keys to set the value to **None**. Press **Enter** to save the change.

NOTE: The 3010H can store up to 4 Sweep Tables. Each sweep table includes the start and stop frequencies. Refer to Chapter 10 for more information about storing and retrieving sweep tables.

Press **F3** to continue to the review sweep table screen.

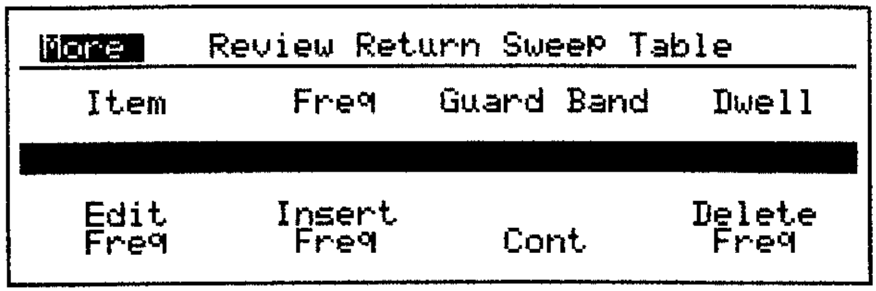


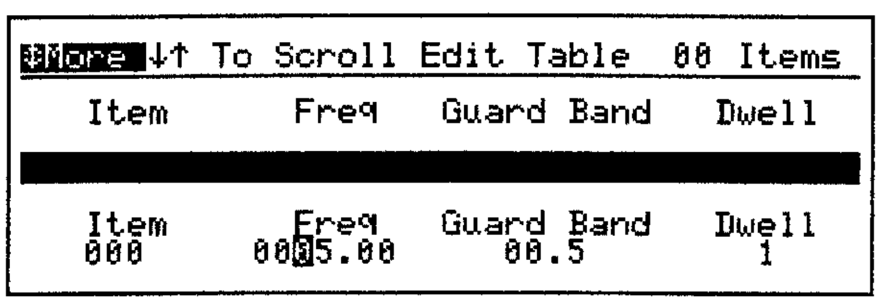
Figure 7-14 Blank Return Sweep Table

Inserting a Frequency into the Return Sweep Table

You are now ready to create the return sweep table. Unlike the forward sweep setup, the return sweep setup does not have a scan function. Most return systems do not have carriers present on the system at all times. Therefore, the scan function would not help create the table. This increases the importance of knowing the frequencies present on the return path, in order to protect them from interference.

An issue to consider when inserting frequencies in the return sweep table is the bandwidth of the return path. The bandwidth of the return path is relatively narrow compared to the forward path. In the forward path, a guard band of 2.9 MHz represents a small percentage of the entire spectrum, when sweeping from 50 to 750 MHz. In the return path, however, a 2.9 MHz guard band represents a much larger percentage of the spectrum when sweeping only 40 MHz. It is important to keep the guard bands as small as possible in order to achieve the maximum frequency resolution.

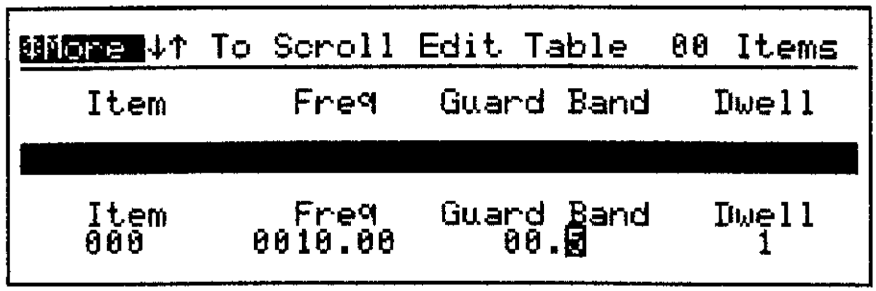
For this example, we have a system with the following three digital carriers present: 10 MHz, 20 MHz, and 30 MHz. To insert a frequency in the sweep table, press **F2**.



ps213h

Figure 7-15 Review Return Sweep Table

The new frequency is displayed at the bottom of the display with a digit of the frequency highlighted. Use the ▲ ▼ keys to select the digit and the ▲ ▼ keys to set the value. Press **Enter** to save the change and move to the guard band field.



os214h

Figure 7-16 Return Sweep Table, Insert Mode

NOTE: The value of the guard band and dwell are set to the default values programmed in the Set Default item in the Return Sweep Setup menu. Refer to Chapter 10 for the procedure to change these values.

To change the guard band, use the ▲ ▼ keys to select the digit and the ▲ ▼ keys to set the value. Press **Enter** to save the changes and move to dwell.

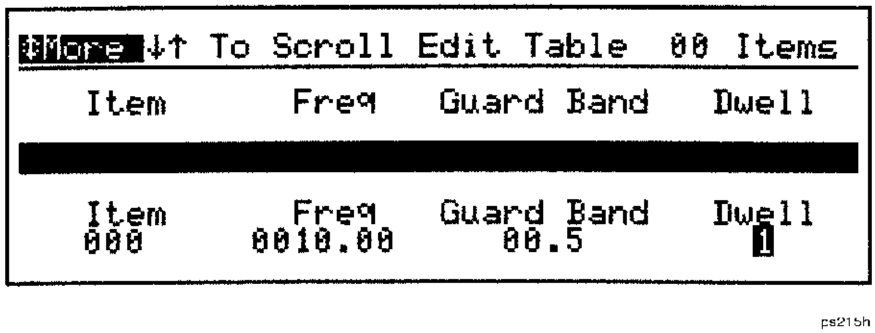


Figure 7-17 Return Sweep Table, Dwell Time

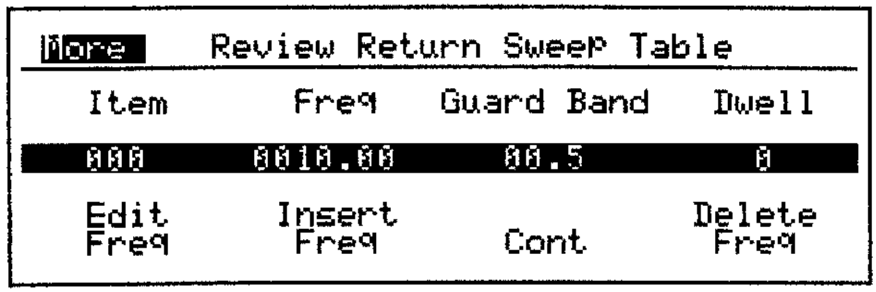
The dwell tells the receiver how long to measure the peak level of the frequency. Table 7-1 is a list of the dwell time values:

Table 7-1 Dwell Times and Applications

Dwell	Time	Application
0	NO READ	Phantom and unstable carriers
1	100 µs	Normal visual carriers
2	4 ms	FM carriers
3	24 ms	Scrambled carriers

For the return path, most frequencies in the table will have a dwell of 0 because the return signals are generally intermittent if they are on at all. Therefore, the only valid dwell is 0.

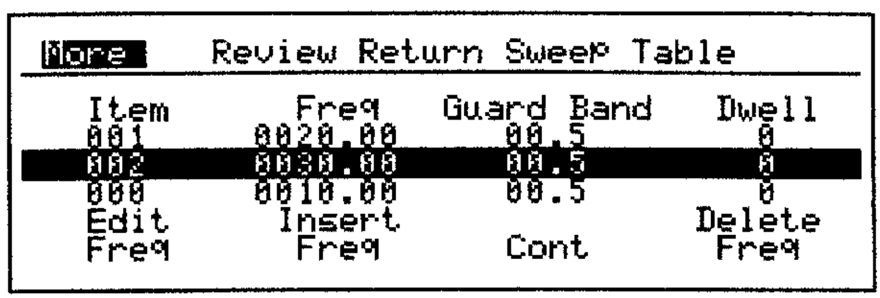
To change the dwell, use the ▲ ▼ keys. Press **Enter** to save the changes and insert the frequency into the return sweep table.



ps216h

Figure 7-18 Review Return Sweep Table, 1 Frequency

This is the time to insert all the frequencies, to be protected, in your system. In our example, we will insert 10 MHz, 20 MHz, and 30 MHz.

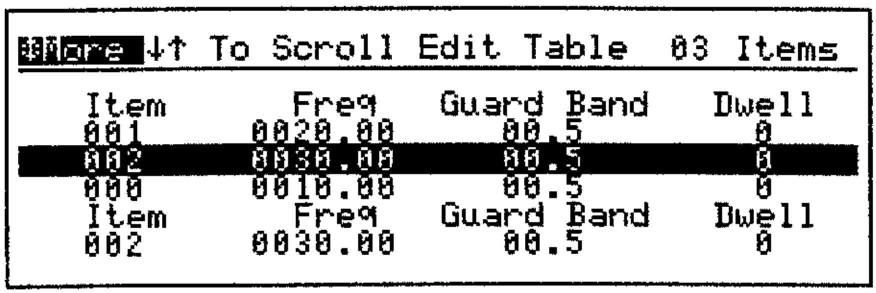


ps217h

Figure 7-19 Review Return Sweep Table, 3 Frequencies

Editing a Frequency in the Return Sweep Table

You may change a value for any of the frequencies. To do so, select the frequency using the ▲ ▼ keys. Press **F1** to edit the highlighted frequency.



ps218h

Figure 7-20 Review Return Sweep Table, Edit

Press **F2** to edit the frequency, press **F3** to edit the guard band, or press **F4** to edit the dwell time. Use the arrow keys to edit the value as described in the “Insert Frequency” section of this chapter. Press **Enter** to save the change to the field and press **Enter** again to store the frequency into the table.

Deleting a Frequency from the Return Sweep Table

Frequencies can be deleted from the return sweep table. To delete a frequency from the table, use the ▲ ▼ keys to select the frequency and press **F4**.

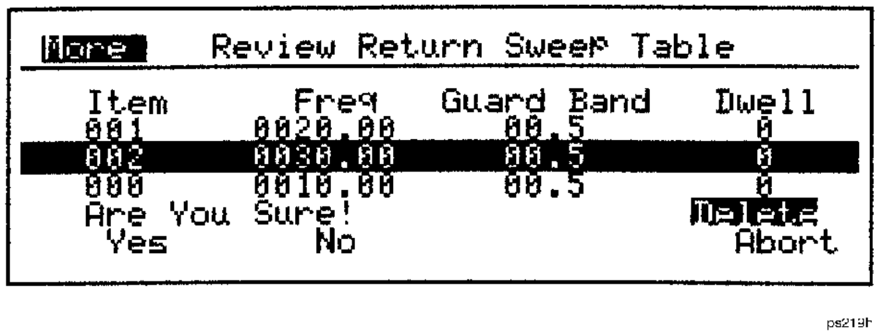
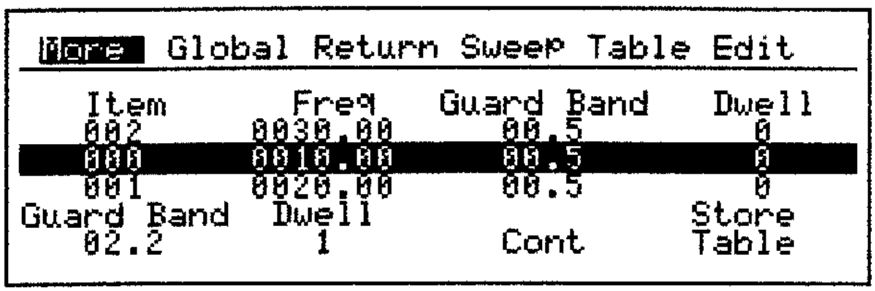


Figure 7-21 Review Return Sweep Table, Delete

Press **F1** to delete the frequency or press **F2** or **F4** to abort the action and return to the review sweep table screen.

Global Return Sweep Table Edit Screen

After you have completed editing the sweep table, press **F3** to proceed to the global return sweep table edit screen.



ps220h

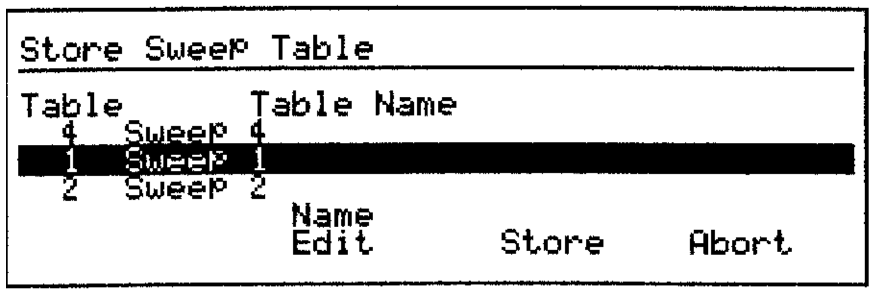
Figure 7-22 Global Return Sweep Table, Edit

The global edit screen allows you to change the guard band or dwell time of all the frequencies in the table with minimal key strokes. Since we have edited individual frequencies in the table, these functions will not be used at this time, however you should be aware of their function when creating custom tables.

To change all of the guard bands, press **F1**, or all of the dwell, press **F2** and use the arrow keys to change the value. The guard band range is from 0.1 to 20 MHz and the dwell range is 0 to 3. Press **Enter** to save the changes.

Storing a Sweep Table

The 3010 can store four sweep tables into memory. The storage file contains all the frequencies, guard bands, and dwell times in the table plus the start and stop frequencies. To store the return sweep table to the file server, press **F4**.



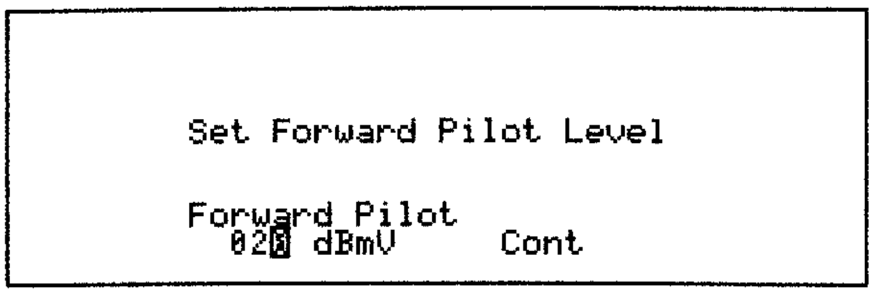
ps221h

Figure 7-23 Store Return Sweep Table

Use the ▲ ▼ keys to select one of the four files. To edit the name of the file, press **F2** and refer to the “Naming a File” section of Chapter 10. Press **F3** to store the table to the selected file and return to the global edit screen.

Setting the Forward Pilot Level

To proceed with the setup, from the global edit screen, press **F3** to continue to the set forward pilot level screen.



ps222h

Figure 7-24 Set Forward Pilot Level

The output range of the forward pilot in the 3010H is adjustable from +10 dBmV to +50 dBmV. The pilot level should be set approximately 10 dB below the visual carriers on the system. Referring to the sample system in Figure 7-2, since the visual carrier level at the forward test point is +20 dBmV, the level of the pilot should be +10 dBmV. The loss between the 3010H and the forward test point is equal to the loss of the cabling, the insertion loss of the testpoint, and the 10 dB loss of the directional coupler used as the combiner. This 10 dB relationship can be observed directly by the 3010R or a spectrum analyzer connected to the forward test point. To illustrate, calculate the output value, add the losses of the insertion directional coupler, the cabling and combining losses, and the level of the signal at the test point, and subtract ten. *Sweep Level= Loss between 3010H and Test point laser input + forward signal level at test point – 10 (to be 10 dB below the carriers)*

To adjust the pilot level, press **F2**. Use the ◀| |▶ keys to select the digit and the ⏶ ⏷ keys to change the value.

Measuring the Forward Pilot Level

The easiest method for setting the forward pilot level is to view the carrier with respect to the adjacent visual carrier using the 3010R in spectrum scan. With the level-adjust digits highlighted, the pilot is turned on, so that the level can be easily measured using the 3010R or any spectrum analyzer. Figure 7-2 shows a testpoint installed after the pilot is inserted. Using the 3010R in the Spectrum Scan mode, the level of the pilot can easily be measured and compared to the visual carriers on the system as shown in Figure 7-25.

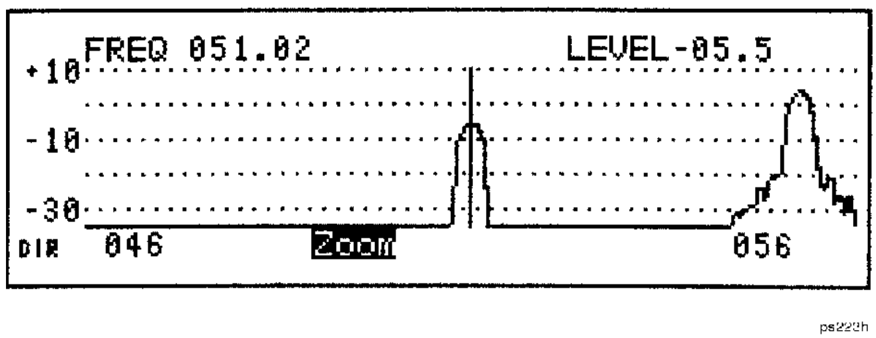


Figure 7-25 Spectrum Scan Forward Pilot

Exiting the Return Sweep Setup

This completes the 3010H setup. Press **F3** to begin monitoring the system.

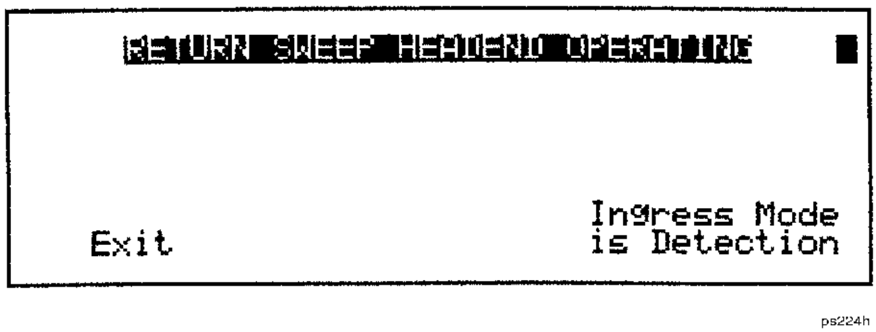


Figure 7-26 Return Monitor Mode

8

Return Path Measurements

Return Path Measurements

The Return Path Monitor function of the 3010H performs three types of measurements: return sweep, return spectrum, and broadcast ingress. (With the addition of Option 052 it also provides forward sweep transmission.) The Ingress Monitoring measurement function performs an additional three monitor measurements for the Return Path: burst counter measurement, average power measurement, and ingress spectrum scan measurement.

The return sweep and return spectrum measurements can be requested by a 3010R in the field. A basic description of operation is listed below.

- The 3010H polls the system and transmits instructions for the reply frequency using the forward pilot. Then it monitors the return frequency looking for a response from a 3010R in the field on that frequency.
- When a remote 3010R is placed in the Return Sweep or Return Spectrum mode and receives the new user poll from the 3010H, it sends a measurement request to the 3010H on the return pilot frequency.
- When the 3010H receives a measurement request from a 3010R, it establishes the communication link and sends the sweep parameters. Then it makes the requested measurements and sends the display data back to the 3010R that requested the measurement.
- If the 3010H receives a high level of ingress on the return path instead of a message from a 3010R, it will make a spectrum scan measurement based on the current spectrum scan setting and will broadcast an alert and the display data on the forward pilot. This can be received by all 3010R, 3010B, and 2010B (with the broadcast return option) instruments in the field.
- When a 3010R receives the broadcast ingress message, the Ingress label will appear over the **F3** key.

You can view the broadcast ingress measurement by pressing **F3** in the 3010R. If you have a 3010B or 2010B (with the broadcast return option), you will view the broadcast ingress measurement when you enter the Return Spectrum mode.

The Ingress mode in the 3010H can be set to Continuous so that the 3010B or 2010B can be used to monitor the condition of the return path at all times. This provides a low-cost troubleshooting tool for the return path of networks.

The three Ingress Monitoring measurements are used to monitor the performance of and troubleshoot the return path.

The Burst Counter is used to measure the duration of a signal which exceeds a user-defined level threshold. The duration of an interfering signal is a clue to the nature of the signal. Knowing the nature of the interfering signal helps the engineer determine the source of the problem.

Average Power is similar to the digital power measurement. It is used to continuously monitor the average power of a user-defined span of the return spectrum. The average power will vary from moment to moment and this can create problems with the return lasers. An increase in power can drive the lasers into clipping, producing data errors. The Average Power measurement allows you to monitor the average power and the power operational budget of the system.

The Spectrum Scan measurement under Ingress Measurements is a spectrum scan measurement that retains maximum, minimum, average and current measurement data. These measurements can be stored and retrieved as four separate spectrum scan files in the file server.

Return Monitor Mode

The Return Monitor function uses the current full-scale, test points, start frequency, and stop frequency set in the Spectrum Scan mode as the default values for the dynamic range and the broadcast ingress measurements.

Setting Scaling and Start/Stop Frequencies for Ingress Mode

If changes are made to the input of the 3010H, it is important to check the results in the spectrum scan mode prior to returning to the Return Monitor mode. Sometimes it is convenient to use the 3010H to make measurements in the Spectrum Scan mode. Again, it is important to recheck the start and stop frequencies and the scaling before returning to the Return Monitor mode.

To enter the Spectrum scan mode, from any screen, press **Menu F4**.

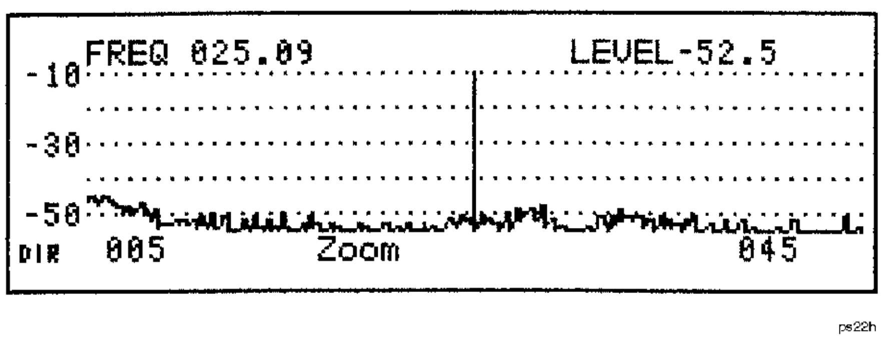


Figure 8-1 Spectrum Scan Mode

If you are checking a 5 to 40 MHz return path, press **F1** and use the arrow keys to set the start frequency.

Next, press **F4** and use the arrow keys to set the stop frequency. The start and the stop frequencies can be any frequency you would like to view in the return path if the broadcast is sent.

With the 3010H connected to the return path, observe the spectrum. Many carriers present on the return path are not online all of the time. It is important to set the Full Scale value so that the highest carrier on the return path will be in the upper division of the display, without going off the top, to maximize the dynamic range of the return spectrum measurement. You can use the Peak Hold function found in Options to capture and hold these transient signals.

Often, measurements are made from test points (TP) rather than directly out of the return path. Setting a TP value in the Spectrum Scan mode will compensate for the loss and display the return spectrum and return sweep measurements as actual levels from equipment under test.

To set the full scale (FS) and test point (TP) values, press **Scale**.

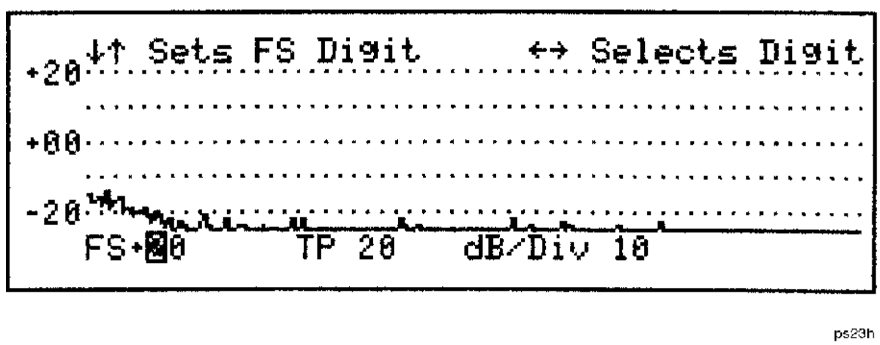


Figure 8-2 Spectrum Scan Scale Screen

1. Press **F1** and use the arrow keys to set the full scale (FS) value.
2. Press **F2** and use the arrow keys to set the test point (TP) value.
3. Press **Enter** to save the changes and return to the Spectrum Scan mode.
4. When the scale and frequencies are set in the Spectrum Scan mode, you are ready to make return path measurements.
5. Press **Menu** to return to the main menu.

Entering the Return Monitor Mode

To begin monitoring the return path, from any screen, press **Menu** ▼ **F1**.

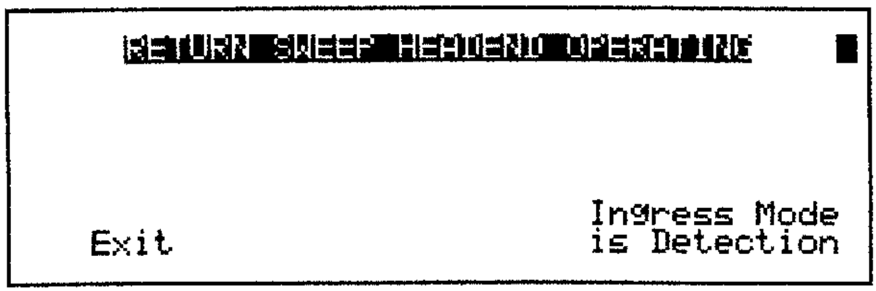


Figure 8-3 Return Path Monitoring Screen

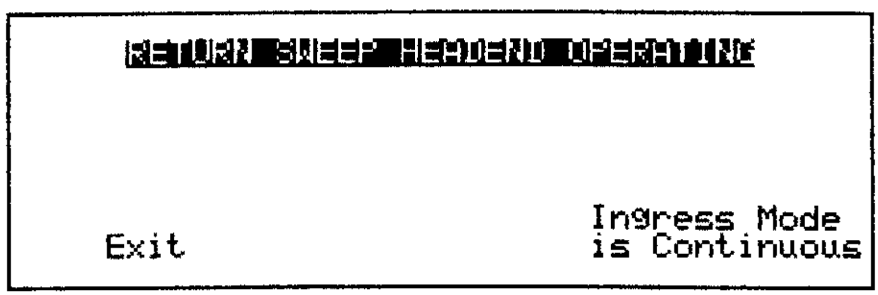
When the 3010H enters the Return Path Monitor mode it begins polling the system with forward pilot. It then monitors the return pilot for a response. When it receives an answer from a 3010R, the 3010H establishes communication with the 3010R and displays the serial number of the 3010R on the screen. The 3010H can communicate with ten 3010R instruments simultaneously, making a different measurement for each. The display on the 3010H is limited to 8 serial numbers. If more than 8 instruments are on the system, two serial numbers will not be displayed.

Ingress Mode Function

The Ingress Mode can be set for detection or continuous. With the Ingress mode set to Detection, the 3010H will measure the noise at the return pilot frequency. If the level is within 30 dB of the full scale setting, the 3010H will make a return spectrum measurement and broadcast the measurement data on the forward pilot. If a 3010R is in a return test mode, an ingress message will appear over the **F3** key, indicating broadcast ingress measurements are present. Pressing the **F3** key will display the data. The start and stop frequencies on this display are defined on the 3010H and can not be changed. In the case of intermittent ingress, an ingress measurement may not be made every measurement cycle of the 3010H. During the polling sequence, if ingress is not present it will return to normal operation.

In the Continuous Ingress mode, the 3010H will make a return spectrum measurement during every polling cycle and broadcast the measurement data on the forward pilot. With this function turned on, the ingress message is present over the **F3** key during every cycle. The results are viewed by pressing **F3**. This mode is used when 3010B and 2010B (with the return path test option) is used in the return system. When 3010B and 2010B instruments are used for making return path measurements, the 3010H must be in the Continuous Ingress mode.

To select the Ingress mode, press **F4**.

