



CaLan 3010R Sweep/Ingress Analyzer

MAN-22020-US001

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Warranty

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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 1-800-297-9726, 514-725-6652 for international calls, or consult our website (www.sunrisetelecom.com/broadband).

Initial Inspection

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 battery charger 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 the battery charger/ac adapter, the product 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 battery charger/ac adapter 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



Do not throw batteries away, but collect as chemical waste.



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.



The CE mark shows compliance with European Community. (If accompanied by a year, it is the year when the design was proven.)



The CSA mark is the Canadian Standards Association safety mark.

ISM 1-A

This is a symbol of an Industrial Scientific and Medical Group 1 Class A product.



This symbol is used to mark the ON position of the power line switch.



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.


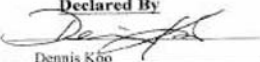


This symbol is used to mark the OFF position of the power line switch.



This symbol is used to mark the ON position of the power line switch.

Regulatory Information

	DECLARATION OF CONFORMITY According to ISO/IEC Guide 22 and EN 45014	
	Manufacturer's Name: Manufacturer's Address:	Sunrise Telecom Inc. 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:	<u>Measurement, Control and Laboratory Equipment</u>	
Trade Name/Model Number:	<u>Calan 3010R Sweep/Ingress Analyzer 85962A</u>	
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>I, the undersigned, hereby declare that the equipment specified above conforms to the above Directive and Standards.</i>		
Declared By		
Signature:		
Full Name:	<u>Dennis Koo</u>	
Position:	<u>VP, Quality</u>	
Company:	Sunrise Telecom Inc.	
Address:	302 Enzo Drive San Jose, CA 95138 USA	
Telephone:	(408) 363-8000	
Facsimile:	(408) 363-8313	
Date:	<u>13 August 2002</u>	

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 Maschinenlaermverordnung –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

1/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

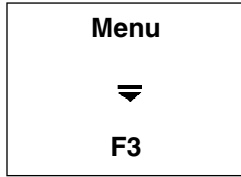
Press this key to recall and save information to or from the file server. You may access the file server from any of the measurement mode screens by pressing **Print/Save**.

Option

Press this key to enter the Option menu or functions related to the active mode or operation.

How to Use This Manual

Quick Reference



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 3010R is an integrated sweep receiver and signal level measurement system.

Standard Features

- Sweep mode compatible with the 3010H sweep/ingress analyzer and the 1777 sweep transmitter
- Measures 165 channels in 3.6 seconds
- Automatic 24-hour measurements
- Differential level comparison
- Field replaceable type-F input and output connector
- Ruggedized weatherproof construction
- 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
- Screen printing of any screen
- Normalized mode
- Formalized reports
- Large format graphical LCD display
- Parallel printer interface
- Dual Aural Carrier function
- Burst counter measurement
- Average power measures
- Spectrum monitor measurement
- User-definable C/N bandwidth
- dB μ V and dBmV switchable
- FCC pass/fail report writer including 24-hour report
- Return path ingress measurement
- Digital power measurement
- Return sweep mode
- Return normalized sweep mode
- Headend return monitor mode
- Internal return sweep source
- Instrument cloning
- Fast sweep mode

System Overview

The CaLan 3010 represents a unique concept in signal measurement devices allowing the use of forward and return sweep measurements and return ingress measurements in a low cost, high performance package. The 3010 incorporates features such as normalized sweep, automatic level measurement, and memory file storage with graphic capability into a rugged, durable measurement system.

Return Path Measurements

The 3010R offers a complete solution for return path alignment and maintenance featuring a full 50 dBmV internal sweep source. The 3010R has four return path measurement modes: Return Sweep, Return Normalized Sweep, Return Spectrum, and Ingress measurements. Both sweep measurements and the return spectrum measurement can be called on demand from the field. The Ingress measurement is automatically broadcast to all field units when an ingress problem affects the communications between the 3010R and the 3010H. By using the return spectrum and spectrum scan measurement, return problems can easily be located and repaired.

The 3010R can also be setup to function as a 3010H. By changing the operation mode of the 3010R to headend mode, the 3010R has the same capability for return monitoring as the 3010H and can be used in the field for checking a specific section of the system.

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, or just the source instrument's channel plan or sweep table data.

Forward System Alignment

The 3010 is compatible with your existing CaLan 1777/1776 integrated sweep system; allowing the user to test the frequency response of any broadband network, with or without a signal present. Using the Normalized function, the output of amplifiers in the system can be compared to a reference stored in memory and graphically displayed on the screen or stored into the file server. With the Channel Scan mode selected, the response of the system can also be viewed using the visual carriers on the system.

SLM Function

The CaLan 3010 has all of the functional SLM (signal level measurement) advantages of the CaLan 2010. It will measure 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 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.

AGC Window Adjustment

AGC Window Adjustment

The performance of the system is dependent upon the operating window of the AGC (automatic gain control) of the amplifier. Typically, the window is set by comparing the absolute level system pilot carriers to the temperature and the cable length. The 3010 allows the user to monitor the absolute level of two carriers while sweeping in the Normalized System mode, eliminating the need to change operational modes or settings. This produces a great time savings to the user.

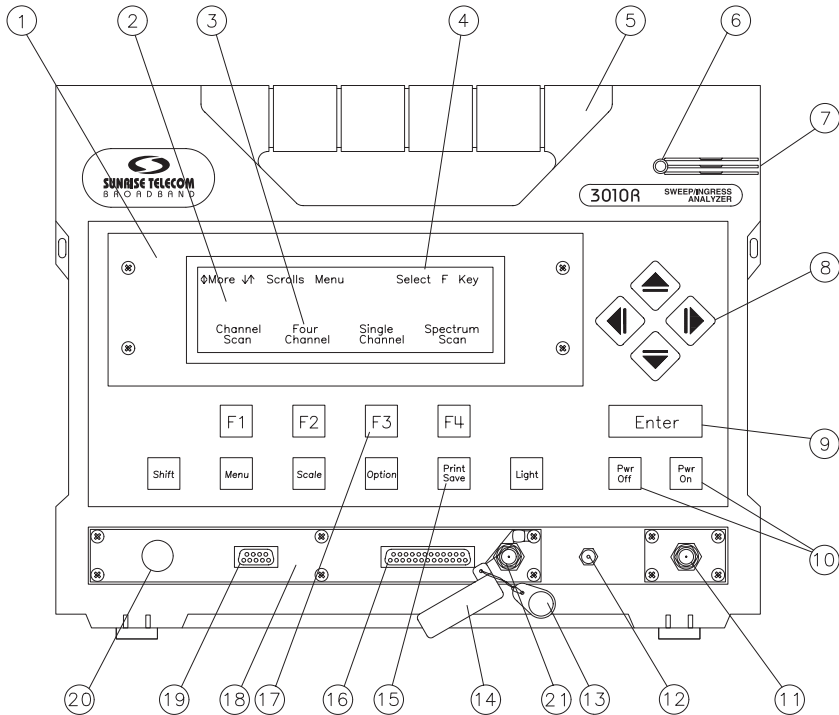
Spectrum Analysis and Distortion Testing

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.

Front Panel Feature Overview

1. **Display lens:** replaceable clear scratch resistant plastic.
2. **LCD display screen:** compact Super Twist 240 × 64 dot matrix.
3. **Softkey menu:** describes the function of the softkeys.
4. **Message line:** top line of screen is used for messages.
5. **Carrying handle:** for easy grip and portability.
6. **Temperature sensor:** calibrated sensing probe.
7. **Speaker:** micro-dynamic mylar speaker mounted in a water-tight compartment.
8. **▲ ▼ ◀ ▶** keys: used to scroll through menus and move markers.
9. **Enter:** used to save changes made with softkeys.
10. **Pwr On** and **Pwr Off:** turns the meter ON and OFF.
11. **RF input:** field replaceable type-F connector.
12. **Battery charger jack:** two conductor power jack.
13. **Cover:** for the battery charger jack.
14. **Dust cover:** for the parallel printer port.
15. **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.
16. **Parallel printer port.**
17. **Softkeys: F1, F2, F3, and F4.** These activate the corresponding function or subset menus displayed directly above them on the display.
18. **Expansion area:** reserved for options such as a fiber optics power meter.
19. **RS-232 interface:** DB 9 connector with removable dust cover.
20. **Fiber power meter input** (optional).
21. **RF Output:** field replaceable type-F connector.

Front Panel Feature Overview



pd21a

Figure 1-1 Front Panel Overview

Battery Operation

The unit is supplied with a 12 Vdc rechargeable sealed lead acid battery. Unpack the unit and make sure that no shipping damage has occurred. Connect the external battery charger/ac supply cable to the 3010 battery charger jack (see item 12 of Figure 1-1) and plug the battery charger/ac adapter into a well-regulated power source. Allow the battery to charge overnight (or at least 10 hours) prior to field operation.

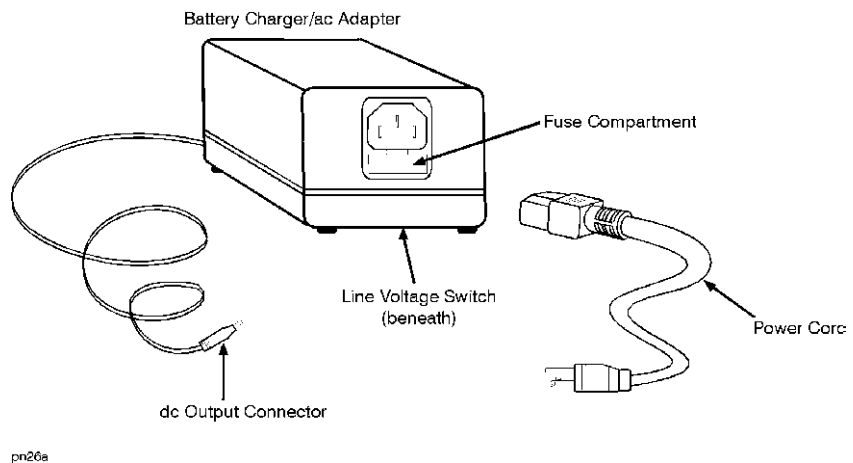


Figure 1-2 Battery Charger/ac Adapter

Install the battery charger/ac adapter so that the detachable power cord is readily identifiable and is easily reached by the operator. The detachable power cord is the battery charger/ac adapter disconnecting device. It disconnects the main circuits from the main

supply before other parts of the instrument. The **Pwr On** and **Pwr Off** buttons on the instrument's front panel are only standby switches and are not LINE switches (disconnecting devices). Alternatively, an externally installed switch or circuit breaker (which is readily identifiable and is easily reached by the operator) may be used as a disconnecting device. When using the battery charger/ac adapter, make sure that the connection to the ac power source is easily accessible.

Battery Operation

WARNING:

This instrument has a rechargeable battery. When replacing the battery, use only the specified battery called out in the “Replacing the Battery” procedure of Chapter 15. Even though, non-rechargeable batteries will fit into the instrument, *do not use non-rechargeable batteries*. The specified replacement battery is the only battery that can be fitted in the instrument and recharged by the battery charger/ac adapter. Trying to charge other batteries could cause an explosion or start a fire.

Only the battery charger/ac adapter supplied with the instrument (part number 0950-2955) should be used to charge the battery or operate the instrument. This battery charger/ac adapter is designed for use with portable CaLan 85960 series of products (2010B, 3010B, and 3010R).

WARNING:

When using the battery charger/ac adapter, the product 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.

CAUTION:

Before plugging the charger/ac adapter into the power source, make sure that the line voltage selector switch is set to the voltage of the power supply and the supply voltage is in the specified range.

With a fully-charged battery, the 3010R will operate continuously for 4 hours or will operate 8 to 12 hours with normal field use without recharging.

Battery Warning Message

The 3010 continuously monitors the status of the battery through the use of a built-in automatic warning system which alerts you to the amount of remaining usable time left on the battery. When the battery voltage reaches 11.5 volts, the word **Bat** will appear in the lower left hand corner of all active displays. Under normal operating conditions, this will give the operator about 30 minutes more of usable time. A second warning is given when the battery reaches 11 volts. The word **Bat** will appear in *reverse* text in the lower left hand corner of the screen. About 10 minutes of usable time will remain.

At this point, if the operator wants to store data, it must be saved immediately to avoid possible loss. The instrument will automatically shut down when the battery reaches 10 volts to protect the cells of the battery.

NOTE:

To keep the battery fully charged, you may keep the unit plugged in when not in use. Lead acid batteries do not have a charge cycle memory, unlike nicad cells.

Menu Maps

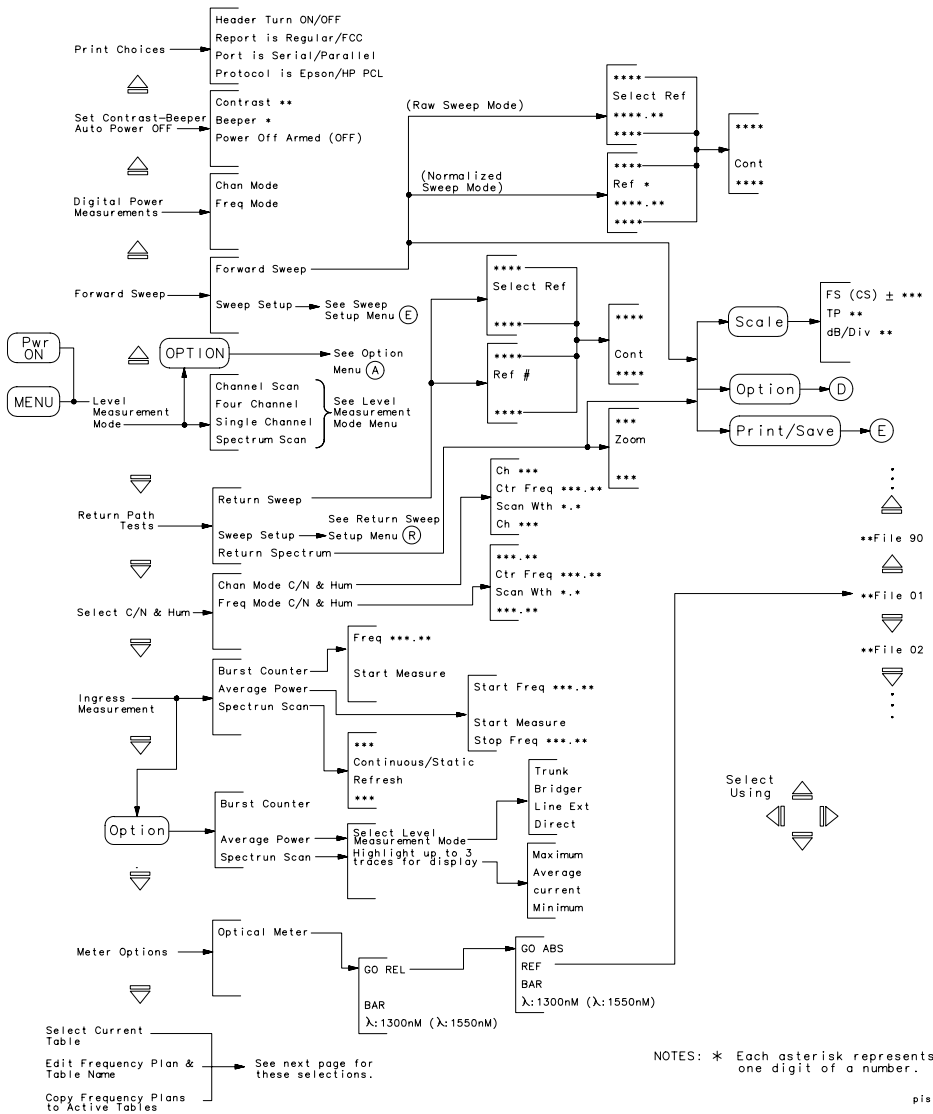
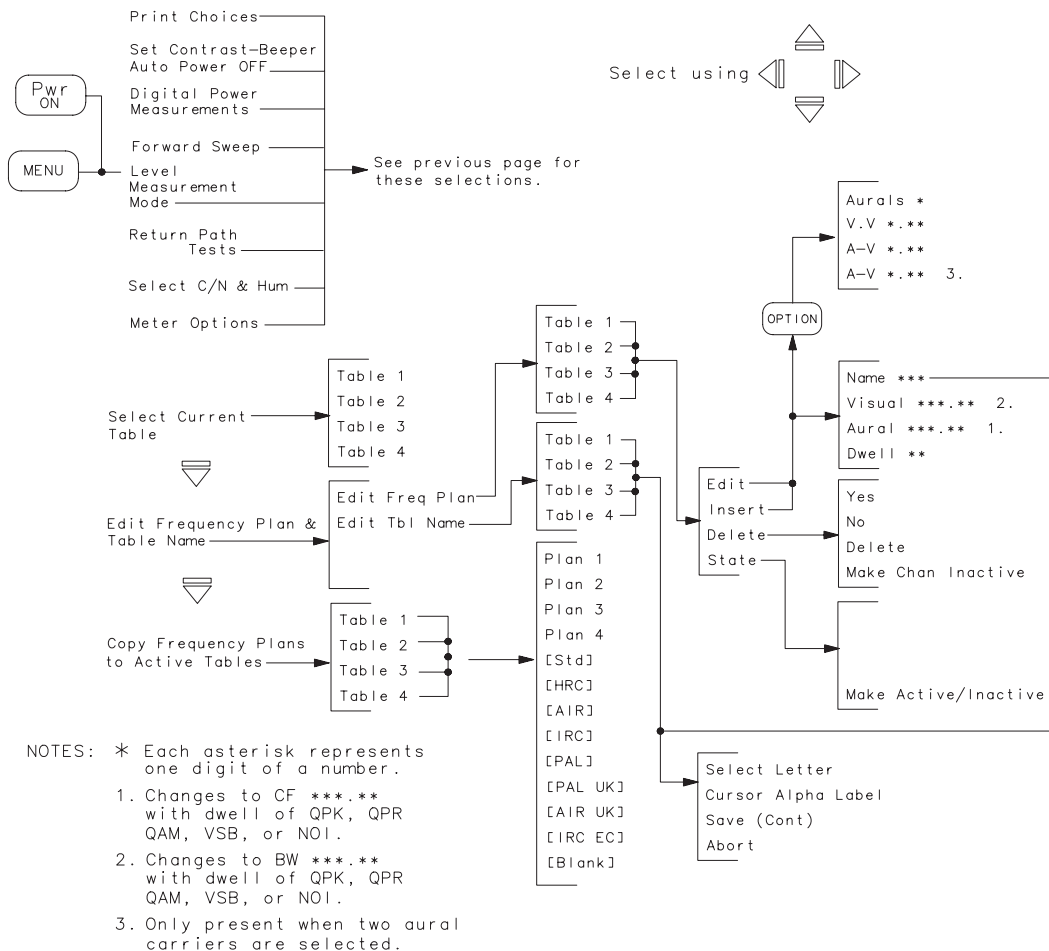


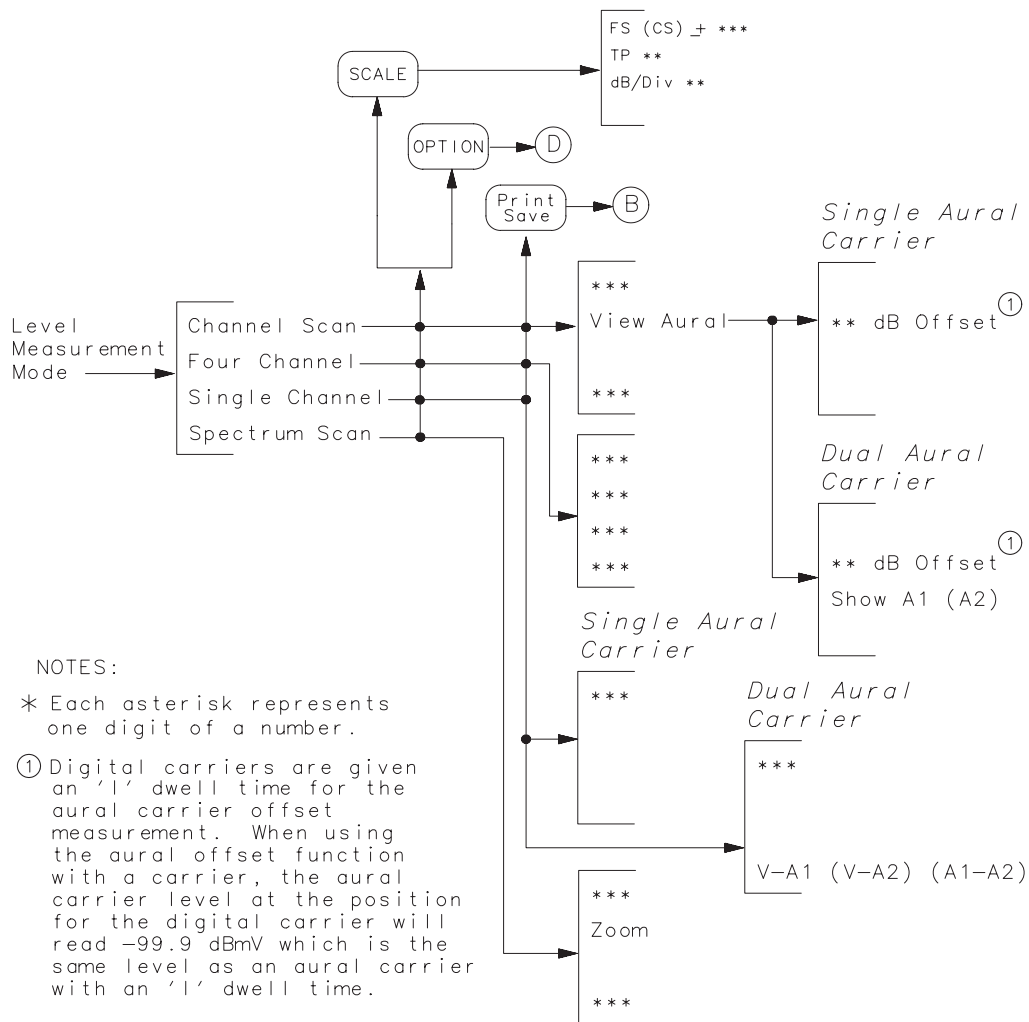
Figure 1-3 Main Menu



pd23a

Figure 1-4 Main Menu (continued)

Menu Maps



pd22b

Figure 1-5 Level Measurement Mode Menu

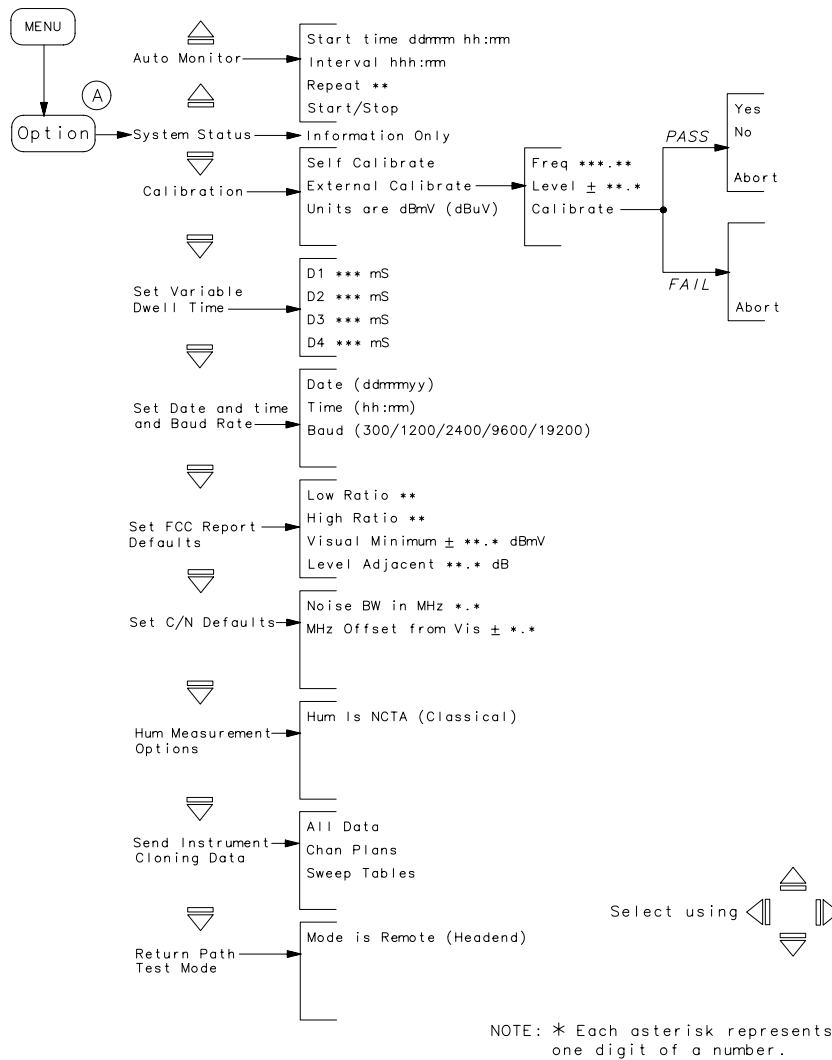
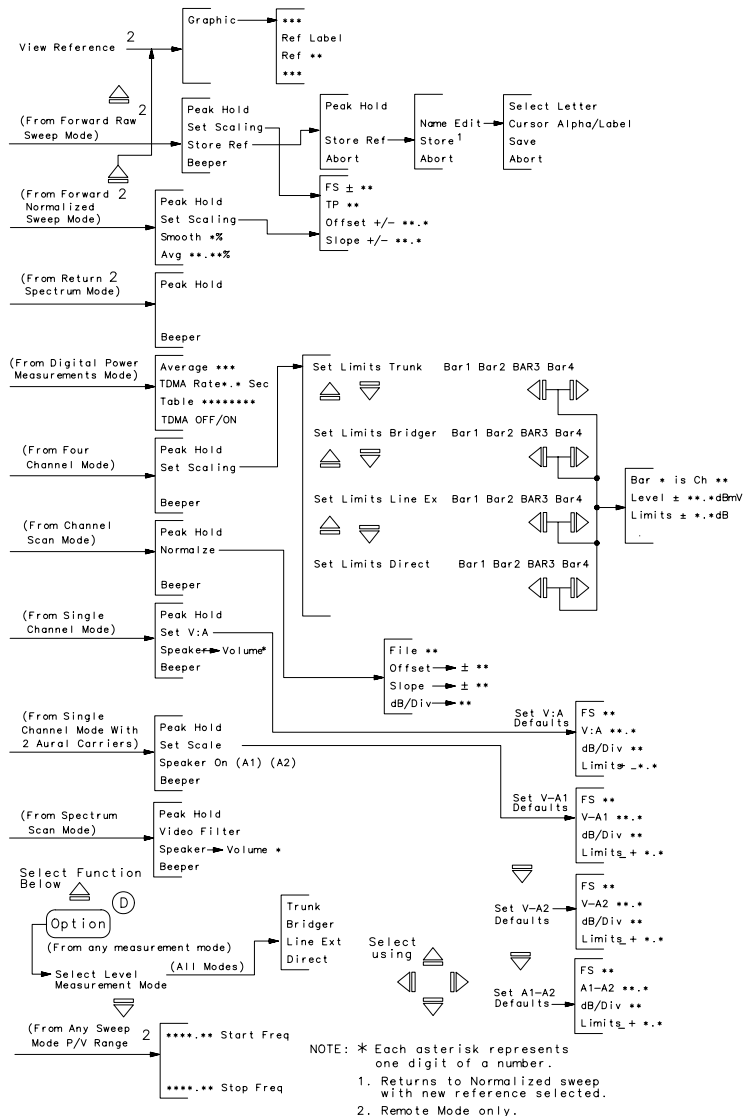


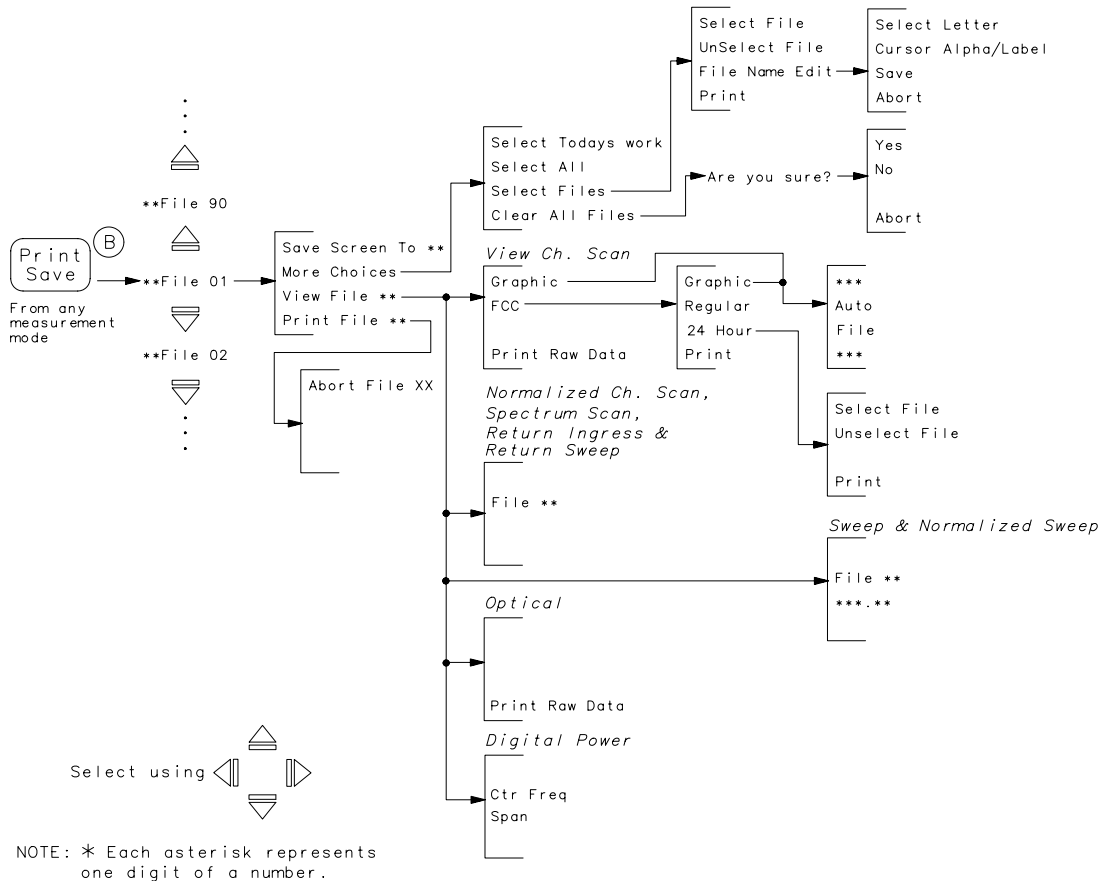
Figure 1-6 Main Options Menu

Menu Maps



pis2

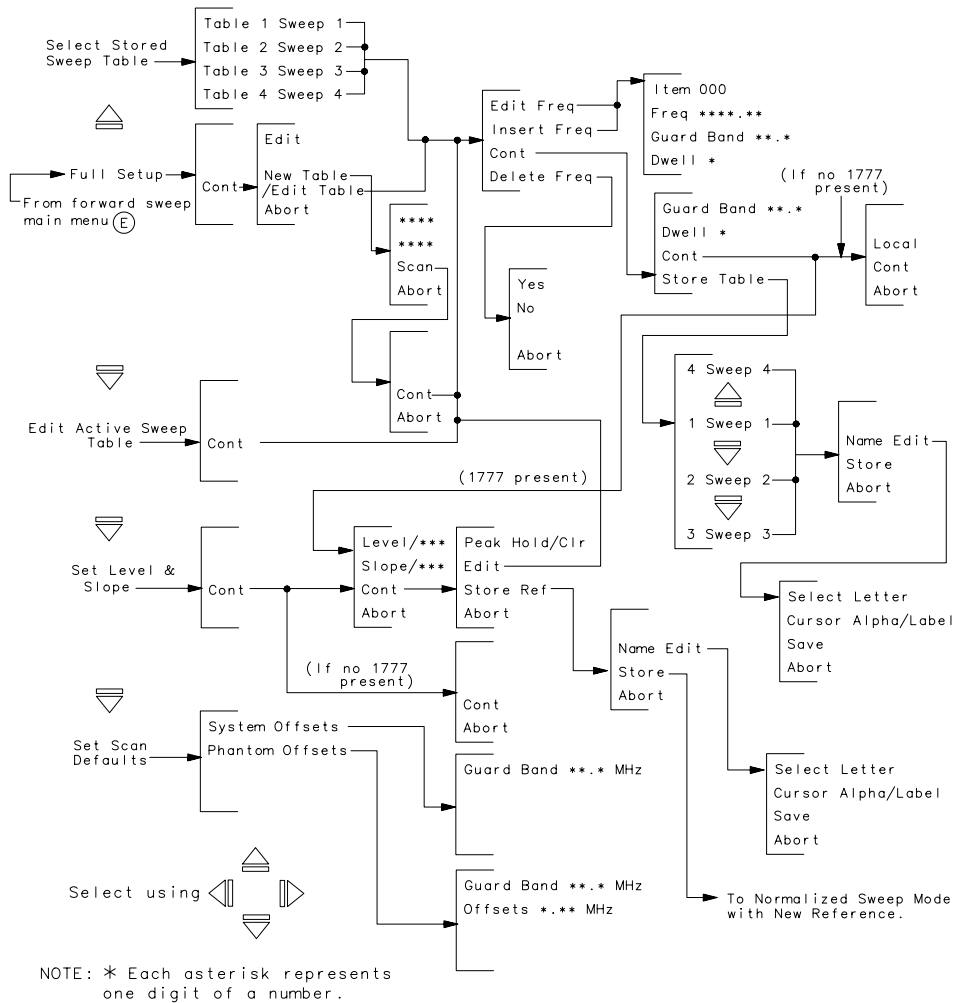
Figure 1-7 Measurement Options Menu



pis3

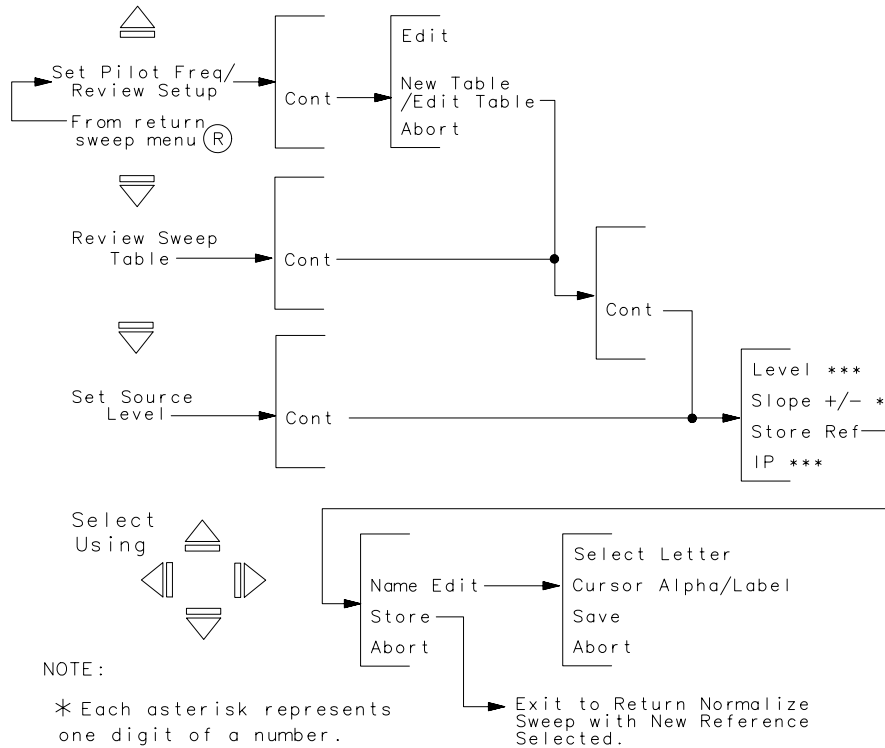
Figure 1-8 Print, Save and Scaling Menu

Menu Maps



pis4

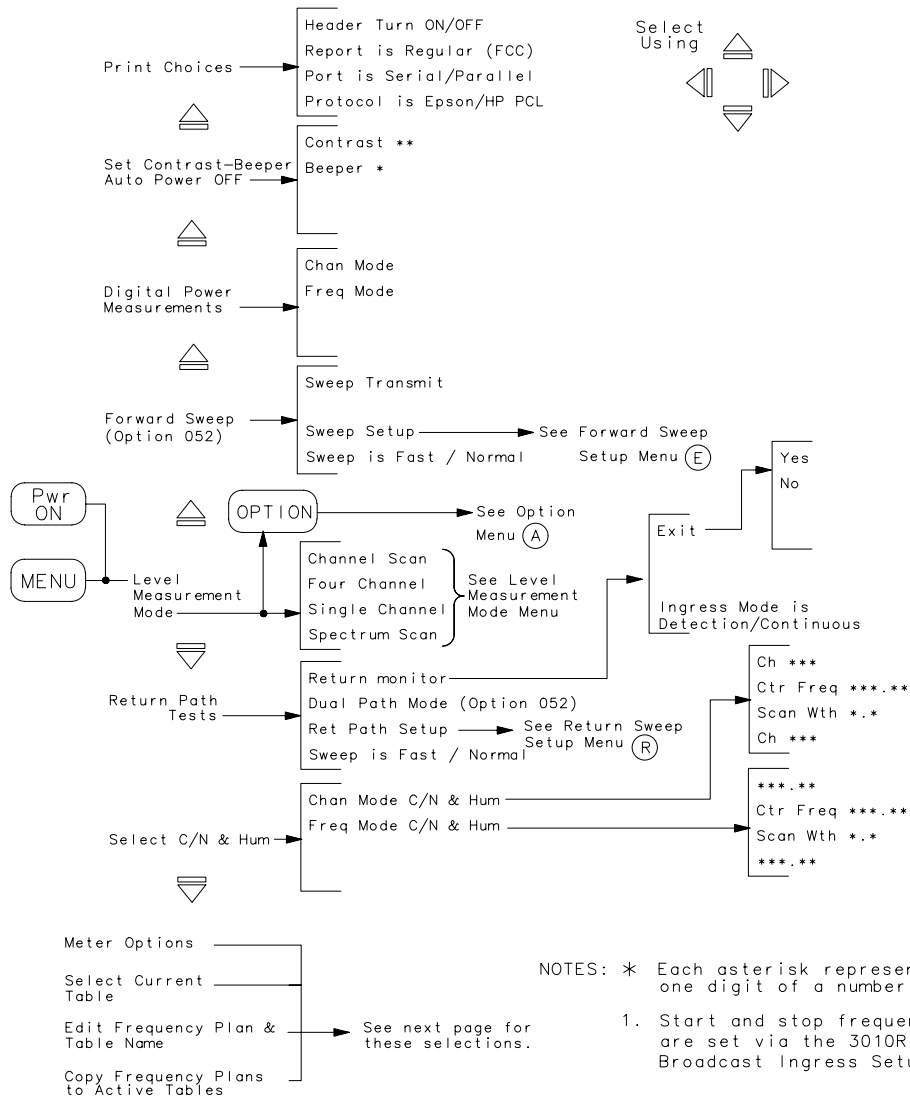
Figure 1-9 Forward Sweep Setup Menu



pis5

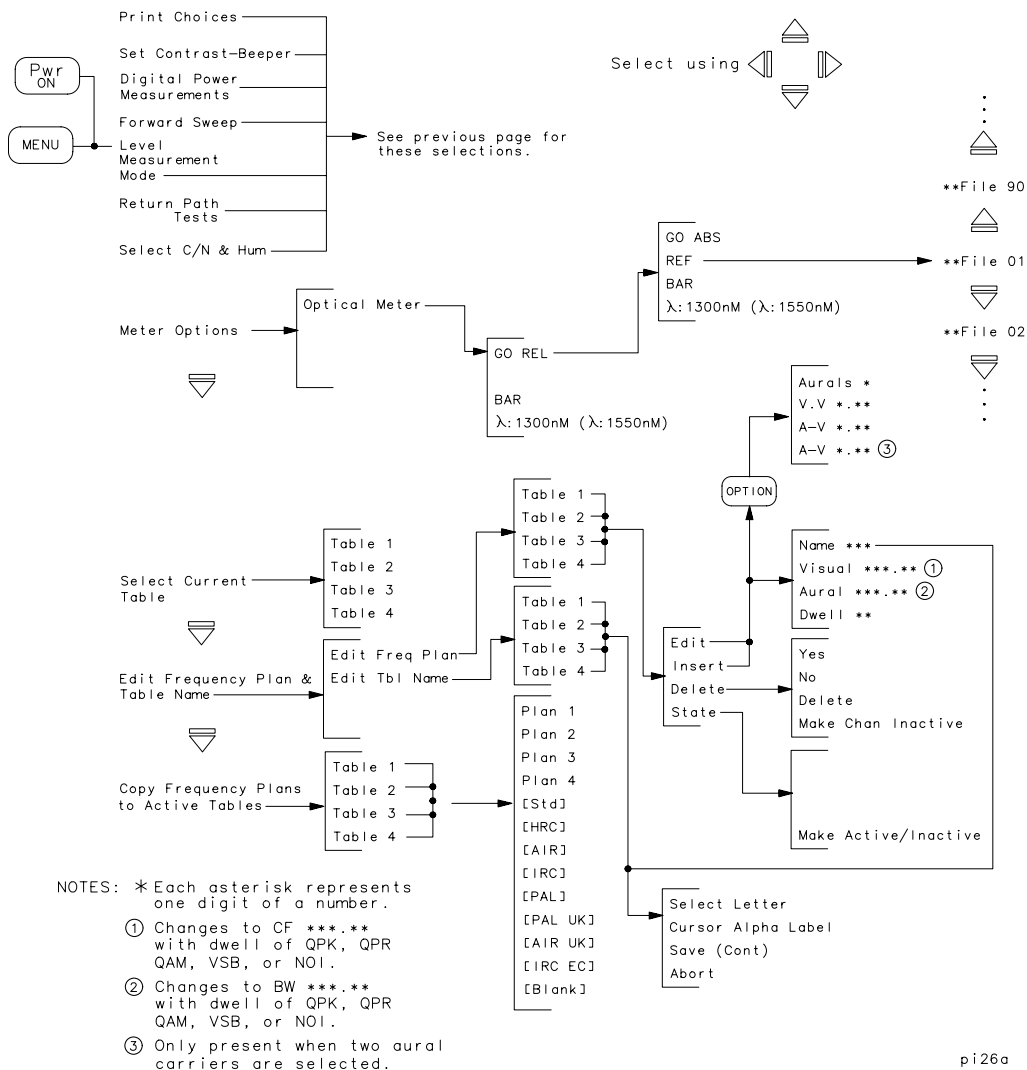
Figure 1-10 Return Sweep Setup Menu in Return Mode

Menu Maps



pis6

Figure 1-11 Return Sweep Setup Menu in Headend Mode



pi26a

Figure 1-12 Return Sweep Setup Menu in Headend Mode (continued)

General Operation

General Operation

Press **Pwr On**.

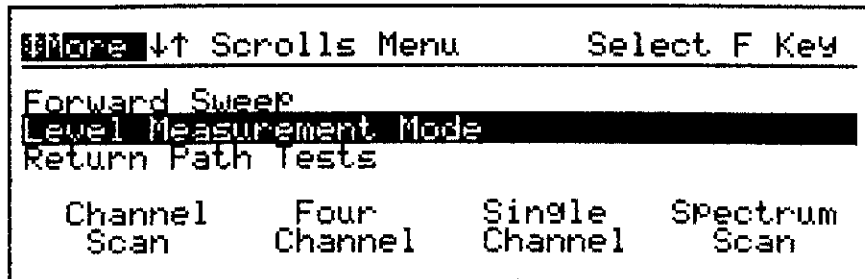
The startup screen appears showing the software version number in use and indicates that the internal calibration is being performed. When calibration is complete, the Main menu screen appears.

NOTE:

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

The Main menu may be accessed at any time by pressing **Menu**.

Main Menu



pd29b

Figure 1-13 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. See Figure 1-13.

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

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 Measurement mode.

Enter

Pressing **Enter** will typically 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 you to store and recall a file in the file server.

Light

Pressing **Light** toggles the display backlight on and off and activates the 3010 battery saving feature, “beeping” every 2 minutes when backlight is on.

Automatic Power Off

The 3010 is equipped with an automatic shut-off feature to maximize battery life. If the 3010 does not see any key access for 12 minutes, it will turn itself off. The automatic shut-off feature is armed every time the unit is turned on. To disable this feature, from the Main menu, press **▲** (three times) then **F3**.

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 is 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

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 **▲** (three times) **F2** and use the **▲** **▼** keys to set the value between 1 and 6. Press **Enter** to save the changes.