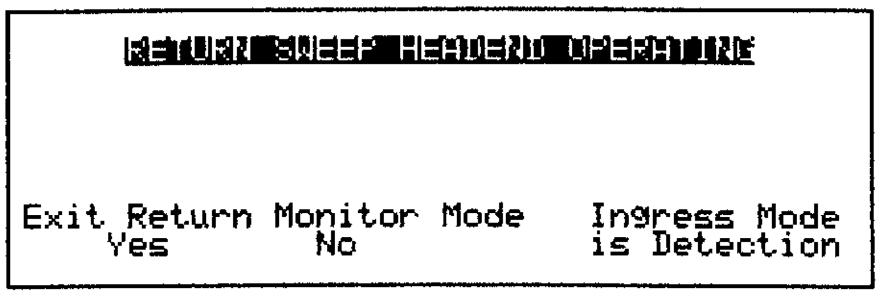


ps234h

Figure 8-4 Continuous Ingress Mode

Exiting the Return Monitor Mode

To exit the Return Monitor Mode, press **F1**.



ps235h

Figure 8-5 Exit Return Monitor Mode

You will be asked to confirm your selection. To exit the mode and return to the Main Menu, press **F1** “Yes” again.

To return to the Return Monitor Mode, press **F2** “No”.

NOTE: The current spectrum scan settings are used for the return spectrum, return sweep, and ingress measurements in the Return Monitor mode. Therefore, changes in those settings will affect the return monitor measurements.

Ingress Monitoring Measurements

The 3010 has three Ingress monitoring measurements: the Burst Counter, Average Power, and Return Spectrum Monitor. These three measurements are used to monitor the performance of and troubleshoot the return path.

Burst Counter is used to measure the duration of a signal which exceeds a user-defined level threshold. The duration of an interfering signal is a clue to the nature of the signal. Knowing the nature of the interfering signal helps an engineer determine the source of a problem.

Average Power is similar to the digital power measurement. It is used to continuously monitor the average power of a user-defined span of the return spectrum The average power will vary from moment to moment, and this can create problems with the return lasers. An increase in power can drive the lasers into clipping, thus producing data errors. The Average Power measurement allows you to monitor the average power and the power operational budget of the system.

Return Spectrum Monitor is a spectrum scan measurement that retains maximum, minimum, average, and current measurement data. These measurements can be stored as four separate spectrum scan files in the file server.

Accessing Ingress Measurements

To access the Ingress Measurements, press the **Down** key three times from the Main Menu. The three ingress measurements are available by pressing the three softkeys, Fl, F2, and F3.

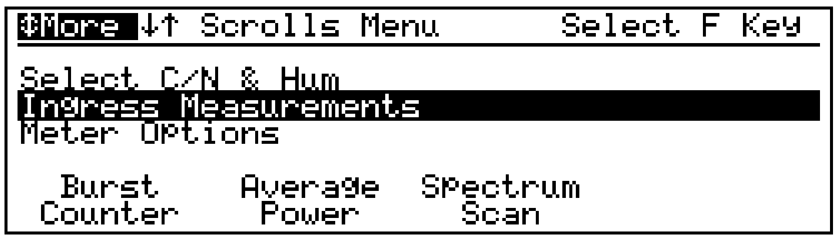


Figure 8-6 Selecting Ingress Measurements from the Main Menu

Key	Measurement
F1	Burst Counter—Time Domain Burst Counter
F2	Average Power—Wideband Average Power
F3	Spectrum Scan—Return Spectrum Monitor

Burst Counter Mode

The Burst Counter measurement tunes the receiver to a user specified frequency and samples the IF looking for signals that exceed a user defined threshold. When a signal is detected which exceeds the sample threshold, the system measures the duration of the burst and increments a counter for bursts of the same approximate duration. The maximum number of bursts that can be recorded is 2.15×10^9. The burst durations are divided into the following time ranges:

- Less than 100 µSec
- Less than 1 mSec (but greater than or equal to 100 µSec)
- Less than 10 mSec (but greater than or equal to 1 mSec)
- Less than 100 mSec (but greater than or equal to 10 mSec)
- Less than 1 Sec (but greater than or equal to 100 mSec)
- Less than 3 Sec (but greater than or equal to 1 Sec)
- Greater than 3 Sec

There are two display screens in the Burst Counter measurement. The **Enter** key toggles between the Burst Counter Summary screen (Figure 8-8) and the Burst Counter Report screen (Figure 8-10).

- The Burst Counter Monitor screen is displayed while the measurements are made. The minimum burst which may be captured is approximately 50 µSec.
- The Burst Counter Summary screen shows the number of burst occurrences in each time range. The counter is paused when the Report screen displays.

Activating the Burst Counter

1. Highlight the Ingress Measurement item on the Main Menu and then press **F1** (Burst Counter) to begin the burst counter measurement.

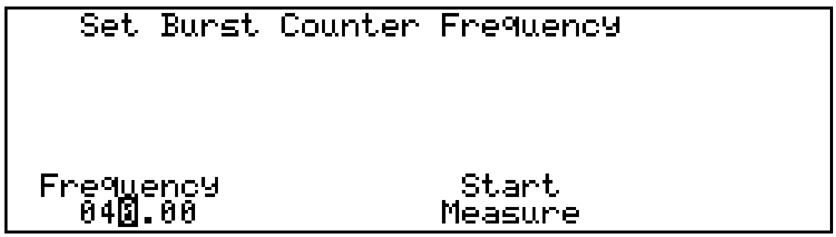


Figure 8-7 Burst Counter Frequency Selection Screen

2. To set the frequency, press **F1** and use the arrow keys to change the value.
3. Press **F3** to begin the measurement.

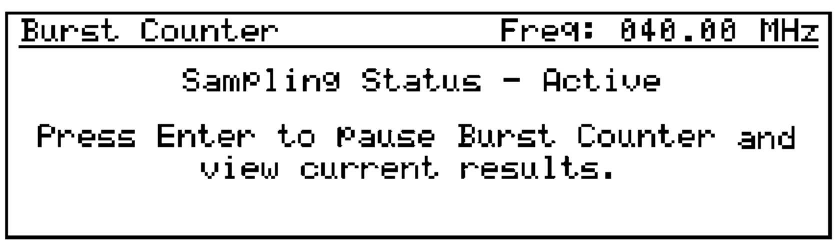


Figure 8-8 Burst Counter Monitor Screen

Setting the Scale and Threshold

The sample threshold is based on a threshold and the attenuator settings. Follow these steps to set the scale and threshold.

1. Press **SCALE** from the active measurement screen as shown in Figure 8-8 to set the attenuator and the threshold.

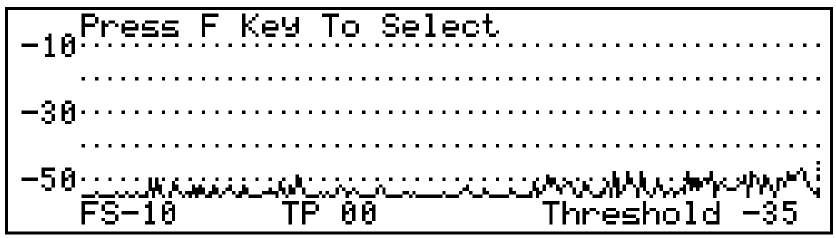


Figure 8-9 Burst Counter Scale Screen

As shown in the Figure 8-9, the Scale screen displays a spectrum scan trace around the monitoring frequency. The FS (Full Scale) value controls the level of the signal. It is important to keep the level of the signals below the overload point to avoid measurement errors. Knowledge of the expected levels at the monitor test point is important.

2. To change the full scale, press the **F1** softkey. Use the arrow keys to change the value.
3. Press **F2** and use the arrow keys to change the test point compensation value. The TP (Test Point), as in the other measurements, is used to offset the level measurements and compensate for test point losses.
4. To set the threshold press **F4** and use the arrow keys to change the value. The threshold value is displayed in the current measurement units (dBmv or dBμV).

   The threshold is the lower measurement limit. Only signals which exceed the threshold are counted.
5. When the scaling is set correctly press, **ENTER** to return to the monitoring screen and continue the measurement.

Viewing the Data

1. Press the **ENTER** hardkey to view the Burst Counter Report. The 3010 takes measurements only when the Active Burst Counter screen is displayed. When the Burst Counter Report displays, the 3010 pauses from taking measurements.

.

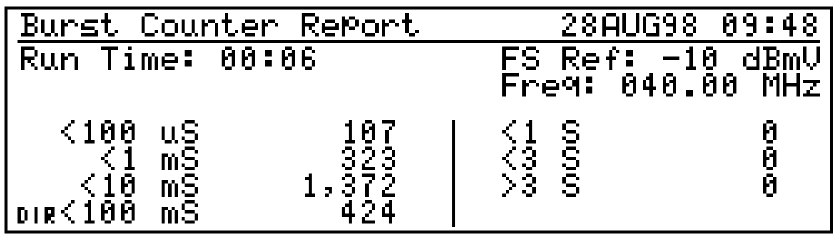


Figure 8-10 Time Domain Burst Counter—Report Screen

2. Press **ENTER** to return to the Active Burst Counter screen shown in Figure 8-8.

Average Power Mode

Average Power measures the integrated average power during each sweep of a user defined frequency span. As the measurement samples, it attempts to measure noise, not TDMA carriers. Therefore, as the sampling occurs, if the sample exceeds a user defined threshold, the sample is assumed to be a carrier and the sample is repeated. If the carrier is detected in ten consecutive sample attempts, the measurement continues and the average power includes the power of the carrier. The measurement displays the following results (see Figure 8-11).

- The average power of the current sweep
- The maximum and minimum average power levels measured during the current run
- The average (mean value) of all measurements taken during the current run

Activating the Average Power Mode

1. Press **F2** (Average Power) with the Ingress Measurements item highlighted on the Main Menu to begin the Average Power Measurement.

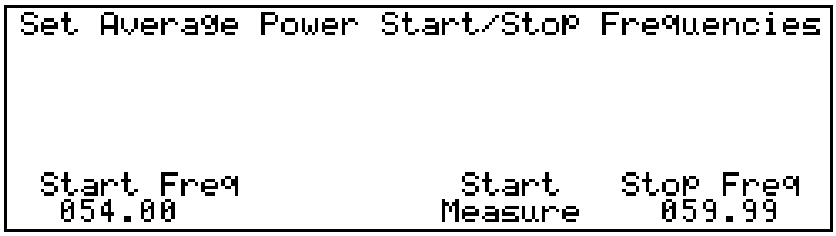


Figure 8-11 Set Average Power Frequency Screen

2. After entering the average power measurement, the user first sets the start and stop frequencies of the measurement span. Select **F1** to change the start frequency or **F4** to change the stop frequency. Use the arrow keys to change the values. Pressing the Up and Down keys changes the frequency values.
3. Press the **F3** softkey (Start Measure) to begin the measurement.

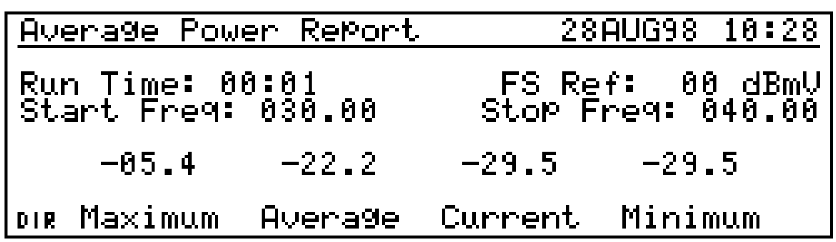


Figure 8-12 Average Power Report Screen

Setting the Scale and Threshold

The average power measurement requires the set up of both the full scale reference and the sample threshold in the Scale screen. The full scale reference should be set approximately 10 dB above the amplitude of the system's TDMA carriers, and the sample threshold should be set approximately 15 dB below the amplitude of the system's TDMA carriers. The threshold value is displayed in the current measurement units (dBmv or dBμV). Once the sample threshold is set, it will track changes in the full-scale reference.

Follow these steps to set the full scale reference and the threshold.

1. Press **SCALE** to set the full scale and threshold.

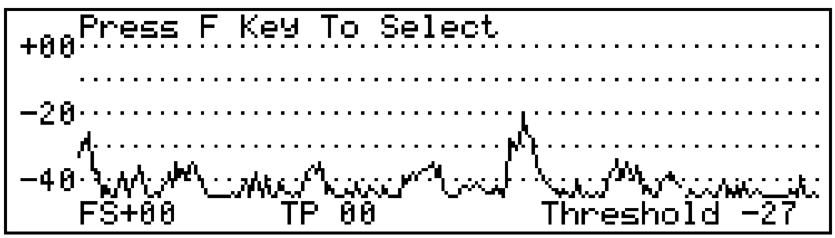


Figure 8-13 Average Power Scale Screen

2. Press **F1** and use the arrow keys to set the Full Scale values.

3. Press **F2** and use the arrow keys to set the TP (Test Point) compensation value.

4. Press **F4** and use the arrow keys to set the Threshold value.

5. When the Full Scale, TP and Threshold are set, press **ENTER** to save the changes and return to the measurement screen.

Return Spectrum Monitor Mode

The Return Spectrum Monitor updates the maximum, average, current, and minimum traces with each scan. The **F2** softkey toggles between the static and continuous mode. When in the continuous mode, the display (Figure 8-14) is updated with each spectrum scan.

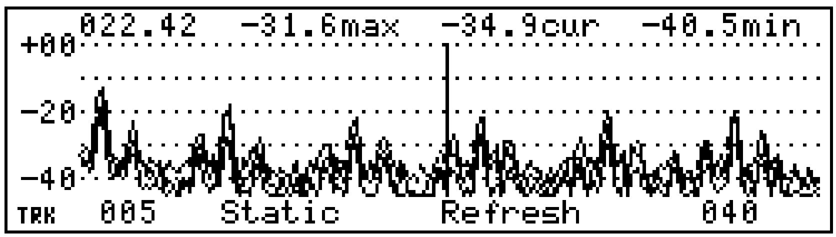


Figure 8-14 Return Spectrum Monitor Display Screen

When in the static mode, the trace data is updated after you press the **F3** softkey (Refresh). The static mode allows the scans to be performed approximately 400 mSec faster than the continuous mode because the display is not updated during the scans.

Activating the Ingress Spectrum Monitor Mode

Follow these steps to change the start and stop frequencies of the measurement span.

1. When the Ingress Measurements item is highlighted on the Main Menu, press **F3** (Spectrum Scan) to begin the Return Spectrum Monitor Mode.
2. Select the start and stop frequencies on the measurement span.
3. Select **Fl** to change the start frequency or **F4** to change the stop frequency.
4. Press the Up and Down keys to change the frequency values.

Setting the Scale

1. Press the **SCALE** key to set the full-scale reference and dB/div.

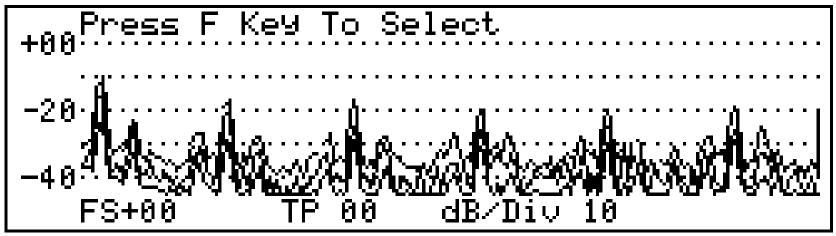


Figure 8-15 Return Spectrum Monitor Scale Screen

2. Press **F1** and use the arrow keys to change the FS (Full Scale) value.
3. Press **F2** and use the arrow keys to change the TP (Test Point) value.
4. Press **F3** and use the arrow keys to change the dB/Div value.

Viewing the Measurements

The screen can display as many as three traces at one time.

1. Press the **OPTION** key to display the trace selections.

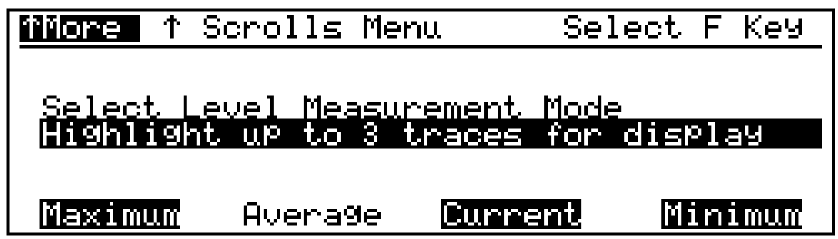


Figure 8-16 Return Spectrum Monitor—Option Screen

2. Press the **F1** through **F4** softkeys to toggle each trace selection ON and OFF. Highlighted traces are the ones turned ON.

3. Leaving the traces you want displayed toggled on, press the **Enter** key to return to the spectrum scan display. Changing the displayed traces does not change the stored data.

Saving the Return Spectrum Monitor Traces

To save the spectrum scan measurement traces, press the **Print Save** key. Each of the four traces are saved in a separate file. When the measurement is exited and then entered again, the data is cleared and reset.

9

Distortion Measurements

Distortion Measurements

Distortion measurements help the technician monitor the performance of the system within a prescribed set of limits. Problems encountered in a cable network are also viewed on the television screen. However, the quality of a given picture is subjective and is not easily quantified or measured. Distortion specifications and measurements tend to make objective and comparative measurements possible.

Making Distortion Measurements

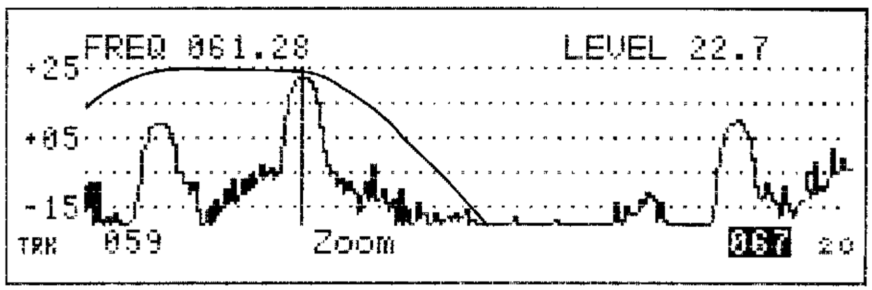
The 3010 allows the user to make some distortion measurements, such as carrier-to-noise, hum, and beats. The dynamic range of the unit must be great enough to measure distortion 50 to 60 dB below the carrier.

Reducing attenuation in order to measure low-level distortion products can overload the front end of the measuring instrument, producing high-level distortion components. To avoid this, use a bandpass filter to eliminate all channels except for the one being measured.

Typical filters used for distortion measurements have an out-of-band rejection of 70 dB and a passband, worst case of 1.5 MHz to 4 MHz. Normally, the wider the passband, the worse the out-of-band rejection.

Fixed Filters

A fixed filter has a center frequency and passband that are tuned at the factory. It is important that the reference carrier and the frequency measurement point of the distortion be within the passband of the filter.



pi795

Figure 9-1 Carrier with Filter Response Overlay

For example, a carrier-to-noise test requires the filter to be flat between the visual carrier frequency and the noise measurement frequency. See Figure 9-1.

Tuning Filters for Making Distortion Measurements

A tunable filter or preselector is often used for distortion measurements, allowing you to make measurements on different channels.

The Spectrum Scan mode is used to view the response of the filter during tuning. Refer to Figure 9-2 when connecting the filter and the 3010 to the system.

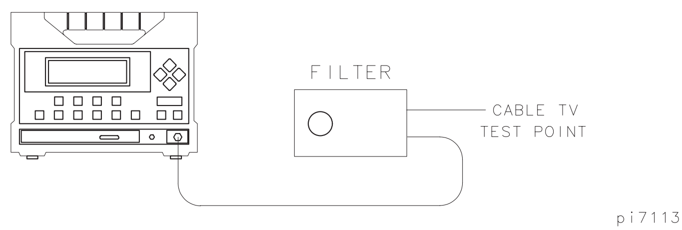
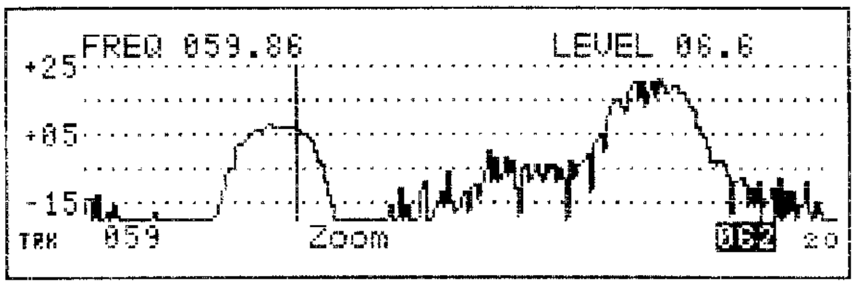


Figure 9-2 3010 with Tunable Filter Connected on the Input

Spectrum Scan Mode

The Spectrum Scan mode is used to tune the filter for the measurement. For example, to measure the carrier-to-noise on channel 3, set the start frequency to 59 MHz and the stop frequency to 62 MHz. See Figure 9-3.



pi797

Figure 9-3 Spectrum Screen with Start with Tuned Filter Installed

For making an out-of-band carrier-to-noise measurement on an active channel, the noise can be measured approximately 1.1 MHz below the visual carrier. To perform this test, the filter must be tuned so that the passband is flat between the visual carrier and the lower adjacent channel aural carrier. Tune the filter as follows:

1. Tune the filter for a peak level on the visual carrier.

2. Tune the filter down in frequency until the level of the visual carrier begins to drop.

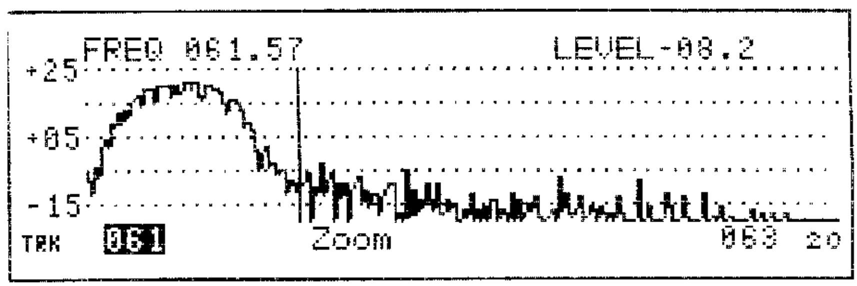
At this point, the lower adjacent aural carrier is peaked.

3. Adjust the filter up in frequency until the visual carrier just returns to the peak level.

The lower adjacent channel aural carrier should still be at its peak level. If the aural carrier drops, you have moved the filter's center frequency too high or the passband of the filter is not wide enough to be used in this procedure.

The filter is now tuned so that the visual carrier is at the high frequency side of the filter passband and the aural carrier is at the low-frequency side of the filter. Figure 9-3 shows a correctly tuned filter for making a carrier-to-noise measurement on an active channel.

In order to make an in-band carrier-to-noise measurement on a channel without video or to make a second-order beat measurement, the filter is tuned so that the visual carrier is placed at the low frequency side of the passband. See Figure 9-4.



pi798

Figure 9-4 Filter Tuned Visual Carrier Low Side Passband

The procedure for tuning the visual carrier to the low frequency side of the filter response is similar to tuning to the high side. In the case above, the start frequency is set to 61 MHz and the stop frequency is set to 63 MHz. The filter is then tuned up in frequency until the visual carrier level begins to drop, and then down in frequency until the visual carrier level just returns to its peak level.

Carrier-to-Noise and Hum Mode

NOTE: The NCTA defines: “Visual carrier-to-noise ratio is the power in a sinusoidal signal whose peak is equal to the peak of a visual carrier, divided by the associated noise power in a four megahertz bandwidth. This ratio is expressed in dB.” As a practical matter, noise manifests itself as a picture impairment and ranges from “not visible”, at ratios greater than 50 dB, to “significantly objectionable” at ratios of less than 36 dB.

The bandwidth correction applied to carrier-to-noise (C/N) measurements can be programmed to channel plans with video bandwidths other than 4 MHz. Refer to the section on programming the carrier-to-noise defaults explained in Chapter 12 of this manual.

NOTE: A signal ≥+20 dBmV at the RF input is required to utilize the full 55 dBc dynamic range of the 3010. Carrier-to-noise can be measured with <+20 dBmV, but the dynamic range is reduced. Dynamic range is displayed on the screen as **`Range Limit XX dBC.`**

Automatic Channel Mode Method

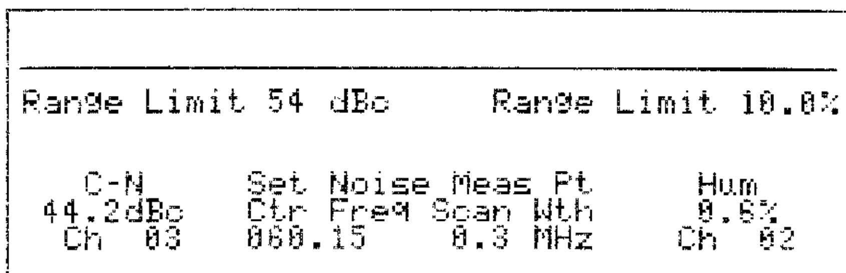
Care must be taken in the selection of test frequencies, bandwidths and preselectors. The preselector passband must include the carrier under test and the complete area for the noise measurement. For an out-of-band carrier-to-noise measurement, the standard setup requires the filter to include the test carrier and a lower passband of at least 1.25 MHz without encountering the filter rolloff. For best results, select a frequency for noise measurement that is 1.1 MHz below the test carrier, and choose a scan width less than 0.3 MHz.

An in-band carrier-to-noise test requires the use of an unmodulated channel. The noise measurement point will be in the video passband of the channel, typically 1.5 MHz above the visual carrier frequency. Before you select the Carrier-to-Noise Measurement function, a filter should be tuned and installed. Please refer to the previous section on fixed and tunable filters.

To select the Channel mode carrier-to-noise measurement from the Main menu, press ▼ (2 times) then **F1**. The firmware in the 3010 will remind you to install the external filter. Press **Enter** to continue. The firmware will measure and calculate the range limit of the 3010 and display the value on the screen. It will then reference the visual carrier of the channel set above the **F1** key and store the value into memory.

Next, it will go to the center frequency set above **F2** and scan the spectrum ± the value programmed above **F3**, to look for the lowest noise value. The carrier-to-noise in dBc is calculated using the measured information with bandwidth correct values applied and displayed on the screen.

NOTE: If the noise center frequency is equal to the carrier frequency, the 3010 will prompt the operator to turn off the carrier after storing the carrier level in memory. This is the most accurate and highest dynamic range method for C/N measurements.



pi799

Figure 9-5 Display by Channel Selection

To change any of the values, press the appropriate softkey and use the arrow keys. Press **Enter** to save the change and repeat the measurement. After the carrier-to-noise measurement is complete, remove the filter and press **Enter** to do the hum measurement.

The hum measurement requires an unmodulated carrier. To change the channel used for the hum measurement, press **F4** and use the ▲ ▼ keys to select the channel. Press **Enter** to save the change and perform the measurement.

NOTE: There are two methods used to measure hum, the NCTA method and the Classical method. The FCC measurement specifications are based on the NCTA method. Refer to "Setting the Hum Measurement Option" in Chapter 12.

Automatic Frequency Mode Method

Quick Reference

C/N or hum measurement by frequency selection

Menu

▼ ▼

F2

Install filter

Enter

C/N measurement is displayed on screen

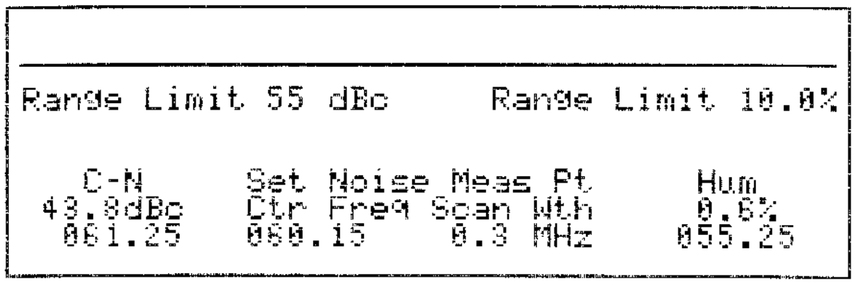
Remove filter

Enter

Hum measurement is displayed on screen

Before you select the Carrier-to-Noise Measurement function, a filter should be tuned and installed. Please refer to the previous section on fixed and tunable filters.

To select the Frequency mode carrier-to-noise measurement from the Main menu, press ▼ ▼ **F2**. The firmware in the 3010 will remind you to install the external filter. Press **Enter** to continue. The firmware will measure and calculate the range limit of the 3010 and display the value on the screen. It will then reference the carrier set above the **F1** key and store the value in memory. Next, it will go to the center frequency set above **F2** and scan the spectrum ± the value programmed above **F3**, looking for the lowest noise value. The carrier-to-noise ratio, in dBc, is calculated using the measured information, with bandwidth correction values applied and displayed on the screen.



pi7100

Figure 9-6 Display by Frequency Selection

To change any of the values, press the appropriate softkey and use the arrow keys. Press **Enter** to save the change and repeat the measurement.

After the carrier-to-noise measurement is complete, remove the filter and press **Enter** to perform the hum measurement.

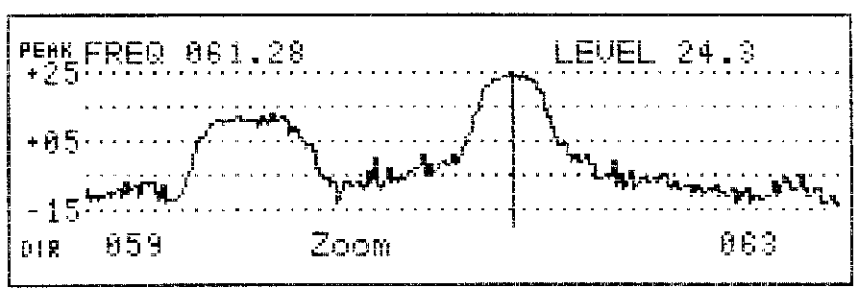
The hum measurement requires an unmodulated carrier. To change the channel used for the hum measurement, press **F4** and use the ▲ ▼ keys to select the channel. Press **Enter** to save the change and perform the measurement.

NOTE: There are two methods used to measure hum, the NCTA method and the Classical method. The FCC measurement specifications are based on the NCTA method. Refer to "Setting the Hum Measurement Option" in Chapter 12.

Manual Spectrum Scan Method

The Spectrum Scan mode can be used for carrier-to-noise measurements. To make a carrier-to-noise measurement using the Spectrum Scan mode, you will need to use a fixed or tunable filter. During the following procedure we will quickly review the tuning of the tunable filter. Please note that the start and stop frequencies set for tuning the filter are the same frequencies used to make the automatic carrier-to-noise measurement. For our example, we will make a carrier-to-noise measurement, out-of-band on channel 3.

1. From the Main menu, press the Spectrum Scan mode.
2. Set the start frequency to the closest frequency below the lower adjacent aural frequency. In the case of channel 3, set the start frequency to 59 MHz.
3. The stop frequency is set to the closest allowable frequency above the visual carrier frequency, which is 63 MHz.
4. Using the ◀| |▶ keys, peak the marker on the visual carrier. See Figure 9-7.

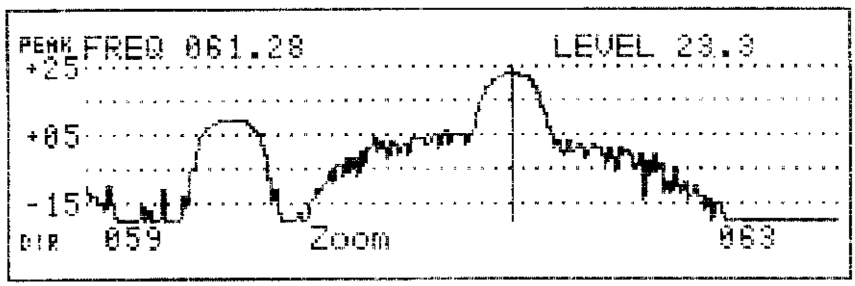


pi7101

Figure 9-7 Spectrum Graphic without Filter

You are now ready to install the filter between the RF input and the 3010.

1. Peak the visual carrier using the filter and note the value.
2. Tune the filter down in frequency until the level of the visual carrier begins to drop. Note the level of the lower adjacent channel aural carrier.
3. Tune the filter up in frequency until the level returns to the peak level. Make sure the aural carrier is still peaked. See Figure 9-8.



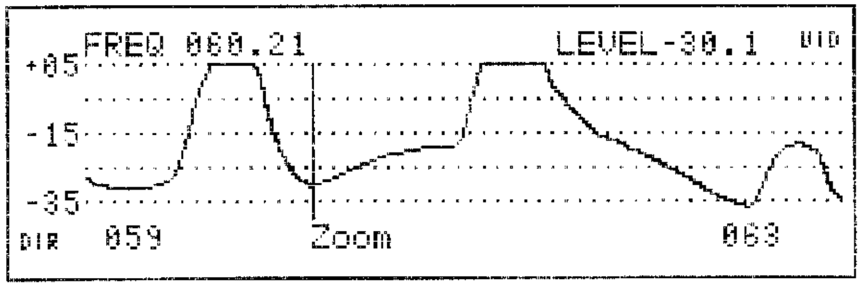
pi7102

Figure 9-8 Spectrum Graphic with Filter; Marker On Visual Carrier

When the filter is tuned to the correct frequency, you are ready to make the measurement.

Making the Measurement

1. Peak the marker on the visual carrier, which in this case is at 61.28 MHz with a level of 23.3 dBmV.
2. Record the visual carrier level as reading 1.
3. To minimize variation in noise level, turn on the video filter by pressing **Option ⏏ F2**. The video filter will slow down the screen scan and will smooth the curve. The slower scan speed must be taken into account when making scale changes and measurements.
4. Press **Scale F1** and use the arrow keys to lower the full scale value so the noise level between the carriers is above the bottom of the screen.
5. Press **Enter** to save the setting and return to the measurement screen. See Figure 9-9.



pi7103

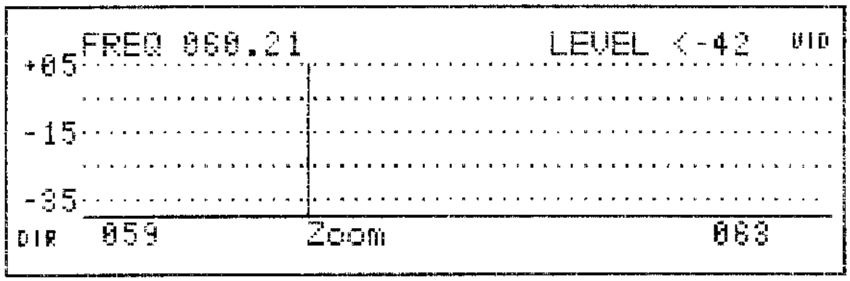
Figure 9-9 Spectrum Graphic with Filter; Marker On Noise Measurement Point

6. Use the ◀| |▶ keys and move the marker to the noise measurement point approximately 1.1 MHz below the visual carrier and write down the system noise level. In the example above, the noise measurement frequency is 60.21 MHz with a level of –30.1 dBmV.

7. Record this level as the system noise measurement, reading 2. It is important that the system noise you are measuring is 10 dB above the noise floor of the measurement device.

8. The next step is to check the noise floor of the 3010. Remove the RF input and measure the level at the same point without changing the marker or full scale setting.

9. Read the 3010 noise floor on the marker and record the value as reading 3. See Figure 9-10.



pi7104

Figure 9-10 Graphic Scan with No Input; Marker at Noise Point

10. Subtract the system noise level, reading 2, from the 3010 noise level, reading 3. This difference should be greater than 10 dB. If the difference is less than 10 dB but greater than 3 dB, a correction value can be found in Table 9-1. For example, in the screen above, the noise floor measurement is less than –42 dBmV; therefore, *noise floor – system noise measurement = 12 dB.*

Table 9-1. Correction Factor Table

Difference in Reading (dB)	Correction Factor (dB)
4.0	1.46
4.5	1.32
5.0	1.19
5.5	1.08
6.0	0.95
6.5	0.88
7.0	0.79
7.5	0.71
8.0	0.64
8.5	0.57
9.0	0.51

A difference of less than 3 dB tells you that the system noise is better than the value measured; however, you do not have enough dynamic range to make an exact measurement. To increase the dynamic range, remove attenuation or increase the input level. With the measurements taken, the carrier-to-noise is calculated by subtracting the system noise level, reading 2, the bandwidth correction factor of 15.1 dB, and the noise-near-noise correction factor, if needed, from the visual carrier level, reading 1.

C/N = (Carrier Level) – (NOISE LEVEL) – 15.1 dB + (NOISE NEAR NOISE CORRECTION)

Example:

C/N = (23.3 dBmV) – (–30.1 dBmV) – 15.1 + (0 dB)

= 38.3 dBc

Hum Measurements

Hum is a low frequency disturbance in cable TV networks and is typically caused by ac power filtering problems that allow 60 Hz, 120 Hz and other frequency components to modulate the video carriers.

Hum can only be measured using a CW carrier. The 3010 measures the composite of the low-frequency components below 400 Hz and displays it in terms of % hum, located above the **F4** key.

There are two methods used to measure Hum: the NCTA method and the Classical method. The FCC measurement specifications are based on the NCTA method. Refer to "Setting the Hum Measurement Option" in Chapter 12.

Because CW carriers are increasingly rare, Hum can be measured on a modulated carrier. Select the exact FM carrier or TV sound carrier frequency and measure Hum. Although this is not as accurate, a measurement below 2% will indicate generally acceptable Hum levels.

Distortion Measurements

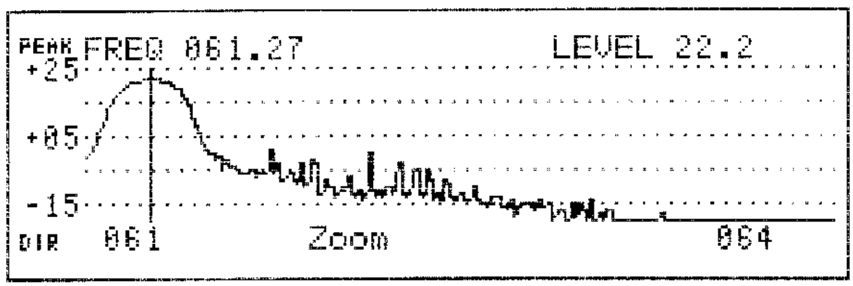
Distortion includes second-order, third-order, composite triple beat, and ingress signals. The second order, third order and composite triple beat are produced by the mixing of carriers caused by non-linearity in amplifiers or other active devices. Composite triple beat and third-order distortions increase at a 3 to 1 rate. Composite triple beats fall directly under the visual carrier. Therefore, the carrier must be removed to make the measurement. Second order distortions increase at a 2 to 1 rate and fall at the carrier ±750 kHz and ±1.25 MHz.

Ingress refers to signals picked up through defects in the shielding of the cable or connectors.

Most distortion measurements are not stated as absolute measurements. Instead, they are referenced to a carrier near the frequency of the distortion. For example, in the case of a second-order, third-order, or composite triple beat measurement, the distortion is referenced to the visual carrier of the channel where the distortion occurs. Ingress signals are referenced to the channel spectrum in which they occur.

The 3010 requires a filter when making distortion measurements, as described in the beginning of this chapter. It is important that the filter is flat between the frequency of the reference carrier and the frequency where the distortion is measured. Any difference in flatness between these points will cause an error in the measurement. Refer to "Tuning Filters for Making Distortion Measurements" for information regarding tuning the filter for distortion measurements.

After you have tuned the filter to include the reference carrier and the frequency of the beat distortion, peak the marker on the reference carrier.



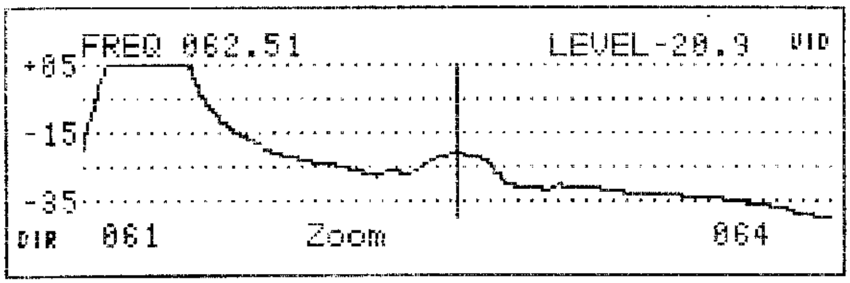
pi7105

Figure 9-11 Carrier Reference Measurement

1. Set the start and the stop frequency in the spectrum scan screen to view the spectrum of interest. In the figure above, the 3010 is set to look at distortions in the video passband of channel 3 with a tunable filter tuned with the visual carrier peaked at the low frequency edge of the filter passband.
2. Turn peak-hold on to insure that the peak level of the carrier is measured. For situations where the distortion level is high, peak hold may be enough to allow you to see the distortion. Note the level of the carrier and write it down as reading number 1.
3. Press **Option** ⏏ **F1** to turn the Peak Hold function off.

NOTE: The next steps in the measurement procedure will vary depending on the distortion you are measuring. If you are measuring a composite triple beat, remove the visual carrier and continue with the procedure. Ingress measurements may involve retuning of the filter if the distortion is outside of the passband of the filter. The example shown in the next steps involve a second order distortion product at 1.25 MHz above the visual carrier.

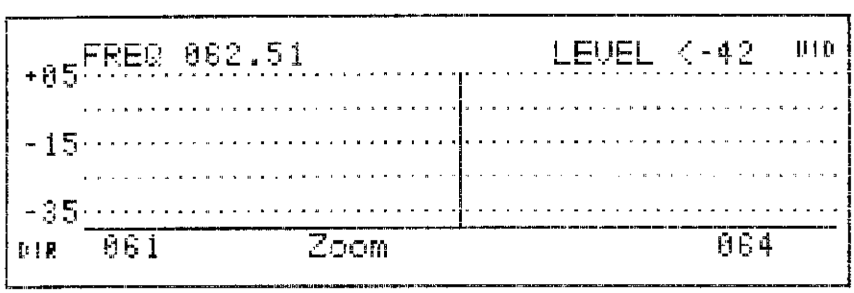
4. Turn the video filter on by pressing **Option** ⏏ **F2**.
5. Change the full scale until the beat is approximately one division above the noise floors shown in Figure 9-12. The scan rate will be slow with the video filter turned on.



pi7106

Figure 9-12 Marker Peaked on the Beat

6. Peak the marker on the beat. The level and frequency of the beat is measured by the marker and recorded as reading 2.
7. Remove the input from the 3010 and allow the trace to update. Note the level of the noise at the location where the distortion measurement was made.



pi7107

Figure 9-13 Marker at the Beat Location, with No Input

The noise level should be at least 10 dB below the level of the beat. As in the carrier-to-noise measurement, a correction value can be added for beat-near-noise measurements. The correction value is found using the same graph as used in the carrier-to-noise procedure.

8. The carrier-to-beat value can be calculated by subtracting reading 2 from reading 1 and adding the correction value from the graph.

Example: Carrier-to-beat= (R1 – R2) + correction value

The frequency of the beat is used to investigate the cause of the beat. In the example above, the beat is 62.5 MHz or 1.25 MHz away from the visual carrier of channel 3. Second order beat distortions in a standard NTSC system will fall 1.25 MHz above the visual carriers, therefore we can assume this to be a second order distortion. If the beat is at a different frequency, we can use the speaker option. With the marker placed over the beat, turn the speaker on and listen to the sound. You may hear video buzz; audio from an FM radio station; audio from a TV channel; audio from a scrambler; coo-coo; or sniffer; or no audio at all. Any of these sounds will point you in the direction of the source of the problem.

10

Storing and Retrieving Data

Storing and Retrieving Data

The 3010 contains a multiformat 90 file server for history storage. Data stored in the files can be one of five possible formats: level measurements, graphic normalized traces, graphic sweep traces, graphic spectrum scan traces, and return spectrum. Each file includes a time and date stamp with a 40 character, user-defined label.

Level measurement files are linked to the active channel plan used when the measurements are stored. Level measurement files can also have a C/N (carrier-to-noise) and hum measurement stored in the same file. In this situation, the printed report will include the C/N and hum measurement in the header at the top of the page. Level measurement files can also be used as references for comparison to level measurements in the Channel Scan Normalized mode.

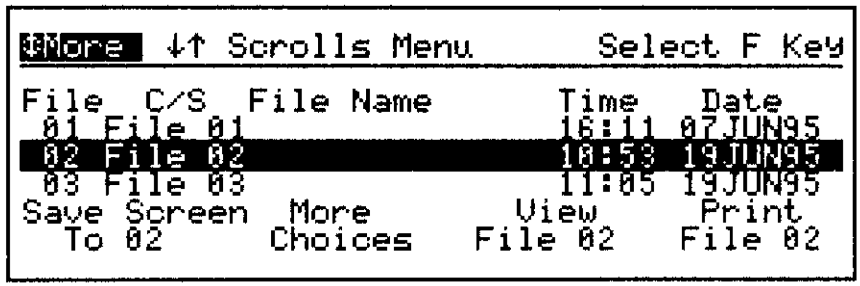
Normalized level measurement responses can be stored as a graphic. It is important to remember that level measurements are normalized against any stored level measurement file. However, sweep files are normalized against any of 12 special reference files. Sweep references are stored at the end of the transmitter setup procedure or under the Option menu in Raw Sweep mode.

Graphic files include all of the data on the screen when the file is stored. For forward sweep and normalized forward sweep responses, this includes the absolute levels of the pilot carriers programmed under **F3**.

Along with the 90 history files, the 3010 holds 12 special references for use in the Normalized Sweep mode, four sweep tables, and the four frequency channel plans.

Storing Measurements

The file server is accessed from any of the measurement modes by pressing the **Print/Save** key.



pi7163

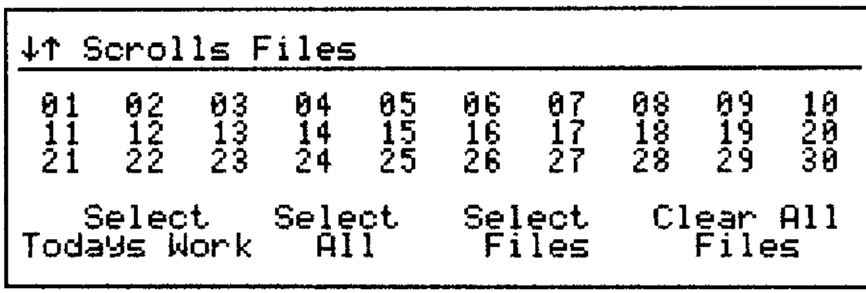
Figure 10-1 File Server Screen

The selected file is highlighted in the center of the display. You can change files by using the ▲ ▼ keys.

To save the data, press **F1**. The 3010 will attach the time, date, and type of measurement to the file.

Naming a File

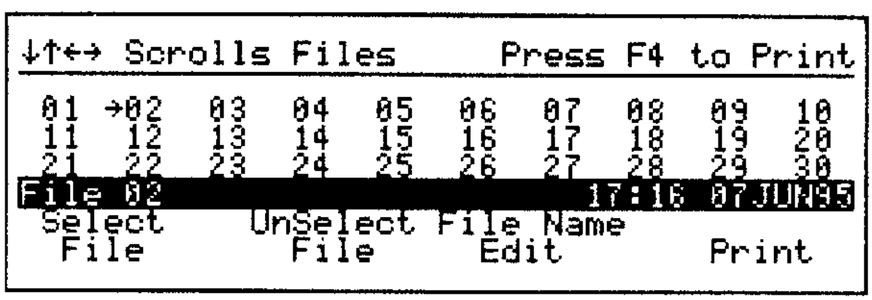
Each file in the file server has a 40 character name attached to it. To edit the name of the file, from the file server screen press **F2** for more choices.



pi7193

Figure 10-2 File Selection Screen

Press **F3** to select the file to be named.

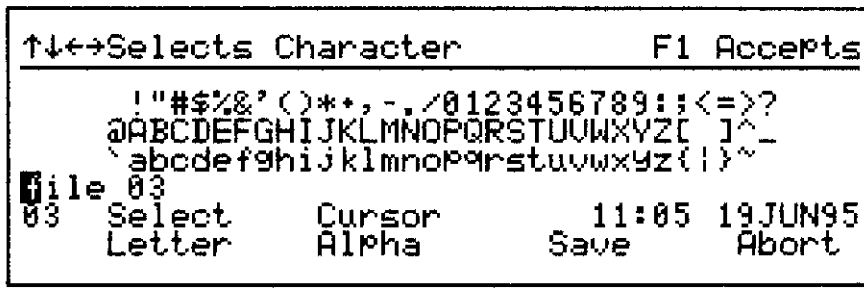


pi7164

Figure 10-3 File Selection Screen Number 2

The selected file number is indicated by a small arrow to the left of the file number. The label of the selected file is displayed at the bottom of the screen. See Figure 10-3.

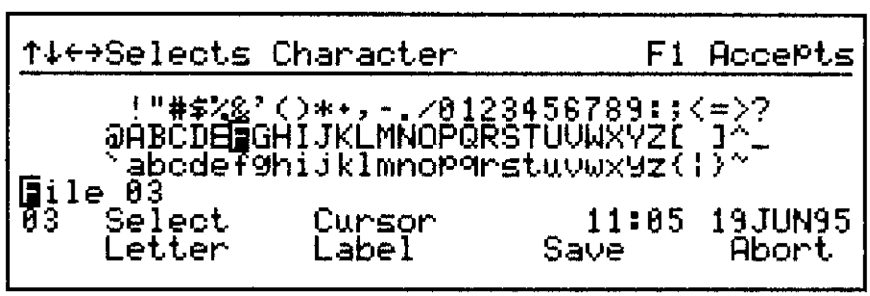
Use the arrow keys to select the file. Press **F3** to enter the character selection screen.



pi7194

Figure 10-4 Character Selection Screen

The screen shown above is the character label screen for the 3010. Notice the cursor is to the far left of the current name of the file to be changed. To move the cursor to the character list above, press **F2**.



pi7195

Figure 10-5 Naming a File

The cursor is now located on the character selection area of the display. Using the arrow keys, place the cursor on the first letter for your new label.

Press **F1** to select the character and move it to the label area. The cursor in the label area will move to the next position. Using the arrow keys, select the next character. Continue this procedure until the label is complete.

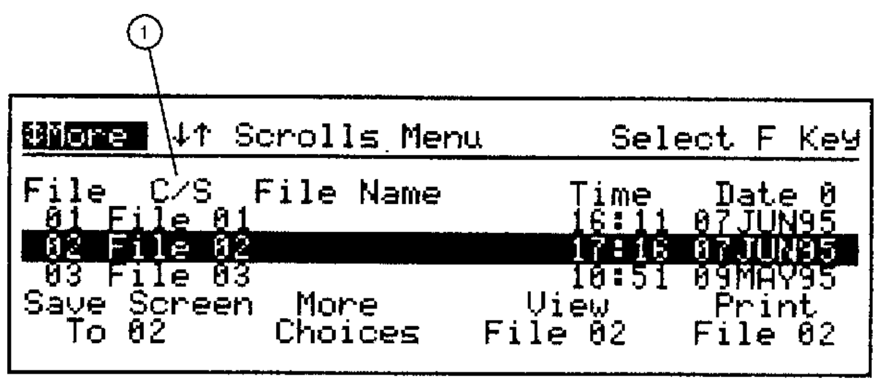
File names in the file server can be 40 characters in length. The table and reference labels can be 10 characters in length.

A space can be entered by selecting the blank space in the character list, using the arrow keys. Press **F1** to select the blank.

F2 toggles the cursor control between the character list and the label.

Press **F3** to save the new name, or press **F4** to abort the changes and exit the character screen. You can select another file to name or you can press **Enter** to exit the file selection screen.

Types of Files



pi7165

Figure 10-6 File Server Screen with a Stored Channel Scan File Selected

In Figure 10-6, a channel scan file is selected and is indicated by **C/S** (1).
Table 10-1 is a list of the different types of history files.

Table 10-1 Different Types of History Files

Measurement	File Type	Data
Channel Scan: Single Channel, Four Channel	C/S	Level Measurements
Normalized Channel Scan	CSN	Graphic
Normalized Sweep	NSw	Graphic
Raw Sweep	Swp	Graphic
Spectrum Scan	S/A	Graphic
Return Spectrum Scan	RS/A	Graphic
Digital Power	ADP	Graphic
Burst Counter	iBC	Graphic
Average Power	iAP	Graphic
Ingress Spectrum Scan	iSA	Graphic

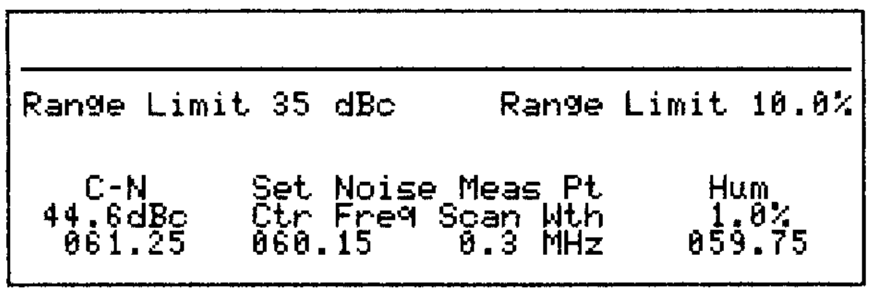
NOTE: Level Measurement files (C/S) are linked to the active frequency plan used to make the measurements. If you edit the frequency plan, data will be lost.

Storage of Ingress Spectrum Scan measurements require 4 consecutive files. The measurements are stored in the following order; maximum, average, current and minimum. All four files will have the same measurement type, “iSA”.

The graphic files store the response displayed on the screen when the **Print/Save** key is pressed. The data includes all of the active information such as peak-hold status, test point name, and test point value. Sweep files include both of the system pilot levels and frequencies if programmed in the sweep table.

Storing Carrier-to-Noise and Hum Measurements

Automatic carrier-to-noise and hum measurements can be attached and stored with channel scan measurements in the file server. Every time a new set of channel scan measurements are stored in the file server, the carrier-to-noise and hum measurement attached to the file are erased. Therefore, before you store the carrier-to-noise measurements, the level measurements must be stored to the selected file in the file server.



pi7199

Figure 10-7 Carrier-to-Noise and Hum Measurements

To store carrier-to-noise and hum measurements, after the measurements are completed, press **Print/Save**. Select the channel scan file and press **F1**. The carrier-to-noise and hum measurements are now attached to the selected file.

NOTE: Stored carrier-to-noise and hum measurements attached to channel scan files are erased when a new set of measurements are stored. Therefore you must store the channel scan measurements to a file before the carrier-to-noise and hum measurements are stored.

Viewing Carrier-to-Noise and Hum Measurements

Stored carrier-to-noise and hum are attached to a channel scan file. When the channel scan file is printed, the carrier-to-noise and hum measurements are printed in the header of the report.