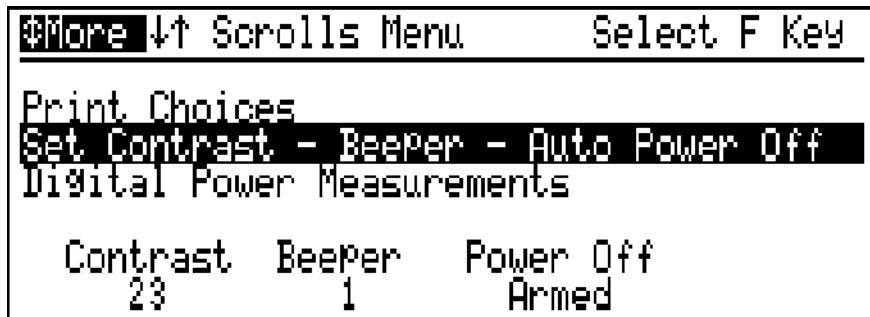


Figure 1-14 Beeper Volume

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.

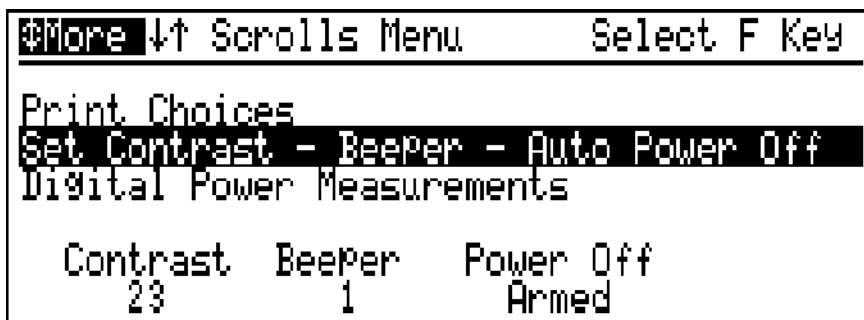


Figure 1-15 Contrast Control

To adjust the contrast, from the Main menu, press ▲ (three times) **F1** then 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 ▲ ▲ ▲ and **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

Channel Plans

Channel Plans

The 3010 uses two tables during operation, the frequency plan table and the 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 3010 how to measure the carrier. The frequency table is used in the Single Channel, Four Channel, Channel Scan, and for creating the forward sweep table. The sweep table is a list of frequencies, guard band, and dwell times used by the 3010 and the 1777 to create the sweep display. The function of the dwell time in the sweep table is the same as the function 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

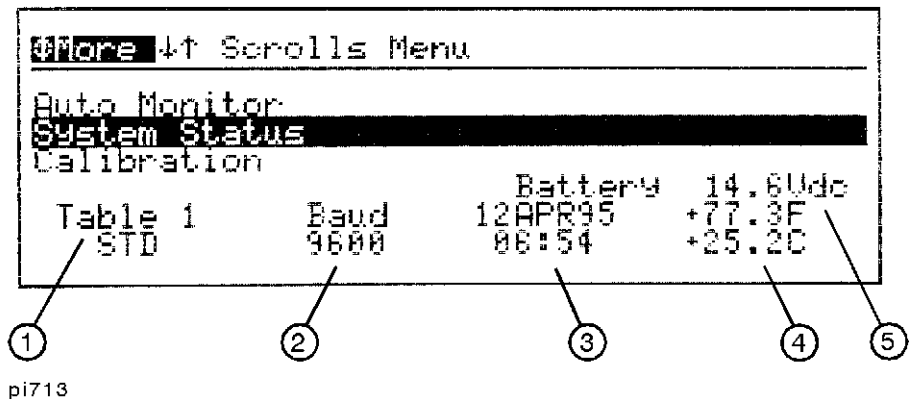


Figure 2-1 System Status Screen

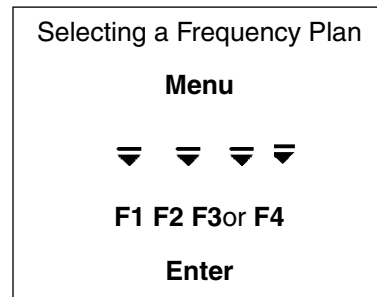
The system status screen tells you which plan is selected ①, the RS-232 baud rate ②, time and date ③, ambient temperature ④, and the battery voltage ⑤.

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

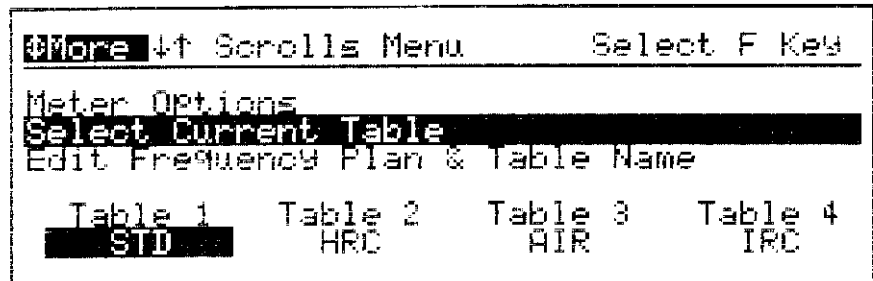
Selecting a Frequency Plan

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



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



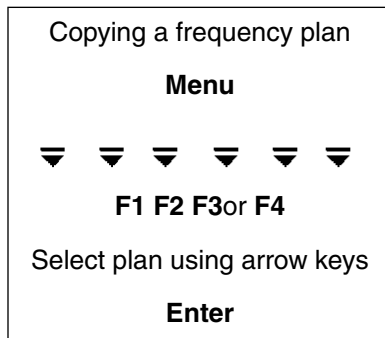
pi714

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



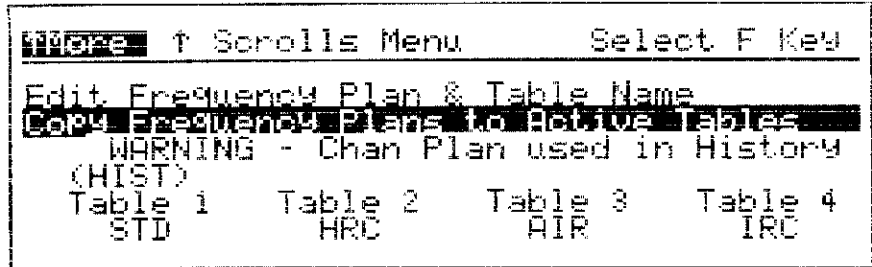
The 3010 has nine preprogrammed and four user-definable frequency plans stored in RAM. See Figure 2-4. The frequency plans shown in brackets are the preprogrammed plans and cannot be changed. The four user-programmable frequency plans on the left of the display are the changeable plans. Preprogrammed 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, press ▼ (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.

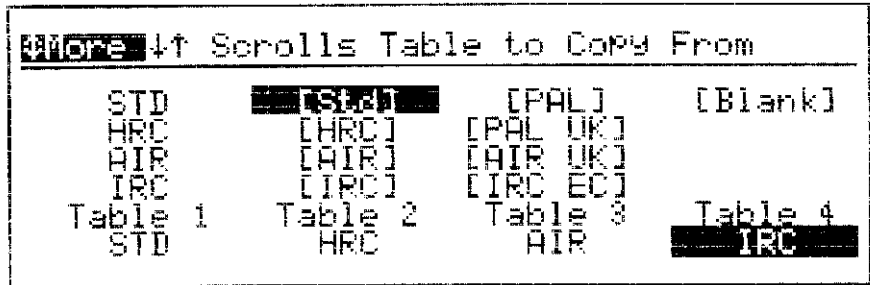
NOTE:

Level measurement files in the file server are linked to the active table used to make the measurement. Tables used for history files are denoted by (HIST) over the table name. See Figure 2-3. Copying a new table to these files will cause a loss of data.



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

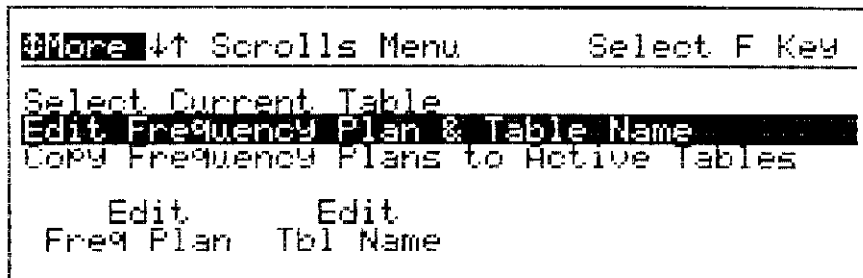
▼ ▼ ▼ ▼ ▼

F2

Select the table to edit

Follow labeling instructions on next page

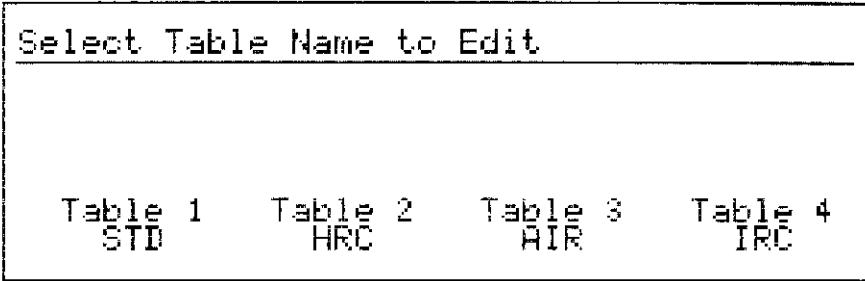
The 3010 table names are defined by the user. To change the name of a table, from the Main menu, press ▼ (5 times) to highlight the Edit Frequency Plan & Table Name function.



pi717

Figure 2-5 Edit Frequency Plan & Table Name Screen

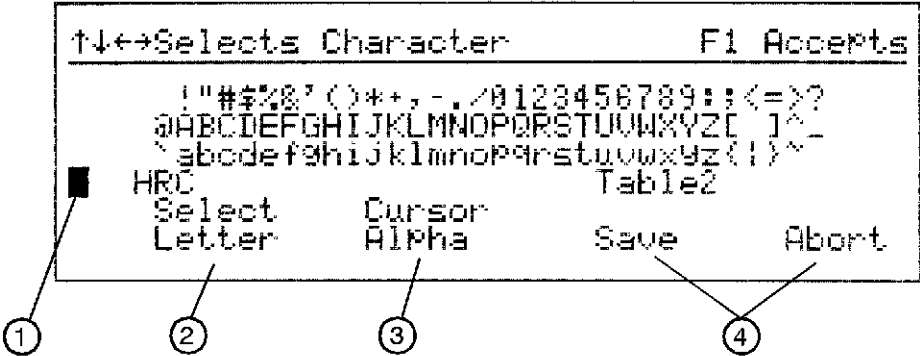
Press **F2** to edit the table name.



pi718

Figure 2-6 Table Selection Screen

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

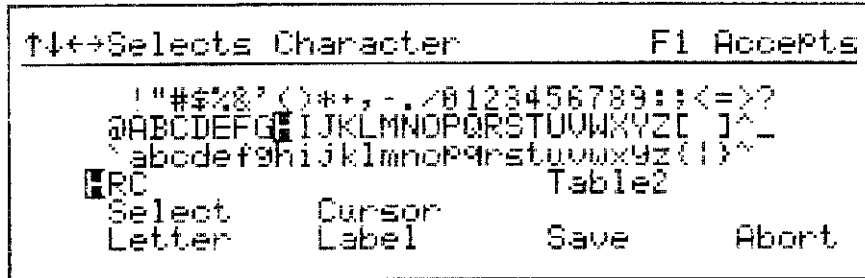


pi719

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.

Naming a Table or Frequency Plan



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 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.

The table label 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.

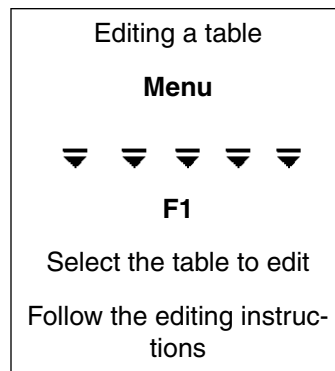
Editing a Table or Frequency Plan

NOTE:

Channel Scan files stored in the file server are linked to the selected table used when they were stored. Changing the frequency plan can result in loss of stored data.

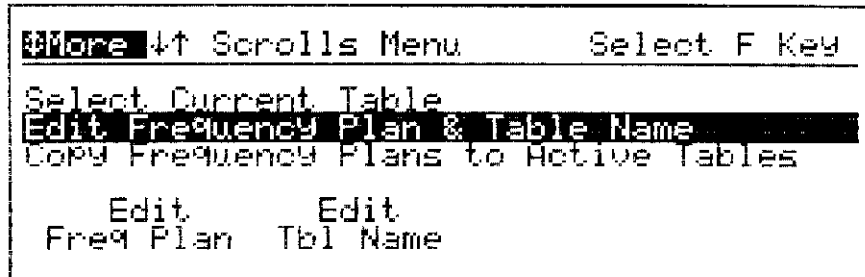
Editing a Table

Quick Reference



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).

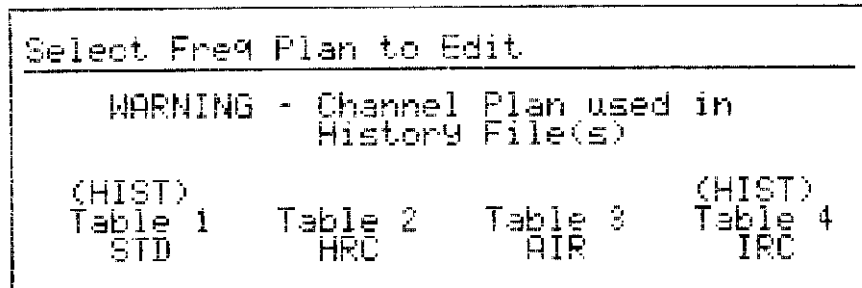
Editing a Table



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).

Name	Visual	Aural	U	Dwell	A
158	997.26	001.76	I		I
02	055.26	059.76	N		N
03	061.26	065.76	N		N

Edit Insert Delete State

pi733

Figure 2-11 Components of the Frequency Plan

Name	CF	Span	Dwell
47A	361.50	003.00	QPR
47B	364.50	003.00	QPR
48A	367.50	003.00	QPR

Name CF Span Dwell
47B 364.50 003.00 QPR

pd222h

Figure 2-12 Channel Plan With Digital Channel

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

Editing a 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.

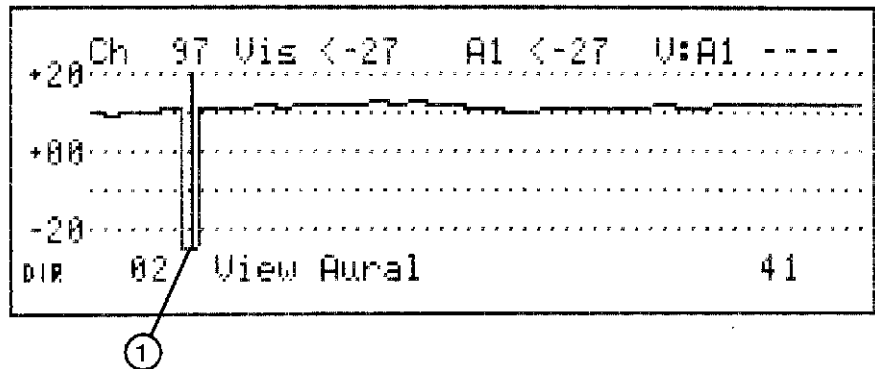
The 3010 is compatible with frequency plans containing dual aural carriers. If the Dual Aural function is turned on, the screen will show two aural frequencies and two aural dwell times. For instructions about dual aural carrier operation, refer to the “Setting the Dual Aural Carrier Frequencies” section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



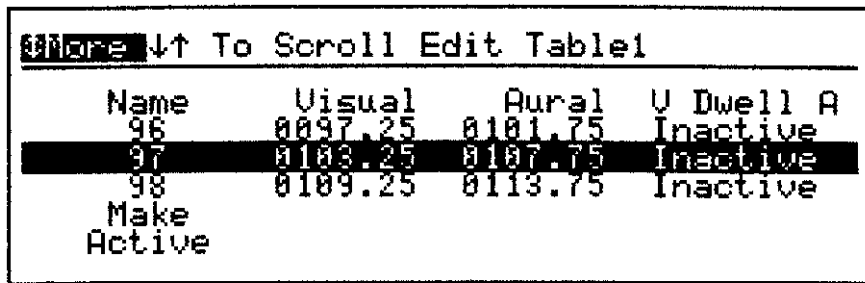
pi734

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. Refer to the facts about frequency tables on the previous page for more information. To edit the state of a channel, press **F4**. See Figure 2-11.



```
Options ↓↑ To Scroll Edit Table1
Name      Visual      Aural      U Dwell  A
 96      0097.25    0101.75    Inactive
 97      0103.25    0107.75    Inactive
 98      0109.25    0113.75    Inactive
Make
Active
```

pd239b

Figure 2-14 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.

ENTER ↓↑ To Scroll Edit Table

Name	Visual	Aural	U Dwell A
96	0097.25	0101.75	Inactive
97	0103.25	0107.75	Active
98	0109.25	0113.75	Inactive
Make			Inactive

pd237b

Figure 2-15 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 **1**, 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

Name	Visual	Aural	U	Dwell	A
158	997.26	001.76	I		I
02	055.26	059.76	N		N
03	061.26	065.76	N		N

More ↑ To Scroll Edit Table4

Edit Insert Delete State

pi733

Figure 2-16 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**.

Name	Visual	Aural	U	Dwell	A
158	997.25	001.75	N		N
T7	007.00	011.50	I		I
T8	013.00	017.50	I		I

Are You Sure! ←-----→ Make Chan

Yes No Delete Inactive

pi738

Figure 2-17 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 2-17.

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

Inserting Channels into the Table

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 2-16.

Name	Visual	Aural	U Dwell	A
98	109.25	113.75	I	I
14	121.25	125.75	N	N
Name	Visual	Aural	Dwell	A
A01	115.25	119.75	N	N

pi7123

Figure 2-18 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 2-19.

↑↓←→Selects Character		F1 Accepts	
!"#\$%&'()*+,-./0123456789:;<=>?			
@ABCDEFGHIJKLMNPOQRSTUVWXYZ [] ^ _			
`abdefghijklmnopqrsstuvwxyz{ }~			
A01	115.25	119.75	N
Select	Cursor		
Letter	Alpha	Cont	Abort

pi7124

Figure 2-19 Character Screen

Inserting Channels into the Table

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 instruction for entering labels. After the new label 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.

Name	Visual	Aural	U	Dwell	A
98	109.25	113.75	I	I	I
14	121.25	125.75	N	N	N
Name	Visual	Aural		Dwell	
99	115.25	119.75	N	N	N

pi7204

Figure 2-20 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 **▲ ▼** keys 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.

Inserting Channels into the Table

Name ↓↑ To Scroll Edit Table4					
Name	Visual	Aural	U	Dwell	θ
98	109.25	113.75	I		I
14	121.25	125.75	N		N
Name	Visual	Aural		Dwell	
99	115.25	119.75	N		N

pi7126

Figure 2-21 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. 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 μ s 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 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. With the cursor on the visual dwell time , use the   keys to select the correct dwell time. See Figure 2-22.

Inserting Channels into the Table

Name	Visual	Aural	U	Dwell	A
98	0109.25	0113.75	I		I
14	0121.25	0125.75	N		N
99	0115.25	0119.75	N		N

pd238b

Figure 2-22 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.

Name	Visual	Aural	U	Dwell	A
98	109.25	113.75	I		I
99	115.25	119.75	N		N
14	121.25	125.75	N		N

Edit Insert Delete State

pi7128

Figure 2-23 Edit Frequency Plan Screen

Notice the location of the new channel in the table. The table is sorted by the visual frequency. See Figure 2-23.

Editing a Channel 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

The editing procedure does not exclude any of the table fields. To edit a channel in the table, select the channel using the ▲ ▼ keys and press **F1**.

Editing a Channel in the Table

Name	Visual	Aural	U	Dwell	A
T7	007.00	011.50	I		I
T01	007.25	011.75	N		N
T8	013.00	017.50	I		I

Name	Visual	Aural		Dwell	
T01	007.25	011.75	N		N

pi744

Figure 2-24 Table Edit Screen

Figure 2-24 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 2-19.
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.

Editing a Channel in the Table

Basic Measurements

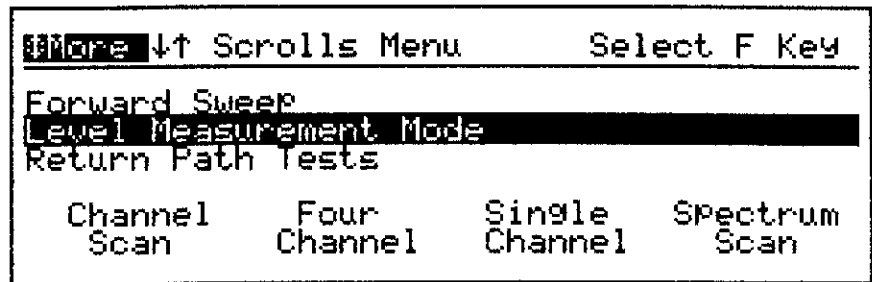
Basic Measurements

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.

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**.



pd29b

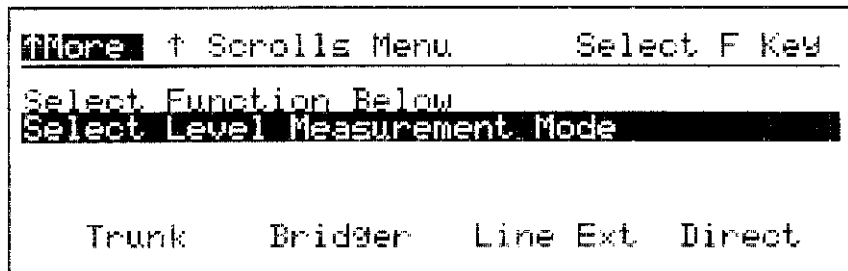
Figure 3-1 Main Menu

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, a set of functions specific to the Measurement mode options are available. The specific available options are:

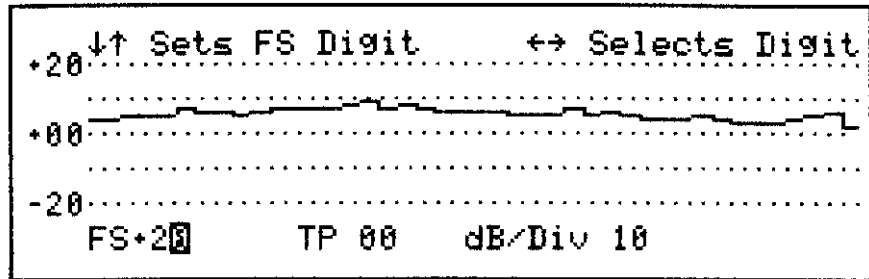
- Peak Hold
- Speaker
- Beeper
- Special Scaling
- Normalization
- Video Filter

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

Scaling

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

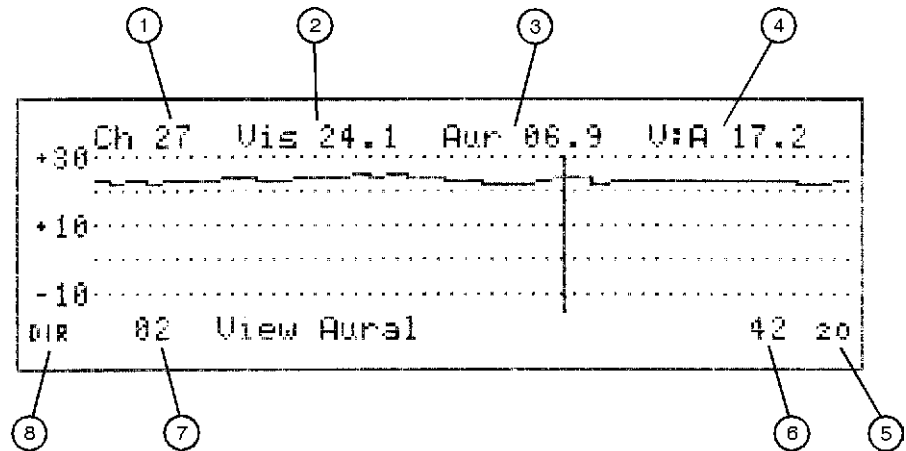
The preset scaling of trunk, bridger, line extender, and direct are programmed by setting the scaling of a Level Measurement mode with that specific test point selected. The selected preset is shown in the bottom left ⑧ of the display. See Figure 3-4. By toggling between the four presets: trunk, bridger,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

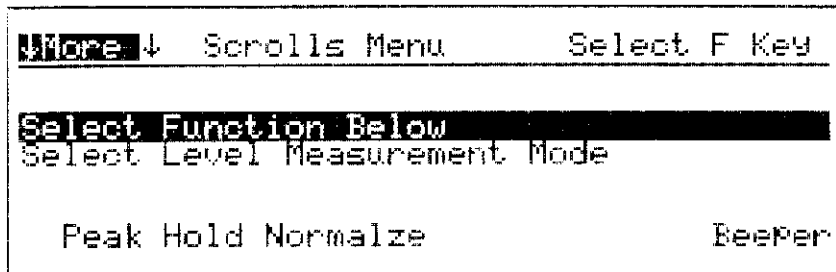
Channel Scan Mode

The Channel Scan mode allows you to view 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.



pi779

Figure 3-4 Annotations for Channel Scan Mode



pi780

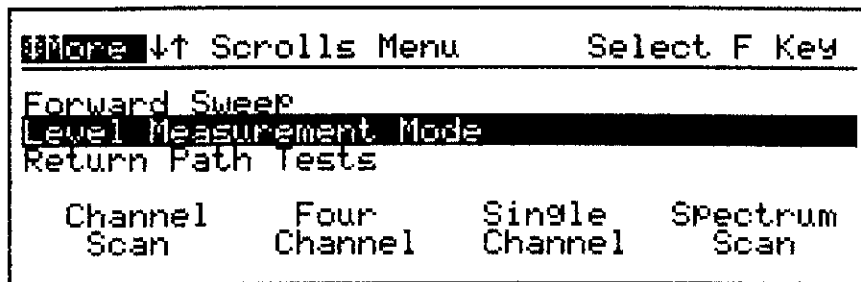
Figure 3-5 Option Annotations in the Channel Scan Mode

Select Channel Scan Mode

Quick Reference

Select Channel Scan mode
Menu
F1

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



pd29b

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

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 the **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

The factory defaults settings with the standard NTSC channel plan active is channels 2 through 36. The channel limits are determined by the active channels in the selected channel plan.

Press **F1** to highlight the start channel. Use **▲ ▼** to select the channel.

Press **Enter** to save the selection.

NOTE:

Holding down **▲** or **▼** accelerates the selection.

Press **F4** to highlight the stop channel. Use **▲ ▼** to select the channel.

Press **Enter** to save selection.

NOTE:

The start channel cannot be higher in frequency than the stop channel and the stop channel cannot be lower in frequency than the start channel.

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.

View Aural Levels

View Aural Levels

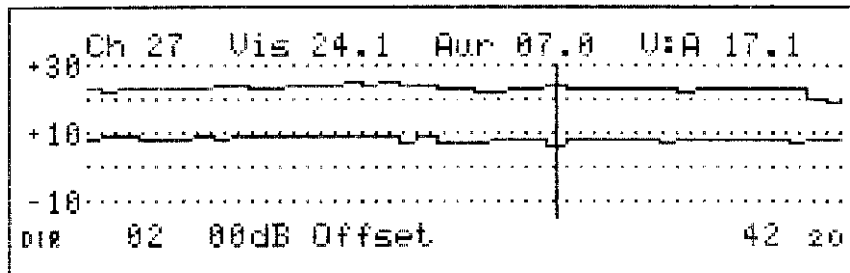
To simultaneously view a trace of the visual and aural signals, press **F2**. See Figure 3-7.

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 \blacktriangle \blacktriangledown . 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.

NOTE:

Refer to Chapter 12 for more information on dual aural carrier operation.



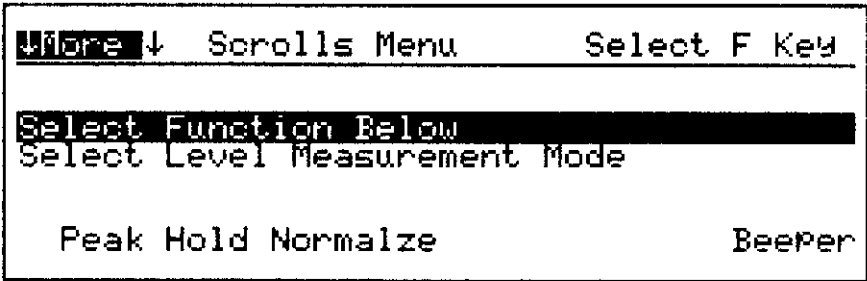
pi782

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.



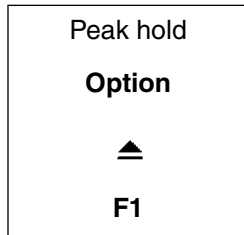
pi7202

Figure 3-8 Option Screen

Peak Hold

Peak Hold

Quick Reference



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 over time can be seen.

Normalization Procedure

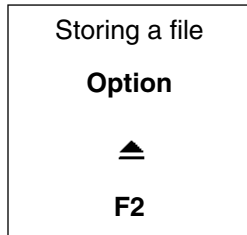
To use the Normalization function, measurement data must be stored in memory and used as the reference. To store a file, refer to Chapter 10 for further details.

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.

Normalization Procedure

Quick Reference



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.

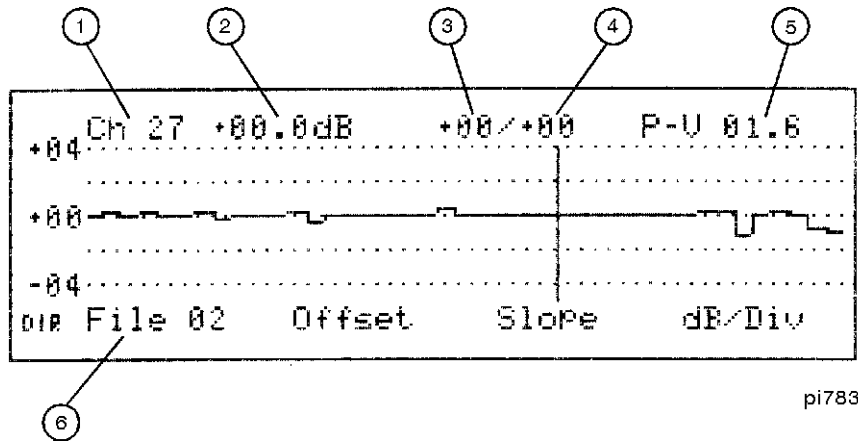


Figure 3-9 Annotations for Normalized Channel Scan Screen

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.

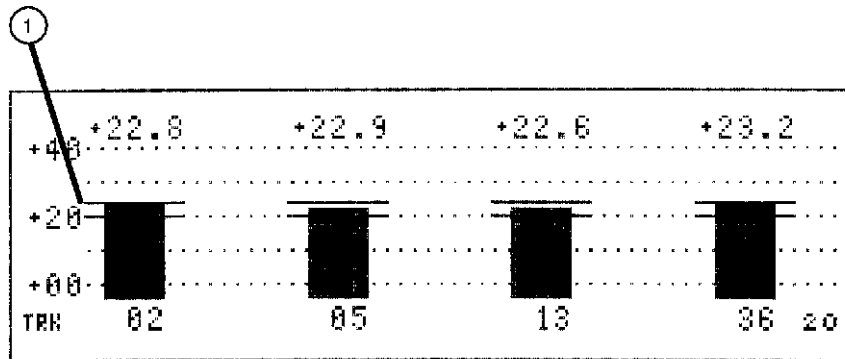
Beeper

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

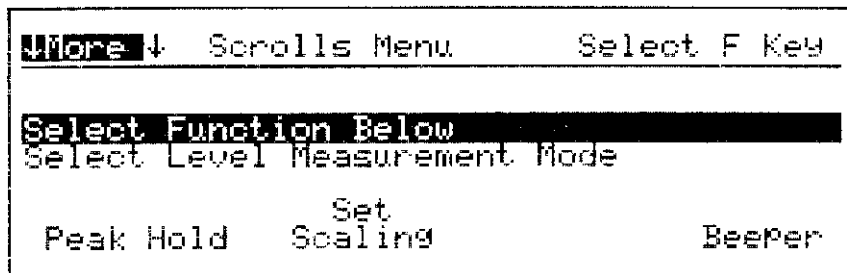
The Four Channel mode is used to rough balance the cable plant. Typically, the system pilot and two channels at the extremes of the spectrum are selected. Limit lines ① may be individually set on all four channels for easy viewing. See Figure 3-10. The “Changing the Default Settings” section in this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

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



pi785

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.

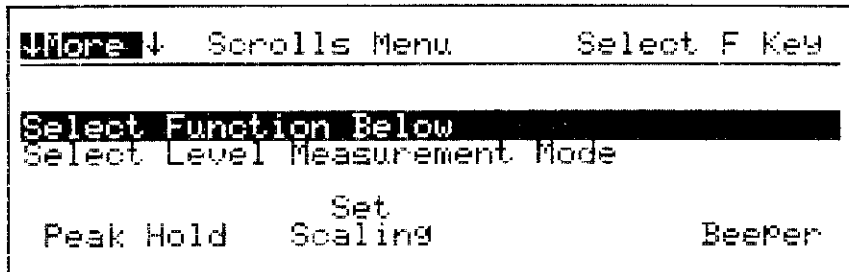
CAUTION:

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.



pi788

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** \blacktriangle 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 \blacktriangle \blacktriangledown to select Trunk, Bridger, Line Extender, or Direct mode.
3. Press \blacktriangleleft \blacktriangleright to select the bar to be changed.
4. Press **F1** and press \blacktriangle \blacktriangledown to select the channel for that bar.
5. Press **F2** to preset the target channel level for the selected channel. Press \blacktriangleleft \blacktriangleright to select the digit and \blacktriangle \blacktriangledown to change the value.
6. Press **F3** to set the limit lines around the expected level. Press \blacktriangle \blacktriangledown 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.

```

More  $\downarrow$   Scrolls Menu          Select Ch Bar
-----
Set Limits Trunk  Bar1 Bar2 Bar3 Bar4
Set Limits Bridger Bar1 Bar2 Bar3 Bar4

Bar1 is          Level      Limits
Ch 02           +23.0dBmV   $\pm$ 2.0dB
  
```

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.

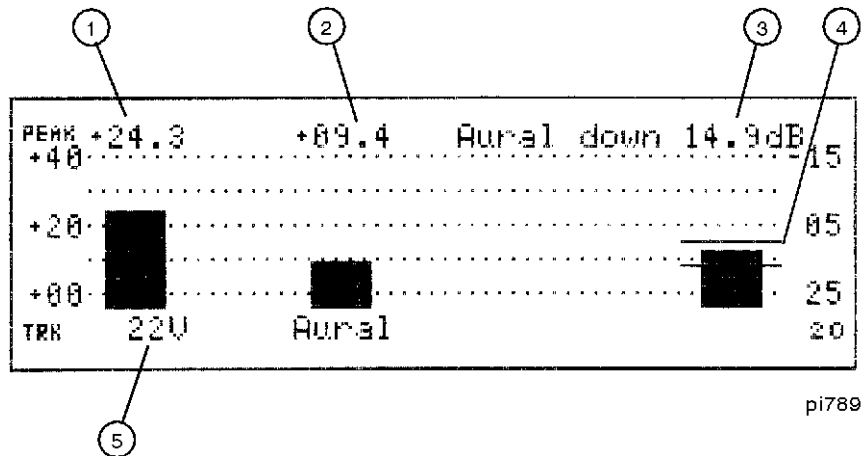
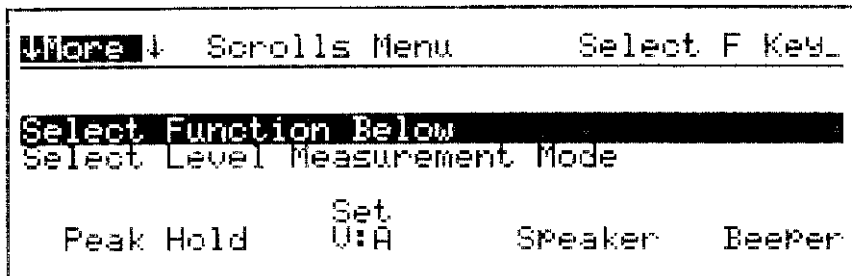


Figure 3-14 Annotations for Single Channel Mode



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 have the last selected mode, for example, trunk, bridge, line ext., or direct. The current selected channel is shown over **F1**. The 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.

To change the measured channel, press **F1** and use the up or down arrow keys to change the value. Press ENTER to save the change.

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

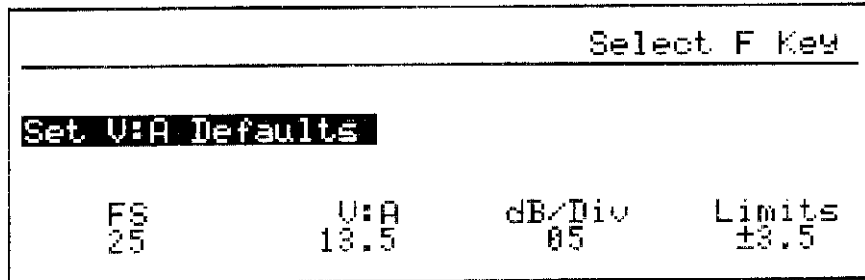
Pressing **F1** causes the 3010 to measure and hold the peak signal. The word **PEAK** is displayed in the upper left on the message line. See Figure 3-14.

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.

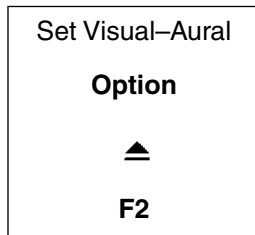
Single Channel Mode Options



pi7205

Figure 3-16 Set Visual to Aural Defaults Screen

Quick Reference



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

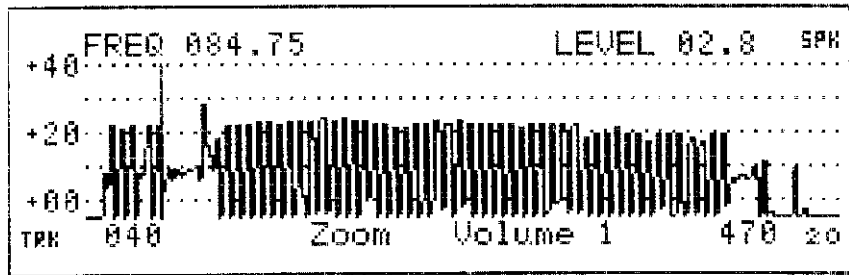
1. Press **Scale** then one of the following selections:
 - Press **F1** to adjust full scale.
 - Press **F2** to adjust test point value.
 - Press **F3** to adjust dB per division.

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 analyzer display is independent of the channel plan. The markers denote frequency position and level not channel levels as in channel scan. 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. The spectrum analyzer display is independent of the channel plan. The markers denote frequency position and level not channel levels as in channel scan.



pi792

Figure 3-17 Annotations for Spectrum Scan Mode

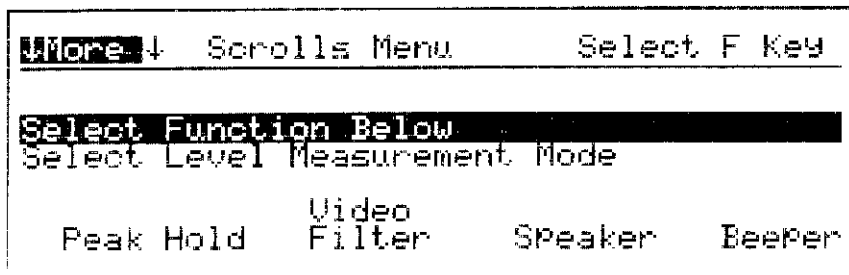


Figure 3-18 Options Available for the Spectrum Scan Mode

Zoom

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**.

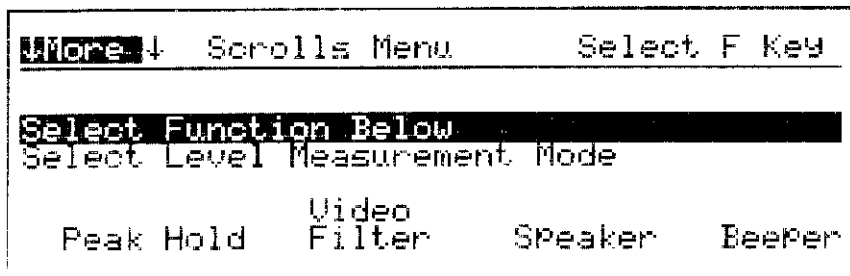
Setting Frequency Span

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.



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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 **< Left Arrow >** **> Right Arrow >** to move the channel marker to display numeric peak values for each frequency. See Figure 3-17. Press **Option < Up Arrow > F1** to turn off the Peak Hold function.

Speaker

Press **F3** to activate the speaker and return to the spectrum screen. This allows the user to listen to the demodulated signal at the frequency marker. The volume is controlled by pressing **F3** and **< Up Arrow >** **< Down Arrow >**. 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.

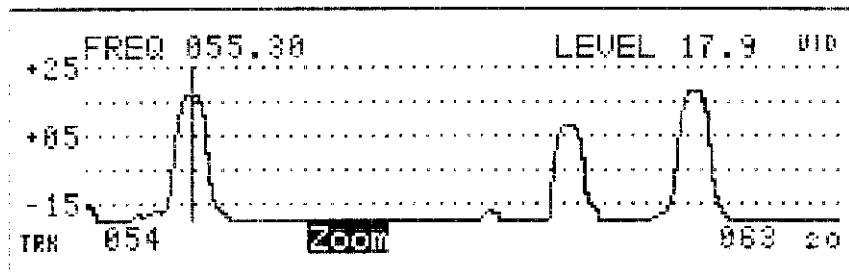
Beeper

Press **F4** to toggle the beeper on and off. The 3010 automatically returns to the spectrum scan screen.

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**.



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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.

Spectrum Scan Mode Options

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.

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 μ s 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** \blacktriangle \blacktriangle .

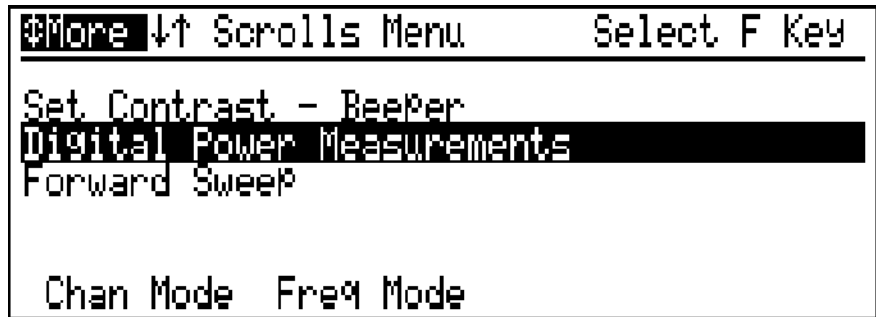


Figure 4-1 Digital Power Measurements in the Main Menu

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** .

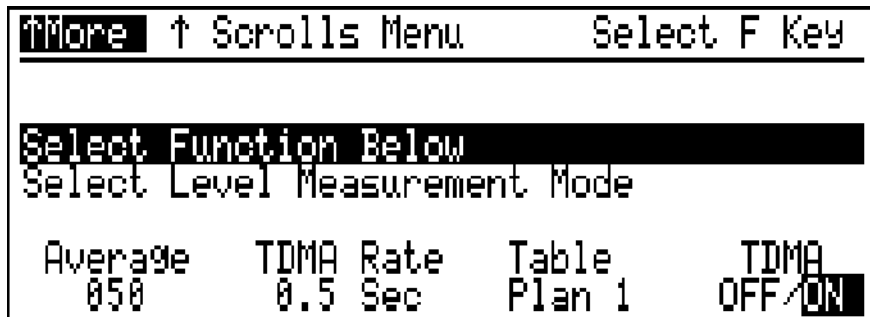


Figure 4-2 Digital Power Measurements Option Menu

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.

NOTE:

Scale key should always be checked during all digital power measurements to ensure accuracy.

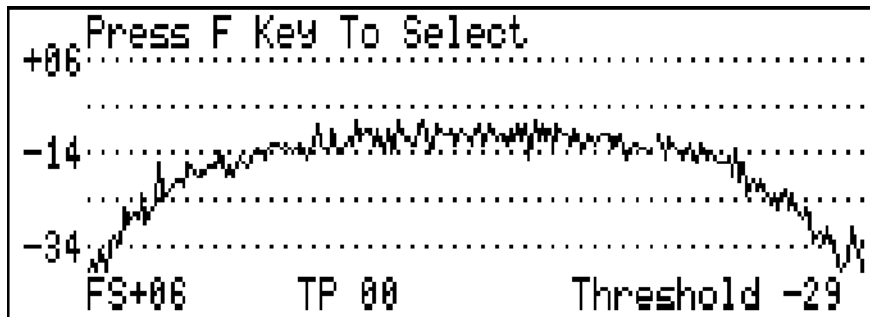


Figure 4-3 Digital Power Measurements Scale Menu

Set the Full Scale Value

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

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 dB μ V, 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 \blacktriangle or \blacktriangledown to display the new channel above **F1**.

NOTE:

If the channel does not appear to change after pressing **F1** and \blacktriangle or \blacktriangledown make sure that you have more than one channel set to a digital dwell in the channel plan.

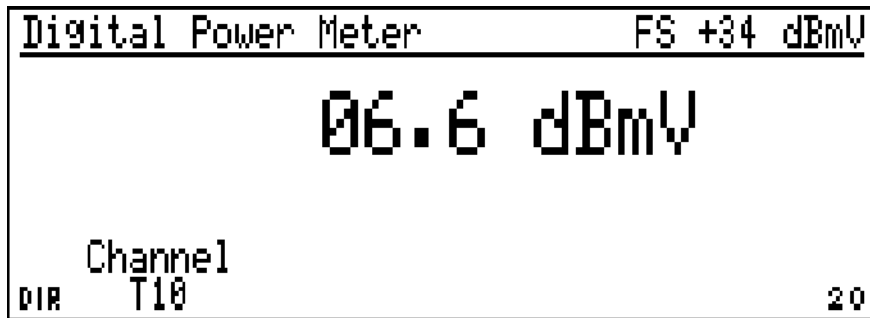


Figure 4-4 Digital Power Measurements Channel Mode Screen

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**, **VSF**, 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.

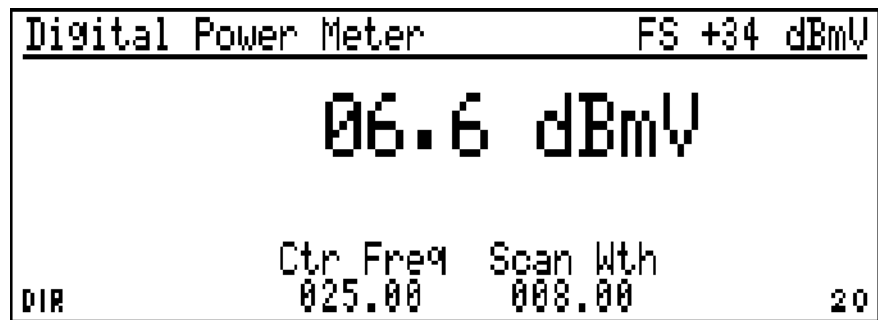


Figure 4-5 Digital Power Measurements Frequency Mode Screen

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**.

Identifying the Channel Or Frequency

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.

Forward Sweep Setup

Forward Sweep Setup

This chapter describes the setup of the forward sweep using the 3010R as the forward sweep receiver.

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

- The first method creates the forward sweep table in the 3010R receiver, and then uploads the table to the transmitter, either a 3010H or a 1777, using an RS-232 cable.
- The second method downloads the sweep table in an existing 1777 transmitter or 3010H (with Option 050 or 052) to the 3010R receiver in the field.

This chapter is divided into three distinct sections. Refer *only* to the section that applies to your forward sweep setup requirement.

- “Setting Up the 3010H Forward Sweep”
Describes how to set up the 3010H using a 3010R.
- “Installing and Programming the 1777 Sweep Transmitter”
Describes how to set up the 1777 or 1777P using a 3010R.
- “Downloading from an Existing Transmitter”
Describes how to download the sweep table to a 3010R from a transmitter that has already been set up.

Transmitter Compatibility

The 3010R can be used with the following transmitters:

- 1777 (CaLan 85951A)
- 1777P (CaLan 85952A)
- 3010H with the forward sweep transmitter option or dual path option (CaLan 85963A Option 050 or Option 052)
- 3010R with the dual path option (CaLan 85962A Option 052)

The setup of the 1777 and the 1777P requires the use of a receiver such as the 3010R. The setup of the 3010H or 3010R with the forward sweep transmitter or dual path option can be done internally or by using a receiver.

Setting Up the 3010H Forward Sweep

Use the following procedure to set up the “3010H with the forward sweep transmitter or dual path” option or the “3010R with the dual path” option as the forward sweep transmitter.

NOTE:**To Avoid Confusion**

When discussing the use of the “3010H with the forward sweep transmitter or dual path option” or “3010R with the dual path option” as the forward sweep transmitter, these transmitters are referred to only as the *3010H* or the *3010H transmitter*.

All future references in this chapter to the “3010R” are referring to the *3010R as a forward sweep receiver*.

Sweep Installation

The 3010R contains two types of tables: the frequency plan and the sweep table. The frequency plan relates visual and aural frequencies to channels and is used to make level measurements and to create the sweep table. The sweep table is made up of frequencies, guard bands, and dwell times and is used by the receiver and the transmitter to produce the sweep response. Frequencies in the sweep table 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.

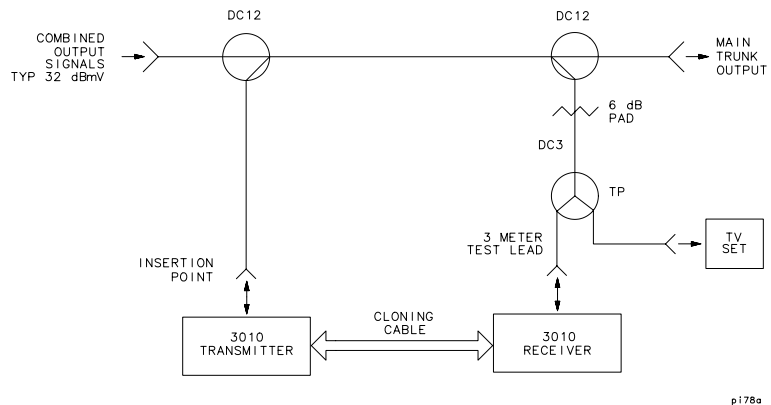
We will take you through the steps for installing the transmitter and receiver, creating a sweep table using the selected frequency table, setting the output level and slope of the transmitter, evaluation of the response for stability, editing of the set up parameters for best sweep stability, and storing a reference.

NOTE:**Downloading from an Existing Transmitter**

With a 3010H installed in your system, the sweep table can be downloaded via the pilot carrier to your 3010R. For the procedure to download sweep tables from the transmitter to the 3010R, proceed to the “Downloading from an Existing Transmitter” section later in this chapter.

Transmitter Installation

The transmitter is typically installed at the headend or hub site. Depending on your particular configuration, the insertion point is normally 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.



p178a

Figure 5-1 The Directional Couplers Used as Combiners

The test point monitored by the 3010R must be located beyond the point where the channels and the transmitter are combined. In many 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 a hybrid fiber coax (HFC) system, you may use the output test point for the drive amplifier of the forward path laser.

Locate the sweep insertion point for the transmitter and the monitor test point in your system.

NOTE:

To avoid interference to the channels on the system, do not put your 3010H in the forward sweep transmit mode until you set up a basic sweep table.

Transmitter Installation

Sweep tables created in the 3010R are transferred to the 3010H via the RS-232. The baud rate of both units must be identical. Before we enter the setup mode, you should check the current baud rate of the receiver by pressing **Menu Option**.

```
@More ↓↑ Scrolls Menu
-----
Auto Monitor
System Status
Calibration
Battery 11.7Vdc
Table 1 Baud 16MAY97 +95.1F
Plan 1 9600 12:05 +35.1C
```

Figure 5-2 System Status Screen

The current baud rate is displayed above **F2**.

NOTE:

3010H Baud Rate

The baud rate should be set to 9600 or 19,200 to transfer the sweep table to a 3010H.

To change the baud rate, press **▼** (3 times).

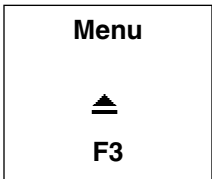
```
@More ↓↑ Scrolls Menu          Select F Key
-----
Set Variable Dwell Time
Set Date and Time and Baud Rate
Set FCC RePort Defaults
Date      Time      Baud
16MAY97   12:06   9600
```

Figure 5-3 Set Date and Time and Baud Rate Screen

Press **F3** and use the **▲ ▼** keys to set the value. Press **Enter** to exit and save the change.

Viewing Existing Sweep Setup Parameters

Quick Reference




The Measurement Mode screen is the start up screen for the 3010R. To enter the Sweep Setup mode from any screen, press **Menu**, then press  until Forward Sweep is highlighted, and finally press **F3**.



Figure 5-4 Sweep Setup Menu

The Sweep Setup menu can recall a previously stored table, edit an existing table, 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, select “Full Setup” and press **F3**.

Viewing Existing Sweep Setup Parameters

Setting Sweep Parameter Control

Current Sweep Parameters					>
Start Freq	0005	Scan Type	Phantom		
Stop Freq	1000	CH Plan	1	Plan 1	
Pilot Freq	0050.00	Swp Table	-	None	
		RS232	OFF		
Edit		New Table		Abort	

Figure 5-5 Sweep Parameter Control Screen

NOTE:

Since the CaLan 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 on 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**. 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.

Current Sweep Parameters				
Start Freq	0040	Scan Type	Phantom	
Stop Freq	0000	CH Plan	1	Plan 1
Pilot Freq	0050.00	SwP Table	-	None
		RS232	OFF	
Edit		New Table		Abort

Figure 5-6 Current Sweep Parameters

To calculate the stop frequency for your system, add 20 MHz to the highest aural 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 Enter to save the changes and move to the pilot frequency.

Current Sweep Parameters				
Start Freq	0040	Scan Type	Phantom	
Stop Freq	0470	CH Plan	1	Plan 1
Pilot Freq	0050.00	SwP Table	-	None
		RS232	OFF	
Edit		New Table		Abort

Figure 5-7 Current Sweep Parameters

Viewing Existing Sweep Setup Parameters

The forward sweep pilot is the frequency which the 3010H uses to communicate with the 3010R. The unit is normally shipped with the pilot set to 50 MHz. The frequency chosen must be free of interference from other carriers..

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

Current Sweep Parameters				>
Start Freq	0040	Scan Type	Phantom	
Stop Freq	0470	CH Plan	1	Plan 1
Pilot Freq	0050.00	Swp Table	-	None
		RS232	OFF	
Edit		New Table		Abort

Figure 5-8 Current Sweep Parameters

The next sweep parameter is scan type. There are two scan types available in the 3010R: Standard Scan and Phantom Scan. With the Standard Scan selected, the 3010R will scan the RF input using the selected frequency plan. If a channel is detected on the system, the 3010R 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 3010R will scan the RF input using the selected frequency plan. If a channel is detected on the system, the 3010R will add the phantom offset frequency, programmed in the Set Scan Parameters screen, to the visual carrier and insert 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 a NTSC system, the phantom carrier offset frequency is typically 1.95 MHz and the phantom carrier guard band is 2.9 MHz.

Viewing Existing Sweep Setup Parameters

Channels detected with a digital dwell will be handled the same with either standard or phantom scan. The center frequency will be entered in the sweep table with a dwell of zero and a guard band equal to one-half of the span of the digital carrier.

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, 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 in the manual will 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 on an NTSC system is 2.2 MHz and sweep resolution for a phantom setup is 6 MHz. Considering the nature of a broadband network, 6 MHz resolution is adequate to test the response of the network.

To select the scan type, with “Scan Type” highlighted, press **F1**.

Use the **▲ ▼** keys to select the scan type. Press **Enter** to save the changes.

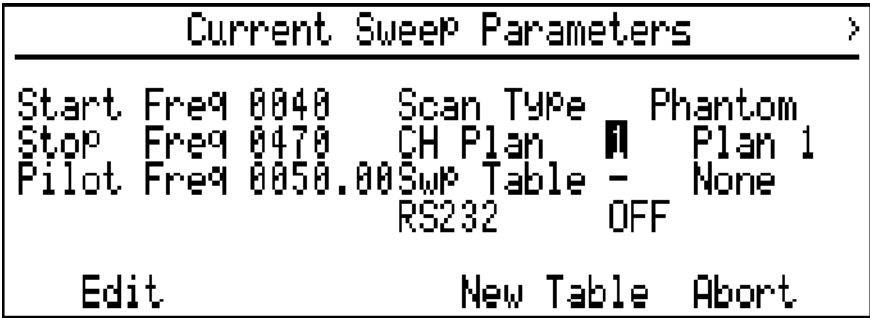


Figure 5-9 Current Sweep Parameters

Viewing Existing Sweep Setup Parameters

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

```
Current Sweep Parameters >
-----
Start Freq 0040      Scan Type Phantom
Stop Freq 0470      CH Plan 1 Plan 1
Pilot Freq 0050.00  Swp Table  None
                    RS232 OFF
Edit                New Table Abort
```

Figure 5-10 Current Sweep Parameters

The 3010R has four files reserved for sweep tables.

NOTE:

Sweep tables stored in the 3010R include the start and stop frequencies. If you select a previously stored 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 store the table. If you would like to create a new table, set the sweep table to "None".

NOTE:

RS-232 Status

The status of the RS-232 connection to the transmitter is shown in the Current Sweep Parameter screen. If the cable is connected and the 3010H is in the "upload" mode, the RS-232 will be on.

After you have the parameters set, press **F3** to continue to the Start, Stop, Scan screen. Connect the 3010R to the output test point of the headend. If the first amplifier is in the headend, use the output test point on the amplifier that you will use to sweep the system.

NOTE:

The following section, “Scanning and Creating a Sweep Table” describes the creation of a new basic sweep table. If you set the sweep table to one of the stored tables, continue at the “Edit Table” section. To change the start and stop frequencies without deleting the existing table, press **Enter** to return to the Forward Sweep Setup menu. Then press **▼ F3** to edit the existing table.

Scanning and Creating a Sweep Table

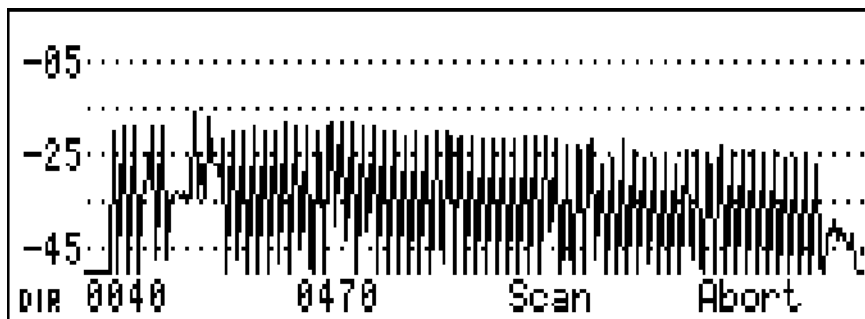


Figure 5-11 The Start, Stop, Scan Screen

NOTE:

If a stored sweep table has been selected, this screen will be skipped. Set the sweep table selection 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 select the digits and **◀ ▶** 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 3010R will detect all of the carriers present on the system, set the full-scale level so that all of the carriers appear in the upper portion of the display, without going off the display.

Viewing Existing Sweep Setup Parameters

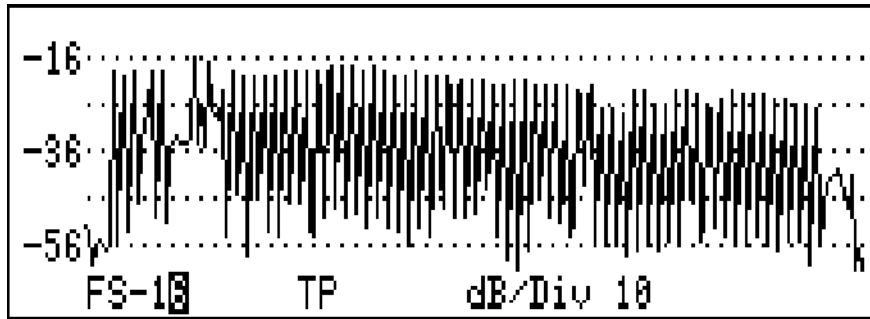


Figure 5-12 Sweep Parameter Sweep

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.

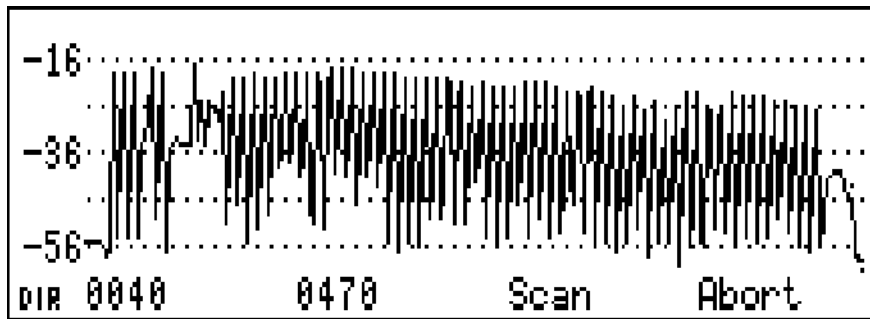
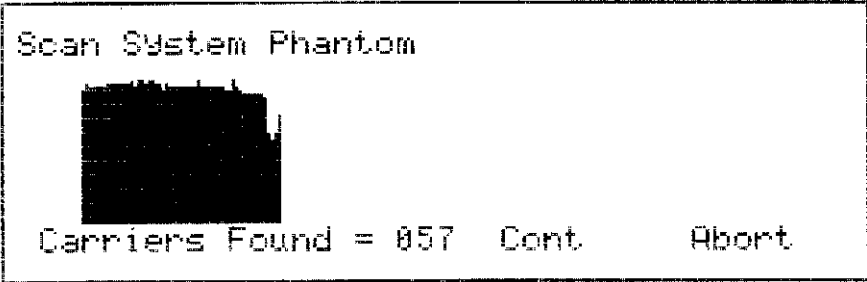


Figure 5-13 Start Stop Scan Screen

You are now ready to scan the system. Press **F3** to create the sweep table.



pi7134

Figure 5-14 Scan Screen

The Scan screen displays the number of carriers entered into the 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** 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.

Editing a Frequency in the Sweep Table

To edit a frequency in the sweep table, use the \blacktriangle \blacktriangledown keys to highlight the frequency and press **F1**.

The screenshot shows a terminal window titled "More ↓↑ To Scroll Edit Table 57 Items". It displays a table with four columns: Item, Freq, Guard Band, and Dwell. The first three rows of the table are highlighted with a black background. The first row shows Item 000, Freq 0057.20, Guard Band 02.9, and Dwell 0. The second row, which is the most prominent, shows Item 001, Freq 0063.20, Guard Band 02.9, and Dwell 0. The third row shows Item 002, Freq 0069.20, Guard Band 02.9, and Dwell 0. Below this, the table headers are repeated: Item, Freq, Guard Band, Dwell, followed by the first row of data: 001, 0063.20, 02.9, 0.

Item	Freq	Guard Band	Dwell
000	0057.20	02.9	0
001	0063.20	02.9	0
002	0069.20	02.9	0
Item	Freq	Guard Band	Dwell
001	0063.20	02.9	0

pi7136

Figure 5-15 Edit Sweep Frequency Screen

The item number is automatically set by the 3010H. To change the frequency, press **F2** and use the \blacktriangleleft \blacktriangleright keys to select the digit and the \blacktriangle \blacktriangledown keys to change the value.

To change the guard band, press **F3** and use the \blacktriangleleft \blacktriangleright keys to select the digit and the \blacktriangle \blacktriangledown keys to change the value.

To change the dwell, press **F4** and use the \blacktriangle \blacktriangledown keys to change the value.

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

More Review Sweep Table			
Item	Freq	Guard Band	Dwell
056	0429.20	02.9	0
000	0057.20	02.9	0
001	0053.20	02.9	0
Edit	Insert		Delete
Freq	Freq	Cont	Freq

pi7135

Figure 5-16 Review Sweep Table Screen

Inserting a New Frequency

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

More ↓↑ To Scroll Edit Table 57 Items			
Item	Freq	Guard Band	Dwell
001	0053.20	02.9	0
002	0069.20	02.9	0
Item	Freq	Guard Band	Dwell
001	0069.20	02.9	0

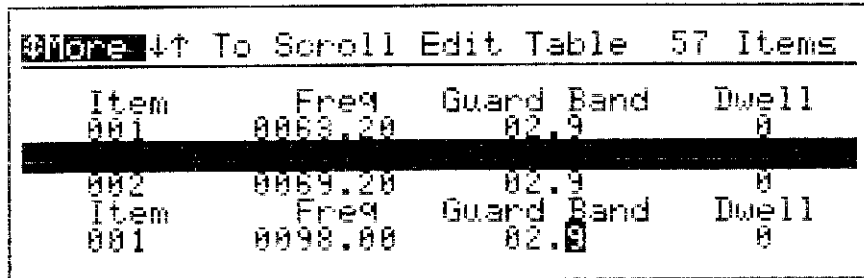
pi7137

Figure 5-17 Frequency Screen

The cursor is highlighting the frequency value.

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

Editing the Sweep Table



```
More ↓↑ To Scroll Edit Table 57 Items
Item      Freq      Guard Band  Dwell
001      0063.20    02.9
002      0069.20    02.9
Item      Freq      Guard Band  Dwell
001      0098.00    02.9
```

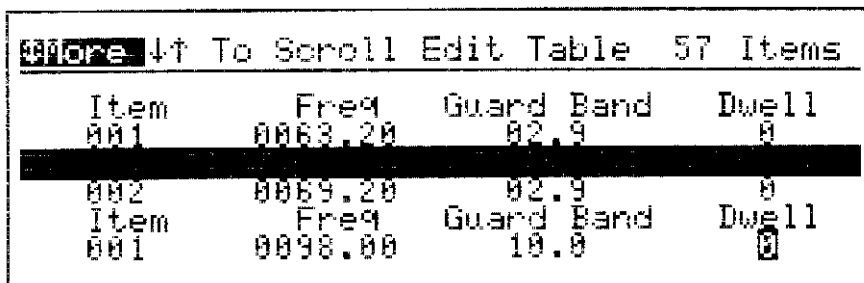
pi7138

Figure 5-18 Setting the Guard Band

NOTE:

It is recommended that you use guard bands to ensure sweep stability. If you sweep through spectrum that uses digital signals, the transmitted sweep points can cause a higher than normal bit errors on these digital signals.

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



```
More ↓↑ To Scroll Edit Table 57 Items
Item      Freq      Guard Band  Dwell
001      0063.20    02.9
002      0069.20    02.9
Item      Freq      Guard Band  Dwell
001      0098.00    10.0
```

pi7139

Figure 5-19 Setting the Dwell

Use the **▲ ▼** keys to set the dwell. Press **Enter** to insert the new frequency in the 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.

Item	Freq	Guard Band	Dwell
004	0085.20	02.9	0
005	0098.00	10.0	0
006	0123.20	02.9	0

Edit Freq Insert Freq Cont Delete Freq

pi7140

Figure 5-20 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**.

Item	Freq	Guard Band	Dwell
004	0085.20	02.9	0
005	0098.00	10.0	0
006	0123.20	02.9	0

Are You Sure!

Yes No Delete Abort

pi7141

Figure 5-21 Deleting a Frequency from the Sweep Table

Editing 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 screen 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 selected frequency. 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 μ s	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 receiver not to read the carrier level and to display the area on the trace at the level of the last measured point.

Quick Reference

Edit Sweep Table
Menu
▲
F3
▼
F3

Although phantom scan was used to create the basic table, any frequency using any dwell from 0 to 3, or guard band up to 20 MHz, can be inserted in 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. You can return to the Edit Table screen from the Sweep menu after you have completed the setup. If you need to change the table, follow the steps in the quick reference block above.

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 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 table. Give them a 1 MHz guard band and a 0 dwell.

Frequency	Guard Band	Dwell Time
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

Editing the Sweep Table

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

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

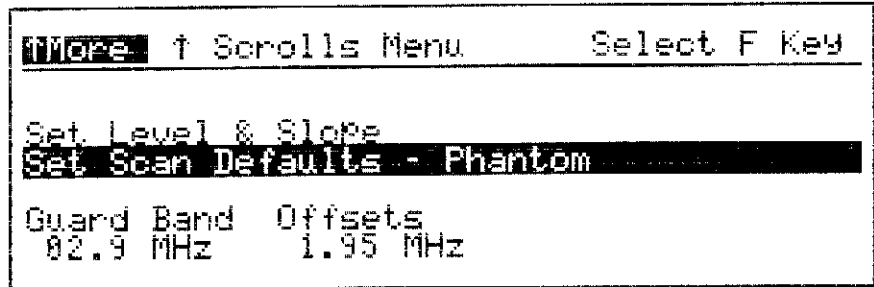
For example, if your system uses channel 4 and channel 36 as the amplifier pilot frequencies, you would insert 67.25 MHz and 295.25 MHz and assign them a 2.2 MHz guard band and a dwell of 1.

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 5-22.



pi7142

Figure 5-22 Inserting Phantom Carriers

The phantom carrier frequency can be 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 is injected into the vestigial sideband of the upper adjacent channel and will sometimes interfere with the data stream modulated on the aural carrier for the scrambled channel. The interference may be visible 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 receiver will measure the level of the aural carrier instead of the sweep point.

Standard Setup Configurations

Editing the Sweep Table

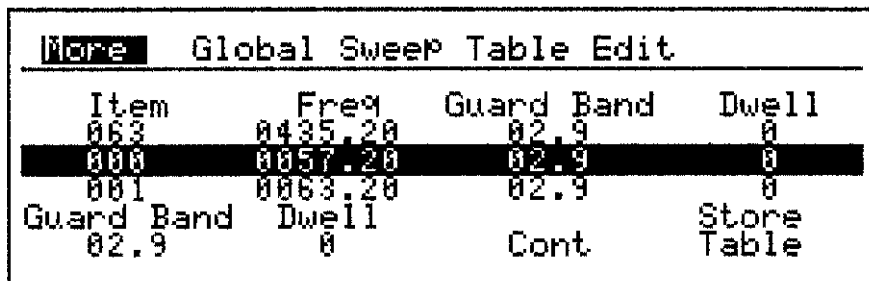
The Standard Setup configuration for the sweep system produces maximum resolution. For this setup, the sweep response consists of measurements from the visual carrier, the aural carrier and a sweep measurement point injected by the transmitter into the center of the channel. The standard setup inserts the visual carrier and the aural carrier into the 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 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 receiver must wait longer than the 100 μ s 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.



Item	Freq	Guard Band	Dwell
000	0435.20	02.9	0
001	0057.20	02.9	0
Guard Band	Dwell	Cont	Store Table
02.9	0		

pi7209

Figure 5-23 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 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.

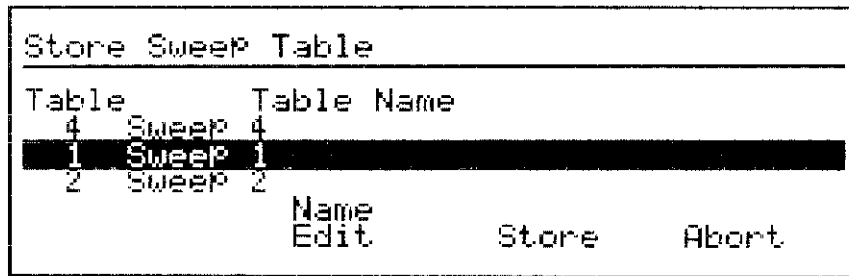
Storing a Sweep Table

Storing a Sweep Table

The 3010R 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**.

NOTE:

There are only 4 sweep tables total. If you store the forward table in sweep table 1, do not store the return sweep table in table 1 because it will overwrite the forward table



pi758

Figure 5-24 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.

Setting the 3010H in the Transmitter Mode

Before the sweep table can be transferred to the 3010H, the following conditions must be met. The baud rate of the 3010H must match the baud rate set in the 3010R. The forward sweep pilot must be set to the same frequency as the forward sweep pilot in the 3010R. The 3010H must be in the forward sweep transmitter mode with the RS-232/Upload function displayed above **F3** set to upload.

Setting the Baud Rate of the 3010H

Changing the baud rate of the 3010H is performed using the same method used to change the baud rate of the 3010R. From the main menu, press **Option**.

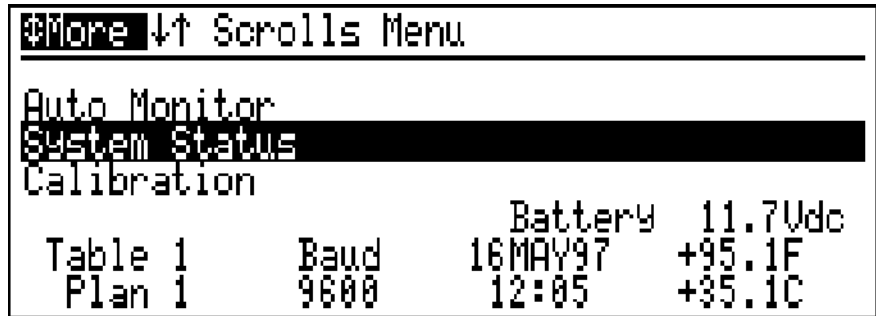


Figure 5-25 System Status Screen

The current baud rate is displayed over **F2** and it must be the same as the current baud rate set in the 3010R.

To change the baud rate, press **▼** (3 times).

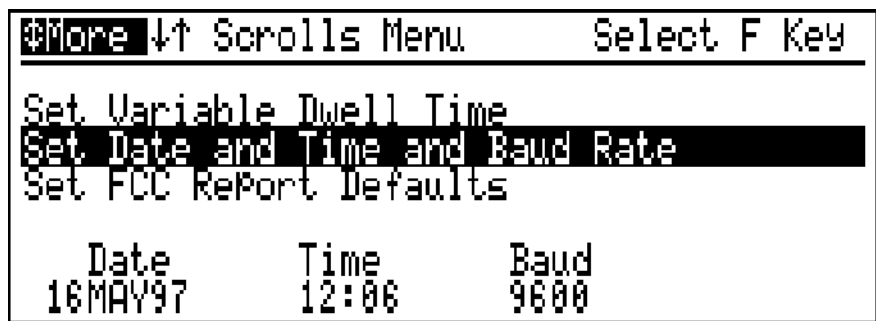


Figure 5-26 Set Date and Time and Baud Rate Screen

Press **F3** and use the **▲** **▼** keys to set the new baud rate. Press **Enter** to exit and save the change.

Setting the 3010H in the Transmitter Mode

Setting the Forward Sweep Pilot

The Forward Sweep Pilot is set in the Forward Sweep Parameters screen of the 3010H. To enter the Forward Sweep Parameters screen, press **Menu** \blacktriangle **F3** (2 times).

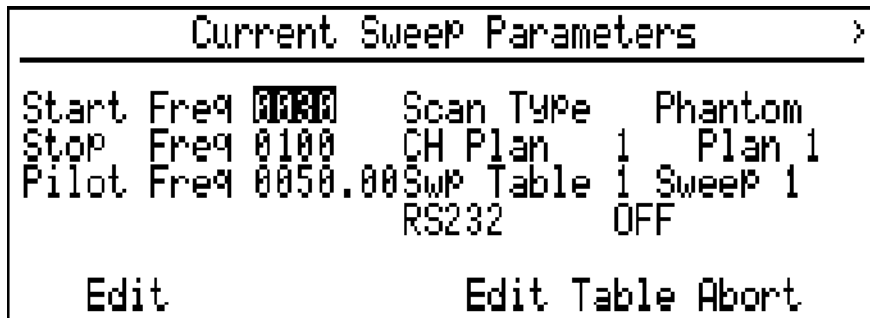


Figure 5-27 Forward Sweep Parameters Screen

As shown in Figure 5-27, the pilot is set to 50 MHz. To change the pilot frequency, use the arrow keys to highlight the pilot frequency.

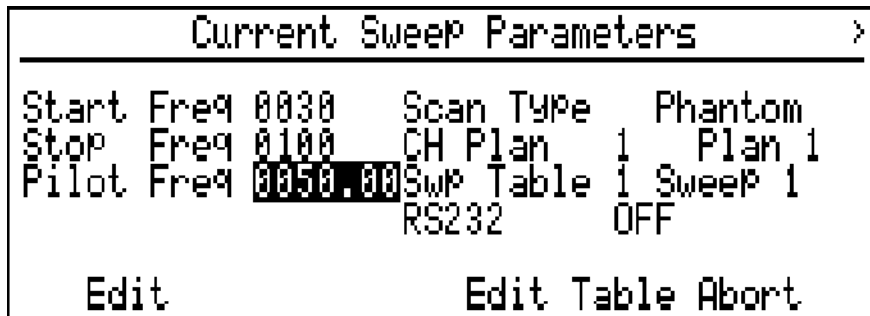


Figure 5-28 Forward Sweep Parameter Screen with the Pilot Highlighted

Press **F1** and use the \blacktriangleleft \blacktriangleright keys to select the digit and the \blacktriangle \blacktriangledown keys to set the value. Press **Enter** twice to save the change.

Entering the Forward Transmitter Mode

When the 3010H is placed in the transmit mode, it will begin to sweep with the sweep table stored into memory. If you are not sure which sweep table is stored in the 3010H, do not connect the RF output to the insertion point of the system until you re-store the table from the 3010R to the 3010H.

To enter the Forward Sweep Transmitter mode, press **Menu** \blacktriangle **F1**.



Figure 5-29 Forward Sweep Transmit Screen

Setting the RS232/Upload function to the “Upload” position allows the 3010H to accept the upload. To toggle the function, press **F3** to set the label to show “Upload”.



Figure 5-30 Forward Sweep Transmit Screen with RS232 Set to Upload

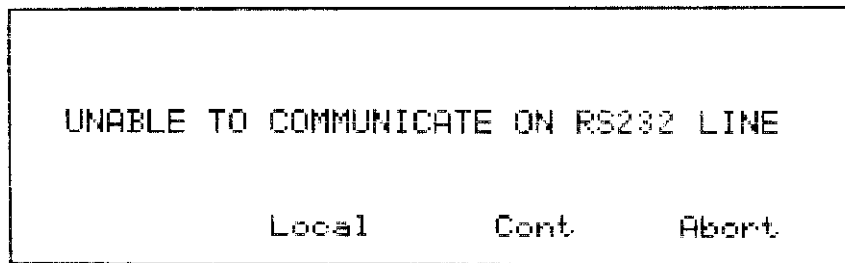
The 3010H is ready to accept the sweep table from the 3010R.

Transferring the Sweep Table to the Transmitter

The sweep table in the 3010R is now ready to be sent to the 3010H sweep transmitter via the RS-232 communication cable. Make sure that the RS-232 cable is connected between the 3010R and the 3010H. The instrument cloning cable can be used for this connection. Refer to Chapter 12 for a pin configuration for the cable.

To transfer the sweep table to the 3010H, press **F3**.

The message “Data Transfer now in process” will appear on the screen and the activity label will change to upload. If the RS-232 cable is not connected, the following message will be displayed on the screen of the 3010R.



pi759

Figure 5-31 RS-232 Warning Screen

If the warning screen is displayed, check the connection of the RS-232 cable, the baud rate setting on the transmitter, and that the RS232/Upload label is displayed above **F3**. With a connection between the 3010R and the transmitter, the 3010R will begin the data transfer. If you have a problem that cannot be repaired at this time, press **F4** to return to the Global Update screen and store the table to the file server.

After the data is transferred to the transmitter the 3010R will begin to look for the transmitter pilot. At this point, the 3010H should be connected to the sweep insertion point of the system and the receiver should be connected to the output test point of the system.

Transferring the Sweep Table to the Transmitter

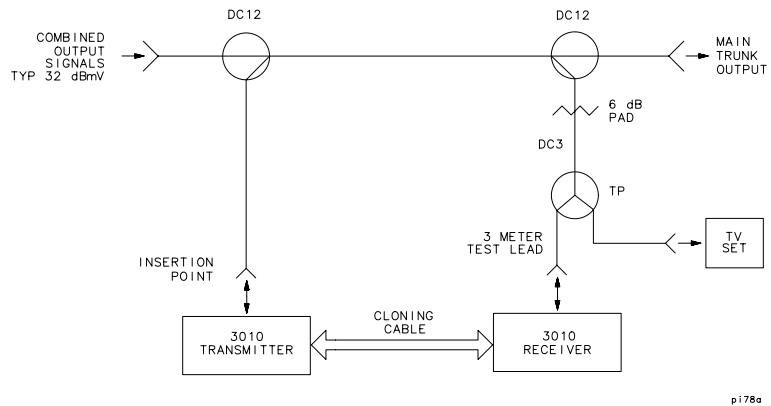


Figure 5-32 Sweep Insertion Setup

Notice the flashing indicator in the upper right corner of the screen, indicating the presence of the pilot information from the 3010H. If the indicator is not flashing, you may not have the pilot frequency matched between the 3010H and the 3010R.

After completion of the data transfer, the next screen will appear. In this screen, you will set the sweep level, adjust the slope of the transmitter, and adjust the attenuation of the displayed sweep.

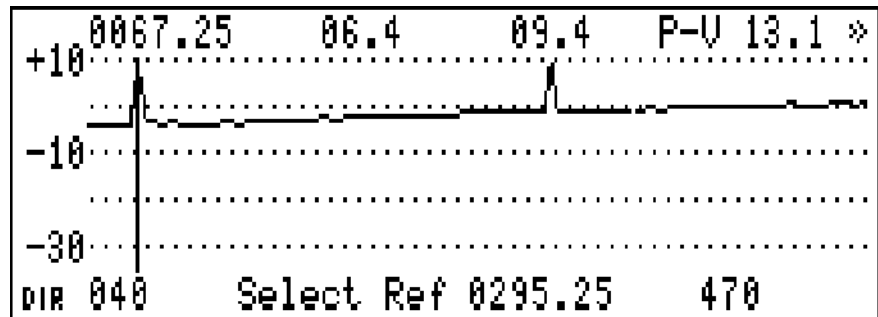


Figure 5-33 Sweep Display with Marker on Low System Amplifier Pilot Channel

Transferring the Sweep Table to the Transmitter

The “Set Level and Slope” screen shows a Phantom Carrier screen with the visual frequency of two pilots added. See Figure 5-33. The low pilot is channel 4 and the high 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 5-33. Note the frequency and the level displayed at the top of the screen. This is the level of the low system pilot. Move the marker to the sweep points above the low pilot.

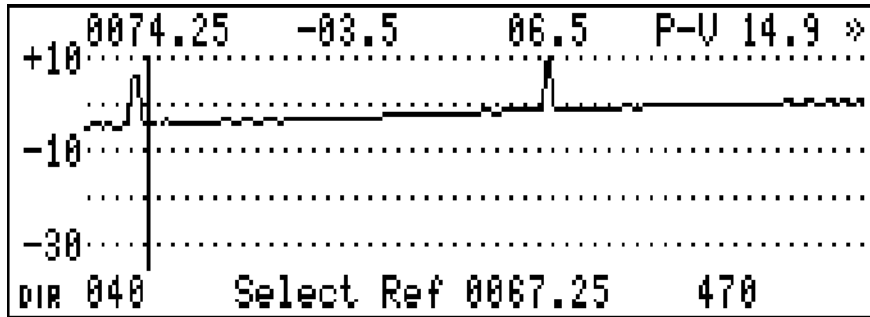


Figure 5-34 Sweep Display With Marker Next to the Low System Amplifier Pilot Channel

With the marker in this position, you are reading the absolute level of the sweep points produced from the 3010H. Note the level of the sweep points. They should be 10 dB below the level of the low pilot carrier.

The output range of the 3010H is between +10 dBmV and +50 dBmV, with a slope range of ± 9 dB. When controlling the 3010H through the RS-232 port, the range is limited to the range of the 1777 transmitter. The output range of a 1777 transmitter is between +35 dBmV and +47 dBmV.

The slope control varies the high frequency with respect to the low frequency. For example, if the transmitter is set for 45 dBmV, you could set the high frequency 9 dB lower in level. If the transmitter is set to an output level of 40 dBmV, the high frequency could be set 7 dB higher or 5 dB lower than the low frequency. To find the output level of the 3010H, press **F1**. With the RS-232 cable connected, the output level of the 3010H will be displayed above the softkey. The output level can now be changed using the **▲** **▼** keys. Change the output level of the 3010H and note the

Transferring the Sweep Table to the Transmitter

change on the screen. Note that the level shown at the marker frequency has also changed. The marker will read the frequency and the level of the measurement point represented on the screen.

The slope adjustment is similar to the adjustment of the transmitter gain. The 3010H slope control adjusts the level at the highest frequency with respect to the lowest frequency displayed on the screen. The adjustment is easily made by observing the relationship between the high pilot level and the sweep points. As in the gain adjustment, you can measure the absolute level of the high pilot carrier and the sweep point next to it and adjust the slope until a difference of 10 dB is achieved.

After the slope is set, press **Enter** to save the change.

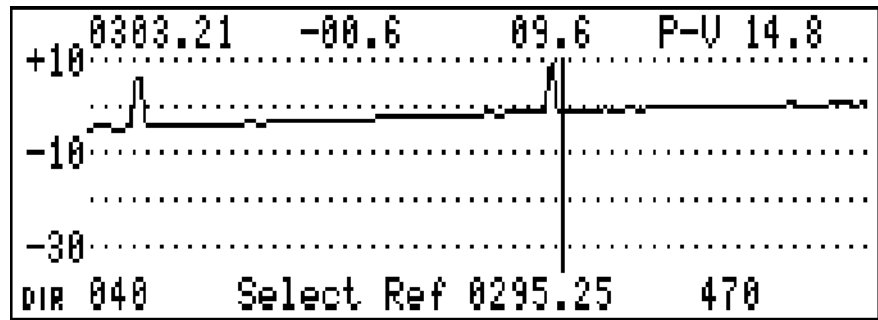


Figure 5-35 Sweep Display With Marker Next to the Higher System Amplifier Pilot Channel

It is important to remember that the value entered as a slope value is at the stop frequency. Therefore, it must be a larger value than the change needed at the pilot frequency.

When adjusting the 3010H output and slope levels, 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 output port of the 3010H to insure a correct impedance match.

As previously stated, the output range of the 3010H is limited when controlled by a receiver through the RS-232 port. The full output range can be achieved by setting the level and slope of the 3010H in the “Set Level and Slope Screen” in the 3010H.

Transferring the Sweep Table to the Transmitter

To access the “Set Level and Slope Screen” in the 3010H, press **F1** twice to exit the Forward Sweep Transmit mode and return to the Main Menu. Then press **▲ F3** **▲ ▼** to highlight the Set Level and Slope selection in the Forward Sweep Setup menu.

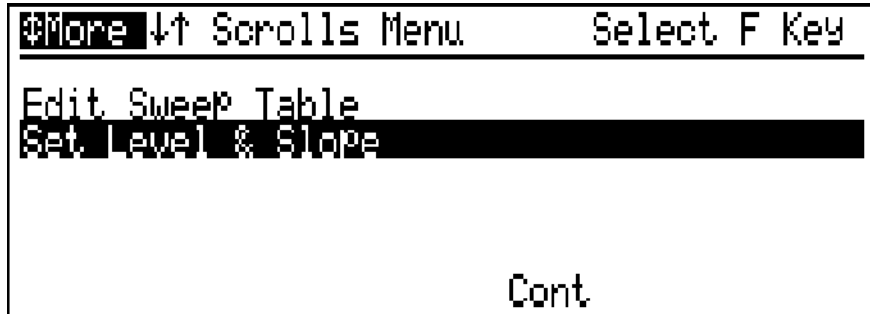


Figure 5-36 Set Level and Slope Selection in the Forward Sweep Setup Menu

Press **F3** to enter the Set Level and Slope screen.

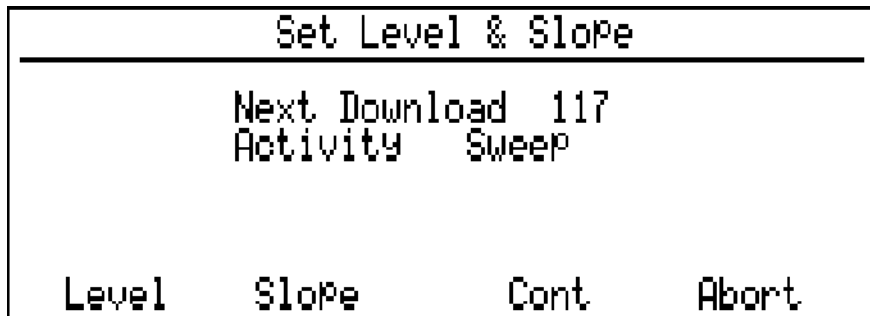


Figure 5-37 Set Level and Slope Screen

When this screen is displayed, the 3010H begins to sweep and the response can be viewed on the 3010R. Press **F1** to set the level or **F2** to set the slope on the 3010H. Use the **◀** **▶** keys to select the digit and the **▲** **▼** keys to set the value. When the level and the slope are set, press **F3** to exit the “Set Level and Slope” screen and return to the forward sweep transmit mode.

The 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 level and slope are set, press **F3** on the 3010R to enter the Reference Average screen.

Fine Tuning the Sweep Response

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

Notice the “Ref. Avg. in Process...” message. The dots to the right of the message are indicators used to give a measure of the stability of the response to be stored away as the reference.