CALAN Form 3010-30 Page 1 of 2 Station Report By__________

Location File 02 Sys #________ ID________

Cas_______ Cable Loss_____ Flat Loss_______ Freq_____ Hub No.______ Aerial / G

Mfg_______ Frequency______ AGC/ALC_________ Pwr______ LE Model_____ # of LEs__

TRK_______ BRG____________ Pad_____ Equ____ Equ2_____ Feeders______ Pwr Dir___

ACV______ Reg DCV____ UnReg DC_________ Ripple______ AGC Voltage_______

P-V___________ dB Second Order______ @ Freq______ AGC/ALC Levels

CTB______dB Ch_________ Map Code_________ M / AGC ____ ____ ____ __

XMod_____dB Ch_________ Other________________________ ____ ____ ____ __

C/N +44.8dB Ch_________ Freq 060.16 15:39 19JUN95 TP___

Hum +01.2% Ch_________ Freq 059.75 15:39 19JUN95 +77.9 F (+25.5 C)

SYSTEM : 1 - STD +78.4 F (+25.8 C) 10:53 19JUN

Ch #	Visual dBmV	Aural dBmV	V:A dB	Ch #	Visual dBmV	Aural dBmV	V:A dB	Ch #	Visual dBmV	Aural dBmV	V c
T7	+06.3	-08.1	14.4	11	+08.0	-06.5	14.5	50	<-27	<-27	--
T8	+06.9	-19.6	26.5	12	+08.1	-06.4	14.5	51	<-27	<-27	--
T9	+07.5	-06.6	14.1	13	+08.0	-06.3	14.3	52	<-27	<-27	--
T10	+07.6	-06.5	14.1	23	+09.5	-05.7	15.2	53	<-27	<-27	--
T11	+07.8	-06.7	14.5	24	+08.5	-06.6	15.1	54	<-27	<-27	--

pi7200

Figure 10-8 Top Part of Report Header

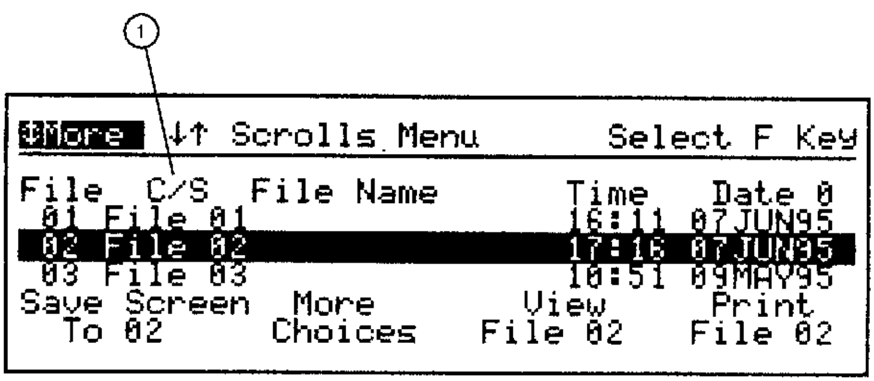
Viewing Stored Files

Here is a list of the file type to view:

- Channel scan
- Normalized channel scan
- Spectrum scan
- Digital power measurement
- Burst counter measurement
- Average power measurement
- Ingress spectrum scan measurement

Channel Scan (Level Measurement Files)

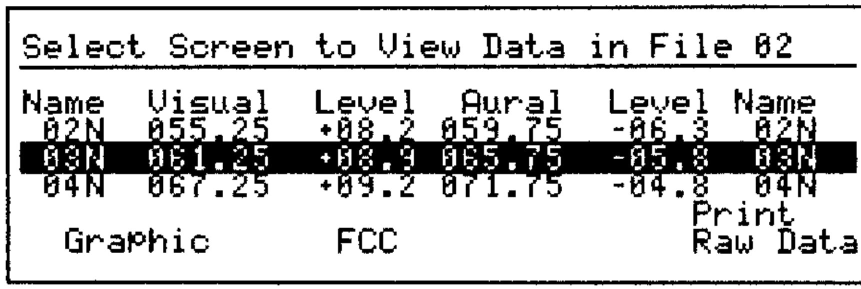
To view the stored channel scan files, enter the file server from any measurement mode by pressing the **Print/Save** key. Use the ▲ ▼ keys to select the file. The file type, **C/S**, ① is displayed above the file names. To view the selected file press **F3**. See Figure 10-9.



pi7165

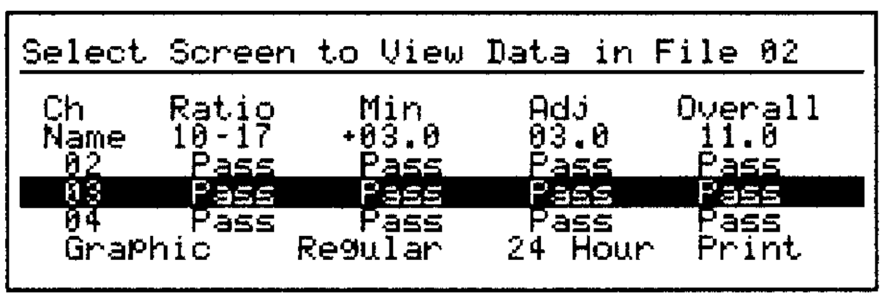
Figure 10-9 Level Measurement View Screen in the Level Measurement Mode

Channel scan files can be displayed on the screen in three forms: raw level measurements, FCC pass/fail report, or graphically. See Figure 10-10, Figure 10-11, and Figure 10-12.



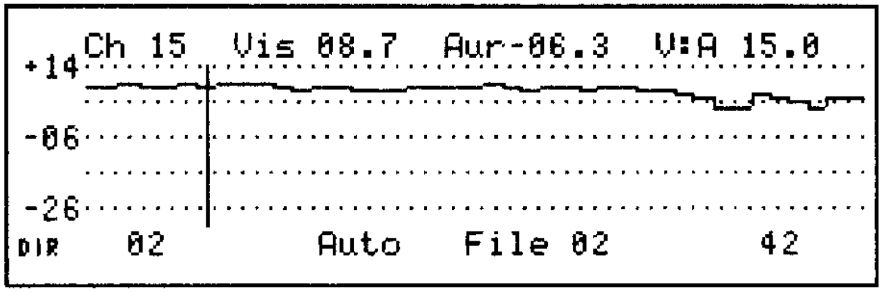
pi7166

Figure 10-10 Raw Level Measurements



pi7167

Figure 10-11 FCC Pass/Fail Report

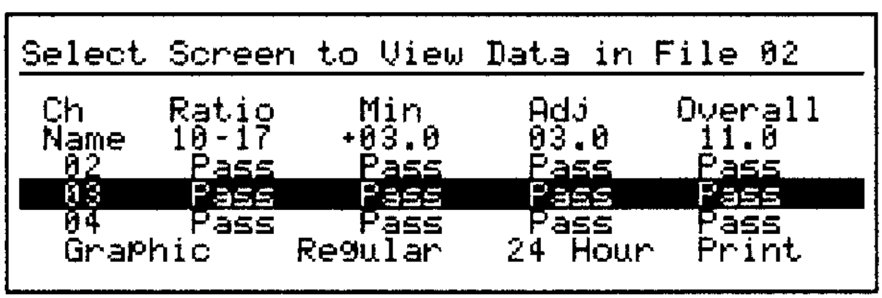


pi7168

Figure 10-12 Graphically

Figure 10-10 shows the raw level measurement display. Use the ⏶ ⏷ keys to view the other level information stored in the file.

A pass/fail report can also be viewed based on FCC level measurement requirements. To toggle between the FCC pass/fail screen and the raw level measurement screen, press **F2**.

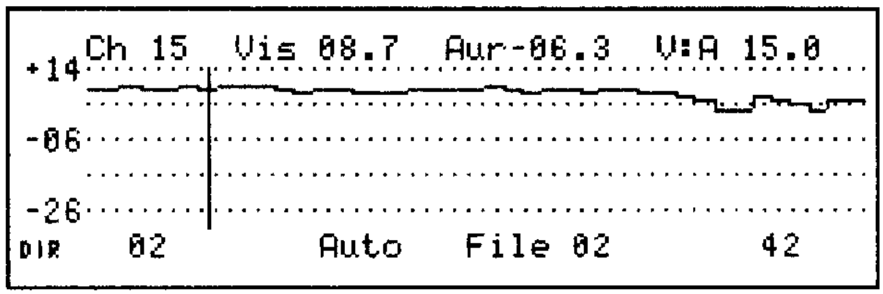


pi7167

Figure 10-13 Pass/Fail Screen

As in the level measurement screen, the other channels are viewed using the ⏶ ⏷ keys. For an explanation of the FCC test criteria, refer to the “FCC Reports” section of this chapter.

The data can also be viewed graphically by pressing **F1**.



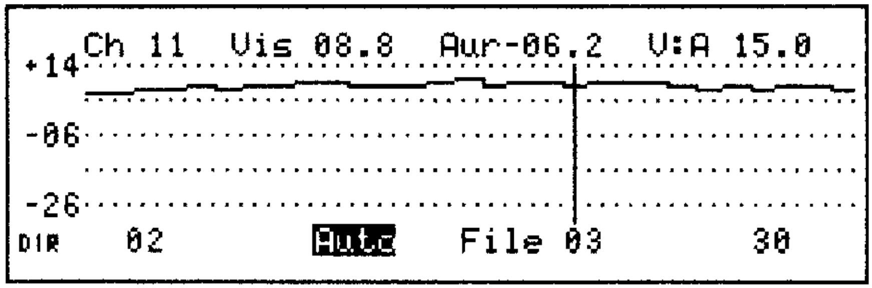
pi7168

Figure 10-14 Channel Scan Graphic Display Screen

The other channel scan files can be viewed by pressing **F3** and using the ⏶ ⏷ keys to change the file.

NOTE: Only channel scan files can be selected from this screen. To view files of other types, you must return to the file selection screen.

In the channel scan graphic display screen, the marker with its associated data, the start channel, and the stop channel, can be changed using the same methods used for an active display. Refer to "Channel Scan Mode" in Chapter 3 for information about these functions.

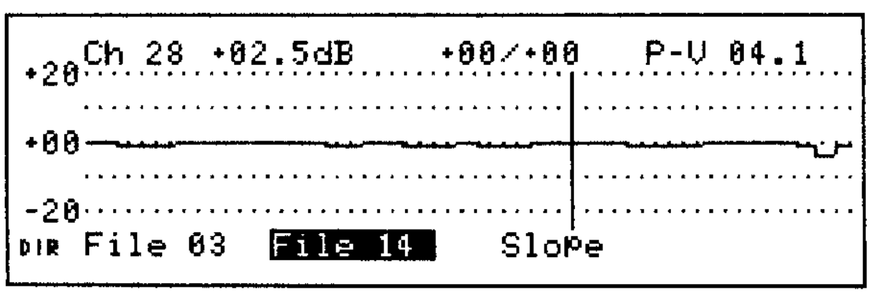


pi7196

Figure 10-15 Channel Scan Motion-on-Screen Display

Normalized Channel Scan Files

To view the stored normalized channel scan files, enter the file server from any measurement mode by pressing the **Print/Save** key. Use the ▲ ▼ keys to select the file. The file type, **CSN**, is displayed above the file names. Press **F3** to view the file.



pi7197

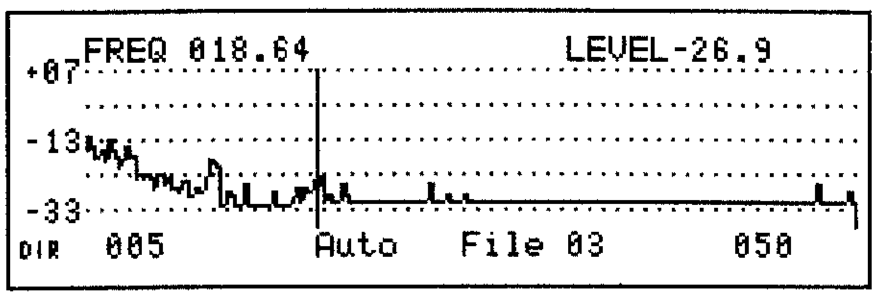
Figure 10-16 Normalized Channel Scan Screen

The reference file name is displayed over the **F1** softkey and the selected file name is displayed over **F2**. Other normalized channel scan files can be selected using the ▲ ▼ keys.

The position of the marker and the relative level at the marker position can be changed by using the ◀ ▶ keys.

Spectrum Scan Files

To view stored spectrum scan files, enter the file server from any measurement mode by pressing the **Print/Save** key. Use the ▲ ▼ keys to select the file. The file type, `S/A,` is displayed above the file names. Press **F3** to view the file.



pd230b

Figure 10-17 Stored Spectrum Scan Screen

In the spectrum scan display, the marker is used to measure the frequency and level at a specific point on the trace by using the ◀ ▶ keys to position the marker. The frequency and level are displayed at the top of the screen.

The stored file name is displayed over the **F3** key. Use the ▲ ▼ keys to view any of the spectrum scan files in the file server.

Spectrum Scan Files

A special function is available for channel scan, spectrum scan, and return spectrum scan graphics: Motion-on-Screen. The Motion-on-Screen or Auto Display mode is available to automatically select files one by one and display the data graphically on the screen. Motion-on-Screen will only function with channel scan files. To activate Motion-on-Screen, press **F2**.

Digital Power Measurements

To view stored digital power measurement files, follow these steps:

1. Enter the file server from any measurement mode by pressing the **PRINT/SAVE** key. Use the **UP/DOWN** keys to select the file. The file type ADP is displayed above the file names.
2. Press **F3** to view the file.

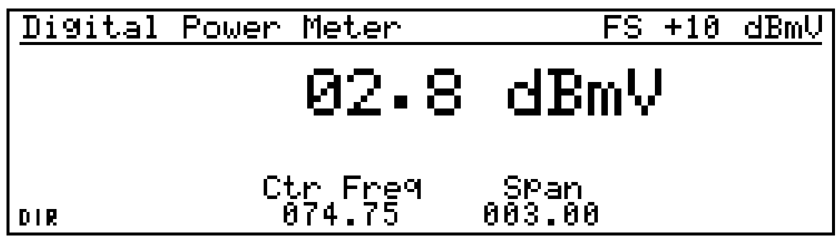


Figure 10-18 Stored Digital Power Frequency Measurement Screen

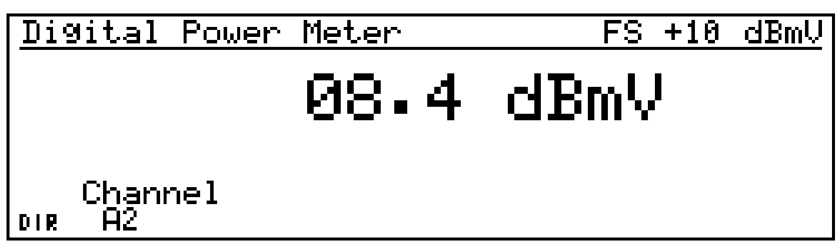


Figure 10-19 Stored Digital Power Channel Measurement Screen

3. To view other digital power measurements press **ENTER** to return to the file server menu. Use the **UP/DOWN** keys to select the next file with the ADP file type and press **F3**.

Burst Counter Files

To view stored burst counter measurement files, follow these steps:

1. Enter the file server from any measurement mode by pressing the **PRINT/SAVE** key. Use the **UP/DOWN** keys to select the file. The file type iBC is displayed above the file names.
2. Press **F3** to view the file.

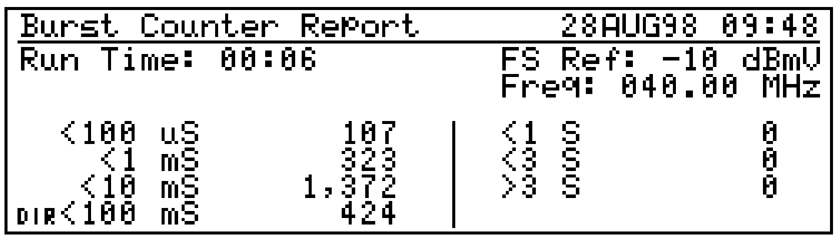


Figure 10-20 Stored Digital Power Frequency Measurement Screen

3. To view other burst counter measurements press **ENTER** to return to the file server menu. Use the **UP/DOWN** keys to select the next file with the iBC file type and press **F3**.

Average Power Files

To view stored burst counter measurement files, follow these steps:

1. Enter the file server from any measurement mode by pressing the **PRINT/SAVE** key. Use the **UP/DOWN** keys to select the file. The file type iAP is displayed above the file names.
2. Press **F3** to view the file.

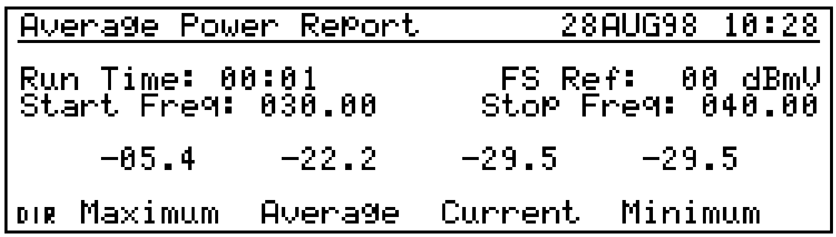


Figure 10-21 Stored Average Power Measurement Screen

3. To view other burst counter measurements press **ENTER** to return to the file server menu. Use the **UP/DOWN** keys to select the next file with the iAP file type and press **F3**.

Ingress Spectrum Scan Files

Ingress spectrum scan files are stored in four consecutive files in the file server. The files are stored in the following order; the maximum trace, the average, the current, and the minimum trace. All four traces are stored with the same time and date.

To view stored ingress spectrum scan measurement files, follow these steps:

1. Enter the file sever from any measurement mode by pressing the **PRINT/SAVE** key. Use the **UP/DOWN** keys to select the first file in the series. The file type iSA is displayed above the file names.
2. Press **F3** to view the maximum trace.

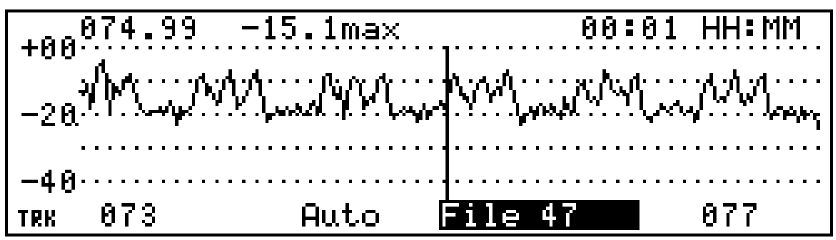


Figure 10-22 Stored Ingress Spectrum Scan Maximum Trace

The kind of trace, maximum (max), average (avg), current (cur), or minimum (min) is displayed next to the marker value at the top of the screen.

3. As in normal spectrum scan screens, the marker is used to measure the frequency and level at a specific point on the trace by using the **LEFT/RIGHT** keys to position the marker. The frequency and level are displayed at the top of the screen.
4. The stored file name is displayed over the **F3** key. Use the **UP/DOWN** keys to view any of the ingress spectrum scan files in the file server.
5. The Motion-on-Screen function is available for Ingress Spectrum Scan files. To activate Motion-on-Screen, press **F2**.

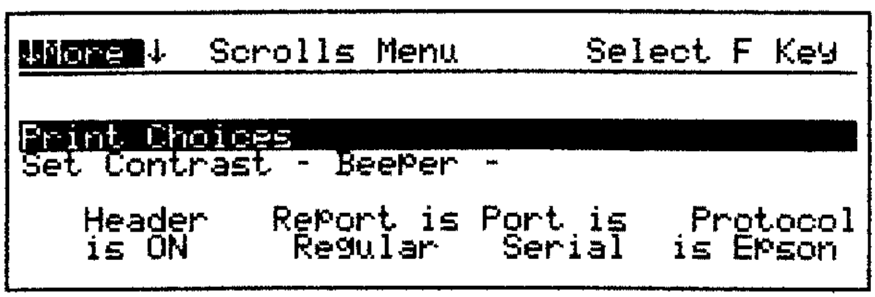
Printer Setup

The 3010 has a parallel and a serial printer interface. The printing format is selectable between Epson graphics and PCL. The PCL is compatible with most printers. Both the interface and the graphics mode is selectable in the firmware.

All of the files stored in the file server can be selected and printed. Channel scan level measurements are printed with or without a header in one of two report forms, raw level measurements and the FCC pass/fail report.

Printer Interface

To select the printer interface, from any screen, press **Menu** ▲ (four times).



ps242h

Figure 10-23 Printer Selection Screen

The current printer interface is displayed over **F3**. To change the printer interface, press **F3**.

The current printer graphic mode is displayed over **F4**. To change the printer graphics mode to Epson or PCL, press **F4**.

The Header status is displayed over **F1**. To turn the header on or off, press **F1**.

To exit the printer interface screen, press **Menu** to return to the Main menu.

Serial Printer Configuration

The 3010 utilizes a serial interface for: downloading sweep tables to the transmitter, communications with a computer, and printer communications. The 3010 requires a serial printer set to the following parameters:

Printer Parameters

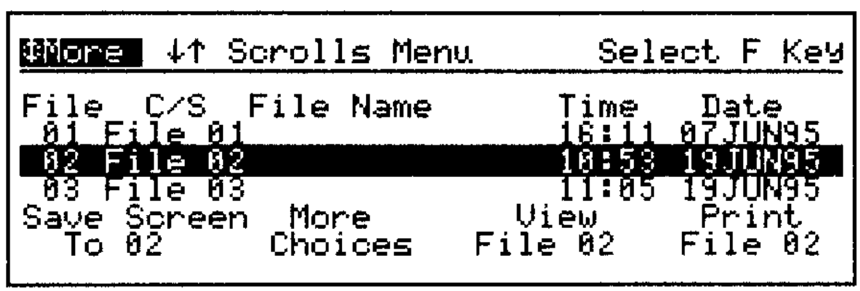
Emulation	Epson FX-8x
Page Length	11 inches
Perforation Skip	Off
Character Set	USA
Carriage Return	CR
Line Feed	LF
Graphic Print Dir.	Unidirectional
LF/Graphic/Pitch Mode	Normal
Protocol	XON/XOFF
Parity	None
Data Length	8 bits
Baud Rate (Stop Bits)	9600 (1)

Printing Display Screens

Any screen can be exported directly to a printer. All the screens in this manual were created using this method. To print a screen, select the screen and press **Shift Print/ Save** with the printer connected to the 3010. The screen will be sent to the printer using the selected printer configuration.

Printing a Stored Measurement

To print stored measurements, from any of the measurement modes, press **Print/ Save** to enter the file server.



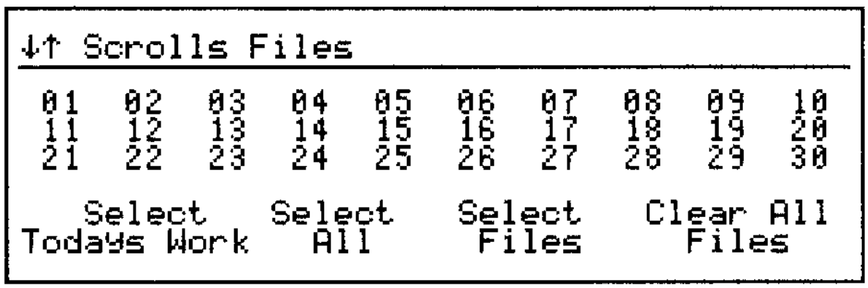
pi7163

Figure 10-24 File Server Screen

Use the ▲ ▼ keys to select a file and press **F4** to print the file. After the **F4** key is pressed, the softkey becomes the print abort key. If a problem is encountered during printing, press **F4** to abort the printing function. While printing graphic screens, the 3010 displays the selected screen. To print another copy of the screen, press the **Enter** key with the trace displayed.

Printing Multiple Stored Measurements

Printing files one file at a time, is time consuming. The 3010 allows you to select and print a group of stored files. To access the Group Print function, from any of the measurement modes, press **Print/Save F2**.



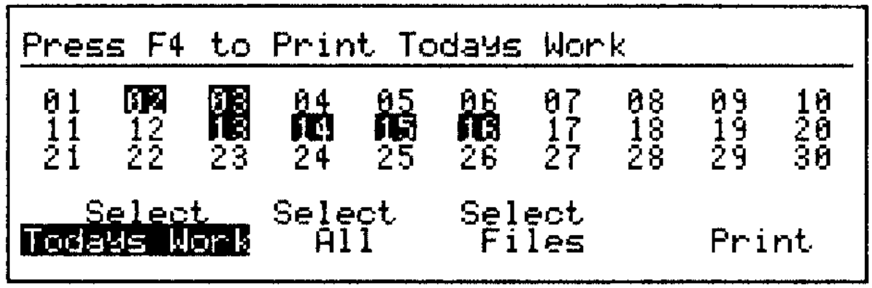
pi7173

Figure 10-25 Group File Selection Screen

There are three ways to select files.

F1 selects today’s work.
F2 selects all of the files.
F3 selects specific files.

To select today’s work, press **F1**. The 3010 will check the file server and select all of the files with the same date as the current date programmed into the 3010. The selected files are indicated by highlighted file numbers. Press **F4** to print the highlighted files.

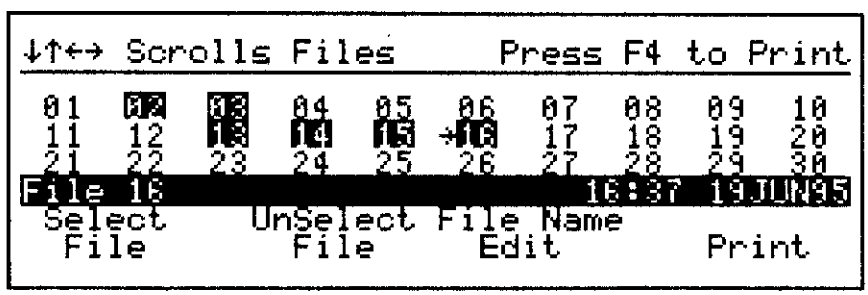


pi7174

Figure 10-26 Today’s Work Selection Screen

To select all of the files, press **F2**. All used file numbers will be highlighted. To unselect all of the files, press **F2** again. Press **F4** to print the highlighted files.

To select specific files, press **F3**.



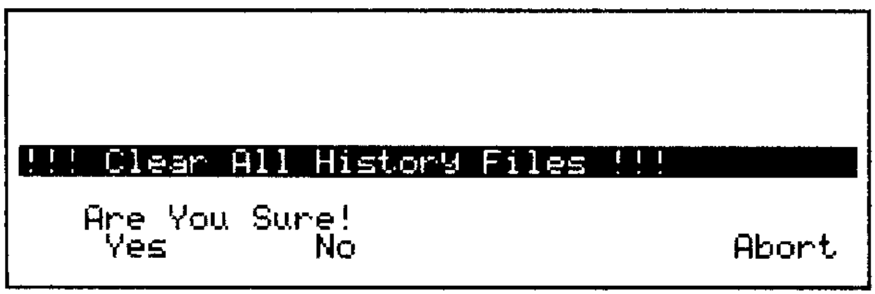
pi7175

Figure 10-27 Single File Selection Screen

Notice the arrow to the left of file 16. The arrow indicates the position of the file pointer. Move the small arrow indicator using the arrow keys to the next file to select. Press **F1** to select a file or press **F2** to unselect a file. When all of the files are selected, press **F4** to print the highlighted files.

Clearing All Files

Files in the file server can be overwritten by new files at any time. If a new file is stored into the file server, the label remains the same, but the time and date is replaced with the current programmed time/date stamp, and the data in the file is overwritten. To clear all of the files in the file server, from the file select screen, press **F4**. See Figure 10-28.



pi7176

Figure 10-28 Clear Files Warning Screen

CAUTION: Cleared files cannot be recovered.

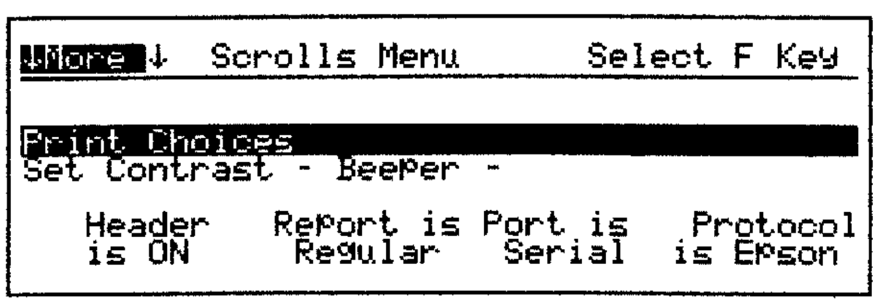
FCC reports

The FCC report uses stored channel scan files of level measurement data to create the pass/fail and the 24-hour variance reports. The 3010 uses raw data stored in the file server and performs calculations on them using programmable defaults. These parameters are set to the FCC specifications when the unit is shipped. To add versatility to the 3010, these parameters are programmable by the user.

Part of the FCC pass/fail report includes the 24-hour variation report. The 24-hour variation report compares four sets of measurements based on the requirements of the FCC specifications. For measurements to be used to create this report, the data must be collected 6 hours apart, with no measurement taken less than 5 hours or more than 7 hours from the adjacent measurement. All four measurements must be taken within a 24-hour period. Care must be taken when collecting data for this report.

Selecting the Report

The FCC pass/fail report feature allows you to toggle between the regular 3010 report, with or without the header, and the FCC report. To toggle between reports, from the Main menu, press ⏏ (four times).



ps242h

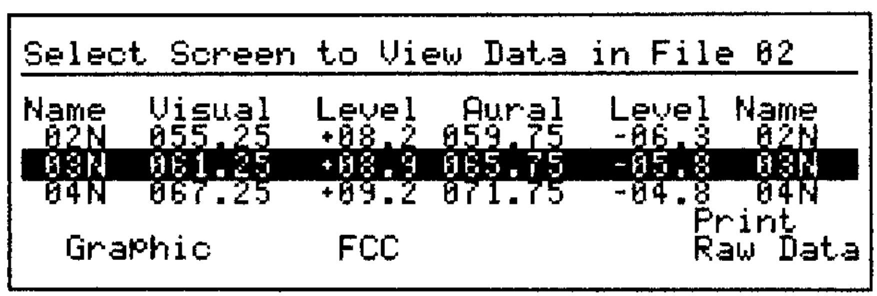
Figure 10-29 Print Choice Screen

The softkey label indicates the setting of the print header over **F1** and the type of report over **F2**. To turn the print header on or off, press **F1**. To select the regular or the FCC report, press **F2**.

Viewing and Printing the FCC Report

The FCC pass/fail results can be instantly viewed from the file server.

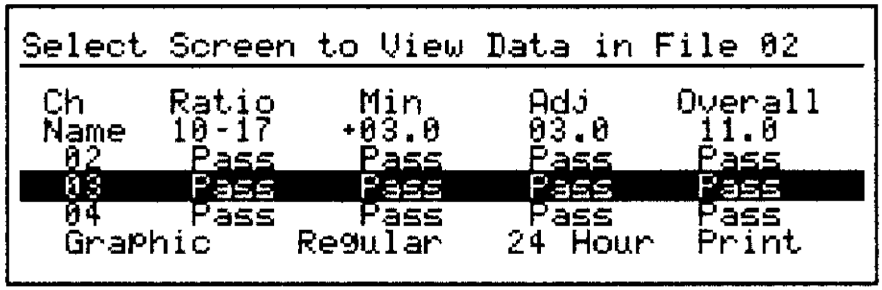
From any measurement mode, press **Print/Save** to enter the file server. Select a channel scan file using the arrow keys and press **F3** to view the selected file.



pi7166

Figure 10-30 View Data Screen

Figure 10-30 shows the raw data stored in the file. To view the FCC report results, press **F2**.



pi7167

Figure 10-31 Pass/Fail View Data Screen

The FCC report is now displayed on the screen. Use the ▲ ▼ keys to scroll through the channels or press **F4** to export the report to the printer.

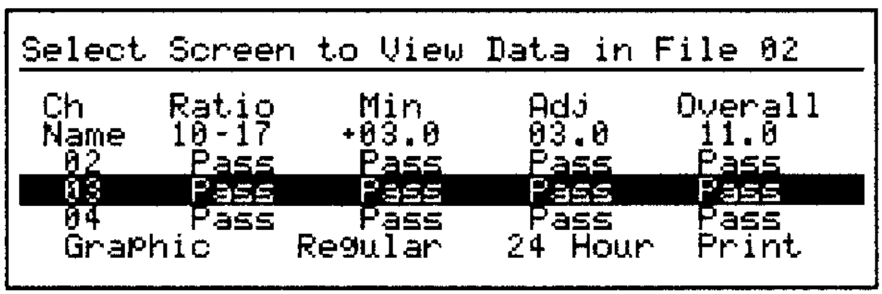
NOTE: The FCC Report must be selected in the print choices screen for the FCC report to print. With the FCC Report selected, the Multi Print function described earlier in this chapter will print the pass/fail report for any number of files.

A sample of the printed report is shown in Figure 10-36. The added data is printed in the header of the report. The report contains: the date and time the data was collected, the temperature, the location, or file name, the peak-to-valley calculated from the data, the test point value if programmed, the number of amplifiers in cascade, and the technician who made the test. All but two of the items in the header are calculated or programmed in the 3010. The cascade and the technician name can be hand-written on the printed copy.

24-hour Variance Report

The 24-hour variance report compares four sets of level measurements and displays pass/fail based on the FCC specifications. Measurements must be approximately 6 hours apart through a 24-hour period. Measurement can not be less than 5 hours or more than 7 hours apart. If the measurements selected do not meet these requirements, the 3010 will not print the report, therefore care must be taken when storing the measurements for the report.

The 24-hour variance report is part of the FCC report feature of the 3010, therefore, the report choice must be set to FCC. This can be done from the Main menu. Press ⏏ (4 times) and select the report by pressing **F2**. The file selection screen for the 24-hour report is accessed from the FCC pass/fail view screen. To select the pass/fail view screen, press **Print/Save** from any of the measurement modes. The FCC report is only valid for channel scan files, so use the arrow keys to select the first file to be used in the report. Press **F3** to view the file.

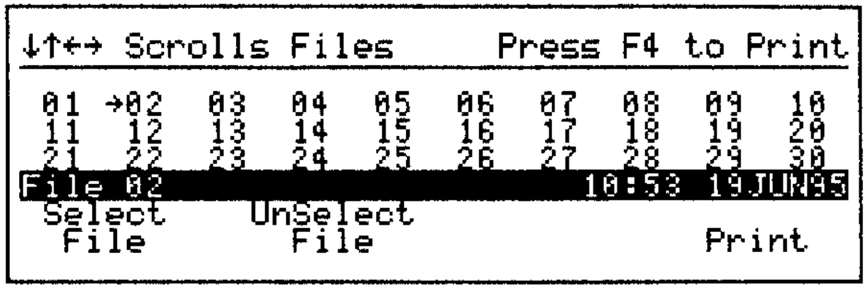


pi7167

Figure 10-32 FCC Pass/Fail Report View Screen

The display should look like Figure 10-32. If the view screen is not in the FCC view mode, press **F2** to change to the FCC pass/fail report.

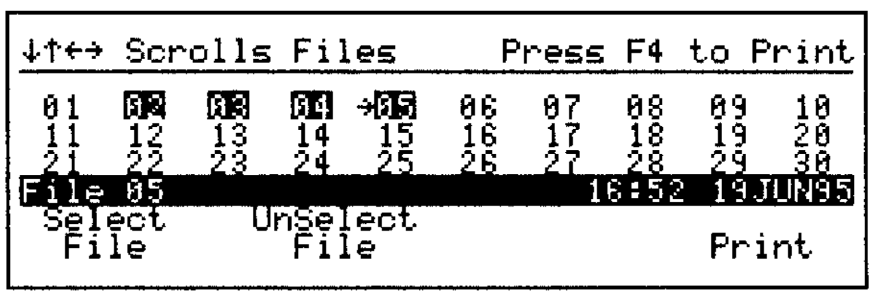
Press **F3** to enter the file selection screen for the 24-hour variance report.



pi7198

Figure 10-33 24-hour Report File Selection Screen

There is a small arrow pointing to the viewed file. Press **F1** to select the first file in the report. Use the arrow keys to move to the next file and press **F1** to select the second file for the report. Continue until you have selected all four files.



pi7178

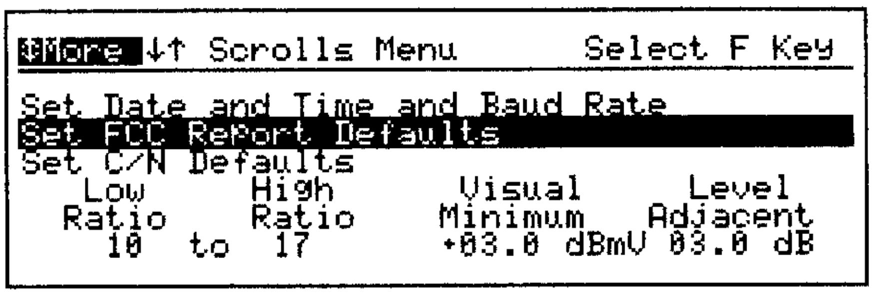
Figure 10-34 24-hour Report File Selection Screen with Four Files Selected

Connect the 3010 to the printer. Press **F4** to print the report. See the example report in Figure 10-37.

The 3010 will not allow you to print this report with files that do not meet the FCC criteria. The error message **`FILES DO NOT GROUP`** will appear in the message line and the report will not print.

Setting the FCC Report Limits

To change the FCC report limits, from the Main menu, press **Option** and ▼ (4 times).



pi7179

Figure 10-35 Set FCC Report Defaults Screen

The pass/fail conditions are set using the **F1** to **F4** keys as follows:

F1 sets the minimum visual to aural difference.

F1 accesses the low visual to aural difference value. Normally, the FCC specification for the minimum difference between the visual and aural carriers is 10 dB. To change the value, press **F1**. Use the arrow keys to change the parameter.

F2 sets the maximum visual to aural difference.

F2 accesses the high visual to aural difference value. The FCC specification for the maximum difference between the visual and aural carriers is 17 dB. To change the value, press **F2**. Use the arrow keys to change the parameter.

F3 sets the minimum visual signal level.

F3 accesses the minimum level for the visual carrier. The FCC specification is 0 or 3 dBmV depending on the test point used. To change the value, press **F3**. Use the arrow keys to change the parameter.

F4 sets the maximum visual adjacent (6 MHz) level difference.

F4 accesses the maximum level difference between adjacent channels. The FCC specification is 3.0 dB. To change the value, press **F4**. Use the arrow keys to change the parameter.

Overall Limit

The overall limit is determined by the highest active frequency in the channel plan. Table 10-2 will help you determine the overall limit for your channel plan. You can change the overall limit for your channel plan by changing the highest active channel in your channel plan.

Table 10-2 Overall Limits

If Your Highest Active Channel Is:	The Maximum Overall Limit For Your System Is:
Channel 36 or below	10 dB
Between Channel 37 and Channel 53	11 dB
Between Channel 54 and Channel 70	12 dB
Between Channel 71 and Channel 86	13 dB
Between Channel 87 and Channel 108	14 dB
Between Channel 109 and Channel 125	15 dB

FCC Pass/Fail Report

CALAN Form 2010 FCC 1 of 2

Date_______ 28OCT93 Cascade___________

Time_______ 21:00 Peak-to-Valley____ 10.3 dB

Temp_______ +79.1 F (+26.2 C) Test Point________

Location___ File 01 Test By___________

Ch	Signal Level Data		V:A	10-17 dB	+03.0 dBmV	03.0 dB	11.0 dB
#	Visual	Aural	Ratio	Ratio	Min	Adj	Overall
02	+07.2	-06.8	14.0	Pass	Pass	Pass	Pass
03	+07.7	-06.8	14.5	Pass	Pass	Pass	Pass
04	+07.4	-06.3	13.7	Pass	Pass	Pass	Pass
05	+08.5	-04.9	13.4	Pass	Pass	Pass	Pass
06	+08.1	-07.9	16.0	Pass	Pass	Pass	Pass
14	+09.8	-05.1	14.9	Pass	Pass	Pass	Pass
15	+11.3	+01.6	09.7	FAIL	Pass	Pass	Pass
16	+12.1	-02.4	14.5	Pass	Pass	Pass	Pass
17	+09.9	+02.8	07.1	FAIL	Pass	Pass	Pass
18	+12.4	+03.9	08.5	FAIL	Pass	Pass	Pass
19	+11.1	02.6	13.7	Pass	Pass	FAIL	Pass
20	+14.3	+00.9	13.4	Pass	Pass	FAIL	Pass
21	+11.1	-04.4	15.5	Pass	Pass	FAIL	Pass
22	+10.9	-04.4	15.3	Pass	Pass	Pass	Pass
07	+10.7	-05.5	16.2	Pass	Pass	Pass	Pass
08	+09.9	-04.7	14.6	Pass	Pass	Pass	Pass
09	+11.3	-03.8	15.1	Pass	Pass	Pass	Pass
10	+10.7	-06.2	16.9	Pass	Pass	Pass	Pass
11	+10.1	-04.4	14.5	Pass	Pass	Pass	Pass
12	+09.4	-05.1	14.5	Pass	Pass	FAIL	Pass
13	+05.0	-07.5	12.5	Pass	Pass	FAIL	Pass
23	+12.2	-02.5	14.7	Pass	Pass	FAIL	Pass
24	+12.6	-03.9	16.5	Pass	Pass	Pass	Pass
25	+10.5	+02.5	08.0	FAIL	Pass	Pass	Pass
26	+10.9	-04.6	15.5	Pass	Pass	Pass	Pass
27	+11.9	-02.9	14.8	Pass	Pass	Pass	Pass
28	+12.6	-01.4	14.0	Pass	Pass	Pass	Pass
29	+14.7	-00.1	14.8	Pass	Pass	Pass	Pass
30	+14.6	-00.8	15.4	Pass	Pass	Pass	Pass
31	+14.7	-00.1	14.8	Pass	Pass	Pass	Pass
32	+15.0	-02.5	17.5	FAIL	Pass	Pass	Pass
33	+14.4	-02.8	17.2	FAIL	Pass	Pass	Pass
34	+13.6	-03.4	17.0	Pass	Pass	Pass	Pass
35	+10.8	-04.3	15.1	Pass	Pass	Pass	Pass
36	+10.6	-10.6	21.2	FAIL	Pass	Pass	Pass
37	+05.3	-05.2	10.5	Pass	Pass	FAIL	Pass
38	+10.7	-04.4	15.1	Pass	Pass	FAIL	Pass
39	+06.3	-08.5	14.8	Pass	Pass	FAIL	Pass
40	+06.0	-08.9	14.9	Pass	Pass	Pass	Pass
41	+05.8	-08.1	13.9	Pass	Pass	Pass	Pass

pi7191

Figure 10-36 Pass/Fail Report

FCC 24 Hour Report

CALAN Form 2010-FCC_24-1 of 2

File 01	Location___ File 01	26OCT93 21:00
File 02	Location___ File 02	27OCT93 03:00
File 03	Location___ File 03	27OCT93 09:00
File 04	Location___ File 04	27OCT93 15:00

Test By__________

File	01	02	03	04			
Date	26OCT93	27OCT93	27OCT93	27OCT93			
Time	21:00	03:00	09:00	15:00	24 Hour	24 Hour	
Ch #	Visual	Visual	Visual	Visual	Variation	Result	Ch #
02	+07.2	+07.5	+07.7	+07.6	00.5	Pass	02
03	+07.7	+08.4	+08.5	+08.5	00.8	Pass	03
04	+07.4	+08.0	+08.3	+08.0	00.9	Pass	04
05	+08.5	+09.2	+08.2	+09.2	01.0	Pass	05
06	+08.1	+08.9	+09.1	+12.6	04.5	Pass	06
14	+09.8	+10.4	+10.4	+10.2	00.6	Pass	14
15	+11.3	+09.7	+11.9	+12.6	02.9	Pass	15
16	+12.1	+13.1	+13.5	+13.1	01.4	Pass	16
17	+09.9	+10.6	+06.5	+10.9	04.4	Pass	17
18	+12.4	+12.5	+14.7	+15.0	02.6	Pass	18
19	+11.1	+12.0	+11.9	+12.2	01.1	Pass	19
20	+14.3	+15.0	+15.2	+14.6	00.9	Pass	20
21	+11.1	+11.8	<-27	+12.0			21
22	+10.9	+11.7	+12.3	+12.1	01.4	Pass	22
07	+10.7	+11.1	-11.4	+11.0	00.7	Pass	07
08	+09.9	+11.1	+10.6	+10.4	01.2	Pass	08
09	+11.3	+12.5	+12.6	+12.2	01.3	Pass	09
10	+10.7	+12.9	+12.7	+12.6	02.2	Pass	10
11	+10.1	+11.9	+11.8	-12.4	02.3	Pass	11
12	+09.4	+09.3	+10.0	+09.8	00.7	Pass	12
13	+05.0	+05.3	+05.6	+06.1	01.1	Pass	13
23	+12.2	+13.1	+13.4	+13.1	01.2	Pass	23
24	+12.6	+13.1	+13.9	+13.5	01.3	Pass	24
25	+10.5	+10.2	+13.1	+11.5	02.9	Pass	25
26	+10.9	+12.4	+10.9	+12.5	01.6	Pass	26
27	+11.9	+13.4	+13.3	+13.2	01.5	Pass	27
28	+12.6	+13.5	+13.8	+13.6	01.2	Pass	28
29	+14.7	+14.9	+15.1	+14.9	00.4	Pass	29
30	+14.6	+15.2	+15.4	+15.3	00.8	Pass	30
31	+14.7	+15.5	+15.6	+15.4	00.9	Pass	31
32	+15.0	+15.8	+16.1	+16.1	01.1	Pass	32
33	+14.4	+15.3	+15.6	+15.5	01.2	Pass	33
34	+13.6	+14.6	+14.7	+14.7	01.1	Pass	34
35	+10.8	+11.9	+12.3	+12.0	01.5	Pass	35
36	+10.6	+10.9	+11.2	+11.0	00.6	Pass	36
37	+05.3	+06.9	+05.7	+05.6	01.6	Pass	37
38	+10.7	+11.8	+12.4	+12.0	01.7	Pass	38
39	+06.3	+07.3	+07.3	+07.0	01.0	Pass	39
40	+06.0	+06.5	+06.7	+06.4	00.7	Pass	40
41	+05.8	+06.4	+06.7	+06.5	00.9	Pass	41

pi7192

Figure 10-37 24-hour Report

Sweep Tables

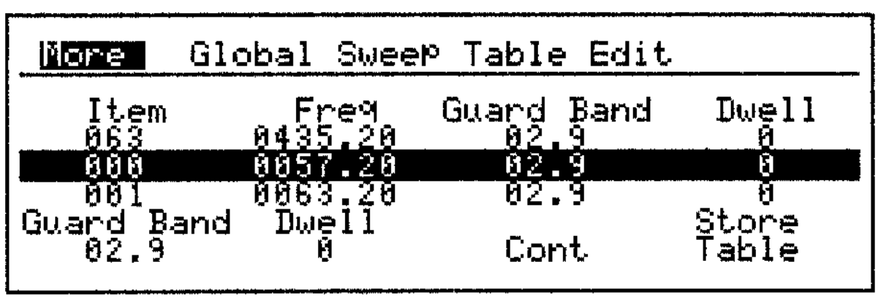
The 3010 can store 4 sweep tables in memory. Each file includes the start frequency, the stop frequency, and the sweep table consisting of all the frequencies, guard bands, and dwell times.

Storing Sweep Tables

The storage selection screen for sweep tables is accessed from the global sweep table edit screen. To access the global sweep table edit screen:

In forward sweep mode, press **Menu** ▲ **F3** ▼ **F3 F3**.

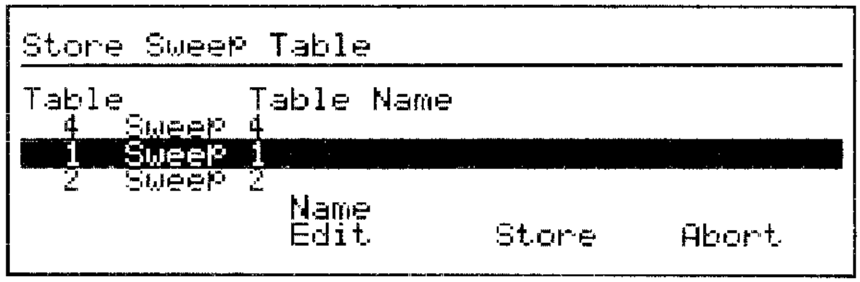
In return path mode, press **Menu** ▼ **F3** ▼ **F3 F3**.



pi7209

Figure 10-38 Global Sweep Table Edit Screen

To store the viewed sweep table with the current start and stop frequencies, press **F4** to enter the sweep table file selection screen in the file server.



pi758

Figure 10-39 Sweep Table File Selection Screen

Use the ▲ ▼ keys to select the file. Press **F3** to store the sweep table to the selected file and return to the global sweep table edit screen. Refer to Chapter 7 for more information about sweep tables and saving them to the transmitter.

Selecting and Retrieving Sweep Tables

The 3010 can store four sweep table files in the file server. Stored sweep tables may be selected from the Forward Sweep Setup menu or the current sweep parameters screen. To enter the Forward Sweep Setup mode, from any screen, press **Menu** ▲ **F3**.

Stored sweep tables may also be selected from the Return Path Setup menu. To enter the Return Path Setup mode, from any screen, press **Menu** ▼ **F3**.

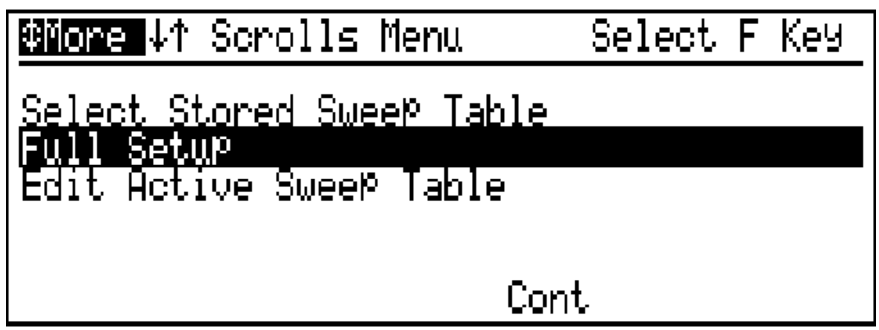
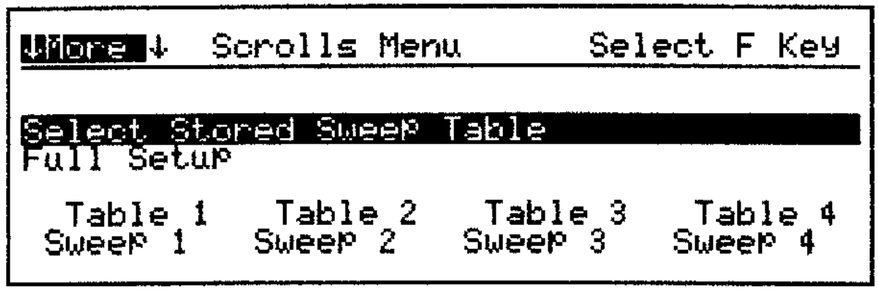


Figure 10-40 Forward Sweep Setup Menu

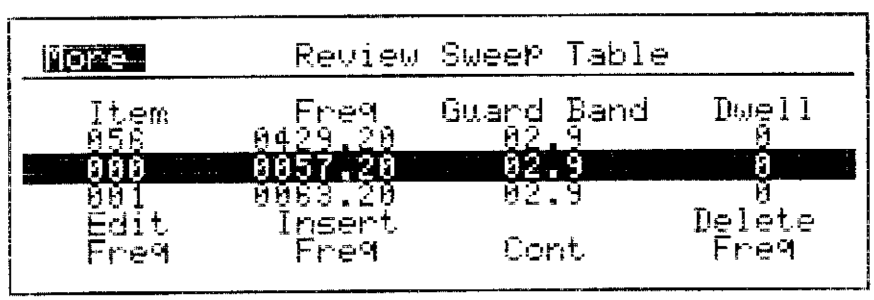
To enter the sweep table selection menu, press ▲.



pd202b

Figure 10-41 Sweep Table Selection Menu Screen

Press **F1**– **F4** to select the sweep table with the start and the stop frequencies stored with the file.



pi7135

Figure 10-42 Sweep Table Edit Screen

The selected sweep table can now be edited and then saved to the transmitter. Refer to Chapter 7 for more information about editing and using sweep tables.

Changing the Start and Stop Frequencies

Sometimes the sweep table is correct, but the start and the stop frequencies are not. The start and the stop frequencies stored with a sweep table can be changed from the Current Sweep Parameters screen. Enter the Current Sweep Parameters screen to change the start and the stop frequencies for a stored sweep table. To enter the Current Sweep Parameters screen from any screen:

In forward sweep mode, press **Menu** ▲ **F3 F3**.

In return path mode, press **Menu** ▼ **F3 F3**.

Use the arrow keys to highlight the Sweep Table.

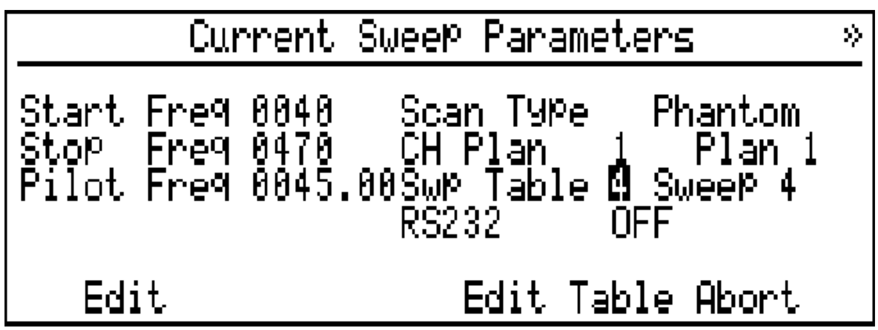


Figure 10-43 Stored Sweep Table Selected

Press **F1** and use the ▲ ▼ keys to select the sweep table. Press **Enter** to save the change.

Use the arrow keys and select the start frequency. Press **F1** and use the arrow keys to set the start frequency to the new value. Press **Enter** to save the change and highlight the stop frequency.

Press **F1** and use the arrow keys to set the stop frequency to the new value. Press **Enter** to save the change.

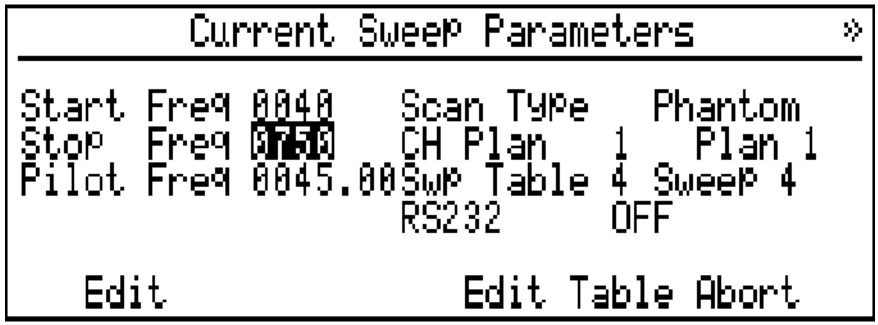
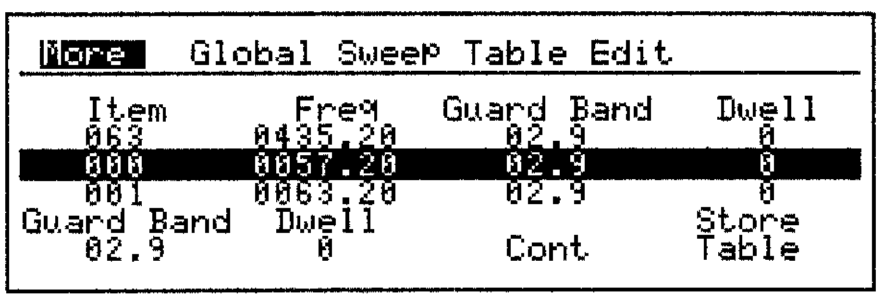


Figure 10-44 New Start and Stop Frequencies

The Current Sweep Parameters screen now shows the stored sweep table with the new start and stop frequencies. Press **F3** to enter the sweep table edit screen. Refer to Chapter 7 for more information about editing sweep tables.

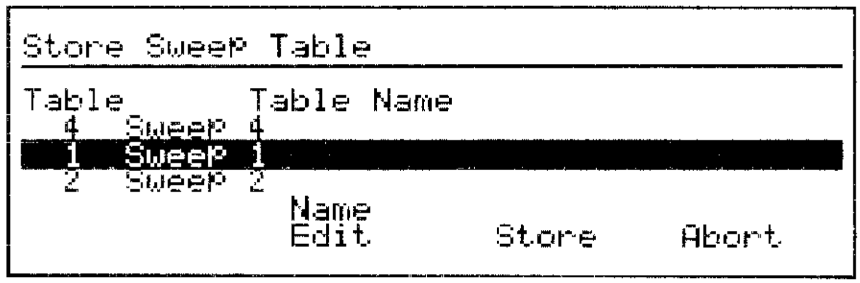
Press **F3** again to enter the Global Sweep Table Edit screen.



pi7209

Figure 10-45 Global Sweep Table Edit Screen

From this screen, the new start and stop frequencies can be stored to the file, however, sometimes you may want to only use the new start and stop frequencies for this one setup. If you would like to store the new start and stop frequencies to the file, press **F4** to enter the file server.



pi758

Figure 10-46 Sweep Table File Selection Screen

Use the ▲ ▼ keys to select the file. Press **F3** to store the sweep table to the selected file and return to the Global Sweep Table Edit screen. Refer to Chapter 7 for more information about sweep tables and saving them to the transmitter.

11

Automatic Measurements

Automatic Measurements

The 3010 is equipped with an Auto Monitor function for making unattended measurements. The obvious application for the Auto Monitor function is to collect data for the FCC 24-hour variance report. However, it is also used for troubleshooting intermittent system response and level problems.

Setting the Parameters

The setup of the Auto Monitor function involves three steps:

1. Setting up the scaling and other parameters for the Measurement mode selected for making the measurements.

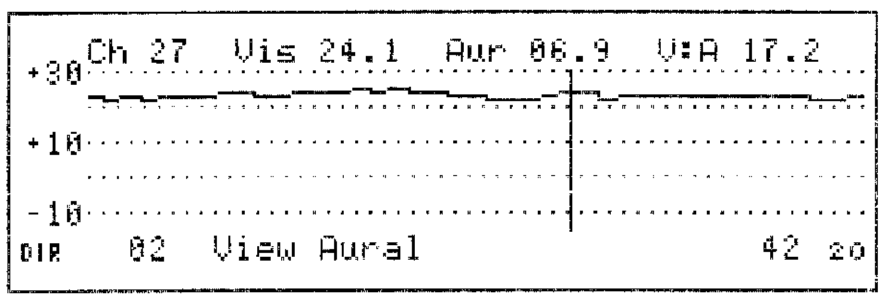
2. Setting the file pointer in the file server to the file where the first measurement will be stored.

3. Setting the time increments for the measurements and the start time for the test.

Channel Scan Mode

The Channel Scan mode stores the levels of the visual and aural carriers on the system to the file server. Channel scan collected data can be used for level record keeping, for producing the FCC report and the FCC 24 hour variance report. When collecting data for the 24-hour report, the interval between measurements must meet the FCC requirements or the report will not print.