If there is less than a 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 remains stable, all dots and the message will 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
- Unstable carrier levels
- Portions of the sweep response at the noise floor

Transferring the Sweep Table to the Transmitter

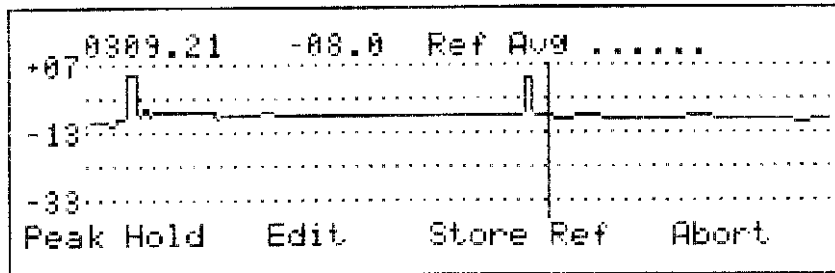
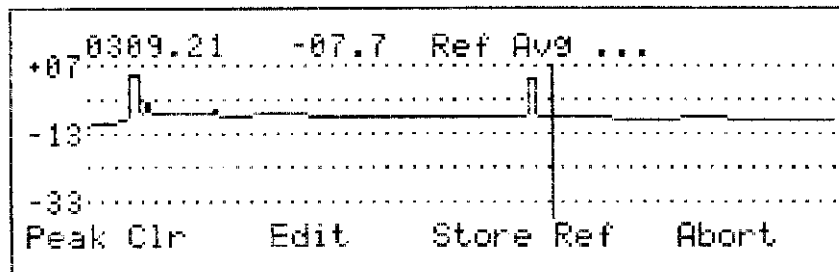


Figure 5-38 Edit and Store Reference Screen

If the “Ref. Avg. in Process” message disappears, press **F3** to store the sweep response as a reference. If the message did not disappear, press **F1** and turn the Peak Hold function on.



pi766

Figure 5-39 Edit Store With Peak Hold On

The “Peak Hold” message above the **F1** key will change to “Peak Clr” when peak hold is activated. Peak hold will hold the peak levels and you can measure the approximate frequency of the interference. This is frequently caused by a dwell of 1 on a scrambled carrier, or a carrier on the system that was not accounted for in the table.

Transferring the Sweep Table to the Transmitter

After you have measured all of the frequencies that need to be edited, press **F2** to return to the edit screen, edit the table, and save the new table into the 3010H by pressing **F3** (2 times).

NOTE:

Another method of finding variations in the response is to store the reference and view it in the Normalized sweep mode in 2 dB/div with Peak Hold turned on. The smoothing and the averaging functions should be set to 0%. Any variation more than one division is the area of the response that should be corrected.

Storing the Reference

Storing the Reference

To enter the Store Reference screen, press **F3**.

```
Store Ref
-----
Ref      Ref      Ref Name
 12      Ref 12
 1       Ref 1
 2       Ref 2
                                     Name
                                     Edit
                                     Store
                                     Abort
```

Figure 5-40 Store Reference File Selection Screen

The 3010R stores up to 12 reference files. In the “Store Ref” selection screen, the destination file is highlighted. Use the \blacktriangle \blacktriangledown keys to select the file. Press **F2** to name the file or press **F3** to store the reference and exit to the Center Normalized mode with the reference file selected.

NOTE:

There are only 12 reference storage files in the 3010R. If you store the forward reference in file 1, ensure that you store the return reference in another file

```
+20 0309.21      00.0      03.6      P-U 03.6
.....
+00 -----
.....
-20
DIR 040      Ref 1      0295.25      470
```

pi767

Figure 5-41 Normalized Response Screen

The setup procedure for the 3010R and the 3010H is complete. Proceed to Chapter 6 for operational instructions.

Installing and Programming the 1777 Sweep Transmitter

To power-up the 1777 or 1777P transmitter:

1. Connect the power cord to the 1777 or the charger jack to the 1777P.
2. Connect the other end of the power plug or the charger to an appropriate power source. For domestic units, the source will be 115 Vac 60 Hz.
3. If your transmitter has a multi-pilot option, select the appropriate pilot for your system using the pilot selector switch found on the back panel of a 1777 or the front panel on a 1777P. See Figure 5-49 and Figure 5-50.
4. Check the “BAUD SELECT” switch on the front panel of the transmitter. The baud rate should be set to “1776” when the 3010R is used to setup the 1777.
5. Turn on the transmitter. The red power indicator light should be on.

NOTE:

The yellow run light on the transmitter should begin to flash at a one-second rate.

6. Turn the transmitter off.

Sweep Installation

The 3010R contains two types of tables: the frequency plan and the sweep table. The frequency plan relates visual and aural frequencies to channels and is used to make level measurements and to create the sweep table. The sweep table is made up of frequencies, guard bands, and dwell times and is used by the receiver and the transmitter to produce the sweep response. Frequencies in the sweep table may be carriers on the system, or they may be used for positioning 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 frequency.

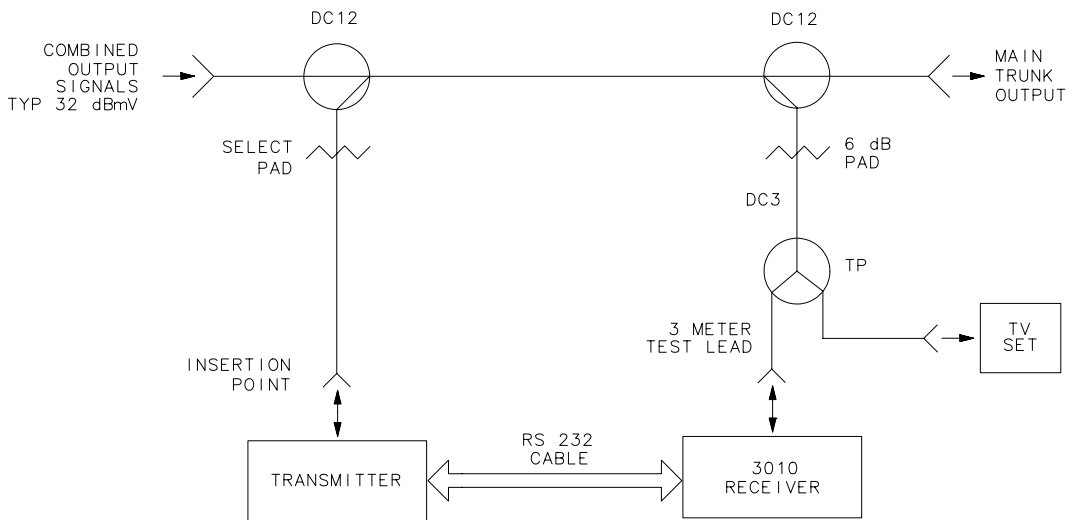
We will take you through the steps for installing the transmitter and receiver, creating a sweep table using the selected frequency table, setting the output level and slope of the transmitter, evaluation of the response for stability, editing of the set up parameters for best sweep stability and storing a reference.

NOTE:**Downloading from an Existing Transmitter**

With a 1777 installed in your system, the sweep table can be downloaded via the pilot carrier into your 3010R. For the procedure to download sweep tables from the transmitter to the 3010R, proceed to the “Downloading from an Existing Transmitter” section later in this chapter.

Transmitter Installation

The transmitter is typically installed at the headend or hub site. Depending on your particular configuration, the insertion point is normally 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.



pi 760

Figure 5-42 The Directional Couplers Used as Combiners

The test point monitored by the 3010R must be located beyond the point where the channels and the transmitter are combined. In many 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. However, in a hybrid fiber coax (HFC) system, you may use the output test point for the drive amplifier of the forward path laser.

Locate the sweep insertion point for the transmitter and the monitor test point in your system.

Transmitter Installation

NOTE:

To avoid any interference to the channels on the system, do not connect the transmitter to the sweep insertion point until it is programmed. The transmitter is shipped programmed with a blank table that may cause sweep points to fall on channels used in your system.

Sweep tables created in the 3010R are transferred to the 1777 transmitter. The baud rate of both units must be set to the same rate. Check that the baud rate of the 1777 is set to “1776”. Check that the current baud rate of the 3010R receiver is set to 9600 by pressing **Menu Option**.

More ↓↑ Scrolls Menu			
Auto Monitor			
System Status			
Calibration			
Table 1	Baud	Battery	11.7Vdc
Plan 1	9600	16MAY97	+95.1F
		12:05	+35.1C

Figure 5-43 System Status Screen

The current baud rate is displayed above **F2**.

NOTE:

3010R and 1777 Baud Rates

The 3010R baud rate *must be* set to “9600” to transfer the sweep table to a 1777. The baud rate on the front panel of the 1777 transmitter *must be* set to “1776”.

To change the baud rate on the 3010R, press ▼ (3 times).

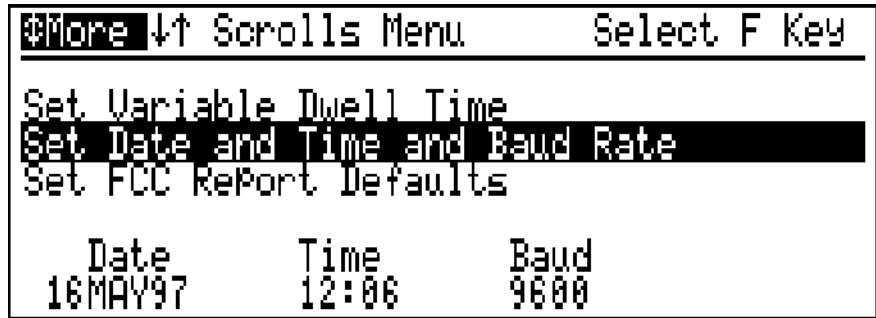
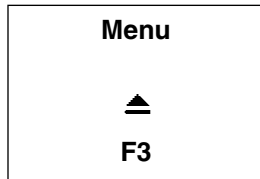



Figure 5-44 Set Date and Time and Baud Rate Screen

Press **F3** and use the ▲ ▼ keys to set the value. Press **Enter** to exit and save the change.

Viewing Existing Sweep Setup Parameters

Quick Reference



The Measurement Mode screen is the start up screen for the 3010R. To enter the Sweep Setup mode from any screen, press **Menu**  **F3**.

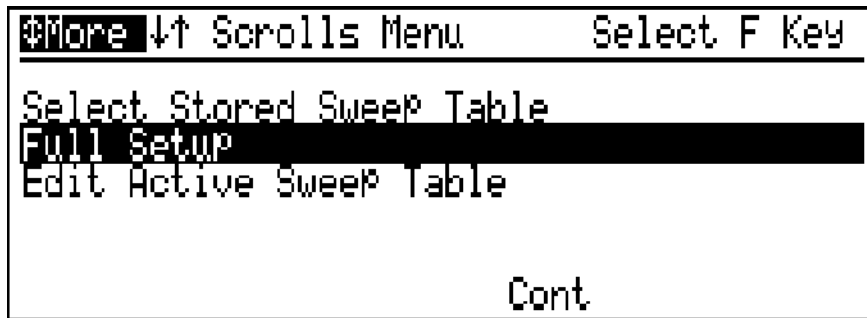


Figure 5-45 Sweep Setup Menu

The Sweep Setup menu can recall a previously stored table, edit an existing table, 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, select “Full Setup” and press **F3**.

Setting Sweep
Parameter Control

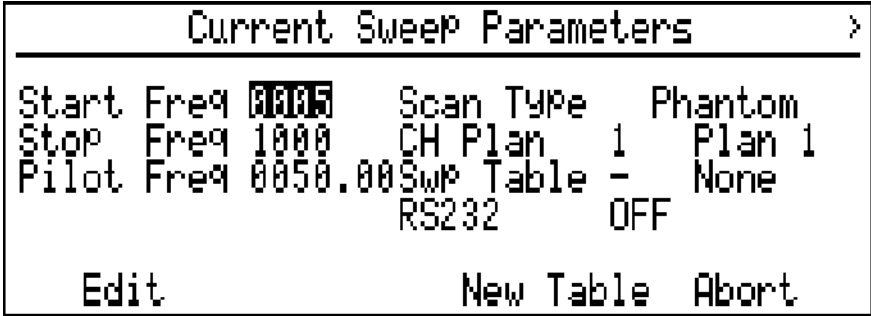


Figure 5-46 Sweep Parameter Control Screen

NOTE:

Since the CaLan 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 on your system.

To calculate the start frequency for testing your system, subtract 15 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**. 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.

Viewing Existing Sweep Setup Parameters

Current Sweep Parameters					>
Start Freq	0040	Scan Type	Phantom		
Stop Freq	0000	CH Plan	1	Plan 1	
Pilot Freq	0050.00	Swp Table	-	None	
		RS232	OFF		
Edit		New Table		Abort	

Figure 5-47 Current Sweep Parameters

To calculate the stop frequency for your system, add 20 MHz to the highest aural 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.

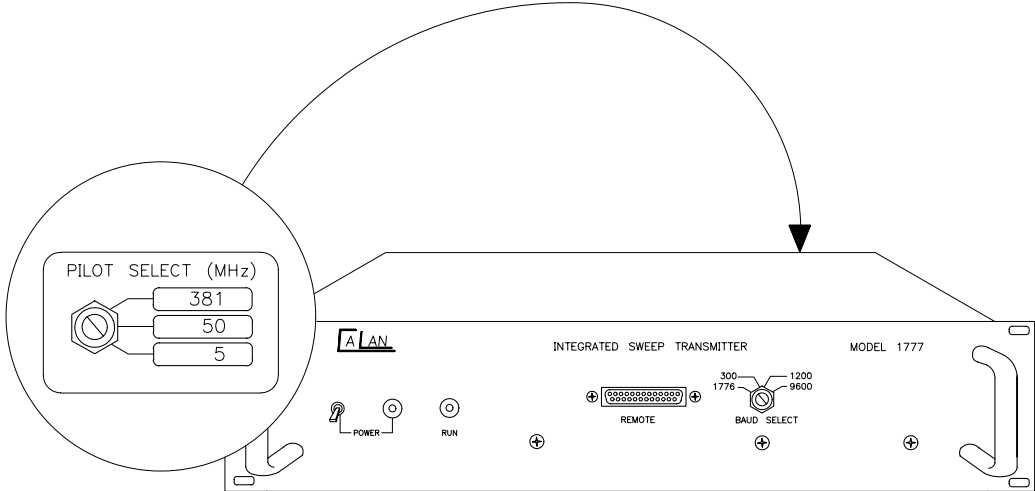
To change the stop frequency, press **F1**. Use the **◀** **▶** keys to select the digit and the **▲** **▼** keys to set the value. Press **Enter** to save the changes and move to the pilot frequency.

Current Sweep Parameters					>
Start Freq	0040	Scan Type	Phantom		
Stop Freq	0470	CH Plan	1	Plan 1	
Pilot Freq	0050.00	Swp Table	-	None	
		RS232	OFF		
Edit		New Table		Abort	

Figure 5-48 Current Sweep Parameters

Viewing Existing Sweep Setup Parameters

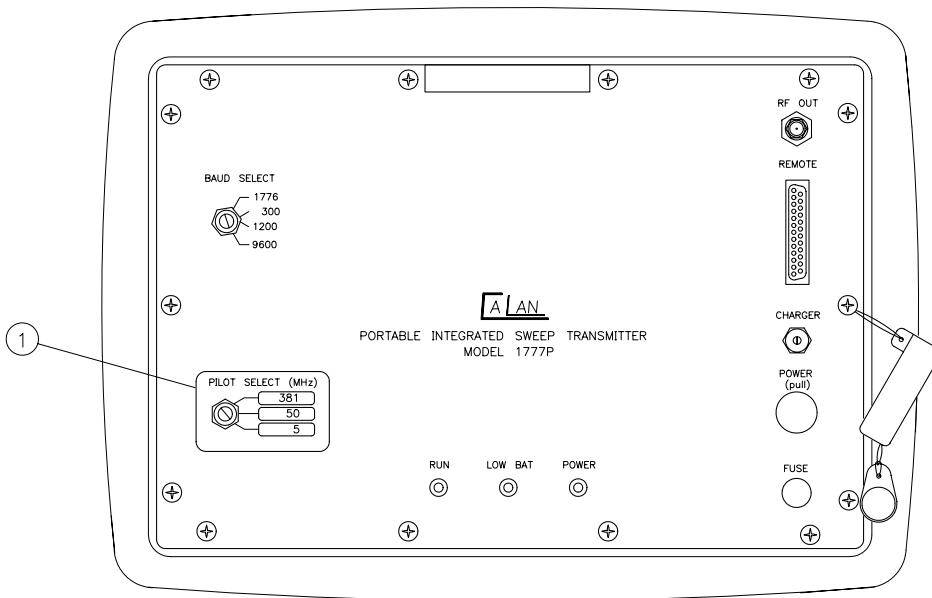
The pilot is the frequency which the 1777 uses to communicate with the 3010R. The unit is normally shipped with the pilot set for 50 MHz or 43 MHz. Check the 1777 transmitter pilot switch to see which pilots are installed in the 1777. The pilot frequency set in the 3010R must match the pilot frequency selected in the 1777.



pi756

Figure 5-49 1777 Pilot Switch

Viewing Existing Sweep Setup Parameters



pi757

Figure 5-50 1777P Pilot Switch

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

Current Sweep Parameters				
Start Freq	0040	Scan Type	Phantom	
Stop Freq	0470	CH Plan	1	Plan 1
Pilot Freq	0050.00	Swp Table	-	None
		RS232	OFF	
Edit		New Table Abort		

Figure 5-51 Current Sweep Parameters

The next sweep parameter is scan type. There are two scan types available in the 3010R: Standard Scan and Phantom Scan. With the Standard Scan selected, the 3010R will scan the RF input using the selected frequency plan. If a channel is detected on the system, 3010R 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 3010R will scan the RF input using the selected frequency plan. If a channel is detected on the system, the 3010R will add the phantom offset frequency, programmed in the Set Scan Parameters screen, to the visual carrier and insert 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 a NTSC system, the phantom carrier offset frequency is typically 1.95 MHz and the phantom carrier guard band is 2.9 MHz.

Channels detected with a digital dwell will be handled the same with either standard or phantom scan. The center frequency will be entered in the sweep table with a dwell of zero and a guard band of 0.1 MHz less than one-half of the span of the digital carrier.

Viewing Existing Sweep Setup Parameters

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, 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 in the manual will 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 on an NTSC system is 2.2 MHz and sweep resolution for a phantom setup is 6 MHz. Considering the nature of a broadband network, 6 MHz resolution is adequate to test the response of the network.

To select the scan type, with “Scan Type” highlighted, press **F1**.

Use the **▲** **▼** keys to select the scan type. Press **Enter** to save the changes.

```
Current Sweep Parameters >
-----
Start Freq 0040   Scan Type   Phantom
Stop  Freq 0470   CH Plan    █    Plan 1
Pilot Freq 0050.00 Swp Table  -    None
                    RS232     OFF

Edit                New Table  Abort
```

Figure 5-52 Current Sweep Parameters

The 3010R has four programmable frequency plans, as described in Chapter 3. The active plan is displayed on the screen and should be the plan created for the system to be tested. For this example, the plan is Plan 1 created in Chapter 2. To change the

plan, use the arrow keys to highlight the selected plan. Press **F1** and use the **▲** **▼** keys to select the new plan. Press **Enter** to save the changes and highlight the sweep table selection.

Current Sweep Parameters			
Start Freq	0040	Scan Type	Phantom
Stop Freq	0470	CH Plan	Plan 1
Pilot Freq	0050.00	Swp Table	None
		RS232	OFF
Edit		New Table Abort	

Figure 5-53 Current Sweep Parameters

The 3010R has four files reserved for sweep tables.

NOTE:

Sweep tables stored in the 3010R include the start and stop frequencies. If you select a previously stored 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 store the table. If you would like to create a new table, set the sweep table to "None".

NOTE:

RS-232 Status

The status of the RS-232 connection to the 1777 is shown in the Current Sweep Parameters screen. If the cable is connected, the RS-232 will be on.

After you have the parameters set, press **F3** to continue to the Start, Stop, Scan screen. Connect the 3010R to the output test point of the headend. If the first amplifier is in the headend, use the output test point on the amplifier that you will use to sweep the system.

Viewing Existing Sweep Setup Parameters

NOTE:

The following section, “Scanning and Creating a Sweep Table” describes the creation of a new basic sweep table. If you set the sweep table to one of the stored tables, continue at the “Edit Table” section. To change the start and stop frequencies without deleting the existing table, press **Enter** to return to the Forward Sweep Setup menu. Then press **▼ F3** to edit the existing table.

Scanning and Creating a Sweep Table

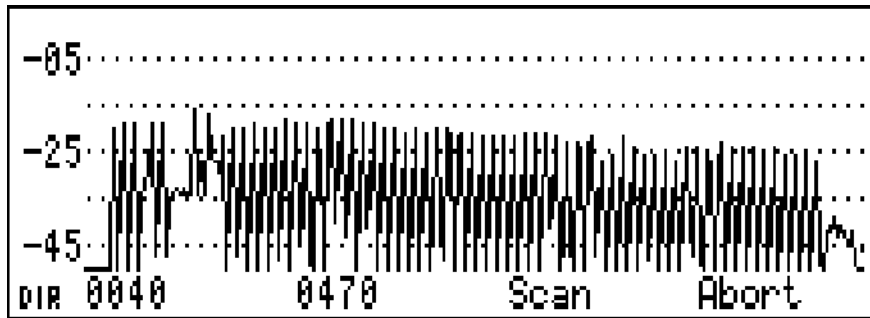


Figure 5-54 The Start, Stop, Scan Screen

NOTE:

If a stored sweep table has been selected, this screen will be skipped. Set the sweep table selection 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 3010R will detect all of the carriers present on the system, set the full-scale level so that all of the carriers appear in the upper portion of the display, without going off the display.

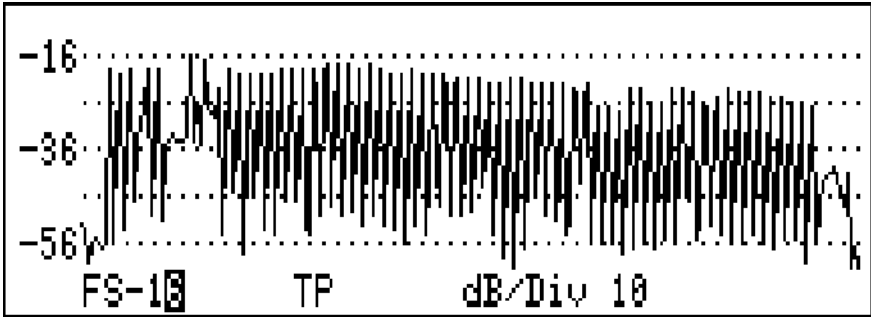


Figure 5-55 Sweep Parameter Sweep

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.

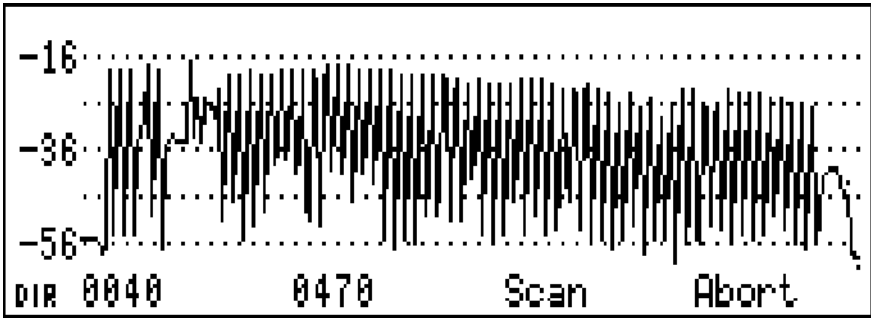
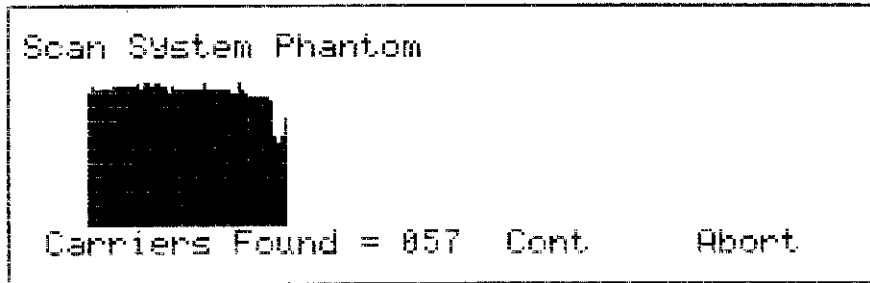


Figure 5-56 Start Stop Scan Screen

You are now ready to scan the system. Press **F3** to create the sweep table.

Viewing Existing Sweep Setup Parameters



pi7134

Figure 5-57 Scan Screen

The Scan screen displays the number of carriers entered into the 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** 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.

Editing a Frequency in the Sweep Table

To edit a frequency in the sweep table, use the \blacktriangle \blacktriangledown keys to highlight the frequency and press **F1**.

The screenshot shows a terminal window titled "More ↓↑ To Scroll Edit Table 57 Items". It displays a table with four columns: Item, Freq, Guard Band, and Dwell. The second row is highlighted with a thick black bar.

Item	Freq	Guard Band	Dwell
000	0057.20	02.9	0
001	0063.20	02.9	0
002	0069.20	02.9	0
Item	Freq	Guard Band	Dwell
001	0063.20	02.9	0

pi7136

Figure 5-58 Edit Sweep Frequency Screen

The item number is automatically set by the 3010R. To change the frequency, press **F2** and use the \blacktriangleleft \blacktriangleright keys to select the digit and the \blacktriangle \blacktriangledown keys to change the value.

To change the guard band, press **F3** and use the \blacktriangleleft \blacktriangleright keys to select the digit and the \blacktriangle \blacktriangledown keys to change the value.

To change the dwell, press **F4** and use the \blacktriangle \blacktriangledown keys to change the value.

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

Editing the Sweep Table

Item	Freq	Guard Band	Dwell
056	0429.20	02.9	0
000	0057.20	02.9	0
001	0053.20	02.9	0

Edit Freq Insert Freq Cont Delete Freq

pi7135

Figure 5-59 Review Sweep Table Screen

Inserting a New Frequency

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

Item	Freq	Guard Band	Dwell
001	0053.20	02.9	0
002	0069.20	02.9	0
001	0089.20	02.9	0

Item Freq Guard Band Dwell

pi7137

Figure 5-60 Frequency Screen

The cursor is highlighting the frequency value.

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

More ↓↑ To Scroll Edit Table 57 Items			
Item	Freq	Guard Band	Dwell
001	0063.20	02.9	0
002	0069.20	02.9	0
Item	Freq	Guard Band	Dwell
001	0098.00	02.9	0

pi7138

Figure 5-61 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.

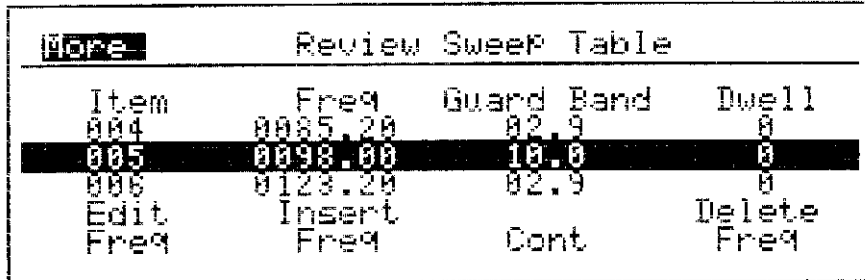
More ↓↑ To Scroll Edit Table 57 Items			
Item	Freq	Guard Band	Dwell
001	0063.20	02.9	0
002	0069.20	02.9	0
Item	Freq	Guard Band	Dwell
001	0098.00	10.0	0

pi7139

Figure 5-62 Setting the Dwell

Editing the Sweep Table

Use the **▲** **▼** keys to set the dwell. Press **Enter** to insert the new frequency in the 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.



Item	Freq	Guard Band	Dwell
004	0085.20	02.9	0
005	0098.00	10.0	0
006	0123.20	02.9	0

More Review Sweep Table

Edit Insert Delete

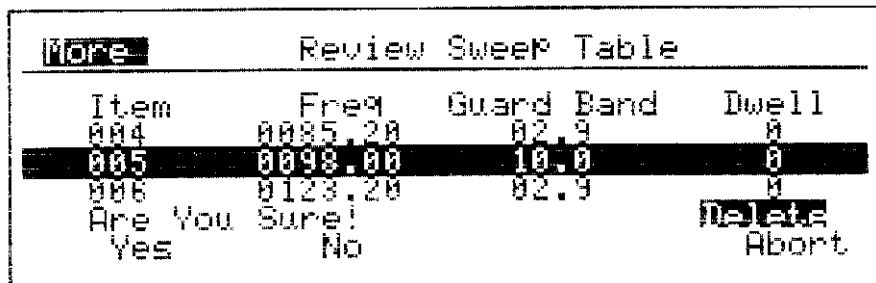
Freq Freq Cont Freq

pi7140

Figure 5-63 Review Sweep Table Screen with New Frequency

Deleting a Frequency in the Sweep Table

Frequencies can be deleted from the sweep table the in same way that 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**.



Item	Freq	Guard Band	Dwell
004	0085.20	02.9	0
005	0098.00	10.0	0
006	0123.20	02.9	0

More Review Sweep Table

Are You Sure!

Yes No Delete Abort

pi7141

Figure 5-64 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 screen 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 selected frequency. Table 5-2 lists dwell times for several applications.

Table 5-2 Dwells, Times, and Applications

Dwell	Time	Application
0	NO READ	Phantom and unstable carriers
1	100 μ s	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 receiver not to read the carrier level and to display the area on the trace at the level of the last measured point.

Quick Reference

Edit Sweep Table

Menu

▲

F3

▼

F3

Editing the Sweep Table

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

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 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 table. Give them a 1 MHz guard band and a 0 dwell.

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

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

For example, if your system uses channel 4 and channel 36 as the 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.

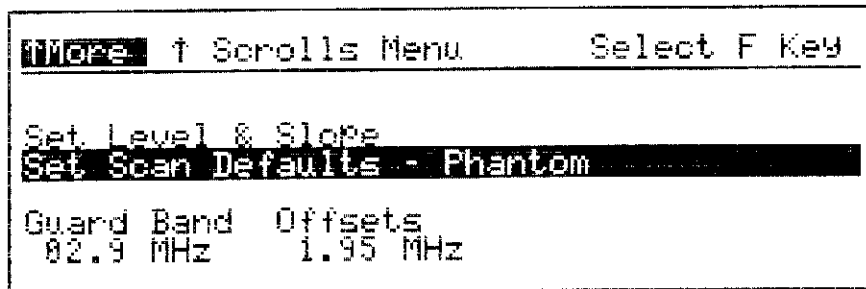
NOTE:

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

Editing the Sweep Table

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 5-65.



pi7142

Figure 5-65 Inserting Phantom Carriers

The phantom carrier frequency can be 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 is injected into the vestigial sideband of the upper adjacent channel and will sometimes interfere with the data stream modulated on the aural carrier for the scrambled channel. The interference may be visible 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 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 setup, the sweep response consists of measurements from the visual carrier, the aural carrier and a sweep measurement point injected by the transmitter into the center of the channel. The standard setup inserts the visual carrier and the aural carrier into the 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 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 receiver must wait longer than the 100 μ s 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.

Item	Freq	Guard Band	Dwell
063	0435.20	02.9	0
000	0057.20	02.9	0
001	0063.20	02.9	0

Guard Band Dwell Store Table
02.9 0 Cont Table

pi7209

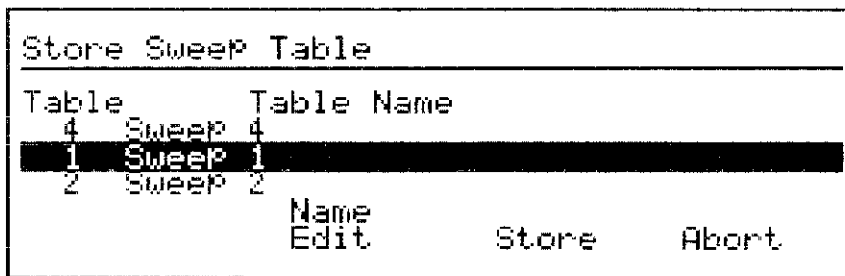
Figure 5-66 Global Edit Screen

Editing the Sweep Table

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 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 3010R 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**.



pi758

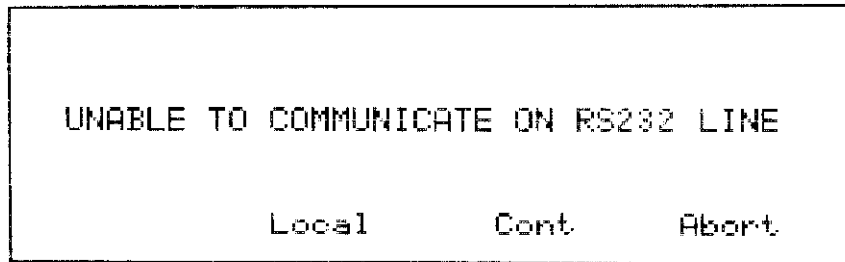
Figure 5-67 Sweep Table File Selection Screen

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.

Transferring the Sweep Table to the Transmitter

The sweep table is now ready to be sent to the 1777 sweep transmitter via the RS-232 communication cable. Make sure that the RS-232 cable is connected between the 3010R and the 1777. The RS-232 cable supplied with the 1777 and the adapter supplied with the 3010R can be used for this connection. Check that the baud rate setting on the 1777 is set to the 1776 position. To change the baud rate on the 1777 transmitter, turn the power switch Off, turn the front panel baud rate switch to the 1776 position, and turn the power back On. To transfer the sweep table to the 1777, press **F3**.

The message “Data Transfer now in process” will appear on the screen and the run light on the transmitter will stay on. If the RS-232 cable is not connected, the following message will be displayed on the screen.



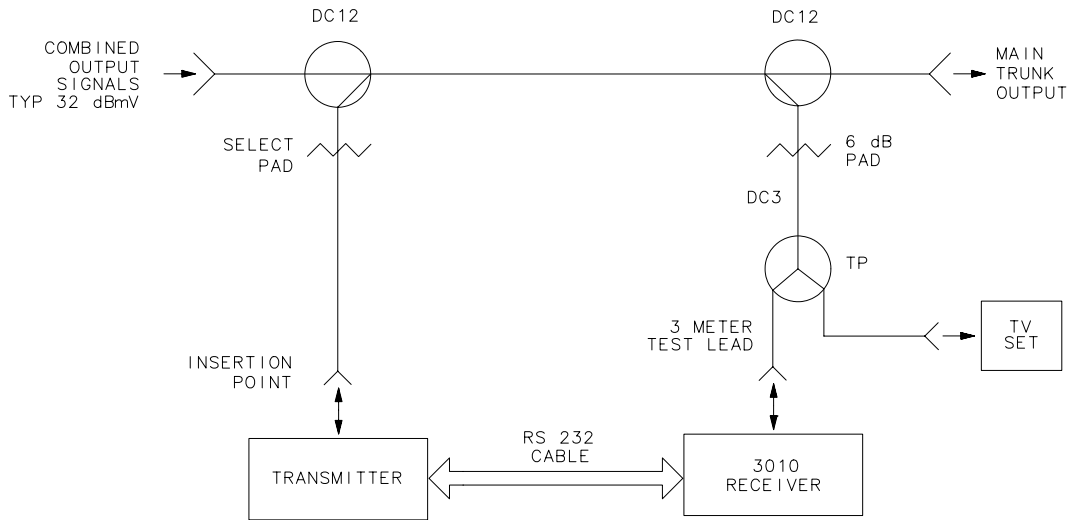
pi759

Figure 5-68 RS-232 Warning Screen

If the warning screen is displayed, check the connection of the RS-232 cable and the baud rate setting on the transmitter. With a connection between the 3010R and the transmitter, the 3010R will begin the data transfer. If you have a problem that cannot be repaired at this time, press **F4** to return to the Global Update screen and store the table to the file server.

Transferring the Sweep Table to the Transmitter

After the data is transferred to the transmitter the 3010R will begin to look for the transmitter pilot. At this point, the 1777 should be connected to the sweep insertion point of the system and the receiver should be connected to the output test point of the system.



pi760

Figure 5-69 Sweep Insertion Setup

Notice the flashing indicator in the upper right corner of the screen, indicating the presence of the pilot information from the 1777. If the indicator is not flashing, you may not have the pilot frequency matched between the 1777 and the 3010R.

After completion of the data transfer, the next screen will appear. In this screen, you will set the sweep level, adjust the slope of the transmitter, and adjust the attenuation of the displayed sweep.

Transferring the Sweep Table to the Transmitter

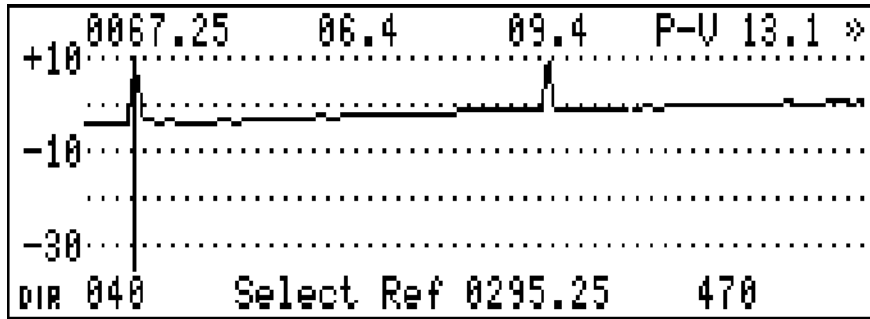


Figure 5-70 Sweep Display with Marker on Low Pilot

The “Set Level and Slope” screen shows a Phantom Carrier screen with the visual frequency of two pilots added. See Figure 5-70. The low pilot is channel 4 and the high 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 5-70. Note the frequency and the level displayed at the top of the screen. This is the level of the low system pilot. Move the marker to the sweep points above the low pilot.

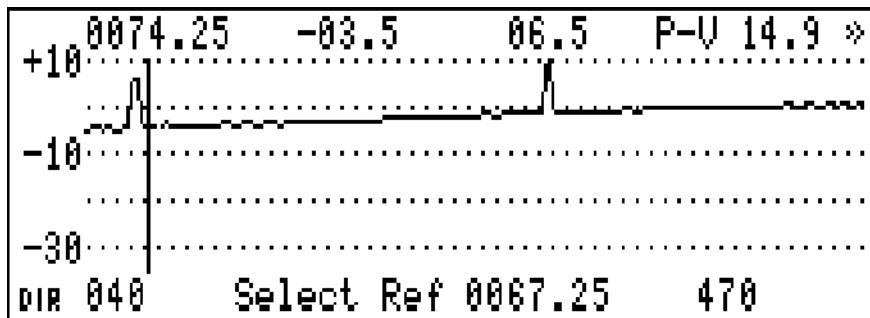


Figure 5-71 Sweep Display With Marker Next to the Low Pilot

With the marker in this position, you are reading the absolute level of the sweep points produced from the 1777. Note the level of the sweep points. They should be 10 dB below the level of the low pilot carrier.

Transferring the Sweep Table to the Transmitter

The 1777 sweep transmitter has an output range between +35 dBmV and +47 dBmV, with a slope range of ± 9 dB. The slope control varies the high frequency with respect to the low frequency. For example, if the transmitter is set for 45 dBmV, you could set the high frequency 9 dB lower in level. If the transmitter is set to an output level of 40 dBmV, the high frequency could be set 7 dB higher or 5 dB lower than the low frequency. To find the output level of the 1777, press **F1**. With the RS-232 cable connected, the output level of the 1777 will be displayed above the softkey. The output level can now be changed using the **▲ ▼** keys. Change the output level of the 1777 and note the change on the screen. Note that the level shown at the marker frequency has also changed. The marker will read the frequency and the level of the measurement point represented on the screen.

The slope adjustment is similar to the adjustment of the transmitter gain. The 1777 slope control adjusts the level at the highest frequency with respect to the lowest frequency displayed on the screen. The adjustment is easily made by observing the relationship between the high pilot level and the sweep points. As in the gain adjustment, you can measure the absolute level of the high pilot carrier and the sweep point next to it and adjust the slope until a difference of 10 dB is achieved.

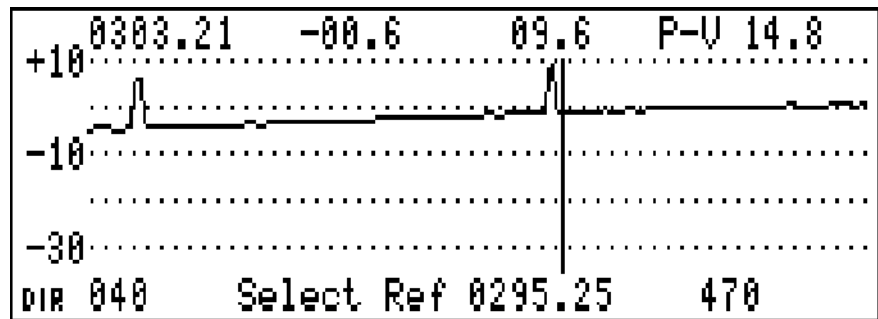


Figure 5-72 Gain and Slope Adjust Screen

It is important to remember that the value entered as a slope value is at the stop frequency. Therefore, it must be a larger value than the change needed at the pilot frequency.

Transferring the Sweep Table to the Transmitter

When adjusting the 1777 output and slope levels, it may be necessary to use external pads between the 1777 and the sweep insertion point to set the operating range for proper slope adjustment. Pads should be placed on the output port of the 1777 to insure a correct impedance match.

The 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** to save the change. Press **F3** to enter the Reference Average screen.

Fine Tuning the Sweep Response

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

Notice the “Ref. Avg. in Process....” message. The dots to the right of the message are indicators used to give a measure of the stability of the response to be stored away as the reference.

If there is less than a 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 remains stable, all dots and the message will 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
- Unstable carrier levels
- Portions of the sweep response at the noise floor

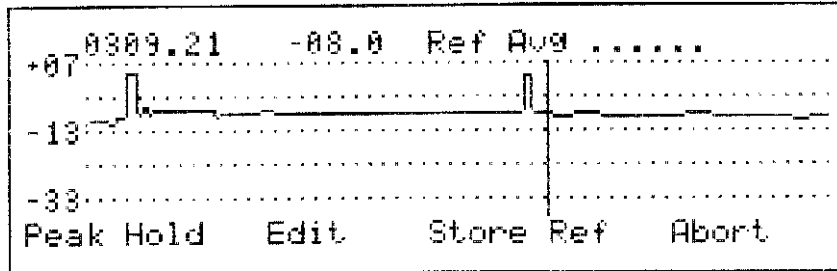
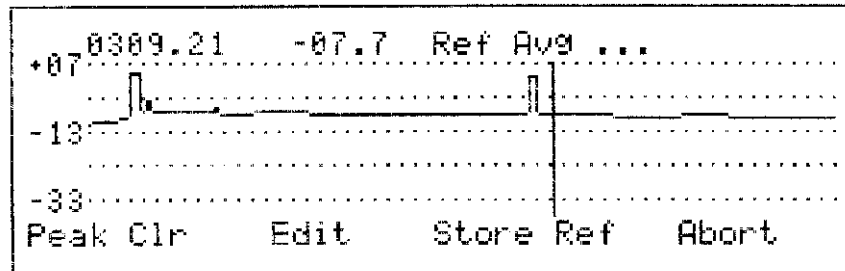


Figure 5-73 Edit and Store Reference Screen

If the "Ref. Avg. in Process" message disappears, press **F3** to store the sweep response as a reference. If the message did not disappear, press **F1** and turn the Peak Hold function on.



pi766

Figure 5-74 Edit Store With Peak Hold On

The "Peak Hold" message above the **F1** key will change to "Peak Clr" when peak hold is activated. Peak hold will hold the peak levels and you can measure the approximate frequency of the interference. This is frequently caused by a dwell of 1 on a scrambled carrier, or a carrier on the system that was not accounted for in the table.

Transferring the Sweep Table to the Transmitter

After you have measured all of the frequencies that need to be edited, press **F2** to return to the edit screen, edit the table, and save the new table into the 1777 by pressing **F3** (2 times).

NOTE:

Another method of finding variations in the response is to store the reference and view it in the Normalized sweep mode in 2 dB/div with Peak Hold turned on. The smoothing and the averaging functions should be set to 0%. Any variation more than one division is the area of the response that should be corrected.

Storing the Reference

To enter the Store Reference screen, press **F3**.

```

Store Ref
-----
Ref      Ref Name
 12      Ref 12
 1       Ref 1
 2       Ref 2
Name
Edit      Store      Abort
  
```

pi765

Figure 5-75 Store Reference File Selection Screen

The 3010R stores up to 12 reference files. In the “Store Ref” selection screen, the destination file is highlighted. Use the \blacktriangle \blacktriangledown keys to select the file. Press **F2** to name the file or press **F3** to store the reference and exit to the Center Normalized mode with the reference file selected.

```

+20 0309.21    00.0    03.6    P-U 03.6
-----
+00-----
-----
-20-----
DIR 040      Ref 1      0295.25    470
  
```

pi767

Figure 5-76 Normalized Response Screen

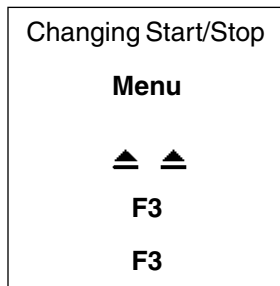
The setup procedure for the 3010R and the 1777 is complete. Proceed to Chapter 6 for operational instructions.