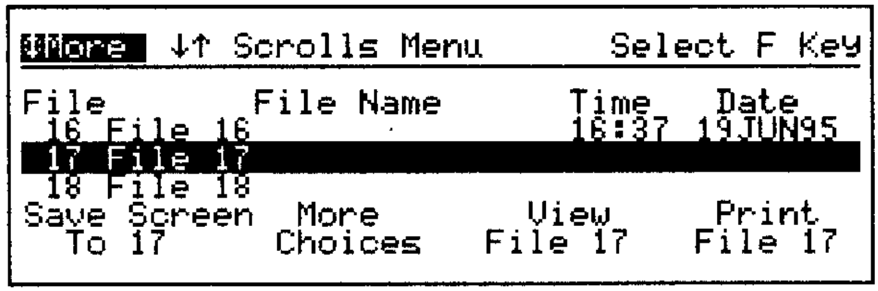
From the Main menu, press **F1** to enter the Channel Scan mode. With the 3010 connected to the test point, make sure the scaling is set so that all of the carriers are above the center of the display, without going off the top of the display. Make sure that any signal variations will not drive the 3010 into overload or into the noise floor. If you are using a test point, make sure it is the correct value.



pi7208

Figure 11-1 Channel Scan Set Correctly

Next, check the file selected in the file server. From the channel scan screen, press **Print/Save**.

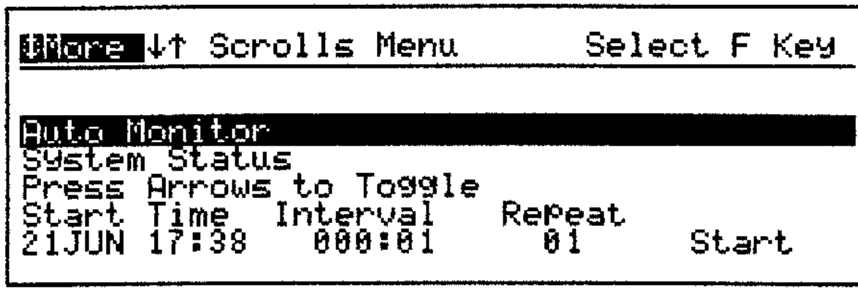


pi7180

Figure 11-2 File Server Screen

Use the arrow keys to select the first file for the test. The 3010 will automatically store the first measurement into this file. Press **Enter** to exit the file server. It is important to have enough files open for the number of tests you want to perform. In the case of a 24-hour test, you will need a minimum of 4 files. You are now ready to set up the Auto Monitor functions.

Auto Monitor Controls



ps239h

Figure 11-3 Auto Monitor Control

The Auto Monitor function is found in the Main Option menu. From any screen, press **Menu Option** ▲ to highlight the Auto Monitor function.

You need to set three parameters before beginning the test: the start time, the interval of time between the tests, and the number of tests.

When in the Auto Monitor mode, the 3010H only makes Channel Scan measurements. Channel Scan measurements are used for the FCC reports.

Set the start time by pressing **F1**. Use the ◀ ▶ keys to select the digit and use the ▲ ▼ keys to change the value for the time and date of the first measurement.

The next item over **F2** is the interval. This is the time between the measurements in hours and minutes. For the FCC tests, set the interval to 006:00 hours.

To set the interval, press **F2**. Use the ◀ ▶ keys to select the digit and use the ▲ ▼ keys to change the value for the time between tests in hours and minutes.

The repeat entry is the number of times the test will be performed. For example, if you would like to make four tests within a 24-hour period, set the repeat value equal to 4 with the interval set to 6 hours. The maximum number of tests that can be performed is equal to the number of files in the file server, which is 90. To set the repeat value, press **F3** and use the ▲ ▼ keys to set the value. Press **Enter** to save the change.

To start the measurement press **F4**. The 3010 will automatically turn off or go to sleep.

NOTE: When the 3010 is turned on with the auto Monitor Mode activated, a message is displayed on the screen warning that the Auto Monitor mode is turned on. If any changes are made to the measurement mode selected for the auto monitor test, or in the file server, the measurement results may change.

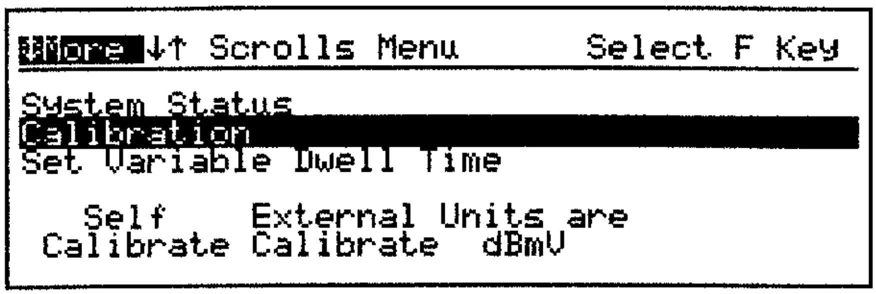
12

Instrument Settings

Instrument Settings

Calibration

The 3010 self-calibrates against an internal source when it is turned on. You can call this calibration routine from the Option menu. The 3010 calibration can also be offset to match a source in the field. From the external Calibration Option menu. To enter the calibration features, from the Main menu, press **Option** ▼.



pd236b

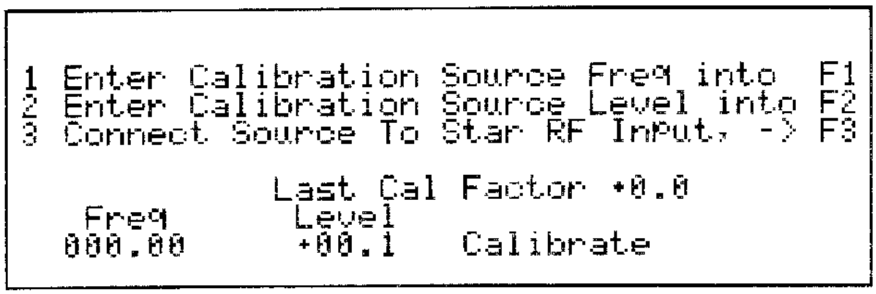
Figure 12-1 Calibration Option Menu

Self-Calibration

To self-calibrate the 3010, press **F1**. The 3010 will calibrate, using the same routine used at turn-on, and return to the Main menu. If it encounters a problem, an error message will be displayed on the screen and the 3010 will revert back to the last valid calibration values.

External Calibration

To calibrate the 3010 using an external source, press **F2** and follow the instructions displayed on the screen.



pi7149

Figure 12-2 External Calibration Screen

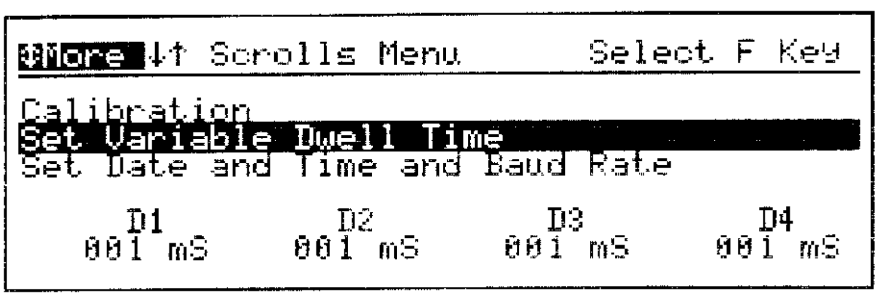
Press **F1** and set the calibration source frequency using the ◀ ▶ keys to select the digit and the ▲ ▼ keys to set the value. Press **F2** and set the level of the calibration source using the arrow keys as above. Connect the level source to the signal input and press **F3** to calibrate the unit. The 3010 will allow deviations as large as 4 dB from the factory calibration. If there is a discrepancy in external calibration greater than this limit, the 3010 will display a message and prompt you to press **F4** to abort.

The 3010 will continue to reference the last calibration. To return to the factory calibration, execute the Self-Calibrate option.

Programming Dwell Times

The 3010 controls the measurement time of a frequency by assigning a dwell. For frequency plans, the available dwell time values are “I” for inactive frequencies (a “no read” condition), “N” for a normal visual or aural carrier (100 µs), and “S” for suppressed-sync scrambled carriers (24 ms). There are also five digital-carrier measurements (“QPK”, “QPR”, “QAM”, “VSB”, and “NOI”) and four programmable dwell times (D1, D2, D3, and D4). The programmable dwell times, D1– D4 can be programmed in 1 ms steps from 1 to 999 ms.

The four programmable dwell times are normally used to measure special scrambled and digital carriers. To program dwell times D1– D4 from the Main menu, press **Option** and ▼ (2 times).



pi7150

Figure 12-3 Programming Dwell Times

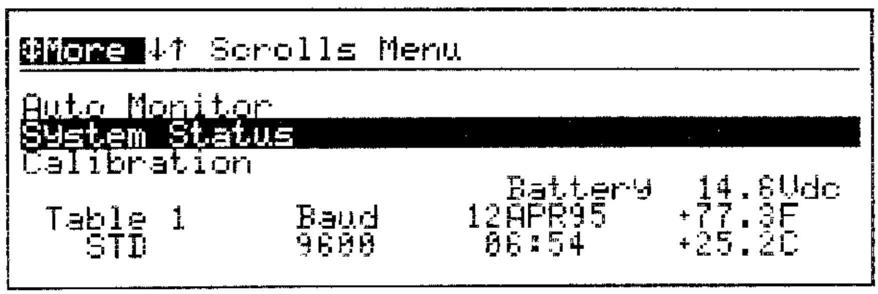
To program the individual dwell times, press **F1 F2 F3** or **F4** to select the dwell time to program. Use the ◀ ▶ keys to select the digit and use the ▲ ▼ keys to change the value of the digit. Press **Enter** to save the entry.

Press **Enter** to return to the Main menu.

Setting Time and Date

The 3010 is equipped with an internal clock. The clock information is used to time/date stamp files stored in memory. The Automatic Measurement mode is directly keyed to the internal clock for time sequencing. It is important for the user to note the format of the time and date fields. The format of the date field is day, month, year (DDMMMYY). The time is in 24-hour format (HH:MM).

To check the system status from the Main menu, press **Option**.

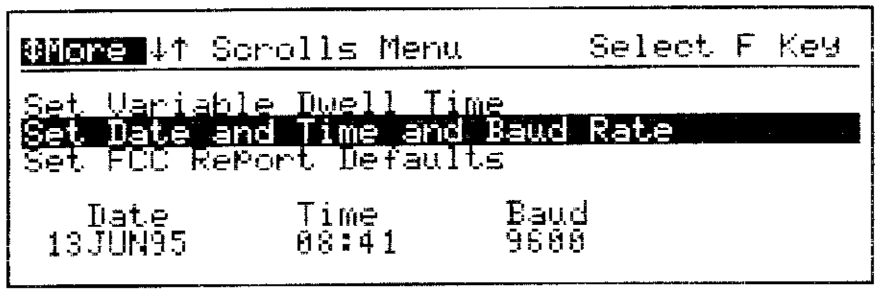


pi7206

Figure 12-4 System Status Display

The system status screen shows the operating environment of the 3010. Although the information appears above the softkeys, they are not used to change the value of the individual items.

To change the value of the time and date, from the Main menu, press **Option** and then ▼ (3 times) to scroll down to the Set Date and Time and Baud Rate screen.



pi7151

Figure 12-5 Setting Time and Date Screen

To change the date, press **F1**. Use ◀| |▶ to select the item and use ▲ ▼ to change the value of the item. Press **Enter** to save the changes and exit.

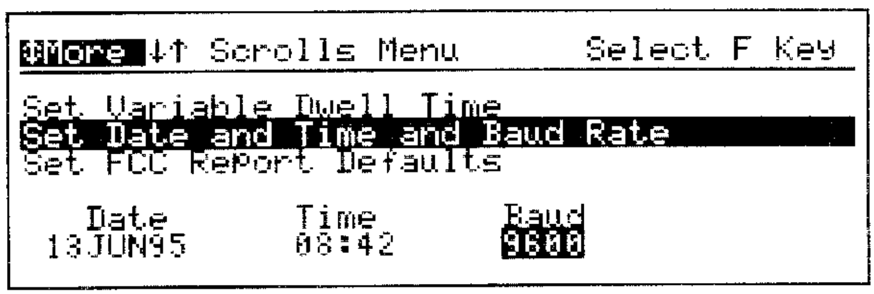
To change the time, press **F2**. Use ◀| |▶ to select the item and use ▲ ▼ to change the value of the item. Press **Enter** to save the changes and exit.

After you have made your changes, press **Enter** to exit the mode and return to the Main menu.

Setting the Baud Rate

The baud-rate adjustment of the 3010 sets the RS-232 communication rate. It is adjustable to any of the common values used: 300, 1200, 2400, 9600, and 19200 baud. Remember that the baud rate of the 3010 must be the same as the computer, printer, or transmitter being used.

To set the baud rate from Main menu, press **Option** ▼ (3 times) **F3**.



pi7152

Figure 12-6 Setting the Baud Rate

Use the ▲ ▼ keys to select the baud rate and press **Enter** to save the changes.

The remaining serial port parameters are:

8 data bits

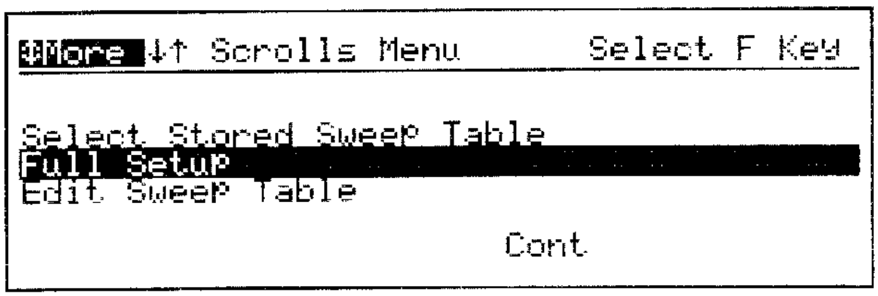
1 stop bit

No parity

Xon\Xoff protocol

Setting the Return Sweep Defaults

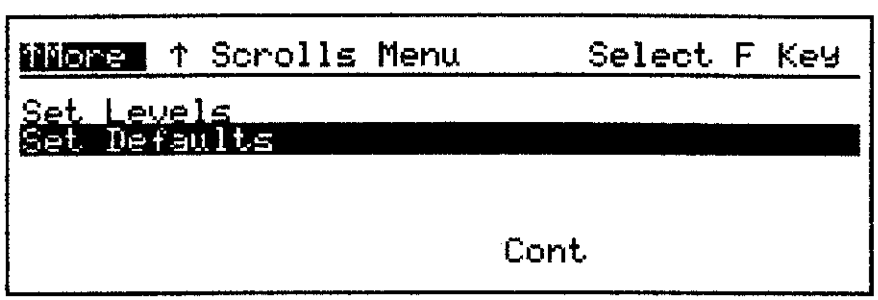
The control of the return sweep defaults is found in the sweep menu. To enter the Sweep Setup menu, press **Menu** ⏷ **F3**.



pi7153

Figure 12-7 Sweep Setup Menu

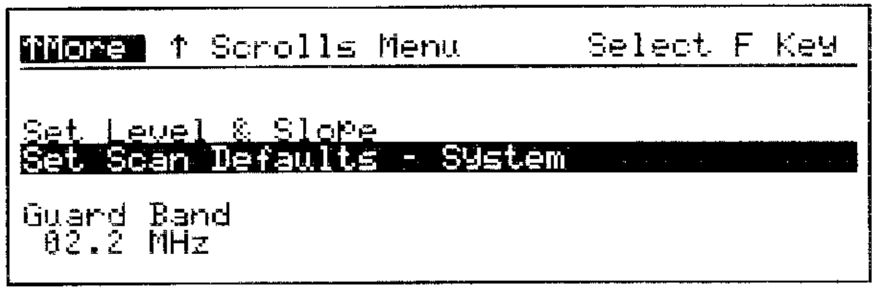
Press ⏷ (3 times) to highlight the set defaults option.



ps243h

Figure 12-8 Set Defaults Screen

To view the defaults, press **F3**.



pi7155

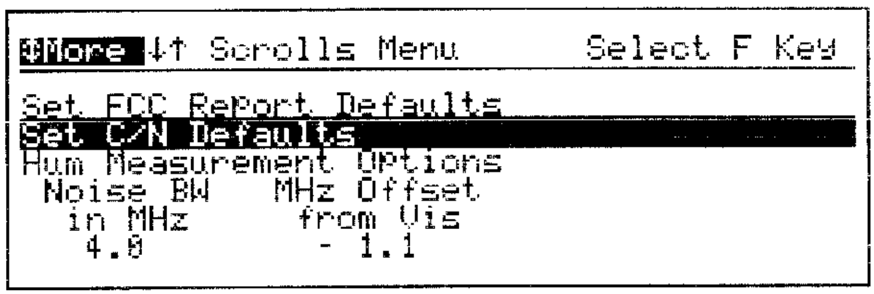
Figure 12-9 View System Default Guard Band Screen

To change the guard band, press **F1** and use the arrow keys to change the value. To change the dwell, press **F2** and use the arrow keys to change the value. Press **Enter** to save the change.

Press **Menu** to return to the main menu or use the arrow keys to select another item in the return setup menu.

Setting Carrier-to-Noise Defaults

The carrier-to-noise measurement is dependent upon the video bandwidth. The 3010 is compatible with video bandwidths from 4.0 MHz to 6.0 MHz. The default for the point where the noise measurement is made is also programmable between –9.9 to +9.9 MHz. To access the C/N programming screen, from the Main menu, press **Option** ⏷ (5 times).



pi7157

Figure 12-10 Carrier-to-Noise Programming Screen

To set the noise bandwidth, press **F1**. Use the arrow keys to set the value between 4.0 and 6.0 MHz. Press **Enter** to save the changes.

To set the noise offset value, press **F2**. Use the arrow keys to set the value between ±9.9 MHz. Press **Enter** to save the changes.

To exit the function, press **Enter** then **Menu** to return to the Main menu.

Setting the Hum Measurement Option

Classical AM measures hum relative to the peak-to-peak amplitude of the carrier. The NCTA method measures hum by dividing the peak-to-peak value of hum modulation by the peak value of the carrier. When comparing the measurements, %Hum (NCTA method) is equal to 2 times %Hum (classic method). The FCC compliance testing specifications use the NCTA method. To enter the hum measurement option screen, from any screen, press **Menu Option** ▼ (6 times).

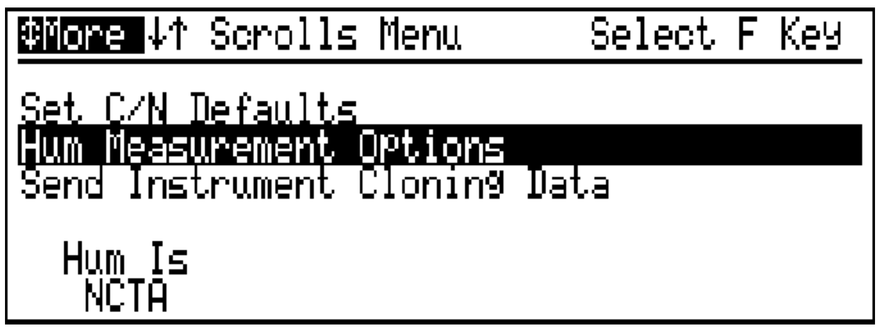


Figure 12-11 Hum Measurement Options Screen

To change the measurement method, press **F1**. Press **Menu** to return to the Main menu.

Cloning the Instrument Settings

The Instrument Cloning feature copies the setup of one instrument (the **source instrument**) to another instrument (the **destination instrument**). The setup information is copied via a serial (RS-232) cable connected between the serial ports of the two instruments. Make sure the baud rates of both instruments are set to the same value. Baud rates of 9600 or 19200 are recommended (see "Setting the Baud Rate"). Figure 12-12 shows the cable connection between the two instruments.

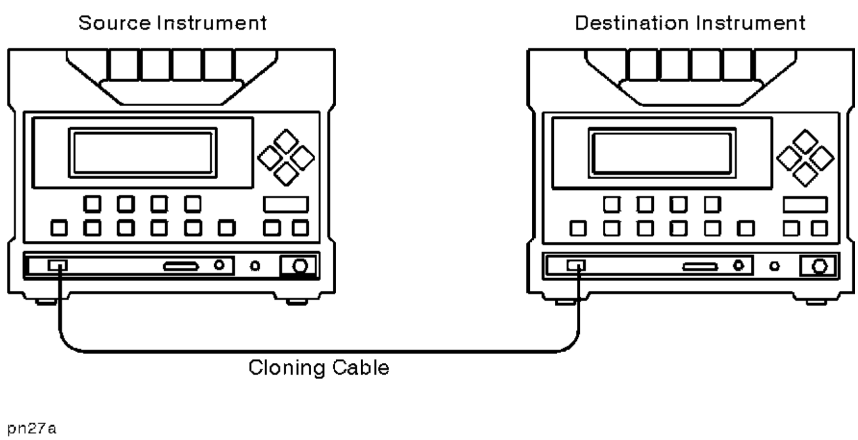


Figure 12-12 Cable Connections for Instrument Cloning

The instrument cloning cable used to connect the instruments is CaLan 85960B Option 044. Figure 12-13 shows the pin configuration of the cloning cable. The part number of the instrument cloning cable is SB103.

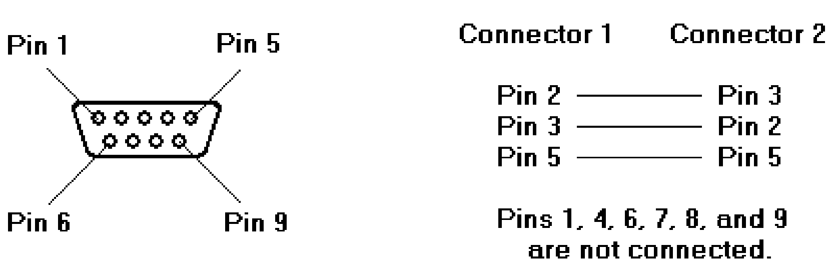


Figure 12-13 Cloning Cable Configuration

The three cloning selections are Channel Plans, Sweep Tables, and all Data. Table 12-1 shows the data that each selection transfers from the source instrument to the destination instrument.

Table 12-1 Instrument Cloning Options

Data Types	Channel Plans	Sweep Tables	All Data
Channel Plans			
Plans 1 to 4	X		X
Current plan selected	X		X
Variable dwells D1 to D4	X		X
Channel Scan			
Start/Stop Channel	X		X
Preset Scaling Test Point			X
Four Channel			
Preset Scaling Test Point			X
Single Channel			
Channel Number	X		X
V:A Defaults (FS, V:A, dB/Div, Limits)			X
Preset Scaling Test Point			X
Sweep Tables			
Tables 1 to 4		X	X
Forward Sweep			
Forward Pilot Frequency			X
Preset Scaling Test Point			X
Sweep Speed Normal / Fast			X
Return Sweep			
Return Pilot Frequency			X
Preset Scaling Test Point			X
Sweep Speed Normal / Fast			X
Spectrum Scan			
Start/Stop Frequency			X
Preset Scaling Test Point			X
Return Spectrum			
Start/Stop Frequency			X
Preset Scaling Test Point			X

Table 12-1 Instrument Cloning Options (Continued)

Data Types	Channel Plans	Sweep Tables	All Data
Four Measurement Modes			
Forward Path			
Trunk			
FS, TP, dB/Div			X
Normalized Sweep Offset and Slope			X
Four Channel Numbers, Levels and Limits	X		X
Bridger			
FS, TP, dB/Div			X
Normalized Sweep Offset and Slope			X
Four Channel Numbers, Levels and Limits	X		X
Line Extender			
FS, TP, dB/Div			X
Normalized Sweep Offset and Slope			X
Four Channel Numbers, Levels and Limits	X		X
Direct			
FS, TP, dB/Div			X
Normalized Sweep Offset and Slope			X
Four Channel Numbers, Levels and Limits	X		X
Return Path			
Trunk – FS, IP, dB/Div			X
Bridger – FS, IP, dB/Div			X
Line Extender – FS, IP, dB/Div			X
Direct – FS, IP, dB/Div			X
Miscellaneous Data			
C/N Defaults			X
Hum Measurement Method			X
dBmV / dBμV Setting			X
Date and Time			X
FCC Report Defaults			X

With both instruments turned on and connected as shown in Figure 12-12, access the source instrument’s Send Instrument Cloning Data screen by pressing **Menu Option** and ⏷ (7 times). It is recommended that the destination instrument be set to the Main menu prior to starting the cloning procedure.

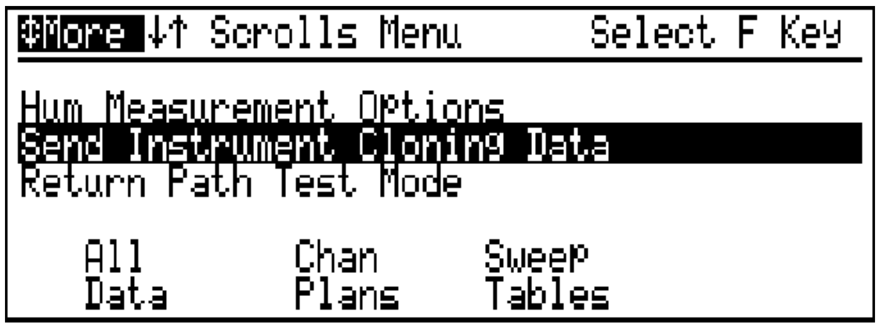


Figure 12-14 Send Instrument Cloning Data Screen

The source instrument’s Send Instrument Cloning Data screen shows the three selections detailed in Table 12-1.

- To copy the source instrument’s Channel Plan data to a destination instrument, press **F1**. This copies all of the stored and active channels, with the associated data shown in Table 12-1, to a second instrument.
- To copy the source instrument’s Sweep Table data to the destination instrument, press **F2**.
- To copy all of the source instrument’s configuration data to the destination instrument, press **F3**.

During the cloning operation, a series of equal signs (=) is displayed on the screen, indicating that the data is being transferred. If the cloning operation is interrupted during the transfer, the data in the destination instrument may be corrupt. The power should be cycled on both instruments and the cloning process repeated.

Setting the Unit of Measurement

The 3010 can convert the unit of measurement from dBmV to dBμV. To set the unit of measurement, press **Option** ▼.

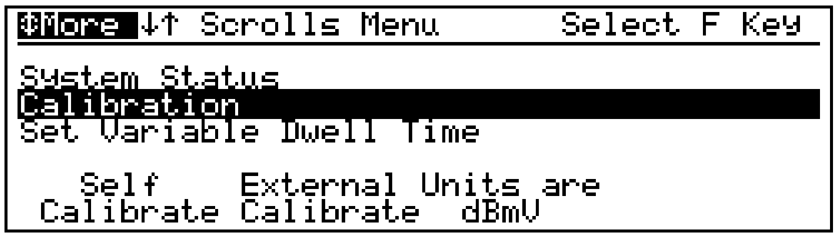


Figure 12-15 Calibration and Unit of Measurement Screen

The highlighted item over **F3** is the current selection. To change the selection, press **F3**.

NOTE: If you are using the 3010B with the ingress monitor option and a 3010H for return path testing, both instruments must use the same units of measure.

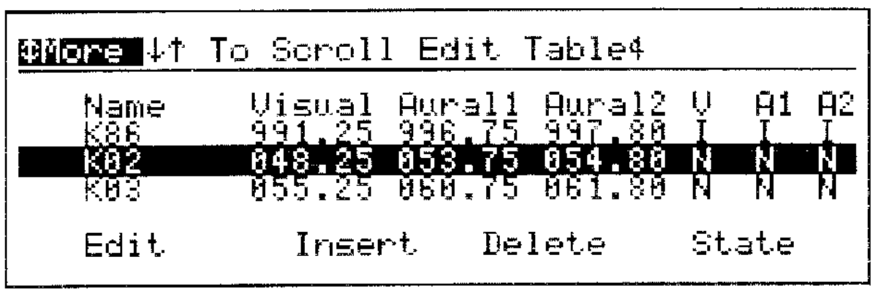
Second Aural Carrier Overview

The 3010 has the ability to measure channels containing a second aural carrier. This option affects the operation of the unit in the Single Channel and Channel Scan modes. To measure the second aural carrier, the 3010 must have an active table configured and programmed for the second aural carrier. This section covers programming and all of the special measurements possible with this feature.