Downloading from an Existing Transmitter

The pilot set in the 3010H or the 1777 and the 3010R synchronizes the transmitter and the receiver. Every 256 sweeps, the 1777 sends the entire setup table, the start frequency, the stop frequency and a check sum value. The 3010H sends the table every 120 sweeps as indicated on the display. When the 3010R detects the download information, it checks the value of the check sum sent by the transmitter against the check sum of the active sweep table in memory. If the check sum values are the same, the 3010R will ignore the download and continue to sweep. However, if the check sum is different, the 3010R will download the new table from the transmitter, reset itself, and begin sweeping with the new table.

Changing the Start and Stop Frequency

Quick Reference



To assure a change in the check sum, the start and stop frequencies must be different from the start and stop frequencies programmed in the transmitter. The start and stop frequencies are changed from the Sweep Parameters screen. To enter the Sweep Parameters screen, from the Main menu, press ▲ F3 (2 times).

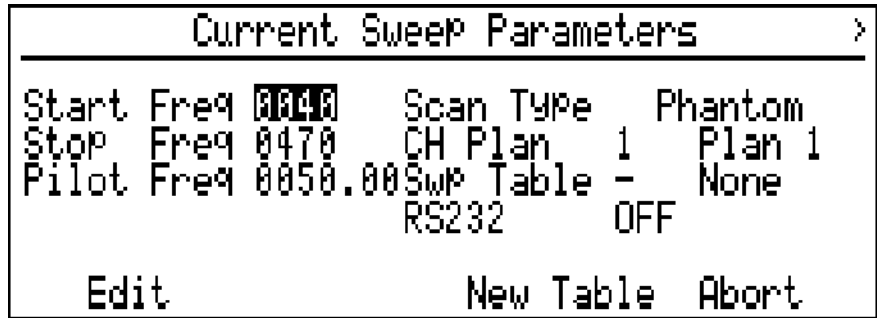


Figure 5-77 Current Sweep Parameters

With the start frequency highlighted, press **F1**. Use the **◀ ▶** keys to select the digit. Then use the **▲ ▼** keys to set the value. The start frequency should be set to a frequency not set in the transmitter. Press **Enter** to save the change and highlight the stop frequency.

Next, set the stop frequency to a frequency different from the one programmed in the transmitter. It is recommended that the span between the frequencies be under 200 MHz, and that they are near the pilot frequency.

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

Changing the Start and Stop Frequency

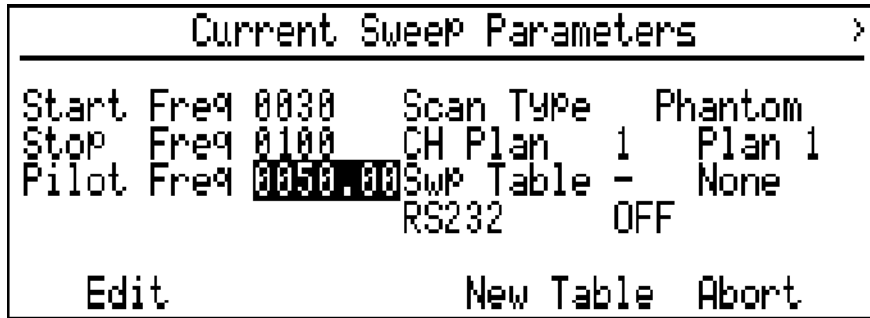


Figure 5-78 Current Sweep Parameters

The sweep will download to the 3010R via the pilot. Set the pilot frequency equal to the pilot frequency programmed in the transmitter by pressing **F1** and using the

◀ ▶ keys to select the digit and the ▲ ▼ keys to set the value. Press **Enter** to save the change.

Disconnect the RF input and the RS-232 cable from the 3010R. Press **F3** (5 times) until you receive the error message shown below.



pi759

Figure 5-79 RS-232 Warning

Press **F2** to exit the Sweep Setup mode.

Changing the Start and Stop Frequency

Connect the 3010R to a test point with the pilot carrier present from a 3010H or a 1777 transmitter. Press **▲ F1** to enter the Sweep mode.

To make sure that you can see the correct sweep trace, the 3010R should be set to the Raw Sweep mode. When the Label function of **F2** is "Select Ref", you are in the Raw Sweep mode. If the label shows a reference file name, you can change it to the Sweep mode by pressing **F2** (2 times).

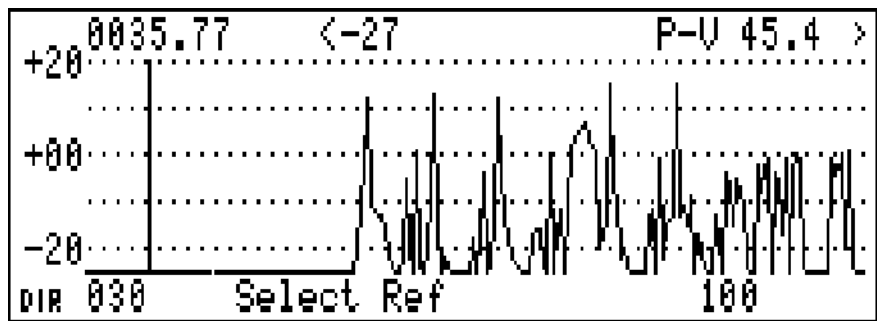
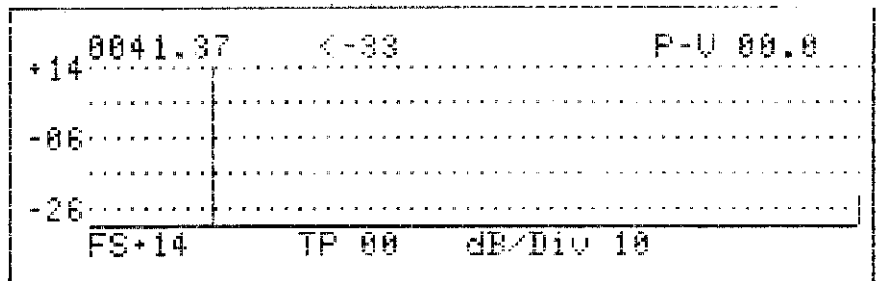


Figure 5-80 Raw Sweep with Different Sweep Table from the Transmitter

It is important to insure that the level of the signal into the 3010R is not too high or too low. To check the scaling, press **Scale**.



pi7146

Figure 5-81 Setting the Scaling

Changing the Start and Stop Frequency

The full-scale value should be set so that all of the carriers on the system are in the upper division of the display. Depending on the difference between the tables in the transmitter and the 3010R, the screen 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 carrier 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.

It is important to set the maximum viewing range on the screen to make sure that you can see the raw sweep trace. To change the dB/Div to 10 dB, press **F3** and use the ▲ ▼ keys to change the value to 10 dB.

Press **Enter** to save the changes and return to the raw sweep display.

If you are using a 3010H and are at the same location, you can force the 3010H to download the table by pressing **F4** with the unit in the forward sweep transmit mode.



Figure 5-82 Forward Sweep Transmitter Screen

Pressing **F4** will trigger the download function and display the action on the screen.

If you are using a 1777 transmitter, it may take up to 5 minutes to download from the transmitter, depending on the table.

Changing the Start and Stop Frequency

When the 3010R sees the difference in the check sum, the screen will stop updating, the 3010R will download the new table, reset itself, and begin to sweep. The raw sweep response will then appear on the screen.

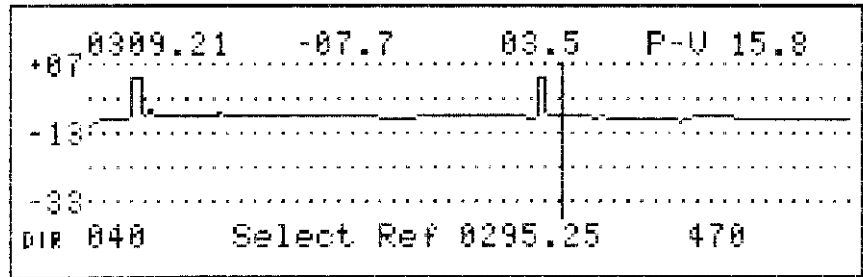


Figure 5-83 Raw Sweep Screen

Once the 3010R receives the table and is sweeping, you must store a reference to use the Normalized Sweep mode. To store a reference at this test point, press **Option**

▲ F3.

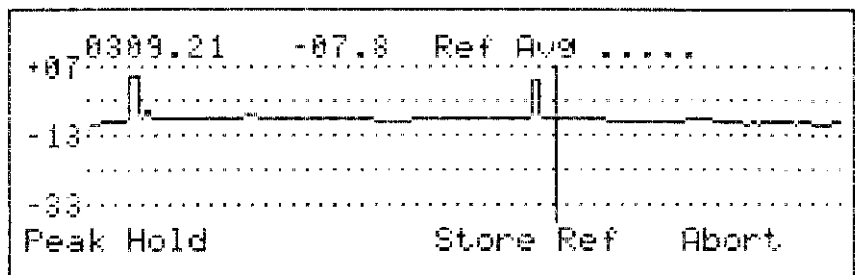
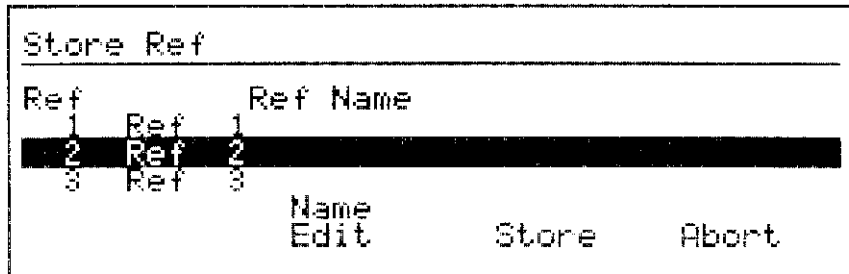


Figure 5-84 Reference Averaging Screen

Changing the Start and Stop Frequency

The Reference Average message is displayed in the upper right corner to indicate the stability of the response. The 3010R averages consecutive sweep responses and if the level does not change more than 2 dB, the 3010R will remove one dot at a time until the message has disappeared. After the message has disappeared, or when you are satisfied that the reference is usable, press **F3** to enter the reference section of the file server.



pi778

Figure 5-85 Reference File Selection Screen

Use the **▲** **▼** keys 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 in the highlighted file, press **F3**. The 3010R will store the reference in the selected file, exit the file server, and enter the Normalized mode with the new reference selected. The reference label will appear over **F2**.

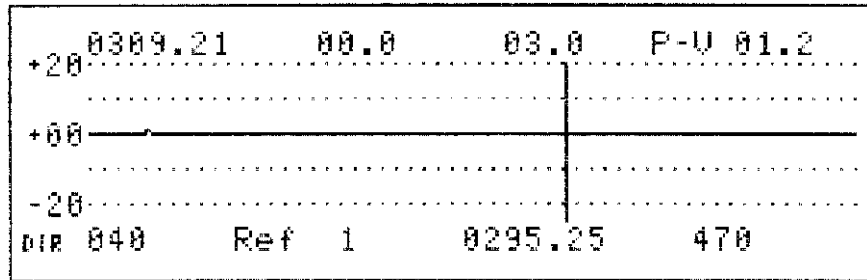


Figure 5-86 Normalized Sweep Screen

Changing the Start and Stop Frequency

Forward Sweep Measurements

Forward Sweep Measurements

Sweep Mode

The Sweep mode allows the 3010R to integrate carrier level measurements with received sweep information from the transmitter. Raw sweep responses can be stored in one of 12 reference files and used to make comparison measurements in the Normalized mode. Along with the relative response measurement, the 3010R allows you to simultaneously measure the absolute value of system pilots preprogrammed as active carriers in the sweep table on the display. To adjust for differences between expected test point readings, the 3010R uses the preset scaling option to program pre-determined the offset values. By programming the expected levels for the four Prescale functions, offsets are automatically calculated and applied to the normalized trace.

In the message line at the top of the screen, the 3010R displays: the frequency ① and level ② of the variable marker, the absolute channel level ③ selected over F3, and the peak-to-valley ④ of the trace displayed on the screen. See Figure 6-1.

In Chapter 5, we suggest setting the start and stop frequencies so that the rolloff of the filters and the amplifiers can be seen. The 3010R allows you to change the start and the stop frequency and increase the resolution without changing the start and stop frequencies of the transmitter. This allows you to take a closer look at the peak-to-valley measurement over a specific span.

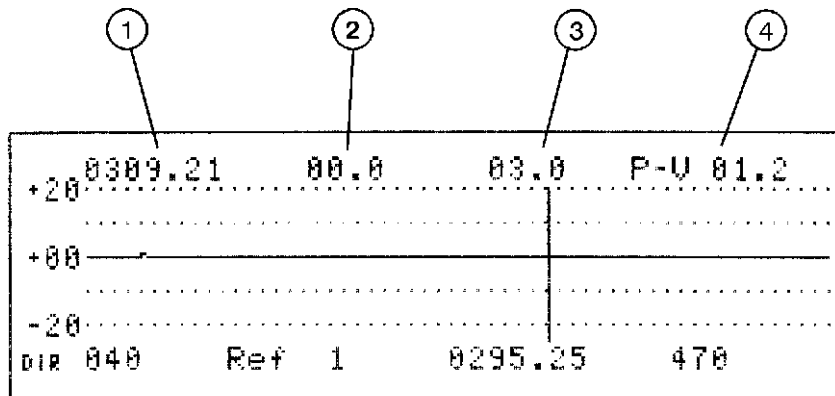


Figure 6-1 Center Normalized Mode with Components Indicated

Sweep Rate

The sweep rate for the forward sweep and the return sweep is determined by the nature of the sweep table and the transmitter that is used. If the 3010H is used as the forward sweep transmitter, the sweep rate can be optimized by setting the transmitter to “Fast”. The rate mode will be automatically downloaded to the receiver. This is indicated by the flashing sweep indicator in the upper right corner of the display as shown in Figure 6-2 and Figure 6-3.

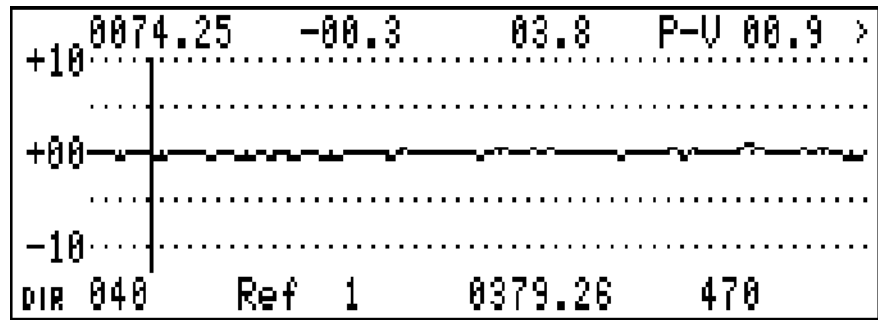


Figure 6-2 Sweep Indicator in the Normal Mode

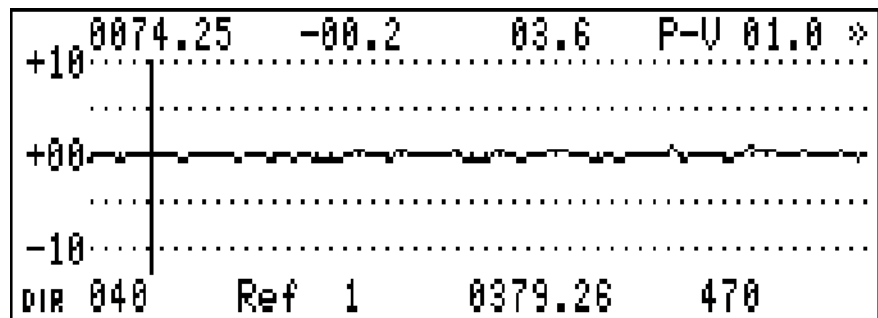


Figure 6-3 Sweep Indicator in the Fast Mode

Screen Resolution

NOTE:

Fast mode operation is only compatible with the latest versions of the 3010B, 3010R, and 3010H (firmware versions 4.0 and later). If you are using a 1777, 1776, 3010A, or earlier versions of the 3010B, the 3010H must be set to Normal mode.

Screen Resolution

The screen resolution on the 3010R is adjustable within the limits of the start and stop frequencies programmed into the sweep transmitter. See Figure 6-1. To change the start and stop frequency:

1. Press **F1** and use the arrow keys to select the new start frequency.
2. Press **Enter** to save the change.
3. Press **F4** and use the arrow keys to select the new stop frequency.
4. Press **Enter** to save the change.
5. Press **F3** to apply the change and return to the active measurement screen.

NOTE:

The minimum start frequency and the maximum stop frequency is the value programmed in the transmitter. The maximum possible resolution is achieved when the displayed span is approximately one half of the span set in the transmitter.

Variable Frequency Marker

The vertical line on the display indicates the position of the variable frequency marker. The frequency and level are displayed at the top of the screen. To change the position of the variable frequency marker, use the ◀ ▶ keys.

Measuring the System Pilots

The setup procedure describes a method used to insert the visual carriers of the pilot channels used in your system into the sweep table with a 1 dwell time. If a frequency is inserted into the sweep table with a 1, 2, or 3 dwell time, it is considered an active frequency. The level of the frequency will be measured and used to create the sweep trace. Any of these active frequencies can also be selected and measured using the **F3** softkey. The selected frequency is displayed over the **F3** softkey and the level is displayed at the top of the screen over the same softkey.

Press **F3** to toggle between the two programmed frequencies.

You can select any two frequencies to measure with the **F3** softkey as long as they are active frequencies in the sweep table. To change the frequency, press **F3** until the frequency to be changed is highlighted and use the ▲ ▼ keys to select the new frequency.

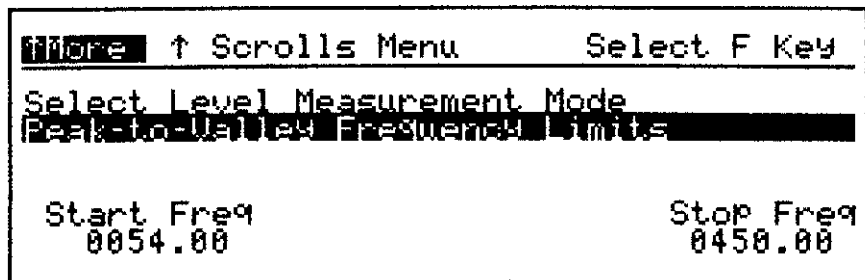
Peak-to-Valley

The range of the peak-to-valley, P/V, displayed in the upper right corner of the display is controlled by the peak-to-valley frequency limits and the display start and stop frequencies. The range is a combination of the highest start frequency and the lowest stop frequency. Table 6-1 illustrates the resultant P/V range for various mixes of start and stop frequencies.

Peak-to-Valley

Table 6-1 Peak-To-Valley Frequency Range



	Start (MHz)	Stop (MHz)
Display	50	700
P/V Limits	54	770
P/V Range	54	700





pd220b

Figure 6-4 Peak-to-Valley Range

To change or view the current P/V limits, press **Option** .

To set the P/V start frequency, press **F1** and use the   keys to set the value.

To set the P/V stop frequency, press **F4** and use the   keys to set the value.

Press **Enter** to save the changes and return to the sweep or normalized forward sweep screen.

Normalized Mode

Normalization is the process of comparing real time measurements to reference measurements stored in memory. The difference of the measurements is displayed on the screen. At the completion of the transmitter setup, the 3010R enters the Normalized Sweep mode with the new reference selected. The reference file is indicated above the **F2** key. For example, in Figure 6-5, **Ref 1** is the reference file. If the current measurement is the same as the reference, the trace will be centered on the display.

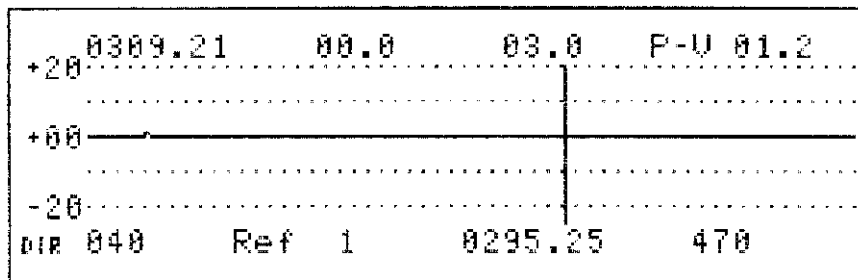


Figure 6-5 Center Normalized Mode with Components Indicated

Normalized mode in a relative measurement, therefore the marker and scaling values will be in dB with 0 dB change in the center of the display.

Smoothing and Averaging

The Smoothing and Averaging functions have been included to enhance the overall display of the trace by eliminating minor trace-to-trace variations that can occur in the Normalized mode of the 3010R.

The Averaging function averages level variations on a point-by-point basis, by displaying the cumulative average level for each point. The Smoothing function compares a selected number of points, computing a “moving average” across the displayed data. Both functions have been designed with adjustment ranges to allow the operator to determine the level of use of each function. Since the two functions interact to some degree, it is recommended that the operator experiment with varying levels of each, on a known reference trace, to determine the best overall use for the specific system being tested. Use the Smooth function for aligning the system, since it does not affect the update rate of the display. Use the Average function prior to printing or storing a trace.

The Smooth and Average functions are found in the **Option** menu, when in the Normalized mode. To adjust the smoothing and/or the averaging from the normalized sweep screen, press **Option** \blacktriangle F3, and use the \blacktriangle \blacktriangledown keys to change the smoothing to 0%, 1%, or 2%. Press F4 and use the \blacktriangle \blacktriangledown keys to change the averaging to 0%, 50%, 75%, 87.5%, or 93.75%. Press **Enter** to save the changes and press **Enter** again to exit the Option menu.

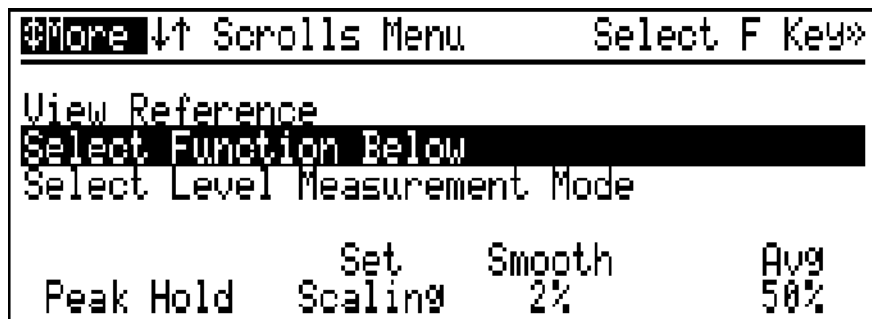


Figure 6-6 Option Menu with Smooth and Average Indicated

NOTE:

Smoothing and Averaging settings are a matter of personal preference. Set Smoothing to 1% or 2% and Averaging to 0% when adjusting an amplifier. Set Smoothing to 0% and Averaging to 50% or 75% when measuring a sharp filter. The sweep references are stored with 75% averaging.

Setting the Offset and Slope Values

The levels within a cable system change depending on the design of the system and the test point where a measurement is made. Although these absolute levels are different, the relationship between the sweep response of the system and the relative levels remains the same. The offset and slope values available in normalized sweep measurements allow you to store a reference at one test point and make normalized measurements at another test point with different system design levels. If you store a reference at the first trunk amplifier, the difference between this reference and each trunk amplifier in the system should be zero. If you offset this trunk reference to match the design levels of the bridger output, the difference between this offset reference and each bridger amplifier in the system should also be zero.

For example, in a typical system, the design level of the lowest channel at the trunk test point is 28 dBmV and the design level of the highest channel is 32 dBmV. In the same system, the design level of the lowest channel at the output of a bridger amplifier is 30 dBmV and the highest channel is 38 dBmV.

In this example, if we stored the reference at the trunk test point, we would enter offset and slope values of the bridger test point relative to the trunk test point levels. The offset and slope values of the test point which was used for the reference are set to zero. To calculate the required offset and slope values for the bridger test point, use the following steps:

1. The offset is equal to the difference in levels at the **lowest** channel.

Offset = bridger level (new test point) – trunk level (reference test point)

Example: **Offset** = 30 dBmV – 28 dBmV
= 2 dB

Setting the Offset and Slope Values

- The slope is equal to the difference in slope between the two test points.

Slope = bridger slope (new test point) – trunk slope (reference test point)

$$\begin{aligned}\text{Example: Slope} &= (38 \text{ dBmV} - 30 \text{ dBmV}) - (32 \text{ dBmV} - 28 \text{ dBmV}) \\ &= 8 \text{ dB} - 4 \text{ dB} \\ &= 4 \text{ dB}\end{aligned}$$


Using this example, a table can be created for the offset and slope values of each test point. If necessary, the direct test point may be used for the fiber node values. An example of this is provided in Table 6-2.

Table 6-2 System Scaling with the Trunk used as the Reference Test Point

Mode		System Levels		Calculated Scaling Values	
Name	Label	Low Channel	High Channel	Offset	Slope
Fiber Node	DIR	32	32	4	-4
Trunk	TRK	28	32	0	0
Bridger	BRG	30	38	2	4
Line Extender	LEx	32	42	4	6

NOTE:

Once these value are loaded into the Set Scaling screen of the 3010R, normalized measurements may be made relative to any test point with the proper offset and slope calculated by the 3010R. The offset and slope used during a normalized sweep measurement is the difference between the values entered for the current test point and the test point selected when the reference was stored.

To set the offset values, from the Normalized or Raw Sweep mode, press **Option**  to enter the Option menu.

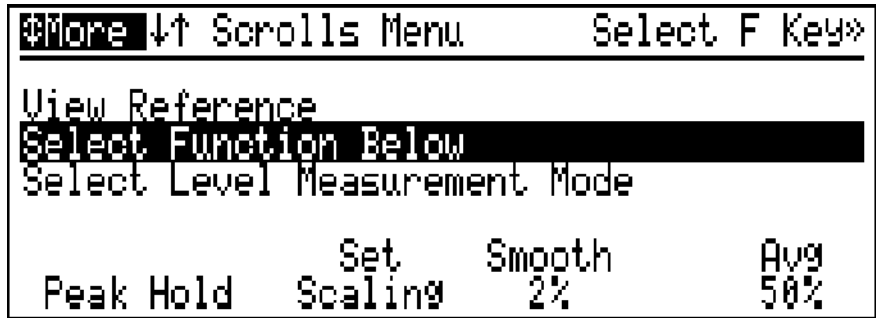


Figure 6-7 Option Screen

Press **F2** to set the offset and slope levels in the Set Scaling screen.

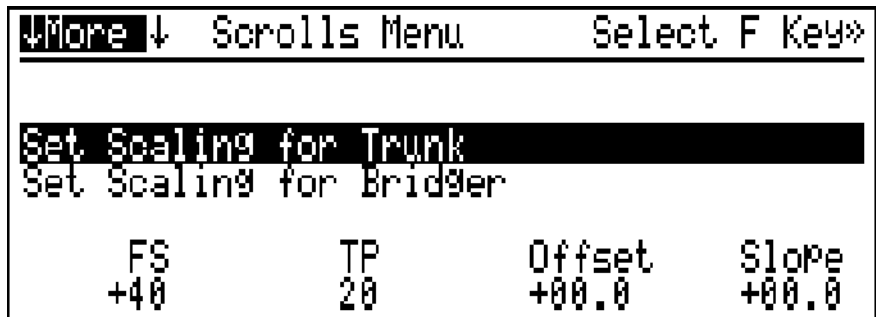


Figure 6-8 Set Scaling Screen

Use the **▲** **▼** keys to select the Set Scaling mode to Trunk, Bridger, Line Ex, or Direct.

To change the full scale, press **F1** and use the arrow keys to select the digit and set the value. Press **Enter** to save the change.

Setting the Offset and Slope Values

To change the test point value, press **F2** and use the arrow keys to set the value. Press **Enter** to save the change.

To change the expected offset level of the highest level on the system, press **F3** and use the arrow keys to set the value. Press **Enter** to save the change.

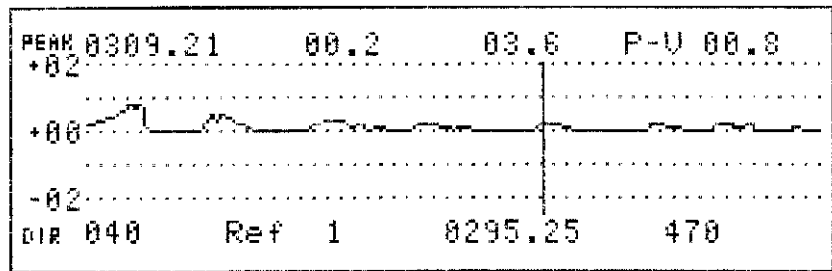
To change the expected slope of the system, press **F4** and use the arrow keys to set the value. Press **Enter** to save the change.

After all of the Set Scaling values are programmed, press **Enter** to save the changes, exit the mode, and return to the sweep screen.

Normalized Mode Options

Peak Hold

The Peak Hold function displays the highest value of a specific measurement point on the screen. Peak Hold captures the peak level of varying signals. To activate Peak Hold from the normalized or raw sweep screen, press **Option ▲ F1**.



pi772

Figure 6-9 Normalized Sweep with Peak Hold Activated

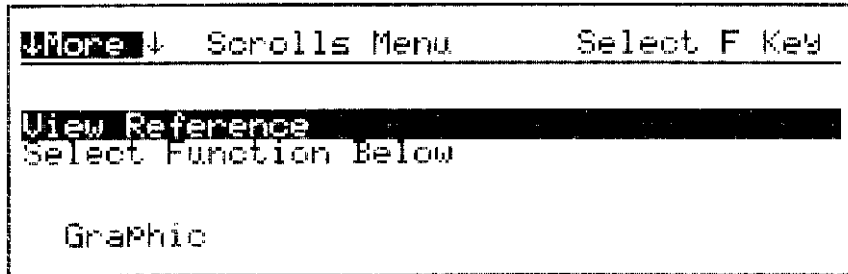
The word **PEAK** in the upper left hand corner of the screen indicates that Peak Hold is turned on. See Figure 6-9.

The peak level of the measurement point is held on the screen and the variable marker will read the specific level at a given point. Press **Option ▲ F1** to turn off Peak Hold.

Viewing a Reference

A reference trace is a raw sweep response stored in memory. Near the end of the setup procedure described in Chapter 5, the raw sweep trace is displayed on the screen with a message **Ref avg in process.....** As the trace updates, the dots to the right of the message disappear one at a time until all of the dots and the message have disappeared. This occurs only if the level of each consecutive sweep is consistent. You can view the references from the Normalized and Raw Sweep modes by pressing **Option ▲** (2 times) to highlight the view reference item in the Option menu.

Normalized Mode Options



pi773

Figure 6-10 View Reference Menu Item in the Option Menu

Press **F1** to view the file selection screen. Using the **▲** **▼** keys, any of the 12 references can be selected.

Press **F3** to view the reference.

Press **Enter** to exit the view reference screen with the last viewed reference file selected.

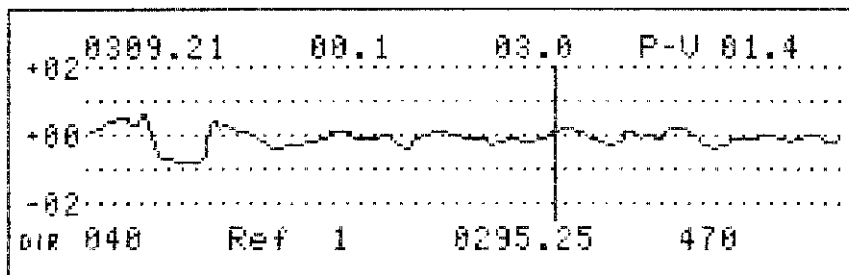


Figure 6-11 Normalized Screen

Selecting a Reference

The 3010R can store 12 references in memory. The active reference is displayed over the **F2** softkey in the Normalized mode. To select the reference, press **F2** to highlight the reference label and use the ▲ ▼ keys to select the active reference.

Raw Sweep Mode

The Raw Sweep display shows the absolute measurements of any active frequencies in the sweep table and the sweep points injected by the transmitter. As previously shown, the raw sweep trace is stored in the memory and used as the reference. The current Sweep mode, Normalized mode, or Raw Sweep mode, is indicated by the label above the **F2** softkey. If **F2** indicates a reference label of one of the 12 reference files, the 3010R is in the Normalized mode. If the label above the **F2** softkey is **Select Ref**, the 3010R is in the Raw Sweep mode.

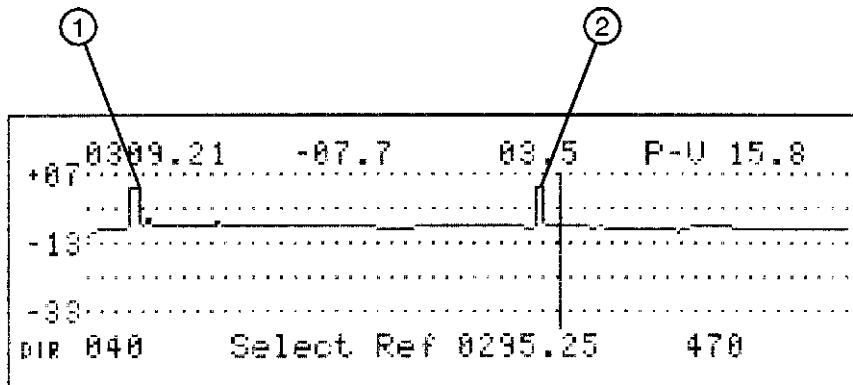


Figure 6-12 Raw Sweep, Phantom Sweep with the Two System Pilots Active

The Raw Sweep display shows the absolute levels measured. In the setup procedure example referred to in Chapter 5 we entered the high and low system pilots. Figure 6-12 shows the absolute levels measured and shows two vertical pedestals representing low system pilot ① and high system pilot ②. The other parts of the trace are approximately 1 division or 10 dB lower in level than the system pilots. This is the recommended level of the transmitter.

In the Raw Sweep mode, the relationship between the active carriers in the sweep table, the system pilot carriers, and the sweep points produced by the transmitter can be measured using the variable marker. Active frequencies in the sweep table are also displayed above the **F3** key as shown in Figure 6-12.

Storing a Reference

References are stored from the Raw Sweep mode. To store a reference, press **Option ▲** to enter the option menu screen.

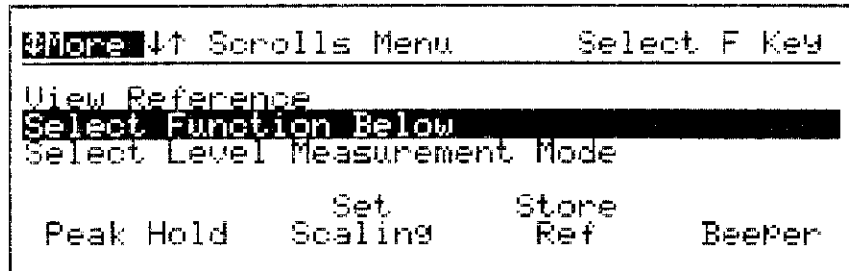


Figure 6-13 Option Menu Screen

Press **F3** to enter the reference average screen.

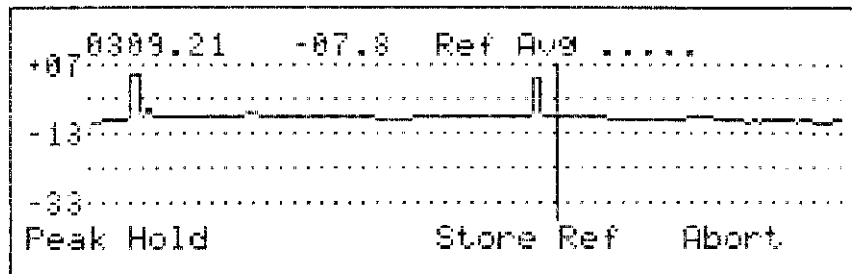
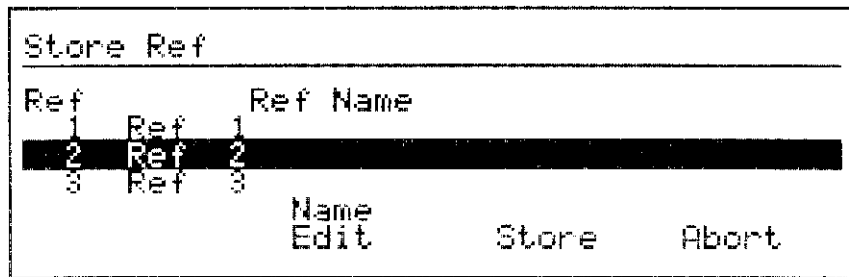


Figure 6-14 The Reference Average Screen

Storing a Reference

The reference average message is displayed in the upper right corner to indicate the stability of the response. If you are storing a reference in the system and some of the measurement points are below the display, the **Ref avg.....** message may indicate an unstable reference. In the case where you are sweeping below the rolloff of the amplifier's diplex filters, the sweep points at these frequencies will be below the level of the noise floor of the 3010R. The random level of the noise may give an indication of instability. You can check this situation by viewing the response on the display. For random variations in the response, refer to the sections "Storing the Reference" and "Fine Tuning the Sweep Response" in Chapter 5.

After the message has disappeared, or when you are satisfied the reference is usable, press **F3** to enter the reference section of the file server.



pi778

Figure 6-15 Reference Section Screen in the File Server

Use the **▲ ▼** keys 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 highlight file, press **F3**. The 3010R will store the reference in the selected file, exit the file server, and enter the Normalized mode with the new reference selected.

Beeper

The beeper indicates when a key is pressed. It can be turned on or off from the Option menu in most Measurement modes. To turn the beeper on and off, from most Measurement modes, press **Option ▲ F4**.

Peak Hold

Peak Hold has the same function in all the Measurement modes of the 3010R. Peak Hold can be activated and deactivated by pressing **Option ▲ F1**.

Storing a Reference

Return Path Setup

Return Path Setup

Overview

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 is compensating for the loss of the same length of cable. Typically, the return amplifiers are set for a constant input level because the signals in the return path are merging. 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 does work, however it has limitations. Typically only a two or four channel signal generator is used in the field, limiting the resolution. It also uses 6 MHz of the forward spectrum which could be a revenue channel.

The combination of the 3010H and 3010R, provides the technician with a means to align both the forward and return paths at the same time with minimal use of forward spectrum. The 3010H/3010R combination also provides for multiple 3010R receivers in the field. The 3010H can communicate with up to 10 field units simultaneously.

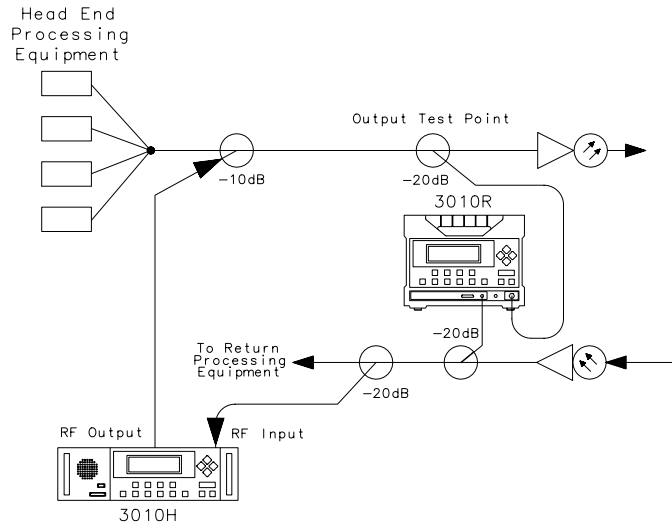
A major problem in the return path of the network is the ingress of unwanted signals into the system. If the ingress signals are large enough, they will disrupt the operation of the return path and the communications between the 3010R and the 3010H. The 3010H monitors the return telemetry frequency, 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 sweep 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.

System Requirements for Return Measurements

The Return Sweep and Return Spectrum modes require a 3010H to be installed at the headend and set to the Return Monitor or Dual Path Mode. Forward sweep requires a 3010H in forward or dual path mode. Refer to the 3010H manual for the setup procedure for the 3010H or refer to the 3010H section of Chapter 12.

The 3010R can be configured anywhere in the network. Normally, the initial setup is performed at the headend. The basic setup procedures are the same, regardless of the location. We will assume the configuration shown in Figure 7-1, unless otherwise stated. This will give us a reference point for discussion of setup issues.

Connecting the 3010H and 3010R at the Headend



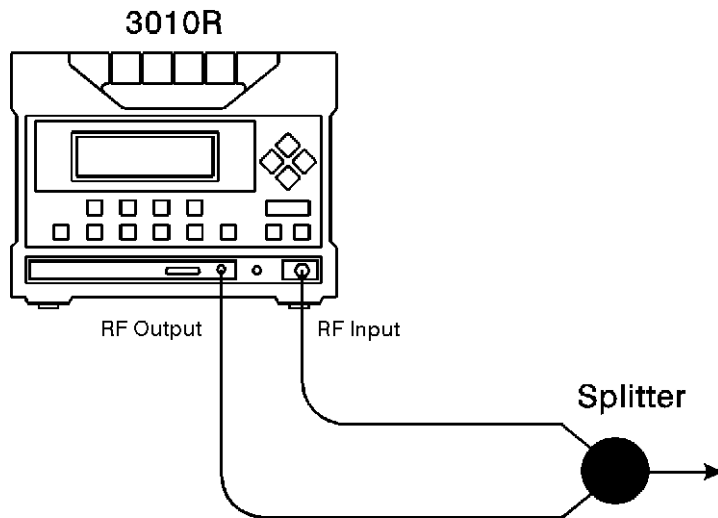
ps29a

Figure 7-1 Connection Diagram for the 3010H and 3010R at the Headend

Figure 7-1 shows a typical equipment connection and test points at the headend. The actual connections may vary. However, the principles used to calculate the source and input levels for the 3010R will be the same, regardless of your configuration. You must know the losses and levels of your particular system in order to install the equipment correctly. These values will vary, depending on the equipment used in your system.

Connecting the 3010R to a Single Test Point for Return Path Measurements

Sometimes, a common test point is used to monitor the forward pilot and the source insertion point for the return path. Figure 7-2 illustrates testing the response of the return path at a customer tap or drop. A standard two-way splitter may be used to connect the RF source output and the RF input to the same test point.



pi27a

Figure 7-2 Front Panel of the 3010R

By using the normalized sweep function, the response error of the splitter is factored into the reference. Level measurement variation can be removed by adding the loss of the splitter to the test point value set by the scale function.

Setting the Forward Pilot Input Level

Setting the Forward Pilot Input Level

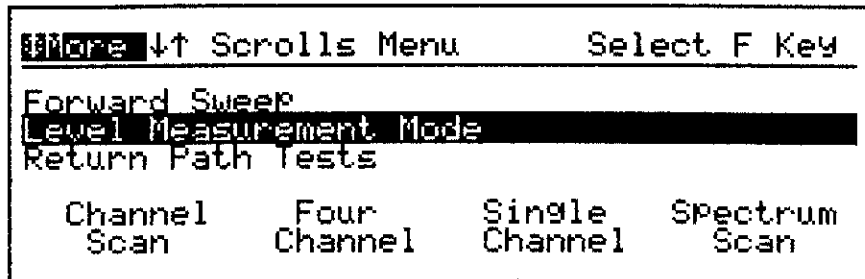
The communications from the 3010H to the 3010R is via the forward pilot. The input sensitivity for the pilot is set by the full scale (FS) setting in the Channel Scan mode.

NOTE:

Remember

When you change the RF input from one test point to another, if the forward levels change, you must go into channel scan to set the scale before you enter the return path test.

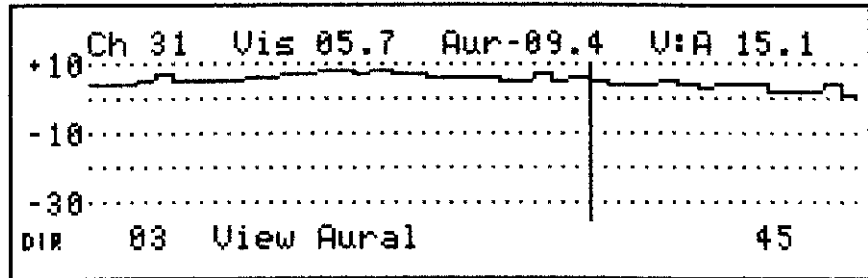
To adjust the input sensitivity for the forward pilot, turn the 3010R on or press **Menu** if it is already on.



nd29b

Figure 7-3 Main Menu

Press **F1** to enter the Channel Scan Screen.



pi24r

Figure 7-4 Channel Scan Screen

Press scale and adjust the display so that the channels are in the upper division of the display, without going off the top, as shown in Figure 7-4. The correct input sensitivity is now set.