Programming a Table with a Second Aural Carrier

The control of the second aural carrier is found under Edit Frequency Plan and Table Name. From the Main menu, press ▼ (5 times).

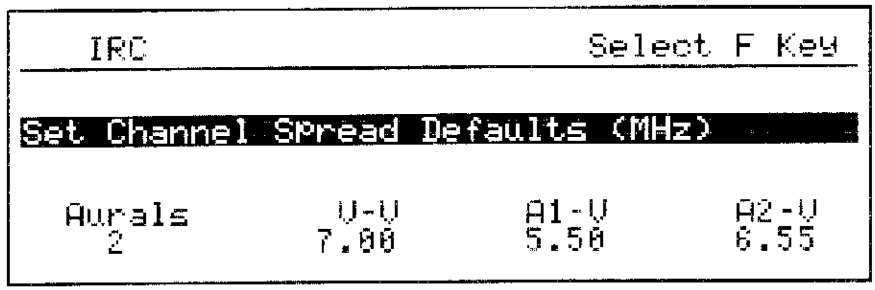
Press **F1** to edit the table. Select the table to edit by choosing the appropriate table from the display and pressing its corresponding softkey, either **F1**, **F2**, **F3**, or **F4**.



pi7159

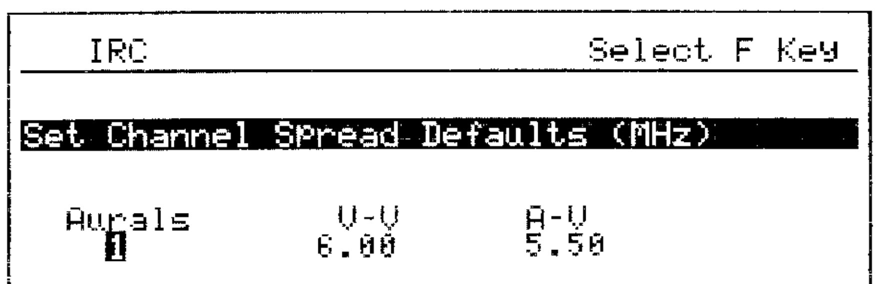
Figure 12-16 Table View Screen with 2 Aural Carriers

Figure 12-16 shows a PAL table containing the second aural carriers. The number of aural carriers selected is part of the programming of the frequency table. To change the number of aural carriers selected and set the default value, press the **Option** key with the Edit Frequency Plan screen displayed as shown above.



pi7160

Figure 12-17 Dual Aural Carrier Default Option Screen



pi7203

Figure 12-18 Single Aural Carrier Default Option Screen

To set the number of aural carriers, press **F1** and use the ▲ ▼ keys to change the value.

The default values set in the screens above are used by the 3010 when inserting new frequencies into the table. The first value is V-V. This refers to the default spacing between adjacent visual carriers in the frequency plan. The V-V value is normally equal to the bandwidth of the channel. For example, a PAL channel plan would be set to 7.00 MHz as shown in Figure 12-17. An NTSC channel plan should be set to 6.00 MHz as shown in Figure 12-18. To change the value, press **F2** and use the arrow keys to set the new value. Press **Enter** to save the change.

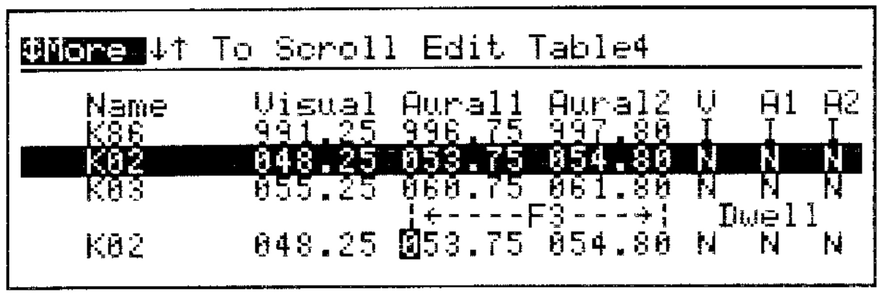
The second value is A1-V. This refers to the default frequency spacing between the visual carrier and the first aural carrier. To change the value, press **F3** and use the arrow keys to set the new value. Press **Enter** to save the change.

The third value is A2-V. This refers to the default frequency spacing between the visual carrier and the second aural carrier. To change the value, press **F4** and use the arrow keys to set the new value. Press **Enter** to save the change.

In the single channel screen, the value of A-V is the spacing between the visual carrier and the aural carrier. The value can be changed using the same method described for changing the other values.

Press **Enter** to exit the aural carrier default screen and return to the channel plan edit screen.

Setting the Dual Aural Carrier Frequencies



pi7162

Figure 12-19 Channel Plan Edit Screen with Two Aural Carriers

With the Dual Aural Carrier option selected, the frequencies for the first aural carrier and the second aural carrier are displayed over **F3**. To edit the aural carriers from the Table Edit screen or the Frequency Insert screen, press **F3**. Use the arrow keys to set the first aural carrier frequency to the correct value. To edit the second aural carrier, press **F3** again. Use the arrow keys to edit the second aural carrier. Press **Enter** to save the changes.

The length of time the 3010 will measure a frequency depends on the dwell time. With the Dual Aural Carrier option, you will also have a dwell time for the second aural carrier. To adjust the dwell times, press **F4** and use the ◀ ▶ keys to select the visual, aural 1, or aural 2 dwell time and use the ▲ ▼ keys to change the value. Press **Enter** to save the changes and exit the edit or insert screen.

Refer to Chapter 2 for more information on creating and editing frequency tables.

Single Channel Mode

The Single Channel mode of the 3010 allows the user to measure the level of the visual, first aural, and the second aural carrier simultaneously. The difference bar on the right side of the display is selectable between V-A1, V-A2, A1-A2.

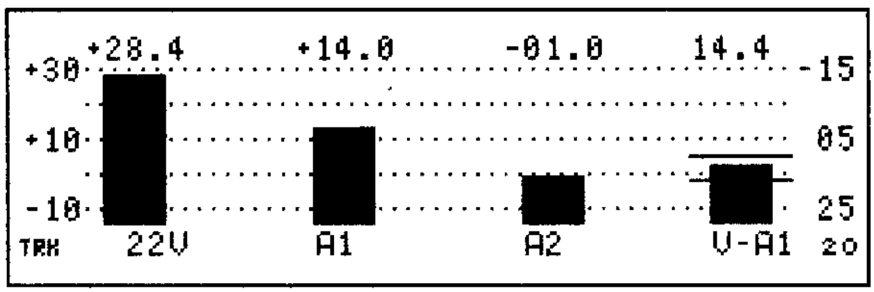
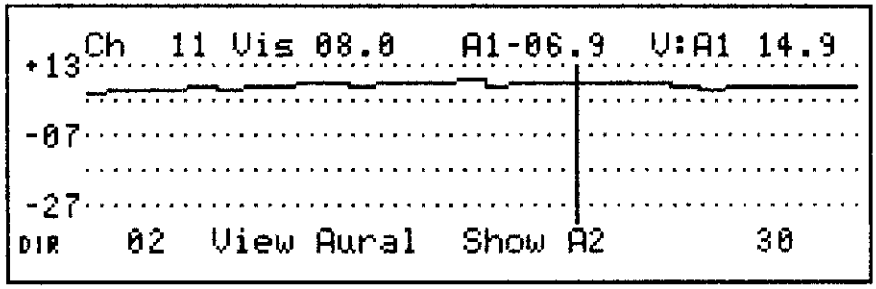


Figure 12-20 Single Channel Display with Dual Aural Carriers

Press **F4** to toggle the difference measurement bar between V-A1, V-A2, or A1-A2.

Channel Scan Mode

In the Channel Scan mode, the selected aural carrier level and the visual-to-selected-aural-carrier ratio at the marker frequency is displayed in the message line at the top of the screen.

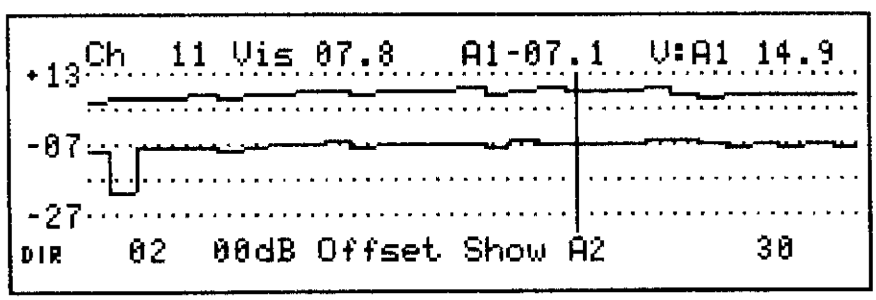


pi7183

Figure 12-21 Dual Aural Carrier Channel Scan Display

To toggle between aural carriers, press **F3**.

The Channel Scan mode shows the aural carriers with the visual carrier. Press **F2** to show the selected aural carriers.



pi7184

Figure 12-22 Dual Aural Carrier Channel Scan Display with Aural Carriers Shown

To offset the aural carrier from the visual carriers, press **F2** and use the ▲ ▼ keys to change the value. To select the other aural carrier, press **F3**.

For information about the other features of the Channel Scan mode, refer to Chapter 3.

Changing Operational Modes Between Headend and Remote

The 3010H is normally used as a headend monitor for the return path. In this mode, some operations are not available, such as forward sweep and forward sweep setup. To add this functionality, the 3010H can be set to the Remote mode where it will respond as a 3010R. With the unit in the Remote mode, it can be used to set up the 1777.

The control for the mode of operation is located in the Option menu and accessed from the Main menu by pressing **Option**, then ▼ 8 times.

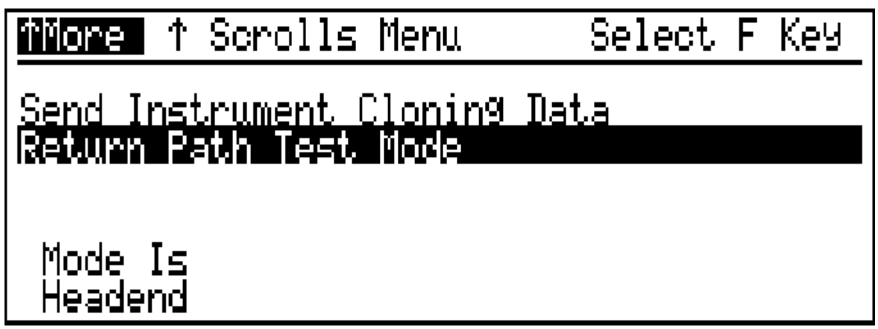


Figure 12-23 Operational Mode Control Screen

The label over the **F1** key shows the current mode of operation. To change the mode of operation, press **F1**.

When changing the operational mode of the unit, some variables may change. Therefore, after selecting a new mode, all of the setup parameters, including pilot frequencies, attenuator settings, and scaling settings, should be rechecked.

13

Options

Options

This chapter provides information about the options available for your instrument. The options described are as follows:

- Forward Sweep Transmitter, Option 050
- Dual Path Mode, Option 052

Forward Sweep Transmitter, Option 050

The Forward Sweep Transmitter option replaces the Return Path Monitor function with a forward sweep transmitter mode. With this option installed, the forward transmitter mode is accessed by pressing **Menu** ⏏.

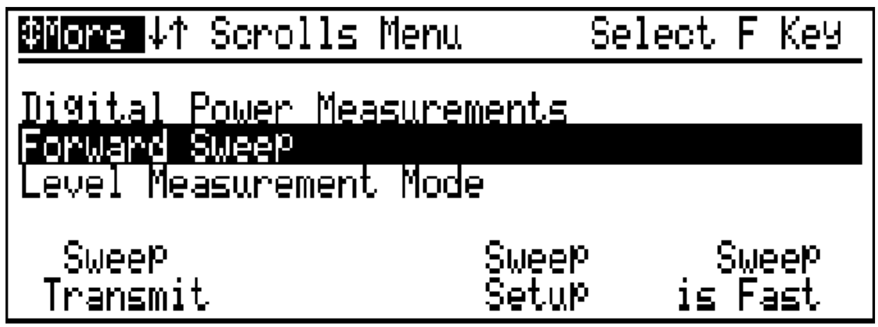


Figure 13-1 Forward Transmitter Mode Screen

To access the setup menu for forward sweep, press **F3**. Refer to Chapter 5 for information about forward sweep transmitter setup.

To select the transmitter mode, press **F1**. Refer to Chapter 6 for more information about forward transmitter mode.

Dual Path Mode, Option 052

The Dual Path option allows the instrument to operate in the forward transmitter mode and the return path monitor mode at the same time. To minimize bandwidth usage in the forward path, both the forward transmitter pilot and the forward return path pilot can be set to the same frequency.

Setup Requirements for Dual Path Mode

Before you can use the Dual Path Sweep mode, you must create a sweep table for the forward path and a sweep table for the return path. Refer to Chapter 5 for information about creating a forward path sweep table. Refer to Chapter 7 for information about creating a return path sweep table.

NOTE: To minimize the number of pilots in the forward path, the forward sweep transmitter pilot and the return path forward pilot can be set to the same frequency. To adjust the respective pilots, refer to the Chapter 5 and Chapter 7.

Selecting Dual Path Mode

The Dual Path mode is selected from Return Path Tests selection on the Main menu.

To select the Dual Path mode:

1. Press **Menu** ▼ to highlight the Return Path Tests selection.
2. Press **F2** to enter the Dual Path mode.

With the instrument in the Dual Path mode, the number of forward sweeps before the next download is indicated above the **F2** softkey.

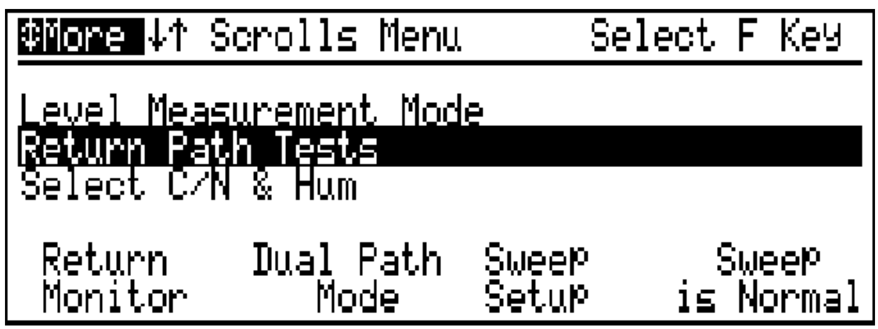


Figure 13-2 Return Path Tests Screen

Exiting the Dual Path Mode

To exit the Dual Path Sweep mode, press **F1** twice. The menu key is disabled in the Dual Path Sweep mode.

Exiting the Dual Path Mode

14

Specifications and Technical Reference

Specifications and Technical Reference

Performance Specifications

This chapter contains specifications, characteristics, and frequency plan tables for the CaLan 3010H Sweep/Ingress Analyzer.

The specifications and characteristics in this chapter are listed separately. The specifications are described first, followed by the characteristics. The frequency plan tables are last.

General	General specifications and characteristics.
Cable TV	Cable TV measurements and characteristics.
Forward/ Return Sweep	Forward/return sweep-related specifications and characteristics.
Frequency	Frequency-related specifications and characteristics.
Amplitude	Amplitude-related specifications and characteristics.
Sweep Source	Sweep source-related specifications and characteristics.
Physical	Input, output and physical characteristics.

The distinction between specifications and characteristics is described as follows:

- Specifications describe warranted performance over the temperature range 0 ˚C to 55 ˚C (unless otherwise noted). The instrument will meet its specifications, within the operating temperature range, after the instrument is turned on and the CAL routines have been run.
- Characteristics provide useful, but nonwarranted information about the functions and performance of the instrument.
- Typical Performance, where listed, is not warranted, but indicates performance that most units will exhibit.

General Specifications

Temperature Range	
Operating	0 °C to 55 °C
Storage	–20 °C to 70 °C

Power Requirements	90 to 264 Vrms, 47 to 63 Hz Power consumption: 20 VA max

Line Module	
Description	Power entry module with 2-pole rocker switch and a captive fuse drawer
Connector	IEC 320 C14 plug
Fuse	2 A / 250 V

Display	
Area	5.0 in x 1.33 in (127 mm x 34 mm)
Resolution	240 x 64 pixels
Type	LCD with EL backlight

Internal Memory	
Data and Graphic Files	90
Channel Plans	4
Sweep Tables	4
Reference Traces	12

Printer Output of Screen Display	Parallel and RS-232

Cable TV Measurement Specifications and Characteristics

These specifications describe warranted performance of the instrument over the operating temperature range

Input Configuration	75 Ω replaceable type F, female

Channel Selection	Analyzer tunes to specified channels based upon selected tune configuration.
Tune Configuration	Standard, off-the-air, HRC, IRC, PAL, SECAM, User-Defined
Frequency Range	5 to 1000 MHz (channel mode)

Visual Carrier Frequency	
Resolution	10 kHz
Accuracy	±25 kHz

Visual Carrier Level	The peak amplitude of the visual carrier is measured to an absolute standard traceable to the National Institute of Standards and Technology.
Typical Accuracy	±1 dB
Absolute Accuracy	±1.8 dB (ref level > 5 dBmV) ±2.3 dB (ref level ≤ 5 dBmV)
Relative Accuracy	±0.7 dB relative to adjacent channels in frequency ±1.5 dB relative to all other channels (ref level > 5 dBmV) ±2.0 dB relative to all other channels (ref level ≤ 5 dBmV)

Visual-to-Aural Carrier Level Difference	The difference between peak amplitudes of the visual and aural carrier is measured.
Difference Range	0 to 40 dB
Resolution	0.1 dB
Accuracy	±0.7 dB

Digital Channel Power Characteristic	
Formats	QAM, QPR (DMX), QPSK, VSB, bursted
Maximum Channel Bandwidth	8 MHz
Amplitude Accuracy (Typical)	±1.5 dB
Measurement Speed (non-bursted)	125 ms / 2 MHz of BW
TDMA Measurement Range	
Burst Width	> 50 μs
Burst Repetition Rate	<1.5 s

Hum/Low Frequency Disturbance	Power line frequency and low frequency disturbance measured on modulated and/or unmodulated carriers; may not be valid for scrambled channels.
AM Range	0.5 to 5%
Resolution	0.1%
Accuracy	±0.2%, ±30% of reading

Visual Carrier-to-Noise Ratio (C/N)[1]	
C/N Accuracy	±2 dB for carriers > 5 dBmV
Range	50 dBc; 55 dBc with carrier turned off (measured in band)
Repeatability	±1 dB

1 A preselector filer may be required to achieve specifications

Forward/Return Sweep Measurements

System amplitude variations are measured relative to a reference trace stored during the setup.

Sweep Setup	
Frequency Range	5 MHz to 1 GHz
Sweep Width	Continuously variable
Minimum Sweep Time	650 ms
Frequency Resolution	222 to 401 data points
Sweep Tables	Four user definable sweep tables of 248 carriers

Frequency Specifications

Frequency Range	5 MHz to 1.0 GHz

Frequency Reference Stability	±5 x 10-6 over full temperature range

Marker Frequency Accuracy	
Accuracy	±25 kHz
Resolution	10 kHz

Frequency Span	
Range	0 MHz to 999 MHz
Resolution	1 MHz

Resolution Bandwidth	230 kHz, ±30 kHz

Video Bandwidth	
Typical	300 kHz
Switchable	10 Hz

Internal Calibrator Frequency	113.36 MHz ±0.2 MHz

Amplitude Specifications

Amplitude Range	–45 dBmV to 70 dBmV

Maximum Safe Input Level	
Average Continuous Power	+70 dBmV
Peak Pulse Power	+70 dBmV
dc	300 Vdc

Residual Responses	Input terminated and FS Ref: –20 dBmV
5 MHz to 1.0 GHz	< – 40 dBmV

Display Range	
Log Scale	0 to –45 dB from reference level is calibrated; 1, 2, 5, 10 dB/div; 4.5 divisions displayed
Scale Units	dBmV, dBμV

Marker Readout Resolution	0.1 dB

Reference Level	
Range	– 40 to +70 dBmV
Resolution	±1 dB
Accuracy	
+70 to +5 dBmV	±0.5 dB
+5 to –40 dBmV (Internal Preamp On)	±1.0 dB

Frequency Response	10 dB input attenuation
1 MHz to 1.0 GHz	±0.5 dB

Calibrator Output Amplitude	±0.25 dB

Display Scale Fidelity	
Log Maximum Cumulative; 0 to –40 dB from reference level	±0.5 dB

Input Return Loss	
0 dB Attenuation	> 14 dB
All Other Settings	> 20 dB

Sweep Source Specifications

All specifications apply over the full operating range of the instrument.

Output Frequency	
Range	5 MHz to 1.0 GHz

Output Power Level	
Range	+10 to +50 dBmV
Resolution	1 dB
Absolute Accuracy	±1.5 dB
Relative Accuracy (100 MHz)	±1.0 dB
Vernier	
Range	10 dB
Accuracy	±0.5 dB over 10 dB range
Output Attenuator	
Range	0 to 30 dB in 10 dB steps

Spurious Outputs	
Harmonic and Nonharmonic Spurs ≥10 MHz	< – 30 dBc
Harmonic and Nonharmonic Spurs <10 MHz	< – 25 dBc

Output Return Loss	> 15 dB

Blanking During Sweep (characteristic)	> 60 dBc

Data Transmission Characteristics	
Range	5 MHz to 1 GHz
Data Carrier	
Modulation Bandwidth	– 30 dBc to < 750 MHz
	– 50 dBc < 1.8 MHz
Proximity of Equal Amplitude CW Carrier without Communication Interference. Frequency Agile with 10 kHz Resolution.	> 300 kHz

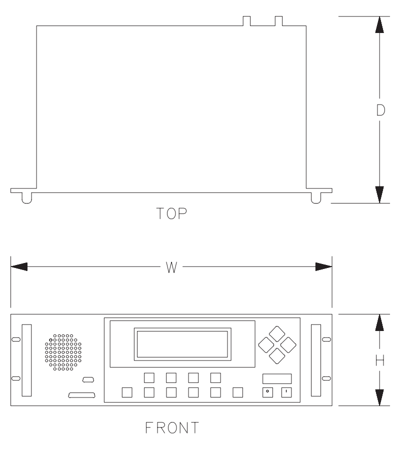
Physical Characteristics

Remote Interface	
RS-232	9 pin subminiature D-shell, female
Parallel Printer port (PCL compatible)	25 pin subminiature D-shell, female

Weight	
Net	4.3 kg (9.5 lbs)
Shipping	9.5 kg (21 lbs)

Dimensions

H 5.25 in. (133 mm)
W 19 in. (483 mm)
D11.5 in. (292 mm)



Frequency Plan Tables

The following 8 tables reflect the data stored in ROM (read only memory) that is resident in the 3010 when it is shipped from the factory. The abbreviation in parentheses is what you will select on the screen when you want to copy one of the tables to a plan.

Table 14-1 Off Air UK Channel Plan (AIR UK)

Channel	Visual	Aural 1	Aural 2	State
U21	471.25	477.25	477.8	active
U22	479.25	485.25	485.8	active
U23	487.25	493.25	493.8	active
U24	495.25	501.25	501.8	active
U25	503.25	509.25	509.8	active
U26	511.25	517.25	517.8	active
U27	519.25	525.25	525.8	active
U28	527.25	533.25	533.8	active
U29	535.25	541.25	541.8	active
U30	543.25	549.25	549.8	active
U31	551.25	557.25	557.8	active
U32	559.25	565.25	565.8	active
U33	567.25	573.25	573.8	active
U34	575.25	581.25	581.8	active
U35	583.25	589.25	589.8	active
U36	591.25	597.25	597.8	active
U37	599.25	605.25	605.8	active
U38	607.25	613.25	613.8	active
U39	615.25	621.25	621.8	active
U40	623.25	629.25	629.8	active
U41	631.25	637.25	637.8	active
U42	639.25	645.25	645.8	active

Table 14-1 Off Air UK Channel Plan (AIR UK) **(Continued)**

Channel	Visual	Aural 1	Aural 2	State
U43	647.25	653.25	653.8	active
U44	655.25	661.25	661.8	active
U45	663.25	669.25	669.8	active
U46	671.25	677.25	677.8	active
U47	679.25	685.25	685.8	active
U48	687.25	693.25	693.8	active
U49	695.25	701.25	701.8	active
U50	703.25	709.25	709.8	active
U51	711.25	717.25	717.8	active
U52	719.25	725.25	725.8	active
U53	727.25	733.25	733.8	active
U54	735.25	741.25	741.8	active
U55	743.25	749.25	749.8	active
U56	751.25	757.25	757.8	active
U57	759.25	765.25	765.8	active
U58	767.25	773.25	773.8	active
U59	775.25	781.25	781.8	active
U60	783.25	789.25	789.8	active
U61	791.25	797.25	797.8	active
U62	799.25	805.25	805.8	active
U63	807.25	813.25	813.8	active
U64	815.25	821.25	821.8	active
U65	823.25	829.25	829.8	active

Table 14-1 Off Air UK Channel Plan (AIR UK) **(Continued)**

Channel	Visual	Aural 1	Aural 2	State
U66	831.25	837.25	837.8	active
U67	839.25	845.25	845.8	active
U68	847.25	853.25	853.8	active
U69	855.25	861.25	861.8	active

Table 14-2 NTSC Off Air Channel Plan (AIR)

Channel	Visual	Aural	State
2	55.25	59.75t	active
3	61.25	65.75	active
4	67.25	71.75	active
5	77.25	81.75	active
6	83.25	87.75	active
7	175.25	179.75	active
8	181.25	185.75	active
9	187.25	191.75	active
10	193.25	197.75	active
11	199.25	203.75	active
12	205.25	209.75	active
13	211.25	215.75	active
14	471.25	475.75	active
15	477.25	481.75	active
16	483.25	487.75	active
17	489.25	493.75	active
18	495.25	499.75	active
19	501.25	505.75	active
20	507.25	511.75	active
21	513.25	517.75	active
22	519.25	523.75	active
23	525.25	529.75	active

Table 14-2 NTSC Off Air Channel Plan (AIR) **(Continued)**

Channel	Visual	Aural	State
24	531.25	535.75	active
25	537.25	541.75	active
26	543.25	547.75	active
27	549.25	553.75	active
28	555.25	559.75	active
29	561.25	565.75	active
30	567.25	571.75	active
31	573.25	577.75	active
32	579.25	583.75	active
33	585.25	589.75	active
34	591.25	595.75	active
35	597.25	601.75	active
36	603.25	607.75	active
37	609.25	613.75	active
38	615.25	619.75	active
39	621.25	625.75	active
40	627.25	631.75	active
41	633.25	637.75	active
42	639.25	643.75	active
43	645.25	649.75	active
44	651.25	655.75	active
45	657.25	661.75	active
46	663.25	667.75	active

Table 14-2 NTSC Off Air Channel Plan (AIR) **(Continued)**

Channel	Visual	Aural	State
47	669.25	673.75	active
48	675.25	679.75	active
49	681.25	685.75	active
50	687.25	691.75	active
51	693.25	697.75	active
52	699.25	703.75	active
53	705.25	709.75	active
54	711.25	715.75	active
55	717.25	721.75	active
56	723.25	727.75	active
57	729.25	733.75	active
58	735.25	739.75	active
59	741.25	745.75	active
60	747.25	751.75	active
61	753.25	757.75	active
62	759.25	763.75	active
63	765.25	769.75	active
64	771.25	775.75	active
65	777.25	781.75	active
66	783.25	787.75	active
67	789.25	793.75	active
68	795.25	799.75	active
69	801.25	805.75	active

Table 14-2 NTSC Off Air Channel Plan (AIR) **(Continued)**

Channel	Visual	Aural	State
70	807.25	811.75	active
71	813.25	817.75	active
72	819.25	823.75	active
73	825.25	829.75	active
74	831.25	835.75	active
75	837.25	841.75	active
76	843.25	847.75	active
77	849.25	853.75	active
78	855.25	859.75	active
79	861.25	865.75	active
80	867.25	871.75	active
81	873.25	877.75	active
82	879.25	883.75	active
83	885.25	889.75	active

Table 14-3 Standard Table (STD)

Channel	Visual	Aural	State
T7	7.00	11.50	inactive
T8	13.00	17.50	inactive
T9	19.00	23.50	inactive
T10	25.00	29.50	inactive
T11	31.00	35.50	inactive
T12	37.00	41.50	inactive
T13	43.00	47.50	inactive
2	55.25	59.75	active
3	61.25	65.75	active
4	67.25	71.75	active
5	77.25	81.75	active
6	83.25	87.75	active
95	91.25	95.75	inactive
96	97.25	101.75	inactive
97	103.25	107.75	inactive
98	109.25	113.75	inactive
99	115.25	119.75	inactive
14	121.25	125.75	active
15	127.25	131.75	active
16	133.25	137.75	active
17	139.25	143.75	active
18	145.25	149.75	active