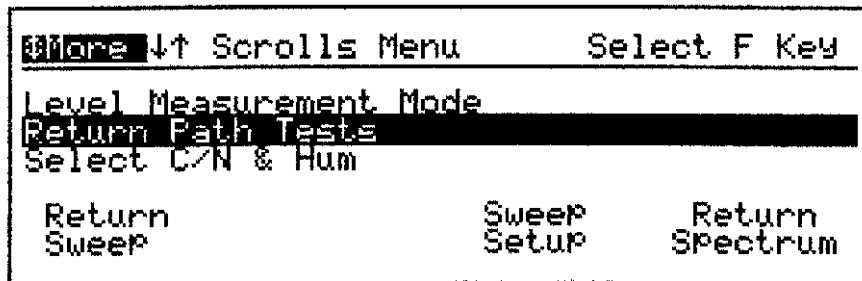
NOTE:

The input sensitivity for the forward pilot in the return path mode is controlled by the current full-scale setting in the channel scan mode. It is important to confirm this setting when the RF input connection is moved from one monitor point to another. To confirm the input sensitivity of the forward pilot, set the full scale value in the channel scan mode so that the channels are in the upper division of the display without going off the top of the display.

Press **Menu** to return to the Main menu.

Setting the Pilot Frequency

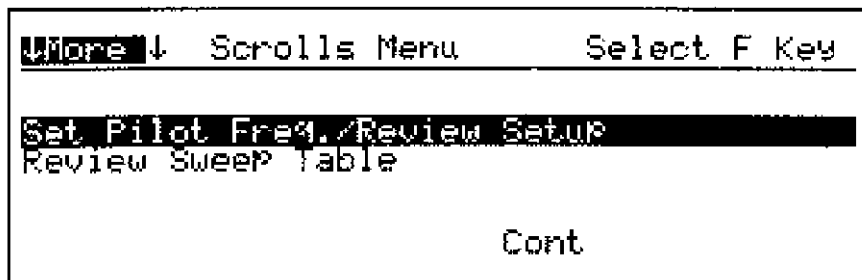
The Return Sweep Setup menu is accessed through the Return Path Tests in the Main menu. From the Main menu, press **▼** to display the Return Path Tests available.



pi23r

Figure 7-5 Return Path Test Menu Selection

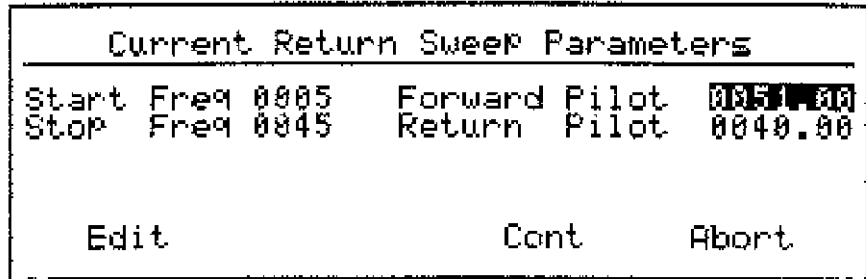
Press **F3** to enter the Return Sweep Setup menu.



pi25r

Figure 7-6 Return Sweep Setup Menu

With **Set Pilot Freq./Review Setup** highlighted, press **F3** to enter the Return Sweep Parameters screen with the Forward Pilot frequency highlighted.



pt26r

Figure 7-7 Current Return Sweep Parameters Screen with Forward Pilot Frequency Highlighted

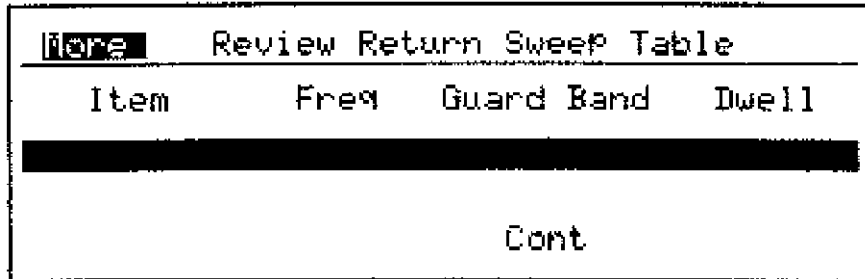
The Current Return Sweep Parameters screen shows the start frequency, the stop frequency, and the return pilot received for the last return sweep received, plus the forward pilot frequency. The start frequency, stop frequency, and the return pilot frequency are controlled by the 3010H. If you have a new 3010R that has not received a return sweep, the start frequency will be 5 MHz, the stop frequency will be 45 MHz, and the return pilot will be 15 MHz.

The Forward Pilot is the communication link from the 3010H at the headend. The Forward Pilot frequency must be the same in the 3010R and the 3010H, in order to communicate.

To set the Forward Pilot frequency, press **F1**. Use the **◀** and **▶** keys to select the digit and the **▲** and **▼** keys to set the value. Press **Enter** to save the change.

Press **F3** to continue to the Review Return Sweep Table screen.

Reviewing the Return Sweep Table



Item	Freq	Guard Band	Dwell
[Redacted]			

Cont

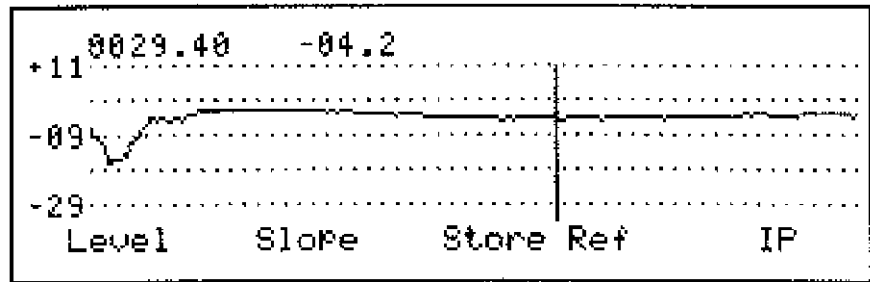
pi27r

Figure 7-8 Review Return Sweep Table Screen

The Review Return Sweep Table displays the last return sweep table received by the 3010R. If this is a new unit, this table will be blank. Edit functions are disabled since the return sweep table is programmed and controlled by the 3010H.

Press **F3** to continue to the Set Source Level and Slope screen.

Setting the Display Scale



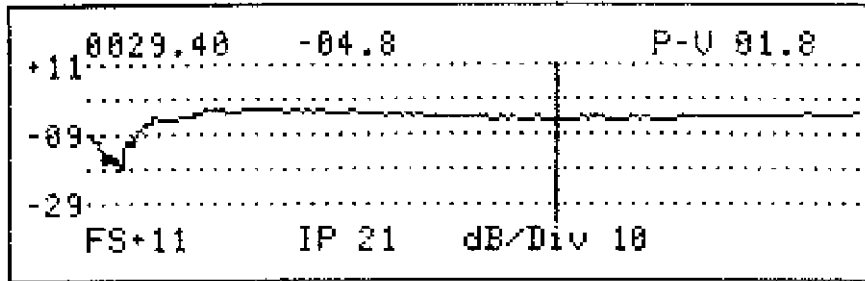
pi28r

Figure 7-9 Set Source Level and Slope Screen

The output of the Sweep Source in the 3010R is set in the Source Level and Slope screen. If the 3010R is connected to the network with a 3010H in the Return monitor mode, the 3010R may begin to sweep when you enter this screen, provided that the output level of the return pilot is within an acceptable range. The display scale may need to be adjusted to bring the measurements into view. Remember, the measurements being viewed are being made at the 3010H, and the display data is being sent to the 3010R. If you set the display scale in the 3010R to the same value as in the 3010H, you should be able to see the response.

The display scale can be changed by pressing **Scale** from this screen. The displayed Full Scale (FS) and dB/division values are adjusted from the Scale screen. In return operation, the FS value does not change the attenuator of the 3010R or the 3010H. In the return mode, the attenuator setting for the measurement is controlled by the selected scale settings in the spectrum scan mode of the 3010H.

Setting the Display Scale



pi29r

Figure 7-10 Return Sweep Set Scale Screen

In the scale screen, to change the Full Scale of the display, press **F1** and use **◀** and **▶** to select the digit and **▲** and **▼** to set the value.

To change the dB/division, press **F3** and use **▲** and **▼** to select the value.

Press **Enter** to save the change and return to the measurement mode.

NOTE:

In the Return Spectrum mode, the IP value is adjustable in the scale screen. In the Return Spectrum mode, the IP value affects the output of the return pilot and can affect the communications between the 3010R and the 3010H. If you are not sure of the exact IP value, you may want to adjust it in the Return Sweep so you can see the level change on the screen. If you are having a problem with the return path, you may have to adjust the level up or down until good communication with the 3010H is indicated.

Communication Status Indicators

The operation of the 3010R in the Return Path measurement requires a communications link between the 3010R and the 3010H. The status of the communication is indicated in all the Return measurements by the flashing indicator in the upper right corner of the display. If the 3010R is not communicating with the 3010H, the source output level may not be correct. The "Setting the Level, Slope, and IP Values for the Source" section explains how to set up the output level of the source.

The communication indicator is in the upper right corner of the display. When everything is working correctly, it is a flashing similar to the forward sweep mode but the pointers are to the left. The following are the possible communications indications:

No Flashing Indicator or Solid Rectangle	Not receiving the Forward Sweep Pilot
Large Flashing Rectangle	Receiving the Forward Pilot, no return communications
Flashing < or <<	Communications are working in both directions, display should be updating

Troubleshooting Return Sweep Communications Problems

No Flashing Indicator or solid rectangle

If you are connected to the system and you have either of these conditions, you should check the following:

1. Check the full scale setting in the channel scan mode. The input sensitivity for the forward pilot is controlled by the full scale setting in the channels scan mode. The channels on the system should be in the upper division of the display without going off the top of the display.
2. Check the forward pilot frequency programmed in the 3010R. The forward pilot frequency programmed in the 3010R must be the same as the forward pilot frequency programmed in the 3010H.

Troubleshooting Return Sweep Communications Problems

3. Make sure the 3010H is connected and in the Return Path Monitor mode. If you are in the field, you can check the level of the forward pilot by using the spectrum scan mode and the peak hold function. If the pilot is not present, the 3010H may be turned off or you may have a problem with the combiner at the headend.

Large Flashing Rectangle

If you are connected to the system and you are receiving a large flashing rectangle, this indicates that the return pilot is not being received by the 3010H. This can be an indication that the return path is not working. You should check the following:

1. Check the setting of the source level, slope, and IP value. If the source level is incorrect, the pilot may not be getting back to the 3010H at the correct level.
2. Check the source insertion point. If the return path is not working, this is the indication you will receive on the display. If you are testing the system at a node or an amplifier in the field, you should try a different insertion point. Not all test points are bi-directional or have a path to the return amplifier.

Flashing < or <<

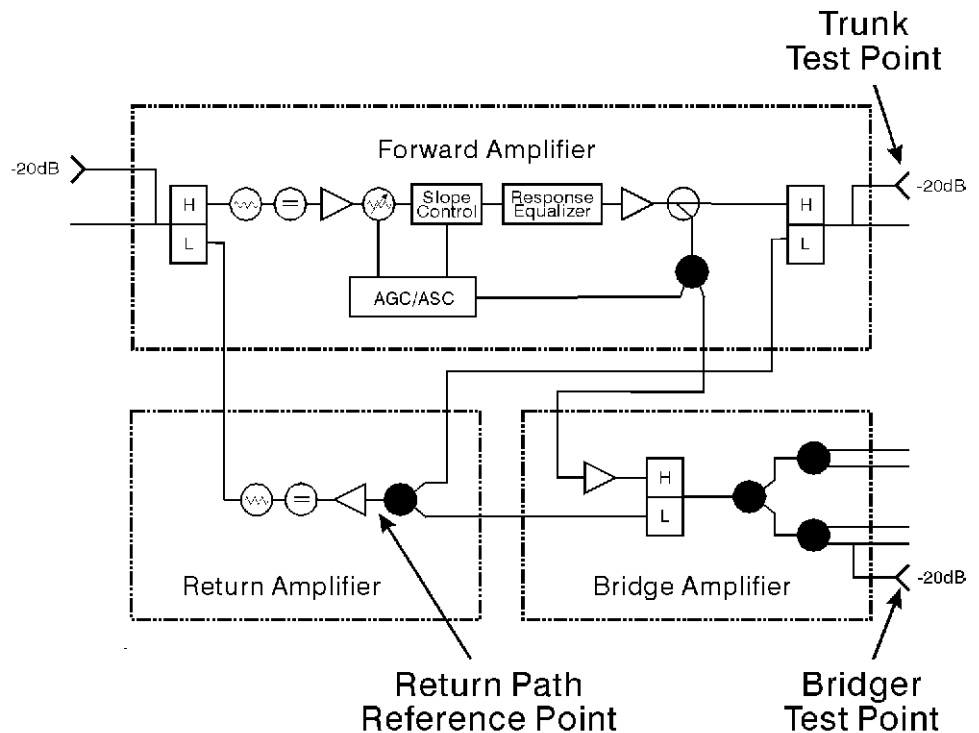
Two-way communication is established. If the display is not updating, you should check the following:

1. Check the full scale setting in the return sweep mode. The return measurements are made by the 3010H and the data is transmitted to the 3010R. The setting of the full scale and test point value in the spectrum scan mode of the 3010H determines its input sensitivity, therefore it is important to note the absolute full scale reference value programmed in the 3010H. If the head end is receiving 15 dBmV of level (regardless of test point correction), your full screen should be 15 dBmV or slightly higher. For more reliable scaling, view the 3010R in the 10 dB/division scale while in this mode.
2. Check the insertion point (IP) value. The IP value partially defines the output level of the 3010R source. It is designed to relate the loss between the insertion point and the actual gain block in the amplifier or fiber laser. The actual output of the 3010R source is the sum of the Level and IP values.

Setting the Level, Slope, and IP Values for the Source

The 3010R source output level is defined by three settings: level, slope, and IP.

To better understand their function as they relate to setting the return path, refer to the block diagram in Figure 7-11.



pi21r

Figure 7-11 Block Diagram of an Amplifier

Level Adjustment

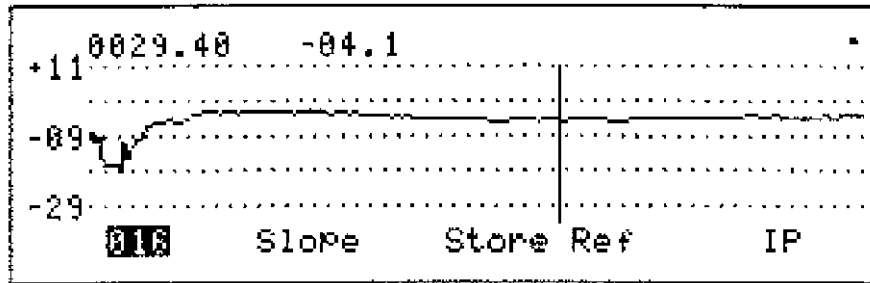
The level adjustment may be thought of as the primary control of the source level. This value defines the desired sweep level at the input to the active gain blocks in the fiber node or the return amplifiers in the system.

Setting the Level, Slope, and IP Values for the Source

For example, assume that the level of the carriers at the input of gain block is +20 dBmV, with no slope. Consistent with the forward sweep setup, we generally minimize the sweep energy injected into the system by setting the sweep 10 dB below the carriers on the system. If the carrier level is +20 dBmV, the sweep level should be +10 dBmV with the slope equal to 0 dB. In Figure 7-11, the point we are referring to is labeled **Return Path Reference Point**.

If you were to inject the test signal at the Return Path Reference Point, you would inject a sweep level of +10 dBmV.

To change the Level, press **F1** and use the arrow keys to adjust the level. In the previous example, this level would be set to 10 dBmV.



pi210r

Figure 7-12 Set Source Level and Slope Screen with Level Activated

IP Adjustment

Amplifiers normally do not have a Test Insertion Point with no loss. Typically, there will be loss to overcome. If you were injecting the signal at the trunk test point in Figure 7-11, you have the loss of the test point, the diplex filter, and the splitters for the distribution. The term IP stands for Insertion Point loss. By changing the IP value, you change the output level of the source to overcome these losses and provide the desired "Level" to the gain block. The sum of the IP and Level is the output of the source. The minimum output is +10 dBmV and the maximum output is +50 dBmV.

To document the insertion loss of your equipment, create a Source Level Matrix for your equipment as shown in Table 7-1. By creating a Source Level Matrix for your specific equipment, the IP value can be referenced to insure that all technicians are using the correct source level for a specific test point.

Table 7-1 Source Output Level Matrix

Internal Coupling Loss	5 dB
Test Point Loss	20 dB
Total Insertion Point Loss (Internal Coupling Loss + Test Point Loss)	25 dB
Sweep Input Level	+10 dBmV
Source Output Level	+35 dBmV

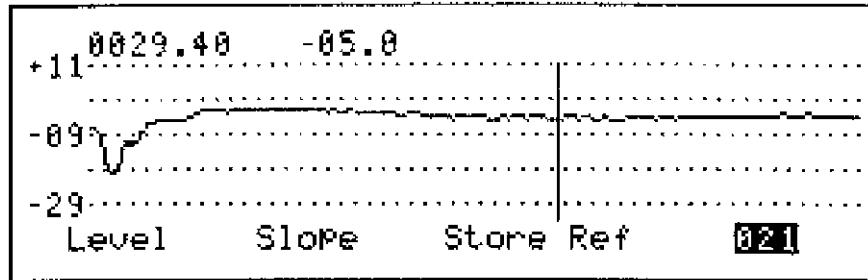
Table 7-1 shows a source level matrix created for the trunk test point of the amplifier in Figure 7-11. The losses between the test point and the input to the return amplifier gain block are as follows:

Test Point Loss	20 dB
Diplex filter Loss	1 dB
Splitter combiner before gain block loss	4 dB
<hr/>	
Total Loss	25 dB

By setting the IP value to 25 dB, the actual output level of the source is equal to the level, +10 dBmV, plus the IP, 25 dB, or a total of +35 dBmV.

To set the IP value, press **F4** and use the arrow keys to adjust the value equal to the insertion loss between the insertion point and the gain block.

Setting the Level, Slope, and IP Values for the Source



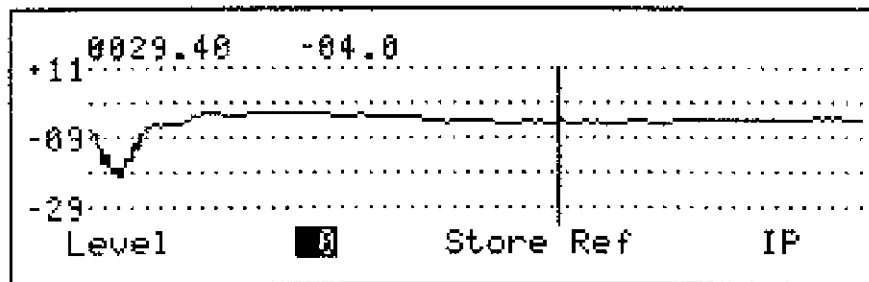
pi211r

Figure 7-13 Set Source Level and Slope Screen with IP Activated

During normal operation of the 3010R, the IP value is accessed by pressing **Scale**. Refer to the Return Path measurements for more information.

Slope Adjustment

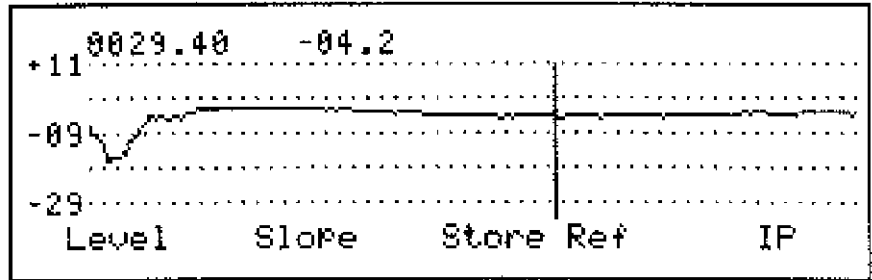
The slope of the source can be varied up to 10 dB, but the slope can not be set to a level where any part of the sweep will be less than 10 dBmV or more than 50 dBmV. When these limits are reached, no further adjustment can be made. To set the slope of the sweep, press **F2**. Use the **▲** and **▼** keys to adjust the value.



pi212r

Figure 7-14 Set Source Level and Slope Screen with Slope Activated

Press **Enter** to save the change.



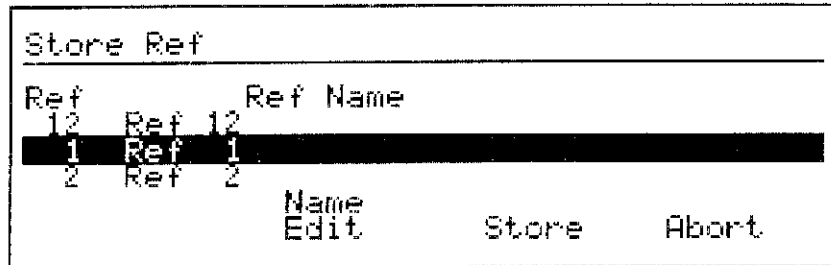
pi28r

Figure 7-15 Set Source Level and Slope Screen

With a stable return sweep trace displayed on the screen at the proper level, press **F3** to store the reference. This reference is the level received at the 3010H when the proper level is delivered to the amplifier gain block.

Selecting the Return Sweep Reference

Selecting the Return Sweep Reference



pi765

Figure 7-16 Reference File Selection Screen

Storing a return sweep reference is the same as storing a forward sweep reference. The 3010R holds a total of 12 references and they can be forward sweep or return sweep.

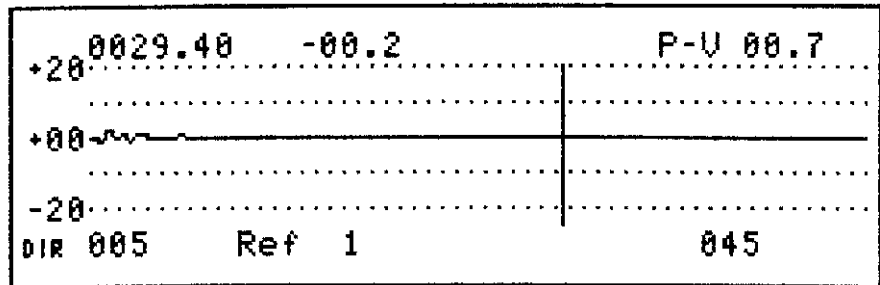
To select the reference, use the ▲ and ▼ keys to select the file.

Naming the Reference File

It is important to remember which is the forward reference and which is the return reference. To name the highlighted file, press **F2**. The labeling procedure is the same for all labels in the 3010R, refer to the "Naming a File" section of Chapter 10 for the procedure to change the file name.

Storing the Reference File

With the file label highlighted, press **F3** to store the reference file and exit the setup mode. The 3010R will automatically enter the return normalized sweep mode with the new reference selected.



pi213r

Figure 7-17 Normalized Return Sweep Screen

You are now ready to make return path tests on the network. For information about the return path test capabilities of the 3010R, proceed to Chapter 8.

Storing the Reference File

Return Path Measurements

Return Path Measurements

Overview

The 3010R has five return path measurement modes, and three Ingress Measurement modes. The five return path measurement modes are:

- Raw Sweep mode
- Normalized Sweep mode
- Return Spectrum mode
- Ingress mode
- Dual Path mode

The three Ingress Measurement modes are:

- Burst Counter
- Average Power
- Return Spectrum Scan

The Raw Sweep and Normalized Sweep modes are accessed through the Return Sweep function key. The Return Spectrum mode is accessed through the Return Spectrum function key. Access to the Ingress mode is available from all three of the other modes when the 3010R receives an ingress measurement message from the 3010H.

In all the return path measurement modes, the displayed information on the 3010R screen are measurements made by the 3010H. In the return sweep modes, the sweep source is created in the 3010R. Therefore, the measurement data is dependent on the following factors:

- Attenuator setting of the 3010H at the headend.
- Output level setting of the source in the 3010R.
- Gain and response of return link.
- Display scale set in the 3010R.

In the Return Spectrum and Ingress modes, the dynamic range of the measurement is dependent on the attenuator setting of the 3010H.

NOTE:**Remember**

Measurements are dependent on:

- Attenuator setting of the 3010H at the headend.
 - Output level setting of the source in the 3010R.
 - Gain and response of return link.
 - Display scale set in the 3010R.
-

From the Return Path test main menu item, you can select Return Sweep or Return Spectrum.

Return Sweep	The 3010R inserts a sweep signal into the return path and views the sweep as detected by the 3010H at the headend.
Return Spectrum	Provides a spectrum scan display of the return path as measured by the 3010H at the headend.

In either measurement, if there is a high level of signal ingress at the headend, the 3010H will automatically broadcast a Return Spectrum measurement to all the field units. When the 3010R receives an ingress message, the word Ingress is displayed above the **F3** key indicating ingress has exceeded the -30 dB threshold at the 3010H. If you press **F3**, you will enter the Ingress mode and see the ingress. Setting the Ingress mode in the 3010H to continuous will provide a broadcast of the Return Spectrum measurement with every poll. With the 3010H in this mode, the ingress measurement can be accessed at any time and a 3010B or 2010B can also monitor the broadcast return spectrum measurement to test the return path.

A 3010R in the headend mode will function as a 3010H and can be used at remote locations for testing portions of the return path. To set the 3010R in the headend mode, refer to Chapter 12.

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-

Return Path Measurements

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.

This chapter explains the operation of all the Return Path Measurements available with the 3010R.

Communication Status Indicators

The operation of the 3010R in the Return Path measurement requires a communications link between the 3010R and the 3010H. The status of the communication is indicated in all the Return measurements by the flashing indicator in the upper right corner of the display. If the 3010R is not communicating with the 3010H, the source output level may not be correct. The "Setting the Level, Slope, and IP Values for the Source" section in Chapter 7 explains how to set up the output level of the source.

The communication indicator is in the upper right corner of the display. When everything is working correctly, it is a flashing similar to the forward sweep mode but the pointers are to the left. The following are the possible communications indications:

No Flashing Indicator or Solid Rectangle	Not receiving the Forward Sweep Pilot
Large Flashing Rectangle	Receiving the Forward Pilot, no return communications
Flashing < or <<	Communications are working in both directions, display should be updating

Troubleshooting Return Sweep Communication Problems

No Flashing Indicator or solid rectangle

If you are connected to the system and you have either of these conditions, you should check the following:

1. Check the full scale setting in the channel scan mode. The input sensitivity for the forward pilot is controlled by the full scale setting in the channels scan mode. The channels on the system should be in the upper division of the display without going off the top of the display.
2. Check the forward pilot frequency programmed in the 3010R. The forward pilot frequency programmed in the 3010R must be the same as the forward pilot frequency programmed in the 3010H.

Troubleshooting Return Sweep Communication Problems

3. Make sure the 3010H is connected and in the Return Path Monitor mode. If you are in the field, you can check the level of the forward pilot by using the spectrum scan mode and the peak hold function. If the pilot is not present, the 3010H may be turned off or you may have a problem with the combiner at the headend.

Large Flashing Rectangle

If you are connected to the system and you are receiving a large flashing rectangle, this indicates that the return pilot is not being received by the 3010H. This can be an indication that the return path is not working. You should check the following:

1. Check the setting of the source level, slope, and IP value. If the source level is incorrect, the pilot may not be getting back to the 3010H at the correct level.
2. Check the source insertion point. If the return path is not working, this is the indication you will receive on the display. If you are testing the system at a node or an amplifier in the field, you should try a different insertion point. Not all test points are bi-directional or have a path to the return amplifier.

Flashing < or <<

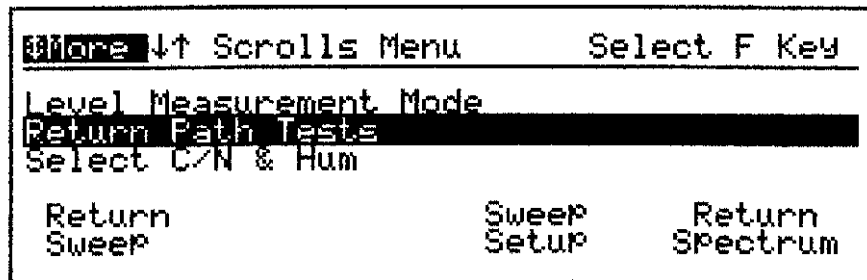
Two-way communication is established. If the display is not updating, you should check the following:

1. Check the full scale setting in the return sweep mode. The return measurements are made by the 3010H and the data is transmitted to the 3010R. The setting of the full scale and test point value in the spectrum scan mode of the 3010H determines its input sensitivity, therefore it is important to note the absolute full scale reference value programmed in the 3010H. If the head end is receiving 15 dBmV of level (regardless of test point correction), your full screen should be 15 dBmV or slightly higher. For more reliable scaling, view the 3010R in the 10 dB/division scale while in this mode.
2. Check the insertion point (IP) value. The IP value partially defines the output level of the 3010R source. It is designed to relate the loss between the insertion point and the actual gain block in the amplifier or fiber laser. The actual output of the 3010R source is the sum of the Level and IP values.

Return Path Tests Menu

For the 3010R to operate, it must receive the forward pilot set in the Return Path Parameter screen. The forward pilot contains the communication instructions and provides the authorization for the remote unit to transmit. Without this authorization, the 3010R will not send any signal in the return path. For this reason, it is recommended that the forward sensitivity is verified in the Channel Scan mode by observing the visual carriers in the upper portion of the display. Refer to Chapter 3.

To select any of the Return Path Tests, from any screen, press **Menu** ▾.



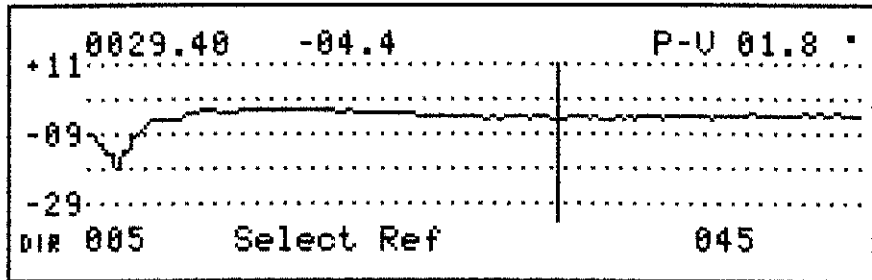
pi23r

Figure 8-1 Return Path Tests in the Main Menu

Entering the Sweep Mode

Entering the Sweep Mode

From Return Path Tests menu, press **F1** to enter the Return Sweep mode.



pi214r

Figure 8-2 Return Sweep Screen, Raw Sweep

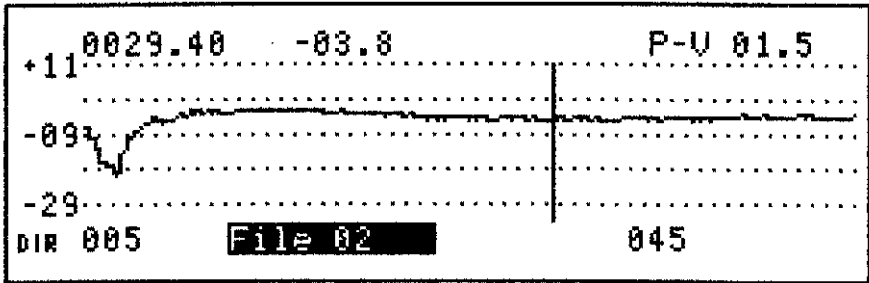
The variable marker displays the actual level of the sweep measured by the 3010H.

Identifying the Mode of Operation

The return sweep screens are similar to the forward sweep screens. They have a similar look and function. The function of the **F3** key is the major difference. In forward sweep, the **F3** key is used to select frequencies in the sweep table that have been given dwell times to measure their levels. In the return sweep mode, the **F3** key is the access key to the ingress screen when an ingress alert exists or when the ingress mode in the 3010H is set to continuous.

One indication of whether the screen is displaying forward sweep or return sweep is the start and stop frequencies. For a given system, the start and the stop frequencies of the return path are different from the start and stop frequencies used in the forward path. Another indication of the sweep is the flashing sweep indicators located in the upper right corner of the display. Return sweep indicators point left (<) while forward sweep indicators point right (>).

As in the forward sweep mode, the return sweep has two modes of operation, **raw sweep** and **normalized sweep**. Figure 8-2 is an example of a return raw sweep display. The raw sweep mode is indicated by the **Select Ref** label displayed above the **F2** key. When the 3010R is in the normalized sweep mode, the label of the selected reference is displayed above the **F2** key. Refer to Figure 8-3 for an example.



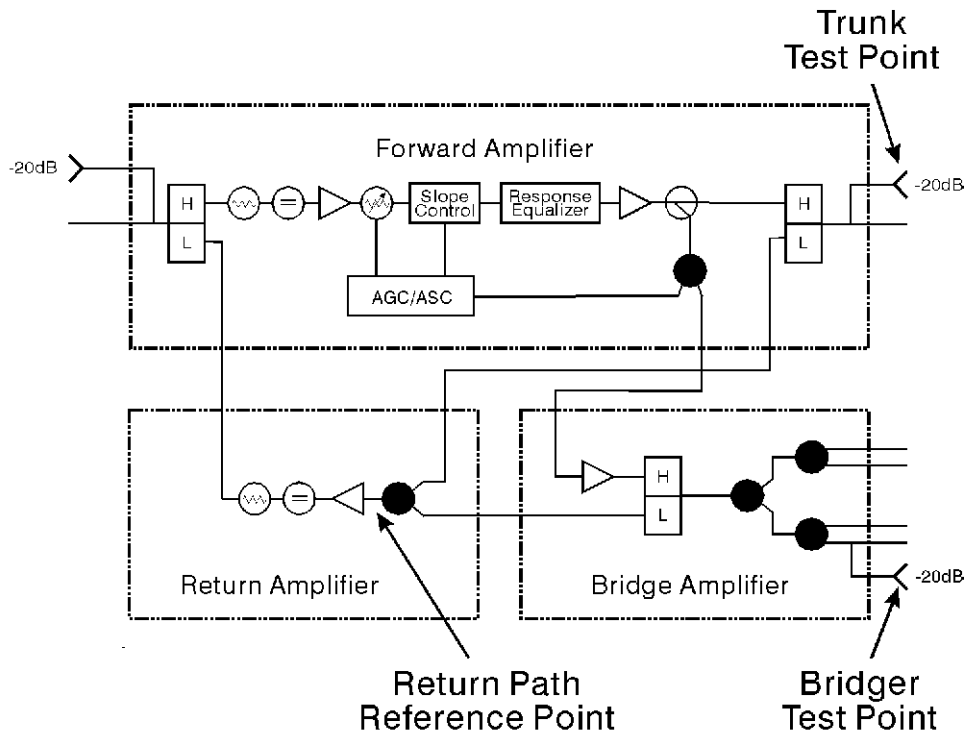
pi215r

Figure 8-3 Normalized Sweep Screen

Identifying the Test Point Insertion Loss and Insertion Point (IP) Value

Identifying the Test Point Insertion Loss and Insertion Point (IP) Value

Normally, a test insertion point at the input of the return gain block of the amplifier will have some insertion loss.



pi21r

Figure 8-4 Block Diagram of an Amplifier

If you are inserting the signal at the trunk test point, shown in Figure 8-4, you have the loss of the test point, the diplex filter, and the splitters for the distribution. The term IP stands for Insertion Point loss. By changing the IP value, you change the output level of the source to overcome these losses and provide the desired "Level" to the gain block. The sum of the IP and Level is the output of the source. The minimum output is $+10\text{ dBmV}$ and the maximum output is $+50\text{ dBmV}$.

Identifying the Test Point Insertion Loss and Insertion Point (IP) Value

By creating a source output level matrix for your specific equipment, as shown in Table 8-1, the IP value can be referenced to ensure that all technicians are using the correct source output level for a specific test point.

Table 8-1 Source Output Level Matrix

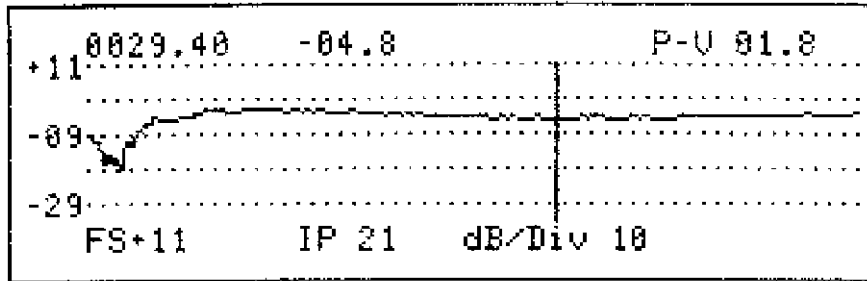
Internal Coupling Loss	5 dB
Test Point Loss	20 dB
Total Insertion Point Loss (Internal Coupling Loss + Test Point Loss)	25 dB
Sweep Input Level	+10 dBmV
Source Output Level	+35 dBmV

Test Point Loss	20 dB
Diplex filter Loss	1 dB
Splitter combiner before gain block loss	4 dB
<hr/>	
Total Loss	25 dB

By setting the IP value to 25 dB, the actual output level of the source is equal to the level, 10 dBmV, plus the IP, 25 dB, or a total of 35 dBmV.

In the return sweep and return spectrum modes, the IP value is accessed by pressing **Scale**.

Identifying the Test Point Insertion Loss and Insertion Point (IP) Value



pi29r

Figure 8-5 Scale Screen in the Raw Sweep Mode

To set the IP value, press **F2** and use **◀|** and **|▶** to select the digit and **▲** and **▼** to select the value.

Changing the Display Scale

The displayed Full Scale (FS) and dB/division values are adjusted from the Scale screen. In return operation, the FS value does not change the attenuator of the 3010R or the 3010H. In the return mode, the attenuator setting for the measurement is controlled by the selected scale settings in the spectrum scan mode of the 3010H. Scale screen

In the scale screen, to change the Full Scale of the display, press **F1** and use **◀** and **▶** to select the digit and **▲** and **▼** to set the value.

To change the dB/division, press **F3** and use **▲** and **▼** to select the value.

Press **Enter** to save the change and return to the measurement mode.

NOTE:

In the Return Spectrum mode, the IP value is adjustable in the scale screen. In the Return Spectrum mode, the IP value affects the output of the return pilot and can affect the communications between the 3010R and the 3010H. If you are not sure of the exact IP value, you may want to adjust it in the Return Sweep so you can see the level change on the screen. If you are having a problem with the return path, you may have to adjust the level up or down until good communication with the 3010H is indicated.

Changing the Displayed Start and Stop Frequencies

Changing the Displayed Start and Stop Frequencies

The screen resolution for the sweep function of the 3010 is adjustable within the limits of the start and stop frequencies programmed into the sweep transmitter. See Figure 8-3.

Press **F1** and use the arrow keys to select the new start frequency.

Press **Enter** to save the change.

Press **F4** and use the arrow keys to select the new stop frequency.

Press **Enter** to save the change.

Press **F3** to apply the change and return to the active measurement screen.

NOTE:

The minimum start frequency and the maximum stop frequency are the values programmed in the 3010H. The best possible frequency resolution is achieved when the displayed span is approximately 1/2 the span set in the 3010H.

Variable Frequency Marker

The vertical line on the display indicates the position of the variable frequency marker. The frequency and level are displayed at the top left of the screen. In the Normalized mode, the level is a relative value based on the selected reference comparison. In the raw sweep mode, the level is the level of the sweep measured by the 3010H. To change the position of the variable frequency marker, use ◀ and ▶.

Option Screens

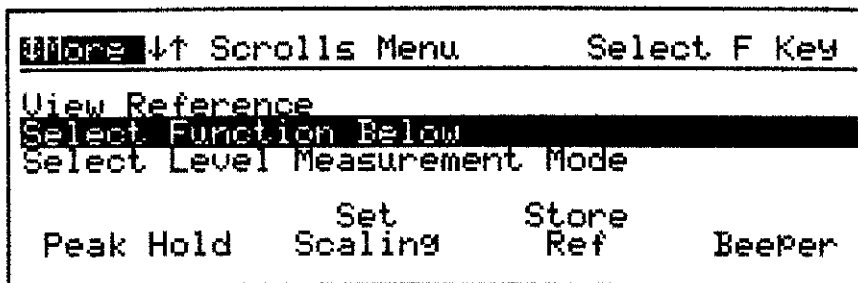
Preset Test Point

In the Return Measurement modes, there are four preset test point values:

- Trunk
- Bridger
- Line Ext (Line Extender)
- Direct

Their function is somewhat different in the return measurement modes, compared to the other measurement modes. In the return measurement modes, the Full Scale value normally remains the same from test point to test point; however, the IP value varies. In the sweep modes, the IP value can be programmed for each of the preset test points. As you move from test point to test point and select one of the preset test points, the output of the source varies.

To set the preset scaling from either of the sweep modes, press **Option ▲** to enter the Option Menu.

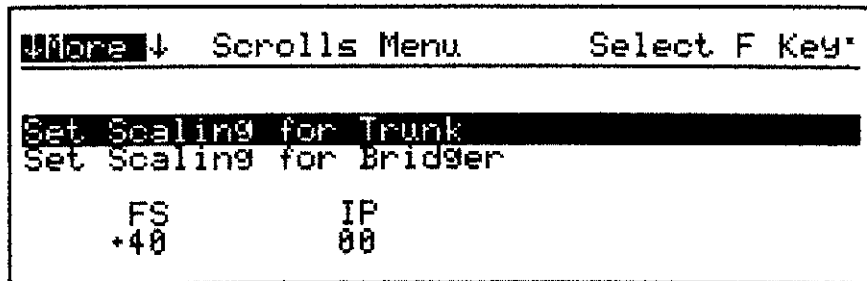


pi216r

Figure 8-6 Option Menu Screen

Press **F2** to enter the Set Scaling Screen.

Option Screens



pi217r

Figure 8-7 Set Scaling Option Screen

Set Scaling

Use **▲** and **▼** to highlight the test point.

Press **F1** to select the FS value. Use **◀** and **▶** to select the digit and use **▲** and **▼** to set the value. Press **Enter** to save the change and return to the test point selection mode.

Press **F2** to select the IP value. Use **◀** and **▶** to select the digit and use the **▲** and **▼** to set the value. Press **Enter** to save the change and return to the test point selection mode.

Press **Enter** again to return to the Return Sweep mode.

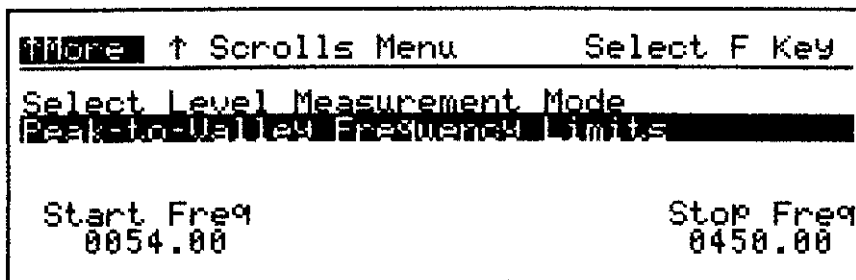
Peak-to-Valley Range

The frequency range of the peak-to-valley (P/V) displayed in the upper right corner of the display is controlled by the peak-to-valley frequency limits or the display start and stop frequencies. The range is a combination of the highest start frequency and the lowest stop frequency. Table 8-2 illustrates the resultant P/V range for various mixes of start and stop frequencies.

Table 8-2 Peak-To-Valley Frequency Range

	Start(MHz)	Stop(MHz)
Display	50	700
P/V Limits	54	770
P/V Range	54	700

To access the Peak-to-Valley Range screen, press **Option** \blacktriangledown .



pd220b

Figure 8-8 Peak-to-Valley Range Screen

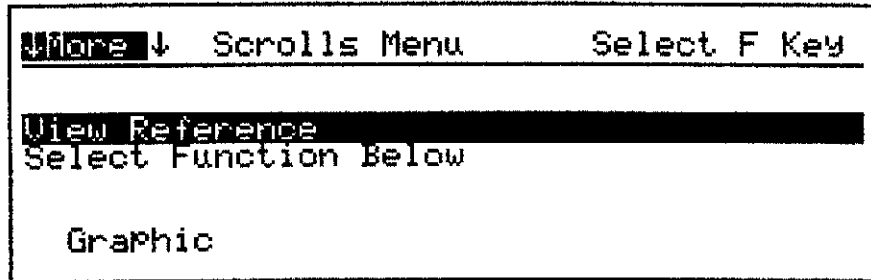
To set the P/V start frequency, press **F1** and use the \blacktriangle \blacktriangledown keys to set the value.

To set the P/V stop frequency, press **F4** and use the \blacktriangle \blacktriangledown keys to set the value.

Press **Enter** to save the changes and return to the sweep or normalized forward sweep screen.

View Reference A reference trace is a raw sweep response stored into memory. You can view the references from the Normalized and Raw Sweep modes by pressing **Option** \blacktriangle \blacktriangle to highlight the view reference menu item in the Option menu.

Option Screens



pi219r

Figure 8-9 View Reference Menu Item in the Option Menu

Press **F1** to view the file selection screen. Using **▲** and **▼**, you can select any of the 12 references.

Press **Enter** to exit the view reference screen with the last viewed reference file selected.

NOTE:

In the view reference function, you can view both forward and return references. When exiting the view reference screen, the selected file becomes the active return sweep reference.

Peak Hold

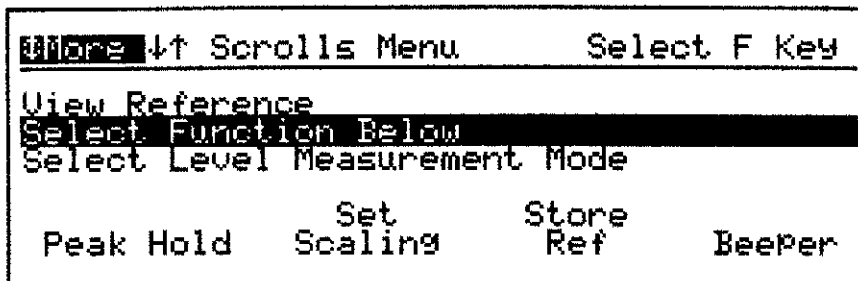
Peak Hold has the same function in all the measurement modes of the 3010. Peak Hold can be activated and deactivated by pressing **Option ▲ F1**.

Beeper

The beeper indicates that a key is pressed. To turn the beeper on or off from most measurement modes, press **Option ▲ F4**.

Storing a Reference

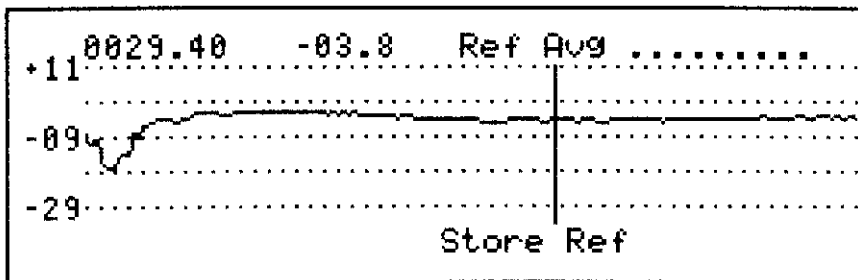
Storing a reference in the return sweep is the same as storing a reference in the forward sweep. References are stored from the Raw Sweep mode. To store a reference, press **Option ▲**.



pi216r

Figure 8-10 Option Menu Screen

Press **F3** to enter the reference average screen.



pi220r

Figure 8-11 Reference Average Screen

The reference average message is displayed in the upper right hand corner to indicate the stability of the response. If you are storing a reference in the system and some of the measurement points are below the display, the **Ref avg.....** message may indicate an unstable reference. In a case where you are sweeping below the roll-off of the amplifier's diplex filters, the sweep points at these frequencies are below the level of the noise floor of the 3010H. The random level of noise may give an indication of instability. You can check this situation by viewing the response on the display.

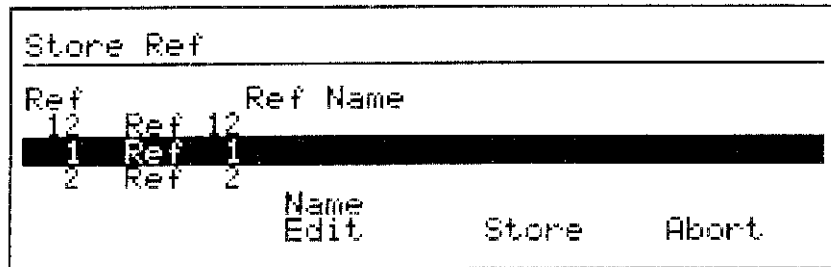
Option Screens

After the message has disappeared or when you are satisfied the reference is usable, press **F3** to enter the reference section of the file server.

NOTE:

Remember

While it is not a good practice, a reference can be stored without waiting for all of the dots to disappear.



pi765

Figure 8-12 Reference File Selection Screen

Use ▲ and ▼ to select the reference file. It is important to label or remember the references used for forward sweep and return sweep. The name of the file can be changed by pressing **F2** and following the instructions in the “Naming a File” section in Chapter 10.

To store the reference to the highlighted file, press **F3**. The 3010 will store the reference in the selected file, exit the file server, and enter the Return Normalized Sweep mode with the new reference selected.

Smoothing and Averaging in Normalized Sweep Mode

The Smoothing and Averaging functions have been included to enhance the overall display of the trace by eliminating minor trace-to-trace variations that can occur in the normalized mode of the 3010. Both functions operate the same way in the forward and return sweep modes.

The averaging function averages level variations on a screen-to-screen basis, displaying the cumulative average level detected for point. The Smoothing function compares a selected number of points. This results in a **moving average** across the displayed data. Both functions have been designed with adjustment ranges to allow the operator to determine the level of use of each function.






NOTE:

Because Averaging and Smoothing are interactive, you should experiment with varying levels of each on a known reference trace. This will help you determine the best overall use for the specific system being tested.

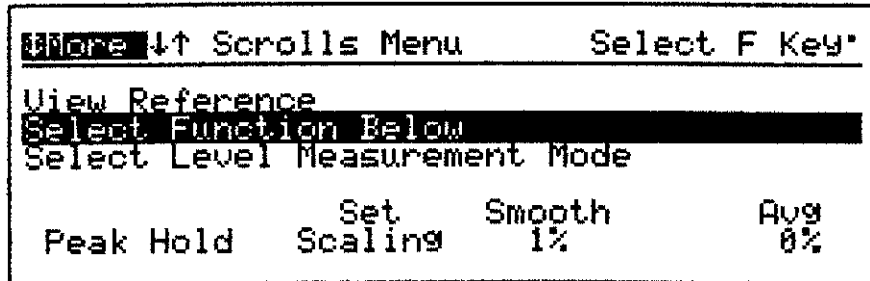
The general rule for using the Smoothing and Averaging functions is:

- Use the Smooth function for aligning the system, since it does not affect the update rate of the display and will remove sharp screen “spikes”.
- Use the Average function prior to printing or storing a trace. The use of Average will cause adjustments to be damped and is not recommended during adjustments.

The Smooth and Average functions are found in the **Option** menu when in the Normalized mode. To adjust the smoothing or the averaging from the normalized sweep screen:

1. Press **Option**  **F3**.
2. Press  and  to change the smoothing to 0%, 1%, or 2%.
3. Press **F4**.
4. Press  and  to change the averaging to 0%, 50%, 75%, 87.5%, or 93.75%.
5. Press **Enter** to save the changes.
6. Press **Enter** again to exit the Option menu.

Option Screens




pi221r

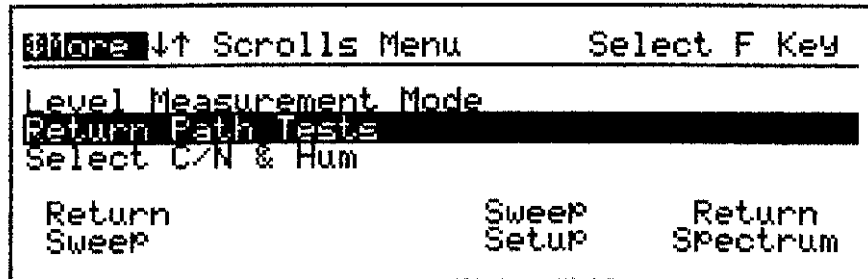
Figure 8-13 Normalized Return Sweep Option Menu

NOTE:

Smoothing and averaging settings are a matter of personal preference. Set Smoothing to 1% or 2% and Averaging to 0% when adjusting an amplifier. Set Smoothing to 0% and Averaging to 50% or 75% when measuring a sharp filter.

Entering the Return Spectrum Mode

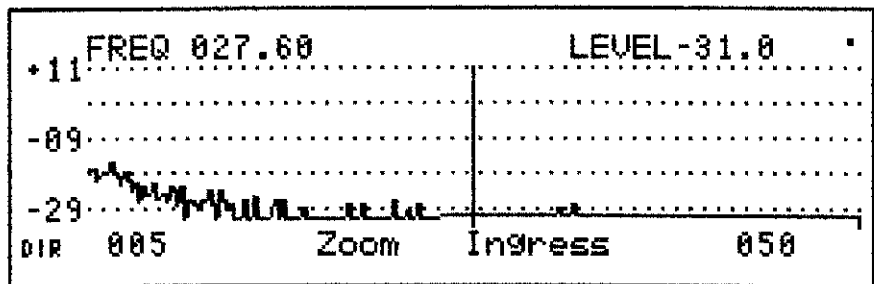
To enter the Return Path Test menu from any screen, press **Menu** .



pi23r

Figure 8-14 Return Path Tests in the Main Menu

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



pi222r

Figure 8-15 Return Spectrum Screen with an Ingress Message

Scaling

The Return Spectrum screen is similar to the Spectrum Scan screen except for the Ingress message over the **F3** key. This label will only appear when the 3010R is receiving an ingress message from the 3010H.

Scaling

In the Return Spectrum mode, the display shows the measurements made by the 3010H. The dynamic range of the measurement is dependent on the attenuator setting of the 3010H in the same manner the Return Sweep measurements are affected. As in the Return Sweep, the Scaling function allows you to change the displayed Full Scale and dB/division values, as well as the IP value.

IP Value and the Return Spectrum Mode

The IP value in the Return Spectrum mode controls the output level of the Return pilot. The Return pilot provides the communication link between the 3010R and the 3010H. Although you can not directly see the results of a change in the Return Spectrum screen, the value is linked to the preset test point values used in the Return Sweep modes. Refer to the "Identifying the Test Point Insertion Loss and Insertion Point (IP) Value" section for more information on setting the Scaling and the IP value.

Setting the Frequency Span

Press **F1** to set the start frequency. Press **F4** to set the stop frequency. To change the values, press **▲** and **▼**. Holding an arrow key will accelerate the changes.

Zoom

As in the Spectrum Scan mode, Zoom allows you to easily zoom in on a particular frequency. Pressing **F2** activates the zoom feature. Use **◀** and **▶** to select the center frequency with the vertical marker. **▲** is used to zoom out by a factor of 2. **▼** is used to zoom in by a factor of 2. Holding **▲** or **▼** will repeatedly zoom until full spectrum or zero span is reached. When zero span is reached, you are reading the level at the frequency indicated above **F1** or **F4** ± 10 kHz.

Options

Peak Hold

Peak Hold has the same function in all the Measurement modes of the 3010. Peak Hold can be activated and deactivated by pressing **Option ▲ F1**.

Beeper

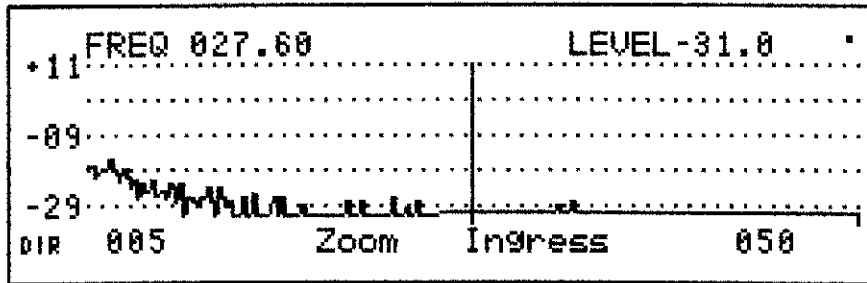
The beeper indicates that a key is pressed. It can be turned on or off from the Option menu in most measurement modes. To turn the beeper on or off from most measurement modes, press **Option ▲ F4**.

Ingress Mode

Ingress Mode

High levels of ingress on the return path can interfere with the return pilot. The 3010H checks the condition of the return path and if it detects ingress levels that will affect the communication, the 3010H will broadcast a Return Spectrum measurement.

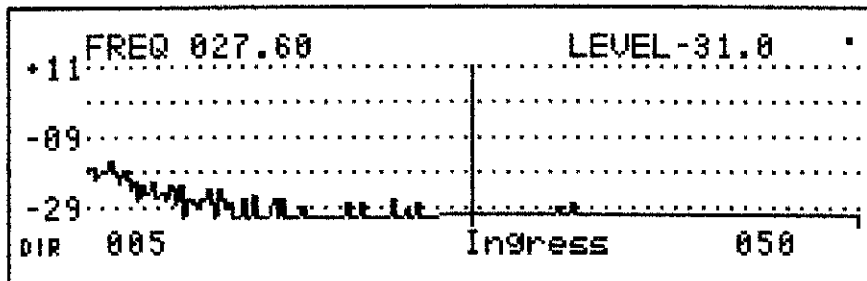
When the 3010R receives an ingress message in either return path test mode, the message Ingress is displayed above the **F3** key and the key becomes active.



pi222i

Figure 8-16 Return Spectrum Screen with an Ingress Message

With the Ingress message displayed above **F3**, press **F3** to enter the Ingress mode.



pi228i

Figure 8-17 Return Spectrum Screen in the Ingress Mode

Ingress Mode

In the Ingress mode, the start and the stop frequencies are fixed to the values set in the Spectrum Scan mode in the 3010H. Note that the Zoom feature is not present in the Ingress mode. Communication between the 3010R and the 3010H is required before the zoom feature will operate. In the Ingress mode, this communication may not exist. Often, Ingress problems are intermittent. Therefore, in the Ingress mode, the 3010R requests a Return Spectrum measurement following each poll from the 3010H. The result is a consistent screen update, even with intermittent communications.

To exit the Ingress mode, press **Menu**.

Accessing Ingress Measurements

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, F1, F2, and F3.

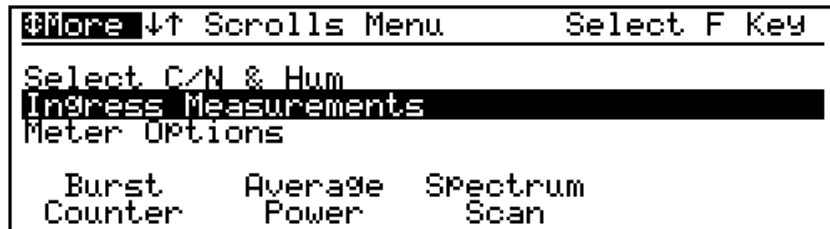


Figure 8-18 Selecting Ingress Measurements from the Main Menu

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 μ Sec
- Less than 1 mSec (but greater than or equal to 100 μ Sec)
- 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 8-20) and the Burst Counter Report screen (Figure 8-22).

- The Burst Counter Monitor screen is displayed while the measurements are made. The minimum burst which may be captured is approximately 50 μ Sec.
- 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

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.

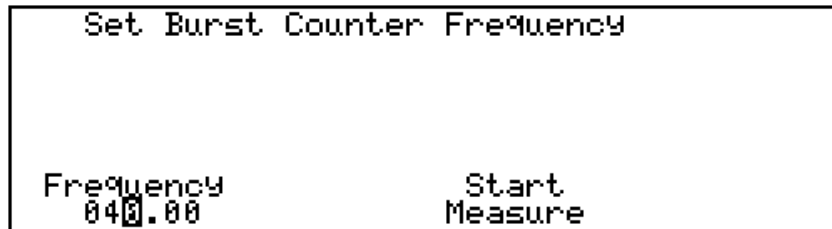


Figure 8-19 Burst Counter Frequency Selection Screen

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

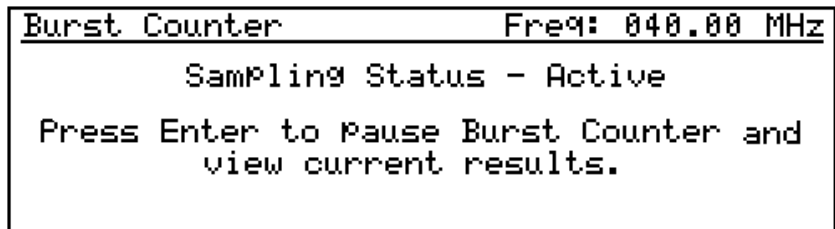


Figure 8-20 Burst Counter Monitor Screen

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 8-20 to set the attenuator and the threshold.

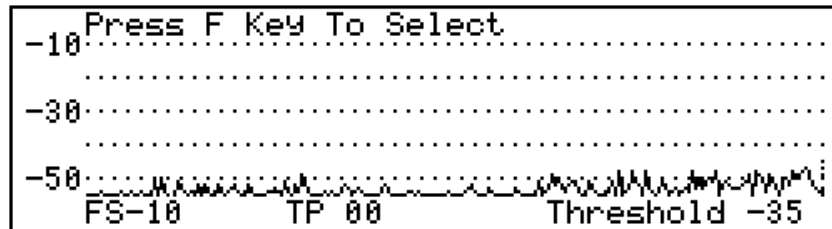


Figure 8-21 Burst Counter Scale Screen

As shown in the Figure 8-21, 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 dB μ V).

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

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.

Burst Counter Report		28AUG98 09:48	
Run Time: 00:06		FS Ref: -10 dBmV	
		FREQ: 040.00 MHz	
<100 uS	107	<1 S	0
<1 mS	323	<3 S	0
<10 mS	1,372	>3 S	0
DIR<100 mS	424		

Figure 8-22 Time Domain Burst Counter—Report Screen

2. Press **ENTER** to return to the Active Burst Counter screen shown in Figure 8-20.

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 8-23).

- 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

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.

```
Set Average Power Start/Stop Frequencies

Start Freq          Start      Stop Freq
054.00             Measure    059.99
```

Figure 8-23 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.

```
Average Power Report      28AUG98 10:28
Run Time: 00:01          FS Ref: 00 dBmU
Start Freq: 030.00      Stop Freq: 040.00
      -05.4    -22.2    -29.5    -29.5
DIR Maximum Average Current Minimum
```

Figure 8-24 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 dB μ V). 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.

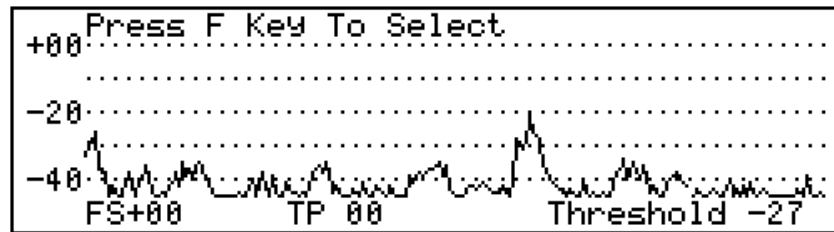


Figure 8-25 Average Power Scale Screen

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

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 8-26) is updated with each spectrum scan.

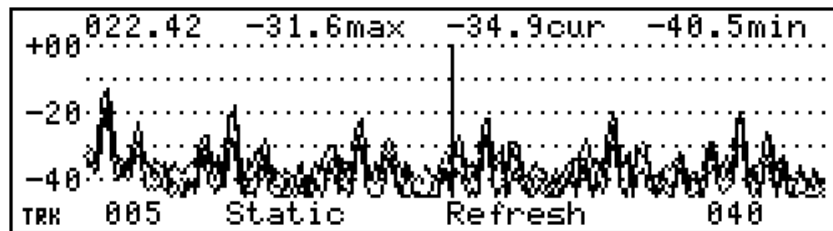


Figure 8-26 Return Spectrum Monitor Display Screen

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 **F1** 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

Setting the Scale

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

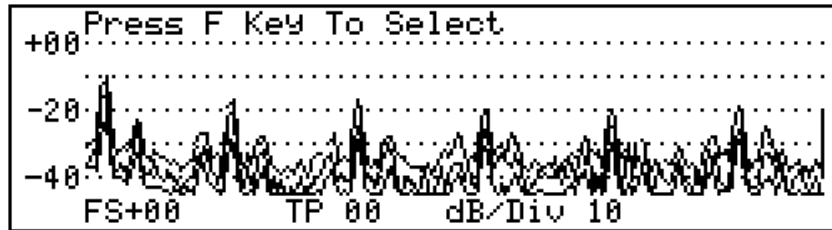


Figure 8-27 Return Spectrum Monitor Scale Screen

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.

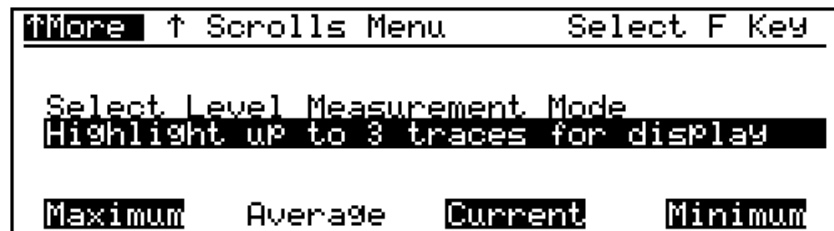


Figure 8-28 Return Spectrum Monitor—Option Screen

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

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.

Distortion Measurements

Distortion Measurements

Making 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 becomes a subjective measurement and not an objective measurement. Distortion specifications and measurements tend to make objective and comparative measurements possible.

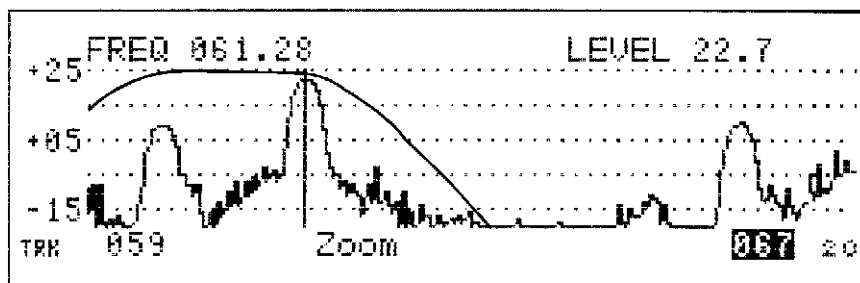
The 3010 allows the user to make some distortion measurements in the network such as carrier-to-noise, hum, and beat measurements. One requirement for distortion measurements is that the dynamic range of the unit must be great enough to measure distortion 50 to 60 dB below the carrier. A common problem with many instruments is that when the attenuation is reduced so that low level distortions can be measured, the instrument will overload. The overload condition is caused by the power of all of the channels overloading the front end.

To correct the overload problem and increase the dynamic range of the instrument, a filter is used to reduce the cumulative power on the input to the instrument. The characteristics of the filter must be known, such as the out-of-band rejection, the bandpass of the filter, and the center frequency.

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. If you are using a fixed filter, the center frequency is fixed; however, if you are using a tunable filter, you have control over the center frequency.

Fixed Filters

A fixed filter is a filter with the center frequency and passband tuned at the factory. Although the user does not have control over the tuning, it is important that the reference carrier and the frequency measurement point of the distortion be within the passband of the filter.



pi795

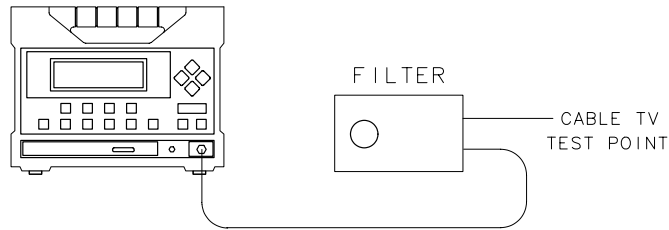
Figure 9-1 Carrier with Filter Response Overlay

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

Many times a tunable filter or preselector is used for distortion measurements. A tunable filter allows the user to make measurements on different channels, however, care must be taken when tuning.

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.

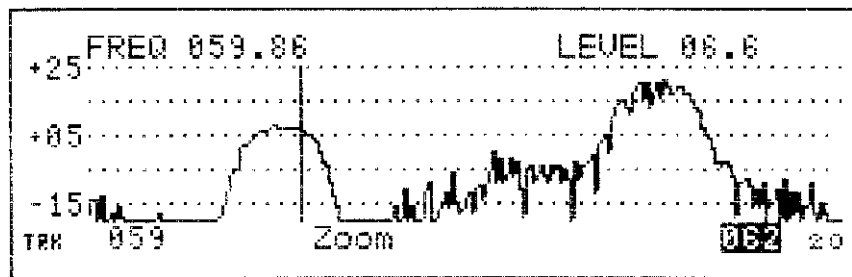


pi7113

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, if you wanted to measure the carrier-to-noise on channel 3, you would 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 aural carrier for channel 2. 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.

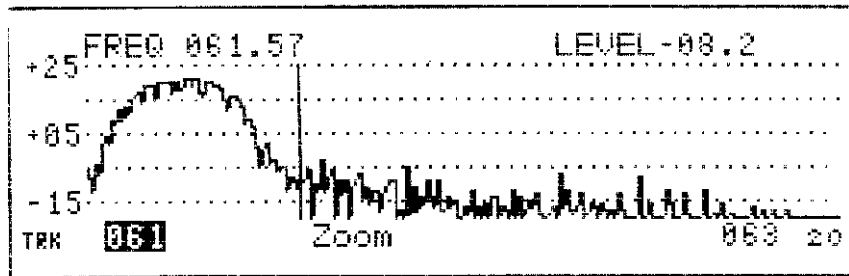
The lower adjacent aural carrier should still be at its peak level. If the aural carrier drops, you have moved the filter too high in frequency or the passband of the filter is not wide enough to be used in this procedure.

Spectrum Scan Mode

The filter is now tuned so that the visual carrier is at the high frequency side of the filter passband and 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, except 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.

NOTE:

A signal $\geq +20$ 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 or filter bandpass 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 set up requires the filter to include the test carrier and a lower passband of at least 1.25 MHz without encountering the filter rolloff. Increasing the separation or the noise test width increases the filter width. For best results, select a frequency for noise 1.1 MHz below the test carrier and 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 \pm 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.

Range Limit 54 dBc		Range Limit 10.0%	
C-N	Set Noise Meas Pt	Hum	
44.2dBc	Ctr Freq Scan Wth	0.6%	
Ch 03	060.15 8.3 MHz	Ch 02	

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

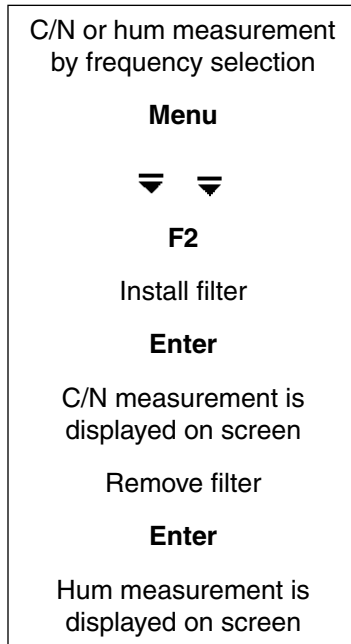
The hum measurement requires an unmodulated carrier. To change the channel used for the hum measurement, press **F4** and use the **▲ ▼** keys to select the channel. Press **Enter** to save the change and perform the measurement.

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



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 \pm the value programmed above **F3**, looking for the lowest noise value. The carrier-to-noise in dBc is calculated using the measured information with bandwidth correction values applied and displayed on the screen.

Range Limit 55 dBc		Range Limit 10.0%	
C-N	Set Noise Meas Pt	Hum	
43.8dBc	Ctr Freq Scan Wth	0.6%	
061.25	060.15 0.3 MHz	055.25	

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.

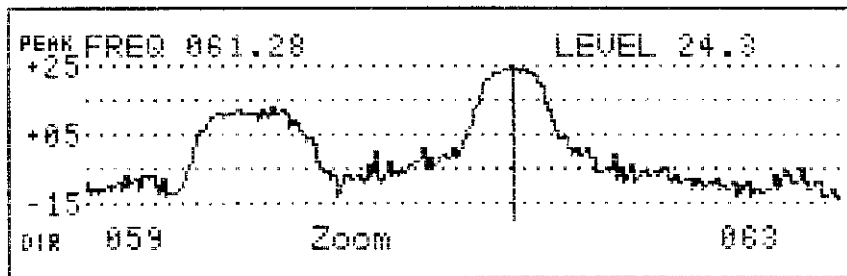
NOTE:

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

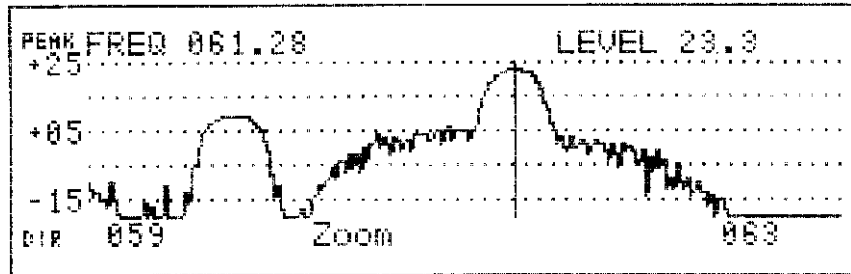
Figure 9-7 Spectrum Graphic without Filter

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

1. The first step in tuning the filter is to 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. At this time, note the level of the lower adjacent aural carrier (aural carrier of channel 2).

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

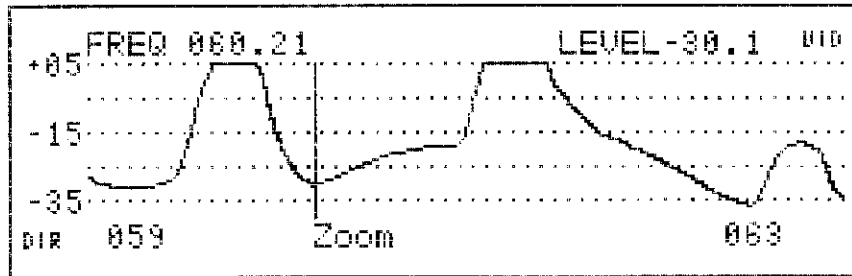
Figure 9-8 Spectrum Graphic with Filter, Marker On Visual

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.

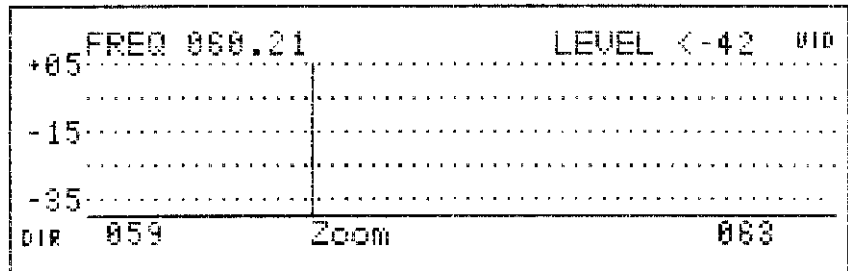
Manual Spectrum Scan Method



pi7103

Figure 9-9 Spectrum Graphic with Filter and 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. 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 previous screen, the noise floor measurement is less than -42 dBmV; therefore, *noise floor – system noise measurement = 12 dB*.

Manual Spectrum Scan Method

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	.79
7.5	.71
8.0	.64
8.5	.57
9.0	.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. The two methods normally used to increase the dynamic range are to 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.

$$C/N = (\text{Carrier Level}) - (\text{NOISE LEVEL}) - 15.1 \text{ dB} + (\text{NOISE NEAR NOISE CORRECTION})$$

Example:

$$\begin{aligned} C/N &= (23.3 \text{ dBmV}) - (-30.1 \text{ dBmV}) - 15.1 + (0 \text{ dB}) \\ &= 38.3 \text{ dBc} \end{aligned}$$

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.

Beat Distortion Measurements

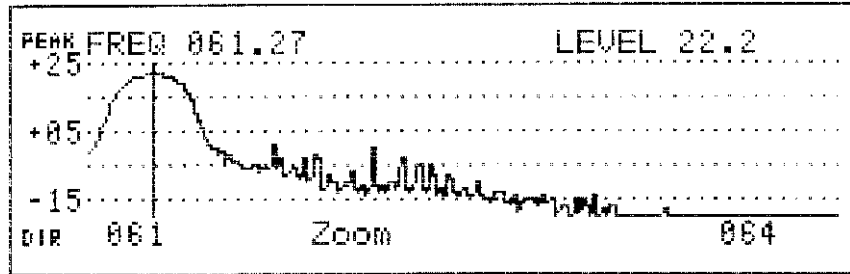
Beat distortions can be second order, third order, composite triple beat, and ingress signals. The second order, third order and composite triple beat are distortions produced by the mixing of carriers caused by non-linearity in amplifiers or other active devices. Composite triple beat and third order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

Ingress refers to signals picked up through opens in the shielding of the cable or connectors. The frequency of these signals will depend on signals present in the air and the nature of the open in the system.

Most beat measurements are not stated as an absolute measurement. 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. In the case of ingress signals, they are referenced to the channel spectrum in which they fall.

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

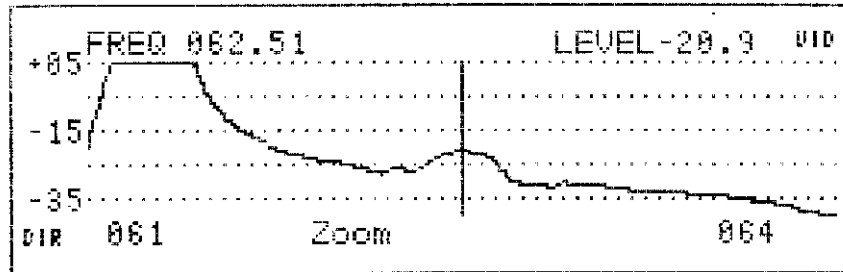
1. Set the start and the stop frequency in the spectrum scan screen to view the spectrum of interest. In the figure above, the 3010 is set to look at distortions in the video passband of channel 3 with a tunable filter tuned with the visual carrier peaked at the low frequency edge of the filter passband.
2. Turn peak hold on to insure that the peak level of the carrier is measured. For situations where the distortion is high in level, the 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 beat distortion you are measuring. If you are measuring a composite triple beat, you would remove the visual carrier and continue with the procedure. Ingress measurements may involve re-tuning of the filter if the beat 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.

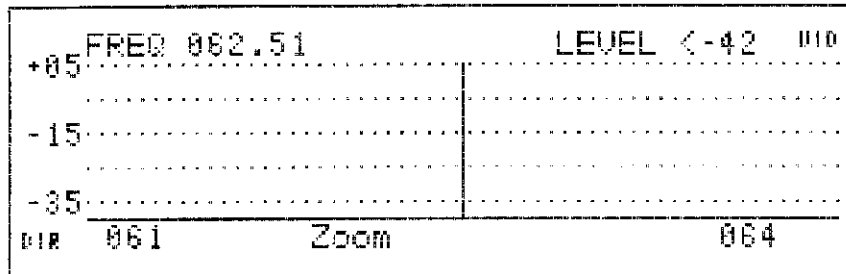
Beat Distortion Measurements



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 beat measurement was made.



pi7107

Figure 9-13 Spectrum with Video Filter on with the 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 correct value can be added for beat near noise measurements. The correct value is found using the same graph 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 correct value from the graph, if any.

Example: Carrier-to-beat = $(R1 - R2) + \text{correction value}$

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. By listening to the demodulated audio, you have another clue to the nature of the beat. Some of the things you may hear are: 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.

Beat Distortion Measurements

Storing and Retrieving Data

Storing and Retrieving Data

The 3010 contains a multi-format 90 file server for history storage. Data stored in the files can be one of 8 possible formats: level measurements, normalized level measurements traces, graphic sweep traces, graphic spectrum scan traces, return spectrum traces, burst count data, digital channel power, and average power data. 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 sweep and normalized 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.

File	C/S	File Name	Time	Date
01	File	01	16:11	07JUN95
02	File	02	16:53	19JUN95
03	File	03	11:05	19JUN95
Save Screen	More	View	Print	
To 02	Choices	File 02	File 02	

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

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.

↓↑ Scrolls Files									
01	02	03	04	05	06	07	08	09	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
Select Today's Work			Select All		Select Files		Clear All Files		

pi7193

Figure 10-2 File Selection Screen

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

↓↑↔ Scrolls Files										Press F4 to Print	
01	→02	03	04	05	06	07	08	09	10		
11	12	13	14	15	16	17	18	19	20		
21	22	23	24	25	26	27	28	29	30		
File 02										17:18 07JUN85	
Select File			UnSelect File				File Name Edit		Print		

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.

```

↑↓↔Selects Character                                F1 Accepts
-----
!"#$%&'()*+,-./0123456789:;<=>?
@ABCDEFGHIJKLMNPOQRSTUVWXYZ [ ] ^ _
\ abcdefghijklmnopqrstuvwxyz{|}~
File 03
03 Select      Cursor      11:05 19JUN95
   Letter      Alpha        Save   Abort
    
```

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**.

```

↑↓↔Selects Character                                F1 Accepts
-----
!"#$%&'()*+,-./0123456789:;<=>?
@ABCDEFGHIJKLMNPOQRSTUVWXYZ [ ] ^ _
\ abcdefghijklmnopqrstuvwxyz{|}~
File 03
03 Select      Cursor      11:05 19JUN95
   Letter      Label        Save   Abort
    
```

pi7195

Figure 10-5 Naming a File

Types of Files

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.

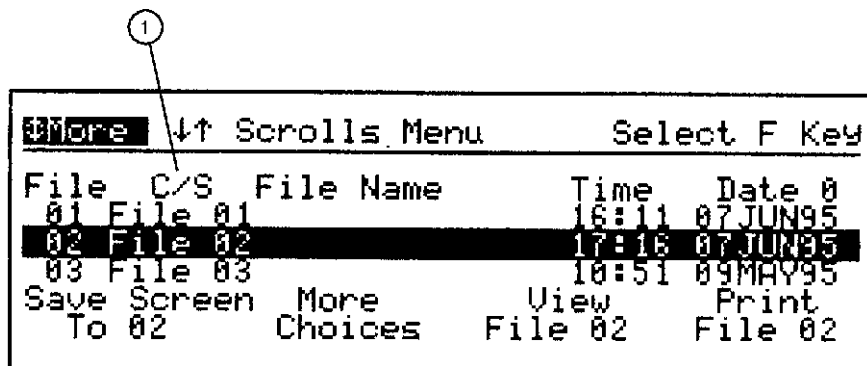
File names in the file server can be 40 characters in length. The table and reference labels can be 10 characters in length.

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



File	C/S	File Name	Time	Date	0
01	File	01	16:11	07JUN95	
02	File	02	17:16	07JUN95	
03	File	03	10:51	09MAY95	
Save Screen		More	View	Print	
To 02		Choices	File 02	File 02	

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** . 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 Normalized Sweep	RNSw	Graphic
Return Raw Sweep	RSwp	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.

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.

Range Limit 35 dBc		Range Limit 10.0%	
C-N	Set Noise Meas Pt	Hum	
44.6dBc	Ctr Freq Scan Wth	1.0%	
061.25	060.15 0.3 MHz	059.75	

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.