Table 14-3 Standard Table (STD) **(Continued)**

Channel	Visual	Aural	State
19	151.25	155.75	active
20	157.25	161.75	active
21	163.25	167.75	active
22	169.25	173.75	active
7	175.25	179.75	active
8	181.25	185.75	active
9	187.25	191.75	active
10	193.25	197.75	active
11	199.25	203.75	active
12	205.25	209.75	active
13	211.25	215.75	active
23	217.25	221.75	active
24	223.25	227.75	active
25	229.25	233.75	active
26	235.25	239.75	active
27	241.25	245.75	active
28	247.25	251.75	active
29	253.25	257.75	active
30	259.25	263.75	active
31	265.25	269.75	active
32	271.25	275.75	active
33	277.25	281.75	active
34	283.25	287.75	active

Table 14-3 Standard Table (STD) **(Continued)**

Channel	Visual	Aural	State
35	289.25	293.75	active
36	295.25	299.75	active
37	301.25	305.75	active
38	307.25	311.75	active
39	313.25	317.75	active
40	319.25	323.75	active
41	325.25	329.75	active
42	331.25	335.75	active
43	337.25	341.75	active
44	343.25	347.75	active
45	349.25	353.75	active
46	355.25	359.75	active
47	361.25	365.75	active
48	367.25	371.75	active
49	373.25	377.75	active
50	379.25	383.75	active
51	385.25	389.75	active
52	391.25	395.75	active
53	397.25	401.75	active
54	403.25	407.75	active
55	409.25	413.75	active
56	415.25	419.75	active
57	421.25	425.75	active

Table 14-3 Standard Table (STD) **(Continued)**

Channel	Visual	Aural	State
58	427.25	431.75	active
59	433.25	437.75	active
60	439.25	443.75	active
61	445.25	449.75	active
62	451.25	455.75	active
63	457.25	461.75	active
64	463.25	467.75	active
65	469.25	473.75	active
66	475.25	479.75	active
67	481.25	485.75	active
68	487.25	491.75	active
69	493.25	497.75	active
70	499.25	503.75	active
71	505.25	509.75	active
72	511.25	515.75	active
73	517.25	521.75	active
74	523.25	527.75	active
75	529.25	533.75	active
76	535.25	539.75	active
77	541.25	545.75	active
78	547.25	551.75	active
79	553.25	557.75	active
80	559.25	563.75	active

Table 14-3 Standard Table (STD) **(Continued)**

Channel	Visual	Aural	State
81	565.25	569.75	active
82	571.25	575.75	active
83	577.25	581.75	active
84	583.25	587.75	active
85	589.25	593.75	active
86	595.25	599.75	active
87	601.25	605.75	active
88	607.25	611.75	active
89	613.25	617.75	active
90	619.25	623.75	active
91	625.25	629.75	active
92	631.25	635.75	active
93	637.25	641.75	active
94	643.25	647.75	active
100	649.25	653.75	active
101	655.25	659.75	active
102	661.25	665.75	active
103	667.25	671.75	active
104	673.25	677.75	active
105	679.25	683.75	active
106	685.25	689.75	active
107	691.25	695.75	active
108	697.25	701.75	active

Table 14-3 Standard Table (STD) **(Continued)**

Channel	Visual	Aural	State
109	703.25	707.75	active
110	709.25	713.75	active
111	715.25	719.75	active
112	721.25	725.75	active
113	727.25	731.75	active
114	733.25	737.75	active
115	739.25	743.75	active
116	745.25	749.75	active
117	751.25	755.75	active
118	757.25	761.75	active
119	763.25	767.75	active
120	769.25	773.75	active
121	775.25	779.75	active
122	781.25	785.75	active
123	787.25	791.75	active
124	793.25	797.75	active
125	799.25	803.75	active
126	805.25	809.75	active
127	811.25	815.75	active
128	817.25	821.75	active
129	823.25	827.75	active
130	829.25	833.75	active
131	835.25	839.75	active

Table 14-3 Standard Table (STD) **(Continued)**

Channel	Visual	Aural	State
132	841.25	845.75	active
133	847.25	851.75	active
134	853.25	857.75	active
135	859.25	863.75	active
136	865.25	869.75	active
137	871.25	875.75	active
138	877.25	881.75	active
139	883.25	887.75	active
140	889.25	893.75	active
141	895.25	899.75	active
142	901.25	905.75	active
143	907.25	911.75	active
144	913.25	917.75	active
145	919.25	923.75	active
146	925.25	929.75	active
147	931.25	935.75	active
148	937.25	941.75	active
149	943.25	947.75	active
150	949.25	953.75	active
151	955.25	959.75	active
152	961.25	965.75	active
153	967.25	971.75	active
154	973.25	977.75	active

Table 14-3 Standard Table (STD) **(Continued)**

Channel	Visual	Aural	State
155	979.25	983.75	active
156	985.25	989.75	active
157	991.25	995.75	active
158	997.25	1001.75	active

Table 14-4 HRC Channel Plan (HRC)

Channel	Visual	Aural	State
2	54.00	58.50	active
3	60.00	64.50	active
4	66.00	70.50	active
1	72.00	76.50	active
5	78.00	82.50	active
6	84.00	88.50	active
95	90.00	94.50	active
96	96.00	100.50	active
97	102.00	106.50	active
98	108.00	112.50	active
99	114.00	118.50	active
14	120.00	124.50	active
15	126.00	130.50	active
16	132.00	136.50	active
17	138.00	142.50	active
18	144.00	148.50	active
19	150.00	154.50	active
20	156.00	160.50	active
21	162.00	166.50	active
22	168.00	172.50	active
7	174.00	178.50	active
8	180.00	184.50	active

Table 14-4 HRC Channel Plan (HRC) (Continued)

Channel	Visual	Aural	State
9	186.00	190.50	active
10	192.00	196.50	active
11	198.00	202.50	active
12	204.00	208.50	active
13	210.00	214.50	active
23	216.00	220.50	active
24	222.00	226.50	active
25	228.00	232.50	active
26	234.00	238.50	active
27	240.00	244.50	active
28	246.00	250.50	active
29	252.00	256.50	active
30	258.00	262.50	active
31	264.00	268.50	active
32	270.00	274.50	active
33	276.00	280.50	active
34	282.00	286.50	active
35	288.00	292.50	active
36	294.00	298.50	active
37	300.00	304.50	active
38	306.00	310.50	active
39	312.00	316.50	active
40	318.00	322.50	active

Table 14-4 HRC Channel Plan (HRC) (Continued)

Channel	Visual	Aural	State
41	324.00	328.50	active
42	330.00	334.50	active
43	336.00	340.50	active
44	342.00	346.50	active
45	348.00	352.50	active
46	354.00	358.50	active
47	360.00	364.50	active
48	366.00	370.50	active
49	372.00	376.50	active
50	378.00	382.50	active
51	384.00	388.50	active
52	390.00	394.50	active
53	396.00	400.50	active
54	402.00	406.50	active
55	408.00	412.50	active
56	414.00	418.50	active
57	420.00	424.50	active
58	426.00	430.50	active
59	432.00	436.50	active
60	438.00	442.50	active
61	444.00	448.50	active
62	450.00	454.50	active
63	456.00	460.50	active

Table 14-4 HRC Channel Plan (HRC) (Continued)

Channel	Visual	Aural	State
64	462.00	466.50	active
65	468.00	472.50	active
66	474.00	478.50	active
67	480.00	484.50	active
68	486.00	490.50	active
69	492.00	496.50	active
70	498.00	502.50	active
71	504.00	508.50	active
72	510.00	514.50	active
73	516.00	520.50	active
74	522.00	526.50	active
75	528.00	532.50	active
76	534.00	538.50	active
77	540.00	544.50	active
78	546.00	550.50	active
79	552.00	556.50	active
80	558.00	562.50	active
81	564.00	568.50	active
82	570.00	574.50	active
83	576.00	580.50	active
84	582.00	586.50	active
85	588.00	592.50	active
86	594.00	598.50	active

Table 14-4 HRC Channel Plan (HRC) (Continued)

Channel	Visual	Aural	State
87	600.00	604.50	active
88	606.00	610.50	active
89	612.00	616.50	active
90	618.00	622.50	active
91	624.00	628.50	active
92	630.00	634.50	active
93	636.00	640.50	active
94	642.00	646.50	active
100	648.00	652.50	active
101	654.00	658.50	active
102	660.00	664.50	active
103	666.00	670.50	active
104	672.00	676.50	active
105	678.00	682.50	active
106	684.00	688.50	active
107	690.00	694.50	active
108	696.00	700.50	active
109	702.00	706.50	active
110	708.00	712.50	active
111	714.00	718.50	active
112	720.00	724.50	active
113	726.00	730.50	active
114	732.00	736.50	active

Table 14-4 HRC Channel Plan (HRC) (Continued)

Channel	Visual	Aural	State
115	738.00	742.50	active
116	744.00	748.50	active
117	750.00	754.50	active
118	756.00	760.50	active
119	762.00	766.50	active
120	768.00	772.50	active
121	774.00	778.50	active
122	780.00	784.50	active
123	786.00	790.50	active
124	792.00	796.50	active
125	798.00	802.50	active

Table 14-5 IRC EC Channel Plan (IRC EC)

Channel	Visual	Aural 1	Aural 2	State
K02	49.06	54.56	54.80	active
K03	56.07	61.57	61.81	active
K04	63.08	68.58	68.82	active
S03	119.15	124.65	124.89	active
S04	126.16	131.66	131.90	active
S05	133.17	138.67	138.91	active
S06	140.18	145.68	145.92	active
S07	147.19	152.69	152.93	active
S08	154.20	159.70	159.94	active
S09	161.21	166.71	166.95	active
S10	168.21	173.71	173.95	active
K05	175.22	180.72	180.96	active
K06	182.23	187.73	187.97	active
K07	189.24	194.74	194.98	active
K08	196.25	201.75	201.99	active
K09	203.26	208.76	209.00	active
K10	210.27	215.77	216.01	active
K11	217.28	222.78	223.02	active
K12	224.29	229.79	230.03	active
S11	231.29	236.79	237.03	active
S12	238.30	243.80	244.04	active
S13	245.31	250.81	251.05	active

Table 14-5 IRC EC Channel Plan (IRC EC) (Continued)

Channel	Visual	Aural 1	Aural 2	State
S14	252.32	257.82	258.06	active
S15	259.33	264.83	265.07	active
S16	266.34	271.84	272.08	active
S17	273.35	278.85	279.09	active
S18	280.36	285.86	286.10	active
S19	287.37	292.87	293.11	active
S20	294.38	299.88	300.12	active
S21	301.38	306.88	307.12	inactive
S22	308.39	313.89	314.13	inactive
S23	315.40	320.90	321.14	inactive
S24	322.41	327.91	328.15	inactive
S25	329.42	334.92	335.16	inactive
S26	336.43	341.93	342.17	inactive
S27	343.44	348.94	349.18	inactive
S28	350.45	355.95	356.19	inactive
S29	357.46	362.96	363.20	inactive
S30	364.46	369.96	370.20	inactive
S31	371.47	376.97	377.21	inactive
S32	378.48	383.98	384.22	inactive
S33	385.49	390.99	391.23	inactive
S34	392.50	398.00	398.24	inactive
S35	399.51	405.01	405.25	inactive
S36	406.52	412.02	412.26	inactive

Table 14-5 IRC EC Channel Plan (IRC EC) (Continued)

Channel	Visual	Aural 1	Aural 2	State
S37	413.53	419.03	419.27	inactive
S38	420.54	426.04	426.28	inactive
S39	427.54	433.04	433.28	inactive
S40	434.55	440.05	440.29	inactive
S41	441.56	447.06	447.30	inactive
S42	448.57	454.07	454.31	inactive

Table 14-6 IRC Channel Plan (IRC)

Channel	Visual	Aural	State
2	55.25	59.75	active
3	61.25	65.75	active
4	67.25	71.75	active
1	73.25	77.75	active
5	79.25	83.75	active
6	85.25	89.75	active
95	91.25	95.75	active
96	97.25	101.75	active
97	103.25	107.75	active
98	109.25	113.75	active
99	115.25	119.75	active
14	121.25	125.75	active
15	127.25	131.75	active
16	133.25	137.75	active
17	139.25	143.75	active
18	145.25	149.75	active
19	151.25	155.75	active
20	157.25	161.75	active
21	163.25	167.75	active
22	169.25	173.75	active
7	175.25	179.75	active
8	181.25	185.75	active

Table 14-6 IRC Channel Plan (IRC) (Continued)

Channel	Visual	Aural	State
9	187.25	191.75	active
10	193.25	197.75	active
11	199.25	203.75	active
12	205.25	209.75	active
13	211.25	215.75	active
23	217.25	221.75	active
24	223.25	227.75	active
25	229.25	233.75	active
26	235.25	239.75	active
27	241.25	245.75	active
28	247.25	251.75	active
29	253.25	257.75	active
30	259.25	263.75	active
31	265.25	269.75	active
32	271.25	275.75	active
33	277.25	281.75	active
34	283.25	287.75	active
35	289.25	293.75	active
36	295.25	299.75	active
37	301.25	305.75	active
38	307.25	311.75	active
39	313.25	317.75	active
40	319.25	323.75	active

Table 14-6 IRC Channel Plan (IRC) (Continued)

Channel	Visual	Aural	State
41	325.25	329.75	active
42	331.25	335.75	active
43	337.25	341.75	active
44	343.25	347.75	active
45	349.25	353.75	active
46	355.25	359.75	active
47	361.25	365.75	active
48	367.25	371.75	active
49	373.25	377.75	active
50	379.25	383.75	active
51	385.25	389.75	active
52	391.25	395.75	active
53	397.25	401.75	active
54	403.25	407.75	active
55	409.25	413.75	active
56	415.25	419.75	active
57	421.25	425.75	active
58	427.25	431.75	active
59	433.25	437.75	active
60	439.25	443.75	active
61	445.25	449.75	active
62	451.25	455.75	active
63	457.25	461.75	active

Table 14-6 IRC Channel Plan (IRC) (Continued)

Channel	Visual	Aural	State
64	463.25	467.75	active
65	469.25	473.75	active
66	475.25	479.75	active
67	481.25	485.75	active
68	487.25	491.75	active
69	493.25	497.75	active
70	499.25	403.75	active
71	505.25	509.75	active
72	511.25	515.75	active
73	517.25	521.75	active
74	523.25	527.75	active
75	529.25	533.75	active
76	535.25	539.75	active
77	541.25	545.75	active
78	547.25	551.75	active
79	553.25	557.75	active
80	559.25	563.75	active
81	565.25	569.75	active
82	571.25	575.75	active
83	577.25	581.75	active
84	583.25	587.75	active
85	589.25	593.75	active
86	595.25	599.75	active

Table 14-6 IRC Channel Plan (IRC) (Continued)

Channel	Visual	Aural	State
87	601.25	605.75	active
88	607.25	611.75	active
89	613.25	617.75	active
90	619.25	623.75	active
91	625.25	629.75	active
92	631.25	635.75	active
93	637.25	641.75	active
94	643.25	647.75	active
100	649.25	653.75	active
101	655.25	659.75	active
102	661.25	665.75	active
103	667.25	671.75	active
104	673.25	677.75	active
105	679.25	683.75	active
106	685.25	689.75	active
107	691.25	695.75	active
108	697.25	701.75	active
109	703.25	707.75	active
110	709.25	713.75	active
111	715.25	719.75	active
112	721.25	725.75	active
113	727.25	731.75	active
114	733.25	737.75	active

Table 14-6 IRC Channel Plan (IRC) (Continued)

Channel	Visual	Aural	State
115	739.25	743.75	active
116	745.25	749.75	active
117	751.25	755.75	active
118	757.25	761.75	active
119	763.25	767.75	active
120	769.25	773.75	active
121	775.25	779.75	active
122	781.25	785.75	active
123	787.25	791.75	active
124	793.25	797.75	active
125	799.25	803.75	active

Table 14-7 PAL UK Channel Plan (PAL UK)

Channel	Visual	Aural 1	Aural 2	State
R08	8.00	14.00	14.55	inactive
R16	16.00	22.00	22.55	inactive
R24	24.00	30.00	30.55	inactive
R32	32.00	38.00	38.55	inactive
R40	40.00	46.00	46.55	inactive
48	48.00	54.00	54.55	inactive
56	56.00	62.00	62.55	active
64	64.00	70.00	70.55	active
72	72.00	78.00	78.55	inactive
80	80.00	86.00	86.55	inactive
88	88.00	94.00	94.55	inactive
96	96.00	102.00	102.55	inactive
104	104.00	110.00	110.55	inactive
112	112.00	118.00	118.55	inactive
120	120.00	126.00	126.55	inactive
128	128.00	134.00	134.55	active
136	136.00	142.00	142.55	active
144	144.00	150.00	150.55	active
152	152.00	158.00	158.55	active
160	160.00	166.00	166.55	active
168	168.00	174.00	174.55	active
176	176.00	182.00	182.55	active

Table 14-7 PAL UK Channel Plan (PAL UK) (Continued)

Channel	Visual	Aural 1	Aural 2	State
184	184.00	190.00	190.55	active
192	192.00	198.00	198.55	active
200	200.00	206.00	206.55	active
208	208.00	214.00	214.55	active
216	216.00	222.00	222.55	active
224	224.00	230.00	230.55	active
232	232.00	238.00	238.55	active
240	240.00	246.00	246.55	active
248	248.00	254.00	254.55	active
256	256.00	262.00	262.55	active
264	264.00	270.00	270.55	active
272	272.00	278.00	278.55	active
280	280.00	286.00	286.55	active
288	288.00	294.00	294.55	active
296	296.00	302.00	302.55	active
304	304.00	310.00	310.55	active
312	312.00	318.00	318.55	active
320	320.00	326.00	326.55	active
328	328.00	334.00	334.55	active
336	336.00	342.00	342.55	active
344	344.00	350.00	350.55	active
352	352.00	358.00	358.55	active
360	360.00	366.00	366.55	active

Table 14-7 PAL UK Channel Plan (PAL UK) (Continued)

Channel	Visual	Aural 1	Aural 2	State
368	368.00	374.00	374.55	active
376	376.00	382.00	382.55	active
384	384.00	390.00	390.55	active
392	392.00	398.00	398.55	active
400	400.00	406.00	406.55	active
408	408.00	414.00	414.55	active
416	416.00	422.00	422.55	active
424	424.00	430.00	430.55	active
432	432.00	438.00	438.55	active
440	440.00	446.00	446.55	active
448	448.00	454.00	454.55	active
456	456.00	462.00	462.55	active
464	464.00	470.00	470.55	active
472	472.00	478.00	478.55	active
480	480.00	486.00	486.55	active
488	488.00	494.00	494.55	active
496	496.00	502.00	502.55	active
504	504.00	510.00	510.55	active
512	512.00	518.00	518.55	active
520	520.00	526.00	526.55	active
528	528.00	534.00	534.55	active
536	536.00	542.00	542.55	active
544	544.00	550.00	550.55	active

Table 14-7 PAL UK Channel Plan (PAL UK) (Continued)

Channel	Visual	Aural 1	Aural 2	State
552	552.00	558.00	558.55	active
560	560.00	566.00	566.55	active
568	568.00	574.00	574.55	active
576	576.00	582.00	582.55	active
584	584.00	590.00	590.55	active
592	592.00	598.00	598.55	active
600	600.00	606.00	606.55	active
608	608.00	614.00	614.55	inactive
616	616.00	622.00	622.55	inactive
624	624.00	630.00	630.55	inactive
632	632.00	638.00	638.55	inactive
640	640.00	646.00	646.55	inactive
648	648.00	654.00	654.55	inactive
656	656.00	662.00	662.55	inactive
664	664.00	670.00	670.55	inactive
672	672.00	678.00	678.55	inactive
680	680.00	686.00	686.55	inactive
688	688.00	694.00	694.55	inactive
696	696.00	702.00	702.55	inactive
704	704.00	710.00	710.55	inactive
712	712.00	718.00	718.55	inactive
720	720.00	726.00	726.55	inactive
728	728.00	734.00	734.55	inactive

Table 14-7 PAL UK Channel Plan (PAL UK) (Continued)

Channel	Visual	Aural 1	Aural 2	State
736	736.00	742.00	742.55	inactive
744	744.00	750.00	750.55	inactive
752	752.00	758.00	758.55	inactive
760	760.00	766.00	766.55	inactive
768	768.00	774.00	774.55	inactive
776	776.00	782.00	782.55	inactive
784	784.00	790.00	790.55	inactive
792	792.00	798.00	798.55	inactive
800	800.00	806.00	806.55	inactive
808	808.00	814.00	814.55	inactive
816	816.00	822.00	822.55	inactive
824	824.00	830.00	830.55	inactive
832	832.00	838.00	838.55	inactive
840	840.00	846.00	846.55	inactive
848	848.00	854.00	854.55	inactive
856	856.00	862.00	862.55	inactive
864	864.00	870.00	870.55	inactive

Table 14-8 PAL Channel Plan (PAL)

Channel	Visual	Aural 1	Aural 2	State
K02	48.25	53.75	54.10	active
K03	55.25	60.75	61.10	active
K04	62.25	67.75	68.10	active
S03	119.25	124.75	125.10	active
S04	126.25	131.75	132.10	active
S05	133.25	138.75	139.10	active
S06	140.25	145.75	146.10	active
S07	147.25	152.75	153.10	active
S08	154.25	159.75	160.10	active
S09	161.25	166.75	167.10	active
S10	168.25	173.75	174.10	active
K05	175.25	180.75	181.10	active
K06	182.25	187.75	188.10	active
K07	189.25	194.75	195.10	active
K08	196.25	201.75	202.10	active
K09	203.25	208.75	209.10	active
K10	210.25	215.75	216.10	active
K11	217.25	222.75	223.10	active
K12	224.25	229.75	230.10	active
S11	231.25	236.75	237.10	active
S12	238.25	243.75	244.10	active
S13	245.25	250.75	251.10	active

Table 14-8 PAL Channel Plan (PAL) (Continued)

Channel	Visual	Aural 1	Aural 2	State
S14	252.25	257.75	258.10	active
S15	259.25	264.75	265.10	active
S16	266.25	271.75	272.10	active
S17	273.25	278.75	279.10	active
S18	280.25	285.75	286.10	active
S19	287.25	292.75	293.10	active
S20	294.25	299.75	300.10	active
S21	301.25	306.75	307.10	inactive
S22	308.25	313.75	314.10	inactive
S23	315.25	320.75	321.10	inactive
S24	322.25	327.75	328.10	inactive
S25	329.25	334.75	335.10	inactive
S26	336.25	341.75	342.10	inactive
S27	343.25	348.75	349.10	inactive
S28	350.25	355.75	356.10	inactive
S29	357.25	362.75	363.10	inactive
S30	364.25	369.75	370.10	inactive
S31	371.25	376.75	377.10	inactive
S32	378.25	383.75	384.10	inactive
S33	385.25	390.75	391.10	inactive
S34	392.25	397.75	398.10	inactive
S35	399.25	404.75	405.10	inactive
S36	406.25	411.75	412.10	inactive

Table 14-8 PAL Channel Plan (PAL) (Continued)

Channel	Visual	Aural 1	Aural 2	State
S37	413.25	418.75	419.10	inactive
S38	420.25	425.75	426.10	inactive
S39	427.25	432.75	433.10	inactive
S40	434.25	439.75	440.10	inactive
S41	441.25	446.75	447.10	inactive
K21	448.25	453.75	454.10	inactive
K22	455.25	460.75	461.10	inactive
K23	464.25	469.75	470.10	inactive
K24	472.25	477.75	478.10	inactive
K25	480.25	485.75	486.10	inactive
K26	488.25	493.75	494.10	inactive
K27	496.25	501.75	502.10	inactive
K28	504.25	509.75	510.10	inactive
K29	512.25	517.75	518.10	inactive
K30	520.25	525.75	526.10	inactive
K31	528.25	533.75	534.10	inactive
K32	536.25	541.75	542.10	inactive
K33	544.25	549.75	550.10	inactive
K34	552.25	557.75	558.10	inactive
K35	560.25	565.75	566.10	inactive
K36	568.25	573.75	574.10	inactive
K37	576.25	581.75	582.10	inactive
K38	584.25	589.75	590.10	inactive

Table 14-8 PAL Channel Plan (PAL) (Continued)

Channel	Visual	Aural 1	Aural 2	State
K39	592.25	597.75	598.10	inactive
K40	600.25	605.75	606.10	inactive
K41	608.25	613.75	614.10	inactive
K42	616.25	621.75	622.10	inactive
K43	624.25	629.75	630.10	inactive
K44	632.25	637.75	638.10	inactive
K45	640.25	645.75	646.10	inactive
K46	648.25	653.75	654.10	inactive
K47	656.25	661.75	662.10	inactive
K48	664.25	669.75	670.10	inactive
K49	672.25	677.75	678.10	inactive
K50	680.25	685.75	686.10	inactive
K51	688.25	693.75	694.10	inactive
K52	696.25	701.75	702.10	inactive
K53	704.25	709.75	710.10	inactive
K54	712.25	717.75	718.10	inactive
K55	720.25	725.75	726.10	inactive
K56	728.25	733.75	734.10	inactive
K57	736.25	741.75	742.10	inactive
K58	744.25	749.75	750.10	inactive
K59	752.25	757.75	758.10	inactive
K60	760.25	765.75	766.10	inactive
K61	768.25	773.75	774.10	inactive

Table 14-8 PAL Channel Plan (PAL) (Continued)

Channel	Visual	Aural 1	Aural 2	State
K62	776.25	781.75	782.10	inactive
K63	784.25	789.75	790.10	inactive
K64	792.25	797.75	798.10	inactive
K65	800.25	805.75	806.10	inactive
K66	808.25	813.75	814.10	inactive
K67	816.25	821.75	822.10	inactive
K68	824.25	829.75	830.10	inactive
K69	832.25	837.75	838.10	inactive
K70	840.25	845.75	846.10	inactive
K71	848.25	853.75	854.10	inactive
K72	856.25	861.75	862.10	inactive
K73	864.25	869.75	870.10	inactive
K74	872.25	877.75	878.10	inactive
K75	880.25	885.75	886.10	inactive
K76	888.25	893.75	894.10	inactive
K77	896.25	901.75	902.10	inactive
K78	904.25	909.75	910.10	inactive
K79	912.25	917.75	918.10	inactive
K80	920.25	925.75	926.10	inactive
K81	928.25	933.75	934.10	inactive
K82	936.25	941.75	942.10	inactive
K83	944.25	949.75	950.10	inactive
K84	952.25	957.75	958.10	inactive

Table 14-8 PAL Channel Plan (PAL) (Continued)

Channel	Visual	Aural 1	Aural 2	State
K85	960.25	965.75	966.10	inactive
K86	968.25	973.75	974.10	inactive

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If You Have a Problem

If You Have a Problem

Assistance

Product maintenance agreements and other customer assistance agreements are available for Sunrise Telecom Broadband products.

For any assistance, contact your sales representative. If you are calling from North America, please call 1-800-701-5208, 408-360-2200 for international calls, or consult our website (www.sunrisetelecom.com).

Returning the Instrument for Service

Before returning any equipment, consult our website (www.sunrisetelecom/broadband) to locate the Sunrise Telecom Broadband representative in your area to obtain a return authorization number (RMA) or telephone 1-800-701-5208 in North America or 408-360-2200 for international. Indicate the Return Authorization number on all correspondence.

If it has been determined the instrument needs to be repaired, use the following steps to package the instrument for shipment to Sunrise Telecom Broadband for service:

- Include your name, company name, address, and phone number. Refer to the instrument by model number and full serial number. Send a copy of any or all of the following information:
  ❏ Any error messages that appeared on the display.

  ❏ Any specific data on the performance of the instrument.
- Use the original packaging materials or a strong shipping container that is made of double-walled corrugated cardboard with 159 kg (350 lb.) bursting strength. The carton must be both large and strong enough to accommodate the instrument and allow at least 3 to 4 inches on all sides of the instrument for packing material.
- Surround the instrument with at least 3 to 4 inches of non-adhesive packing material, or enough to prevent the instrument from moving in the carton.
- Seal the shipping container securely with strong nylon adhesive tape.
- Mark the shipping container “FRAGILE, HANDLE WITH CARE” to ensure careful handling.
- Retain copies of all shipping papers.

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