CALAM Form 3010-30 Page 1 of 2

Station Report By _____

```

Location File_02_____ Sys #_____ ID_____
Cas_____ Cable Loss_____ Flat Loss_____ Freq_____ Hub No._____ Aerial / Gnd
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 19JUN95			
Ch #	Visual	Aural	V:A	Ch #	Visual	Aural	V:A	Ch #	Visual	Aural	V:A
	dBmV	dBmV	dB		dBmV	dBmV	dB		dBmV	dBmV	dB
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
- Sweep
- Spectrum scan
- Return 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**, **Ⓢ** is displayed above the file names. To view the selected file press **F3**. See Figure 10-9.

①

More	↓↑ Scrolls Menu	Select F Key		
File	C/S	File Name	Time	Date
01	File	01	16:11	07 JUN95
02	File	02	17:16	07 JUN95
03	File	03	10:51	09 MAY95
Save Screen	More	View	Print	
To 02	Choices	File 02	File 02	

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.

Select Screen to View Data in File 02					
Name	Visual	Level	Aural	Level	Name
02N	055.25	+08.2	059.75	-06.3	02N
03N	061.25	+08.9	065.75	-05.8	03N
04N	067.25	+09.2	071.75	-04.8	04N
Graphic		FCC		Print	
				Raw Data	

pi7166

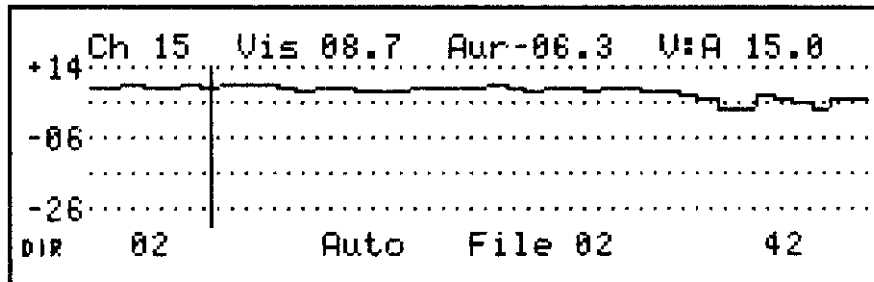
Figure 10-10 Raw Level Measurements

Channel Scan (Level Measurement Files)

Select Screen to View Data in File 02				
Ch Name	Ratio	Min	Adj	Overall
02	Pass	Pass	Pass	Pass
03	Pass	Pass	Pass	Pass
04	Pass	Pass	Pass	Pass
Graphic	Regular	24 Hour	Print	

pi7167

Figure 10-11 FCC Pass/Fail Report



pi7168

Figure 10-12 Graphically

Figure 10-10 shows the raw level measurement display. Use the \blacktriangle \blacktriangledown 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**.

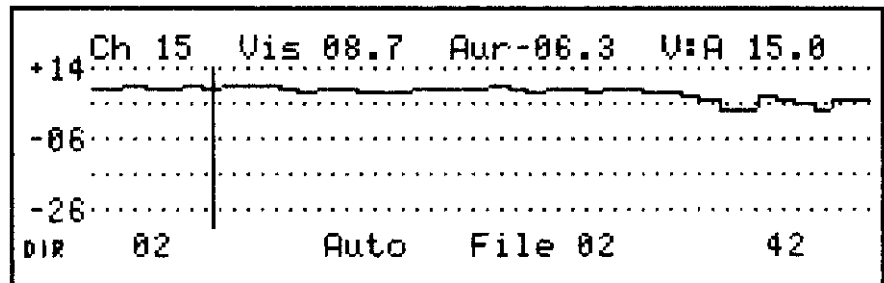
Select Screen to View Data in File 02				
Ch Name	Ratio	Min	Adj	Overall
02	Pass	Pass	Pass	Pass
03	Pass	Pass	Pass	Pass
04	Pass	Pass	Pass	Pass
Graphic	Regular	24 Hour	Print	

pi7167

Figure 10-13 Pass/Fail Screen

As in the level measurement screen, the other channels are viewed using the \blacktriangle \blacktriangledown 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

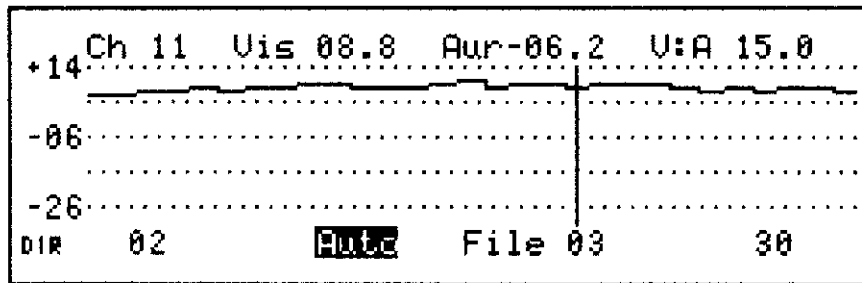
The other channel scan files can be viewed by pressing **F3** and using the \blacktriangle \blacktriangledown keys to change the file.

Channel Scan (Level Measurement Files)

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 the “Channel Scan Mode” section in Chapter 3 for information about these functions.

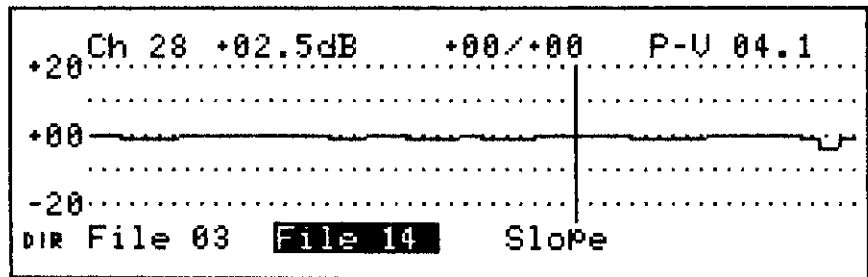


pi7196

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

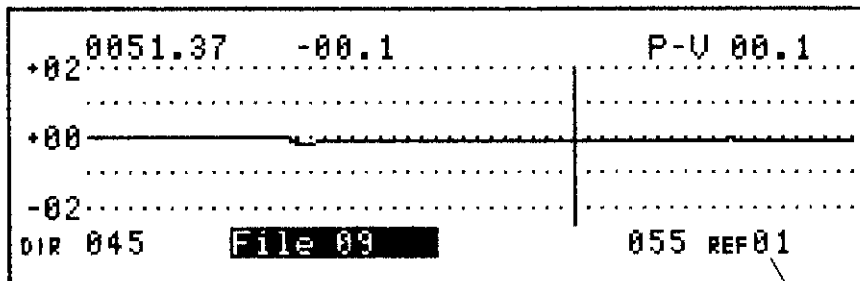
The reference file name is displayed over the **F1** softkey and the selected file name is displayed over **F2**. Other normalized channel scan files can be selected using the **▲ ▼** keys.

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

Sweep Files

Sweep Files

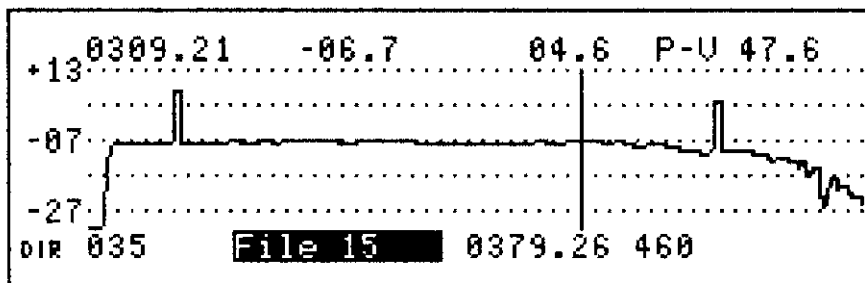
To view stored sweep files, enter the file server from any measurement mode by pressing the **Print/Save** key. Use the \blacktriangle \blacktriangledown keys to select the file. The file type, (**NSw**, **Swp**, **RNSw**, or **RSwp**) is displayed above the file names for normalized sweep and raw sweep files. To view the selected file, press **F3**.



pi7170

Figure 10-17 Stored Normalized Sweep Response

The reference file number ① is indicated in the lower right corner of the display for normalized responses. See Figure 10-17.



pi7171

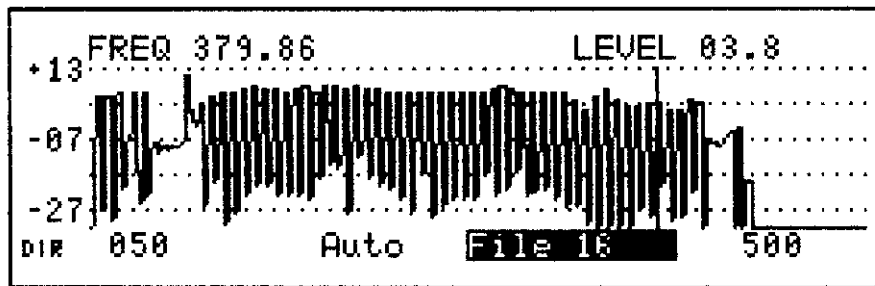
Figure 10-18 Stored Raw Sweep Response

The difference between the normalized sweep file display and the raw sweep file display is the reference file number displayed in the lower right corner of the screen. See Figure 10-17 and Figure 10-18. The storage file name is displayed above **F2**. To select a different file of the same type, use the **▲** **▼** keys. The position of the marker and the relative level at the marker position can be changed by using the **◀** **▶** keys.

A feature of the Forward Sweep and Normalized Sweep mode allows you to view the absolute levels of the system pilot channels if programmed in the sweep table as active frequencies. These levels and frequencies are stored with the file data. Press **F3** to toggle between the system pilots. The levels are displayed at the top of the screen in the same manner that they are displayed in an active screen. This feature is not available for return sweep measurements.

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.



pi7172

Figure 10-19 Stored Spectrum Scan Screen

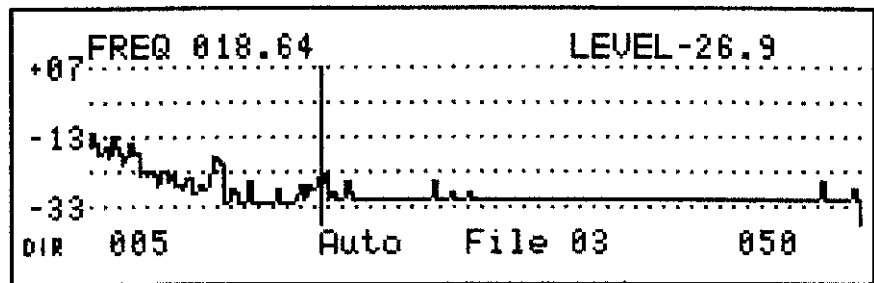
In the spectrum scan display, the marker is used to measure the frequency and level at a specific point on the trace by using the **◀ ▶** keys to position the marker. The frequency and level are displayed at the top of the screen.

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.

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**.

Return Spectrum Scan Files

To view stored return 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 **RS/A** is displayed above the file names. Press **F3** to view the file.



pdf200b

Figure 10-20 Stored Return Spectrum Scan Screen

In the return 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.

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.

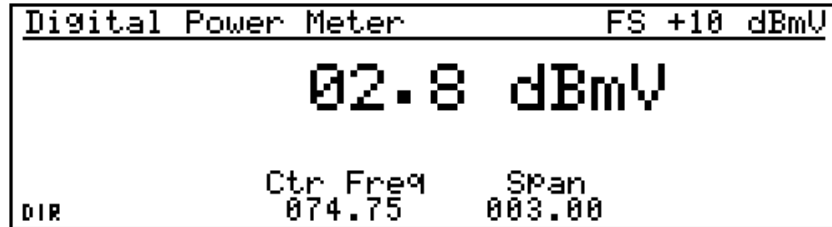


Figure 10-21 Stored Digital Power Frequency Measurement Screen

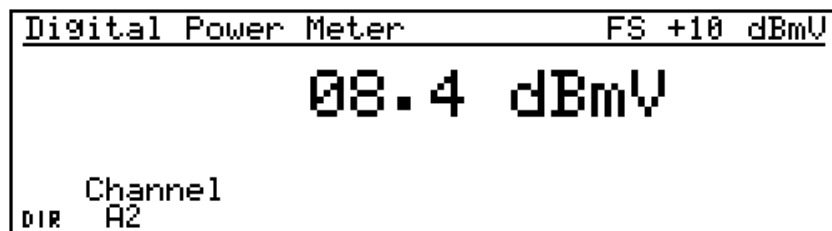


Figure 10-22 Stored Digital Power Channel Measurement Screen

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.

Burst Counter RePort		28AUG98 09:48	
Run Time: 00:06		FS Ref: -10 dBmV	
		Freq: 040.00 MHz	
<100 uS	107	<1 S	0
<1 mS	323	<3 S	0
<10 mS	1,372	>3 S	0
DIR<100 mS	424		

Figure 10-23 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.

Average Power Report		28AUG98 10:28	
Run Time: 00:01	FS Ref: 00 dBmV		
Start Freq: 030.00	Stop Freq: 040.00		
-05.4	-22.2	-29.5	-29.5
DIR	Maximum	Average	Current Minimum

Figure 10-24 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 server 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.

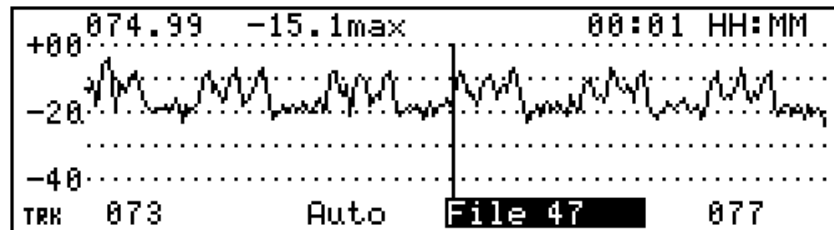


Figure 10-25 Stored Ingress Spectrum Scan Maximum Trace

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

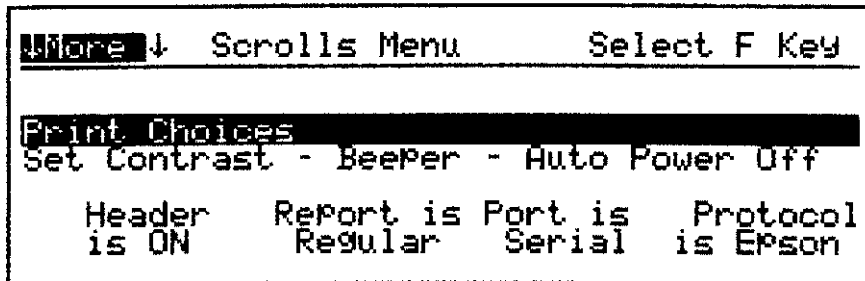
Printer Setup

The 3010R has a parallel and a serial printer interface. The printing format is selectable between Epson graphics and PCL. The PCL is compatible with most HP LaserJet and HP DeskJet 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).



pd2310

Figure 10-26 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

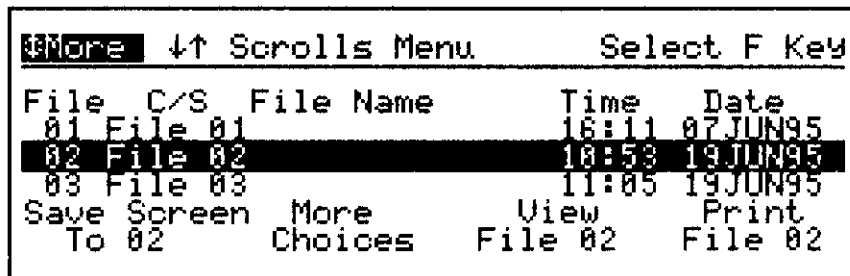
Emulation	Epson FX-8x
Page Length	11 inches
Perforation Skip	Off
Character Set	USA
Carriage Return	CR
Line Feed	LF
Graphic Print Dir.	Unidirectional
LF/Graphic/Pitch Mode	Normal
Protocol	XON/XOFF
Parity	None
Data Length	8 bits
Baud Rate (Stop Bits)	9600 (1)

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.



The screenshot shows a terminal window with a title bar that reads "More ↑ Scrolls Menu Select F Key". The main content is a table with five columns: "File", "C/S", "File Name", "Time", and "Date". The first three rows of the table are highlighted with a black background. The first row is "01 File 01" with time "16:11" and date "07 JUN95". The second row is "02 File 02" with time "18:53" and date "19 JUN95". The third row is "03 File 03" with time "11:05" and date "19 JUN95". Below the table, there are four columns of text: "Save Screen", "More", "View", and "Print". Under "Save Screen" is "To 02". Under "More" is "Choices". Under "View" is "File 02". Under "Print" is "File 02".

File	C/S	File Name	Time	Date
01	File 01		16:11	07 JUN95
02	File 02		18:53	19 JUN95
03	File 03		11:05	19 JUN95

Save Screen More View Print
To 02 Choices File 02 File 02

pi7183

Figure 10-27 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**.

↓↑ Scrolls Files									
01	02	03	04	05	06	07	08	09	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
Select Today's Work			Select All		Select Files		Clear All Files		

pi7173

Figure 10-28 Group File Selection Screen

There are three ways to select files.

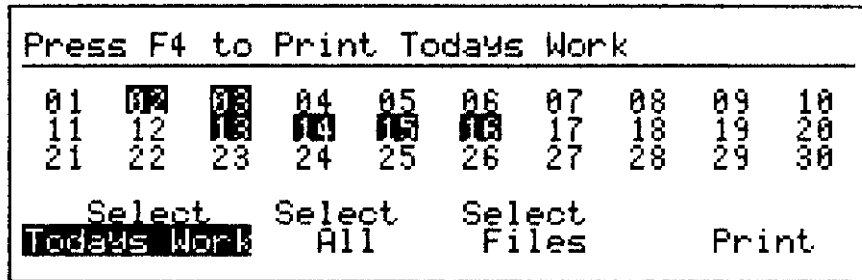
F1 selects today's work.

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.

Printing Multiple Stored Measurements

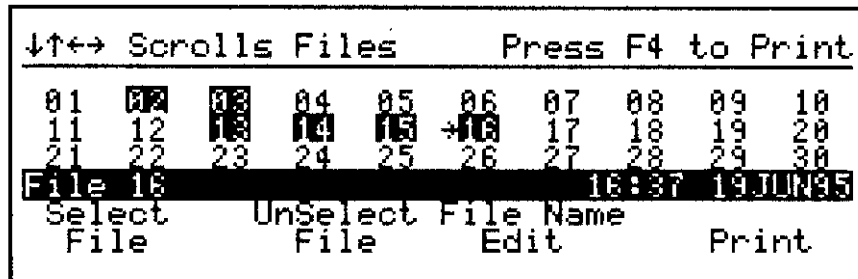


pi7174

Figure 10-29 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**.



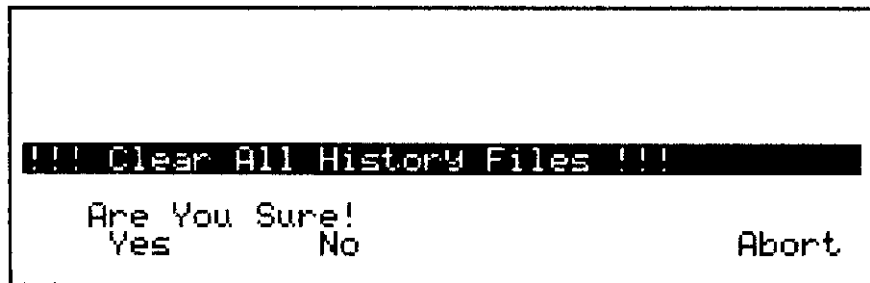
pi7175

Figure 10-30 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 10-31.



pi7176

Figure 10-31 Clear Files Warning Screen

CAUTION:

Cleared files cannot be recovered.

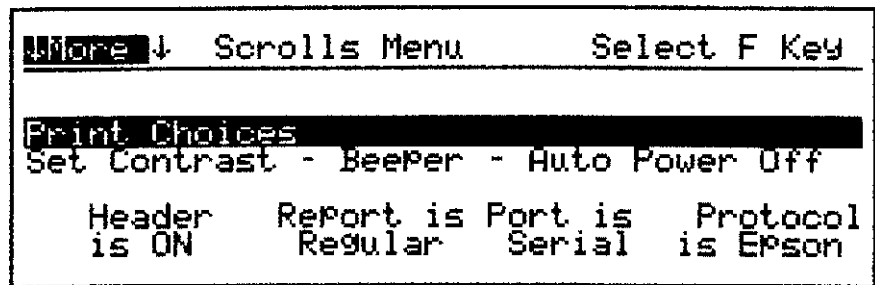
FCC Reports

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).



pd231a

Figure 10-32 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.

Select Screen to View Data in File 02					
Name	Visual	Level	Aural	Level	Name
02N	055.25	+08.2	059.75	-06.3	02N
03N	061.25	+08.9	065.75	-05.8	03N
04N	067.25	+09.2	071.75	-04.8	04N
Graphic		FCC		Print Raw Data	

pi7166

Figure 10-33 View Data Screen

Figure 10-33 shows the raw data stored in the file. To view the FCC report results, press **F2**.

Select Screen to View Data in File 02				
Ch	Ratio	Min	Adj	Overall
Name	10-17	+03.0	03.0	11.0
02	Pass	Pass	Pass	Pass
03	Pass	Pass	Pass	Pass
04	Pass	Pass	Pass	Pass
Graphic		Regular		24 Hour Print

pi7167

Figure 10-34 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 10-39. 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, 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 **▲** (four 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.

Ch Name	Ratio	Min	Adj	Overall
02	10-17	+03.0	03.0	11.0
03	Pass	Pass	Pass	Pass
04	Pass	Pass	Pass	Pass
Graphic	Regular	24 Hour	Print	

pi7167

Figure 10-35 FCC Pass/Fail Report View Screen

The display should look like Figure 10-35. 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.

↓↑↔ Scrolls Files										Press F4 to Print
01	→02	03	04	05	06	07	08	09	10	
11	12	13	14	15	16	17	18	19	20	
21	22	23	24	25	26	27	28	29	30	
File 02							10:53 19 JUN 95			
Select			UnSelect							
File			File				Print			

pi7198

Figure 10-36 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.

↓↑↔ Scrolls Files										Press F4 to Print
01	02	03	04	→05	06	07	08	09	10	
11	12	13	14	15	16	17	18	19	20	
21	22	23	24	25	26	27	28	29	30	
File 05							16:52 19 JUN 95			
Select			UnSelect							
File			File				Print			

pi7178

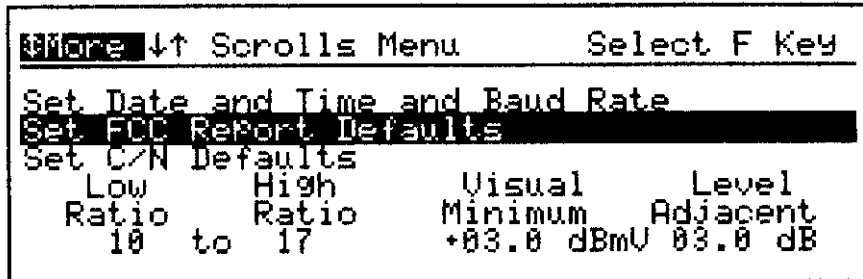
Figure 10-37 24 Hour Report File Selection Screen with Four Files Selected

Connect the 3010 to the printer. Press **F4** to print the report. See the example report in Figure 10-40.

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 10-38 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

Setting the FCC Report Limits

FCC Pass/Fail Report

CALLAM Form 2010 FCC 1 of 2

Date_____ 26OCT93

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 Visual	Level Data Aural	V:A Ratio	10-17 dB Ratio	+03.0 dBmV Min	03.0 dB Adj	11.0 dB 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	-03.0	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	+13.8	+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 10-39 Pass/Fail Report

FCC 24 Hour Report

CALM 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			
Ch #	Visual	Visual	Visual	Visual	24 Hour Variation	24 Hour 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	+11.3	+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 10-40 24 Hour Report

Sweep Tables

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 in the Forward Sweep Setup procedure described in Chapter 5.

To store the current sweep table from any screen, press **Menu** \blacktriangle **F3** \blacktriangledown **F3 F3** to enter the Global Sweep Table Edit screen.

Item	Freq	Guard Band	Dwell
063	0435.20	02.9	0
000	0057.20	02.9	0
001	0063.20	02.9	0

Guard Band 02.9 Dwell 0 Cont Store Table

pi7209

Figure 10-41 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.

Store Sweep Table	
Table	Table Name
4	Sweep 4
1	Sweep 1
2	Sweep 2

Name
Edit Store Abort

pi758

Figure 10-42 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 5 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**.

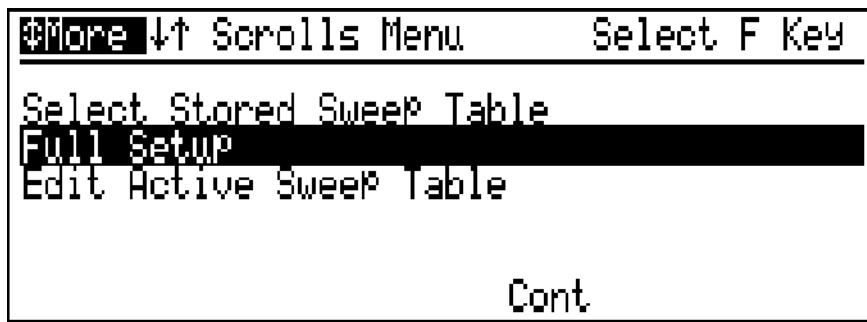
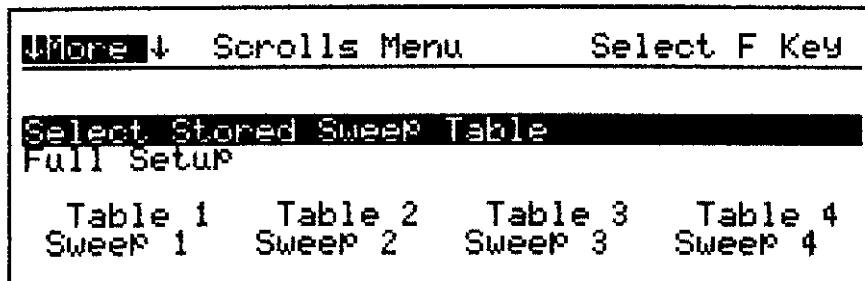


Figure 10-43 Forward Sweep Setup Menu

To enter the sweep table selection menu, press ▲.



pel232b

Figure 10-44 Sweep Table Selection Menu Screen

Press **F1– F4** to select the sweep table with the start and the stop frequencies stored with the file.

More				Review Sweep Table			
Item	Freq	Guard Band	Dwell				
056	0429.20	02.9	0				
000	0057.20	02.9	0				
001	0059.20	02.9	0				
Edit	Insert					Delete	
Freq	Freq	Cont				Freq	

pi7135

Figure 10-45 Sweep Table Edit Screen

The selected sweep table can now be edited and then saved to the transmitter. Refer to Chapter 5 for more information about editing and using sweep tables.

Changing the Start and Stop Frequencies

Sometimes the sweep table is correct, however, the start and the stop frequencies are not correct. The start and the stop frequencies stored with a sweep table can be changed from the current sweep parameters screen. To change the start and the stop frequencies for a stored sweep table, from any screen, press **Menu** **▲ F3 F3** to enter the current sweep parameters screen.

Use the arrow keys to highlight the Sweep Table.

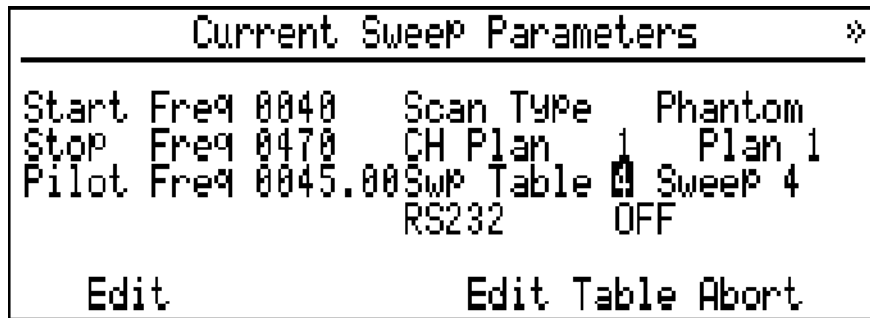


Figure 10-46 Stored Sweep Table Selected

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.

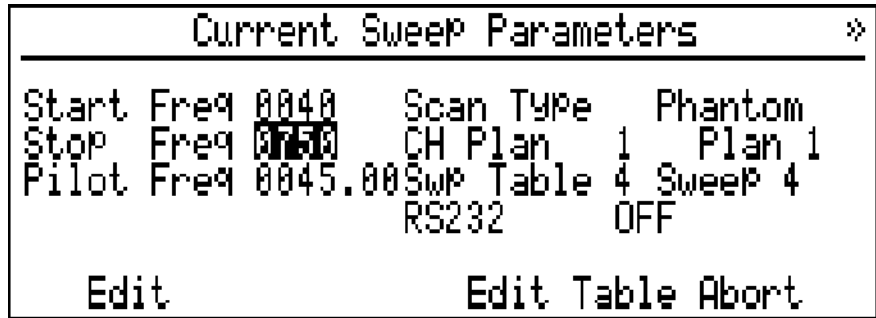
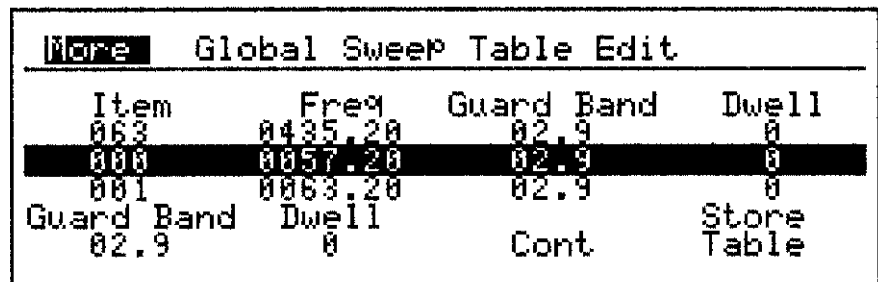


Figure 10-47 New Start and Stop Frequencies

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 5 for more information about editing sweep tables.

Press **F3** again to enter the global sweep table edit screen.



pi7209

Figure 10-48 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.

Changing the Start and Stop Frequencies

Store Sweep Table	
Table	Table Name
4	Sweep 4
1	Sweep 1
2	Sweep 2

Name Edit Store Abort

pi758


Figure 10-49 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 5 for more information about sweep tables and saving them to the transmitter.

Reference Files

The 3010 has a total of 12 files for forward and return sweep references. A reference file is a raw sweep response stored in memory. Therefore, references are stored with the 3010 in the Raw Sweep mode. References are used in the Normalized Sweep mode. In the normalized sweep mode, the input response is compared to the selected reference and the difference is displayed on the screen. The current reference is displayed over the **F2** key in the Normalized Sweep mode.

Storing References

References are raw sweep responses, therefore to store a reference, the 3010 must be in the Raw Sweep mode. To enter the Sweep mode from any screen press **Menu**  **F1**.

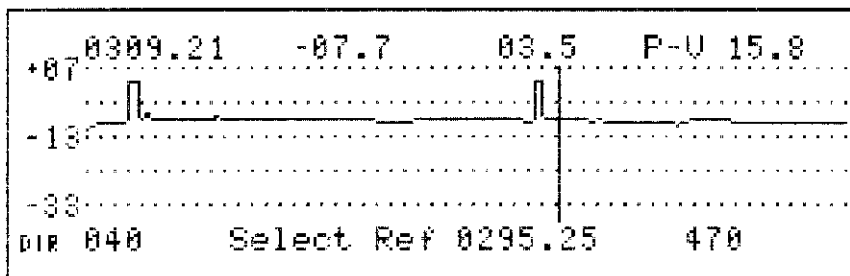
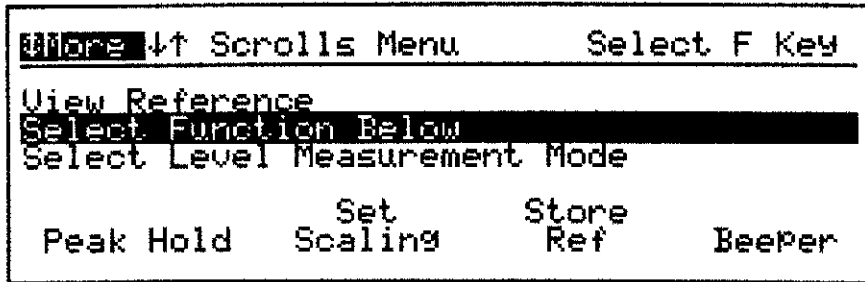


Figure 10-50 Raw Sweep Mode

The sweep mode of operation is indicated by the label over the **F2** key. If the label over the **F2** key is **Select Ref** as shown in Figure 10-50, the 3010 is in the Raw Sweep mode. If the label of the **F2** key is a reference label, the 3010 is in the Normalized mode with that reference selected. To change the 3010 from the Normalized mode to the Raw Sweep mode, press **F2** twice.

Storing References

With the 3010 in the Raw Sweep mode, press **Option** \blacktriangle to enter the raw sweep option screen.



pi216r

Figure 10-51 Raw Sweep Option Screen

Press **F3** to enter the Reference Averaging screen.

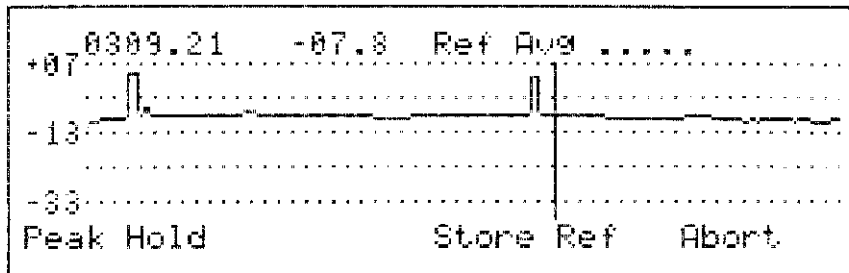


Figure 10-52 Reference Averaging Screen

The reference average message displayed in the upper right corner of the screen indicates the stability of the response. If a reference is being stored in the field and a portion of the response is near the noise floor of the 3010, the reference average

message may not go away indicating an unstable reference. In this case, the reference can be used, however, the portion of the response referenced to the noise floor maybe somewhat unstable.

When the response is somewhat stable, press **F3** to enter the reference storage area of the file server.

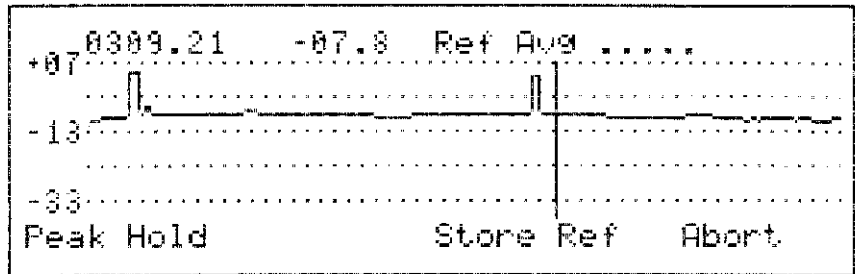


Figure 10-53 Reference Files Selection Screen

Use the **▲** **▼** keys to select the file and press **F3** to store the file and exit to the normalized mode with the new reference selected.

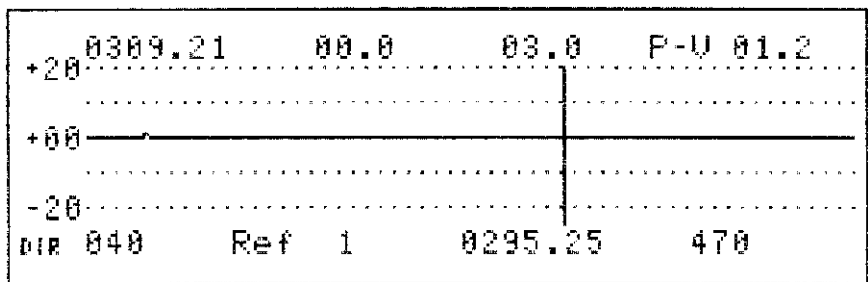


Figure 10-54 New Reference Selected

In the Normalized Sweep mode, the new reference file label is displayed over the **F2** key.

Selecting References

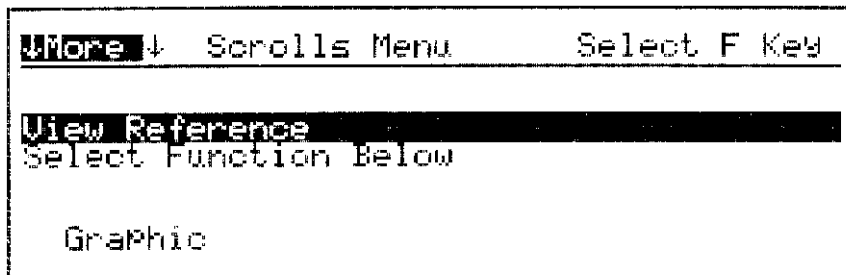
Selecting References

References are selected from the Normalized sweep mode. In the Normalized Sweep mode, the current reference is displayed over the **F2** key. See Figure 10-54.

To select a different reference, press **F2** to highlight the reference label and use the **▲ ▼** keys to select another reference.

Viewing References

References are raw sweep responses stored into memory. To view any of the 12 reference, from the raw sweep or Normalized Sweep mode, press **Option ▲ ▲** to enter the View Reference menu.



pi773

Figure 10-55 Reference Option Menu

Press **F1** to view the reference.

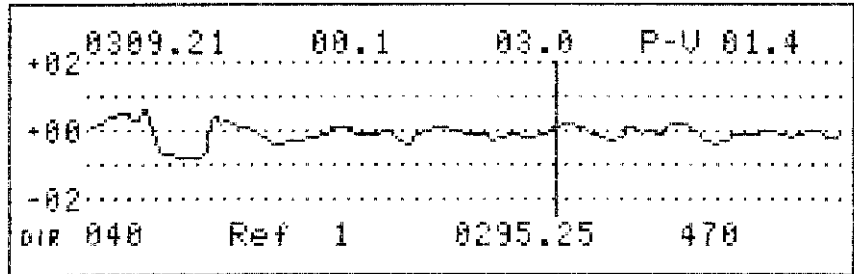


Figure 10-56 Stored Reference

Use the ▲ ▼ keys to select any of the 12 references. Press **Enter** to exit the view references screen and return to the Sweep mode.

Viewing References

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.

The Auto Monitor feature can make:

- Channel scan measurements
- Forward sweep measurements
- Forward normalized sweep measurements

The Auto Monitor feature does not make any return measurements.

Setting the Parameters

The setup of the Auto Monitor function involves three steps:

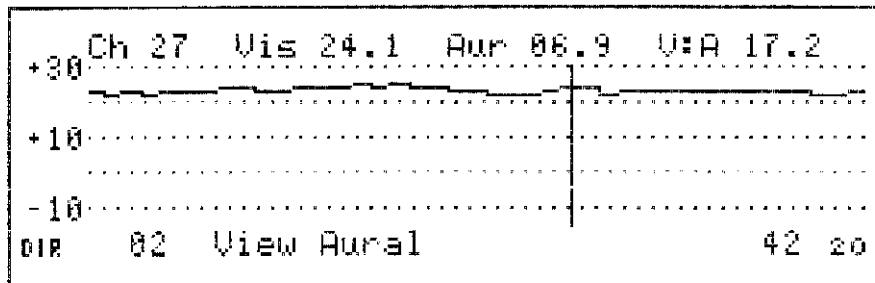
1. Setting up the scaling and other parameters for the Measurement mode selected for making the measurements.
2. Setting the file pointer in the file server to the file where the first measurement will be stored.
3. Setting the time increments for the measurements and the start time for the test.

Channel Scan Mode

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**.

File	File Name	Time	Date
16	File 16	16:37	19 JUN 95
17	File 17		
18	File 18		
Save Screen	More	View	Print
To 17	Choices	File 17	File 17

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.

Raw Sweep Measurement

The Raw Sweep mode allows you to take many absolute sweep measurements at a test point in the system. The Raw Sweep function will produce a graphic storage file, therefore it can not be used with the FCC Report function.

From the Main menu press **▲ F1** to enter the Sweep mode. If the label over **F2** is **Select Ref**, you are in the Raw Sweep mode. If the softkey has a reference label, you are in the Normalized Sweep mode. To enter the Raw Sweep mode from the Normalized Sweep mode, press **F2** twice.

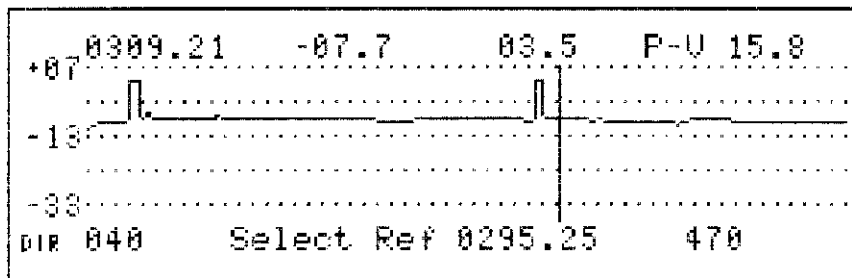


Figure 11-3 Raw Sweep

With the 3010 connected to the test point, make sure the scaling is set so that the response is in the top half of the display. You want to make sure that any signal variations will not drive the 3010 into overload or into the noise floor.

The next item is to check the file selected in the file server. Press **Print/Save**. Use the arrow keys to select the first file for the test. The 3010 will automatically store the first measurement into this selected file. It is important to have enough files open for the number of tests you want to perform. Press **Enter** to exit the file server. You are now ready to set up the auto monitor controls.

Normalized Sweep Measurement

The Normalized Sweep mode allows you to take relative sweep measurements at a test point in the system. The Normalized Sweep function will produce a graphic storage file, therefore it cannot be used with the FCC Report function.

From the Main menu, press **▲ F1** to enter the Sweep mode. If the label over **F2** is **Select Ref**, you are in the Raw Sweep mode. If the softkey has a reference label, you are in the Normalized mode. Before making these timed measurements, you must select the reference. You may want to store a new reference if you are interested in seeing the changes at this test point over a period of time. To store a new reference, refer to Chapter 10.

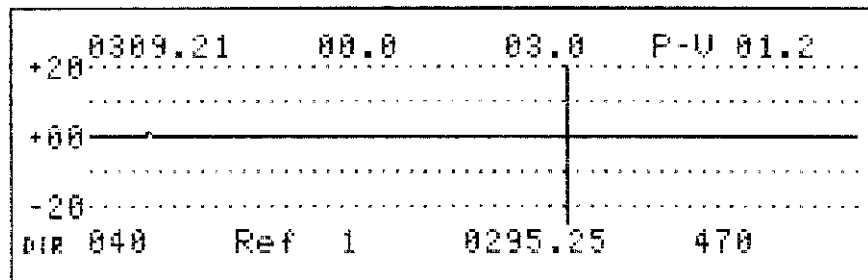
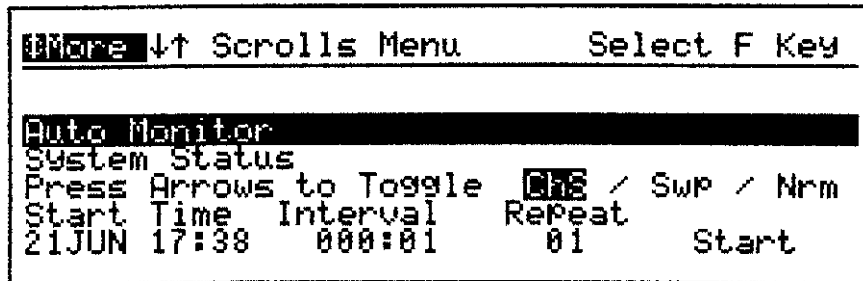


Figure 11-4 Normalized Sweep with New Reference

The next item is to check the file selected in the file server. Press **Print/Save**. Use the arrow keys to select the first file for the test. The 3010 will automatically store the first measurement into this file. It is important to have enough files open for the number of tests you want to perform. Press **Enter** to exit the file server.

You are now ready to set up the auto monitor control.

Auto Monitor Controls



pd2350

Figure 11-5 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 four parameters before beginning the test: the Measurement mode, the start time, the interval of time between the tests, and the number of tests.

When you enter the Auto Monitor mode, the current measurement mode is highlighted. Use the arrow keys to select the Measurement mode you will use for this series of measurements. For the FCC tests, you must use channel scan, **ChS**, measurements.

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 warning message is displayed on the screen telling you the Auto Monitor mode is turned on. It is important to remember if you make any changes to the measurement mode selected for the auto monitor test or in the file server, you may change the test measurements.

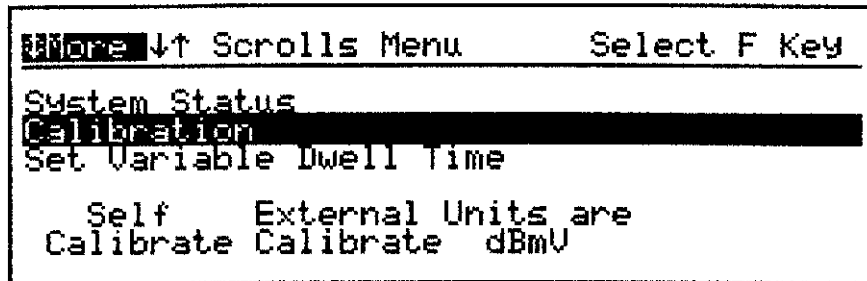
Auto Monitor Controls

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. This is the external calibration feature. To enter the Calibration Option menu, 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.

```
1 Enter Calibration Source Freq into F1
2 Enter Calibration Source Level into F2
3 Connect Source To Star RF Input, -> F3

      Last Cal Factor +0.0
Freq      Level
000.00    +00.1  Calibrate
```

pi7149

Figure 12-2 External Calibration Screen

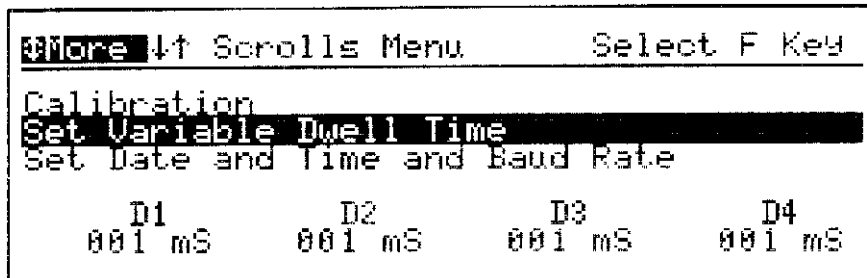
Press **F1** and set the calibration source frequency using the **◀▶** keys to select the digit and the **▲▼** keys to set the value. Press **F2** and set the level of the calibration source using the arrow keys as above. Connect the level source to the signal input and press **F3** to calibrate the unit. The 3010 will allow deviations as large as 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 time. 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

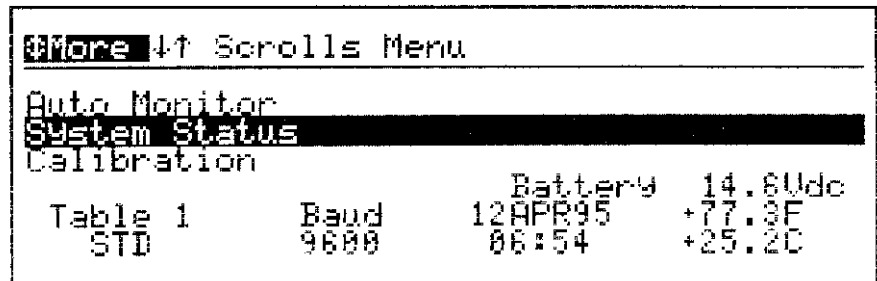
To program the individual dwell times, press **F1 F2 F3** or **F4** to select the dwell time to program. Use the ◀ ▶ keys to select the digit and use the ▲ ▼ keys to change the value of the digit. Press **Enter** to save the entry.

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 (DDMMYY). The time is in military time format (HH:MM).

To check the system status, from the Main menu, press **Option**.



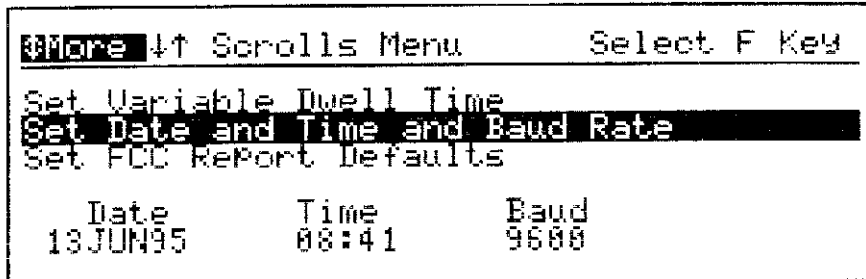
pi7206

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.

Setting Time and Date



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.

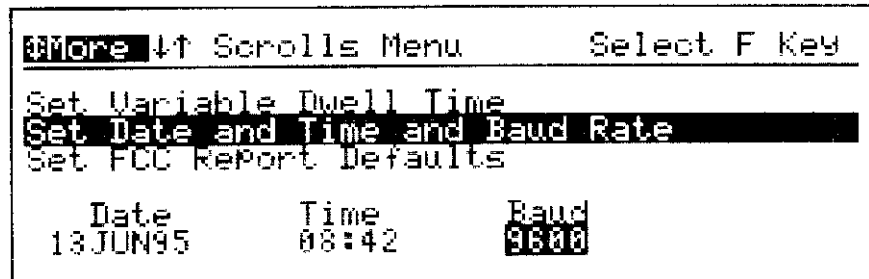
To change the time, press **F2**. Use **◀ ▶** to select the item and use **▲ ▼** to change the value of the item. Press **Enter** to save the changes and exit.

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 baud rate setting of the 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.

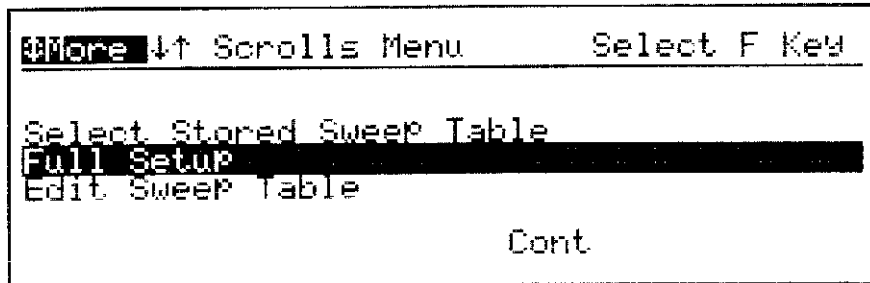
The remaining serial port parameters are:

- 8 data bits
- 1 stop bit
- No parity
- Xon\Xoff protocol

Setting the Forward Sweep Scan Defaults

Setting the Forward Sweep Scan Defaults

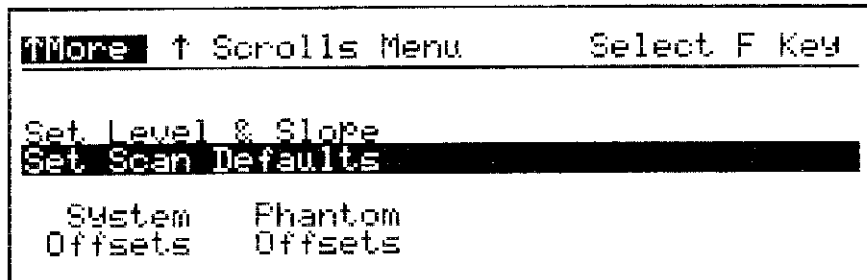
The control of the scan defaults is found in the Sweep menu. To enter the Sweep Setup menu, press **Menu** \blacktriangle **F3**.



pi7153

Figure 12-7 Sweep Setup Menu

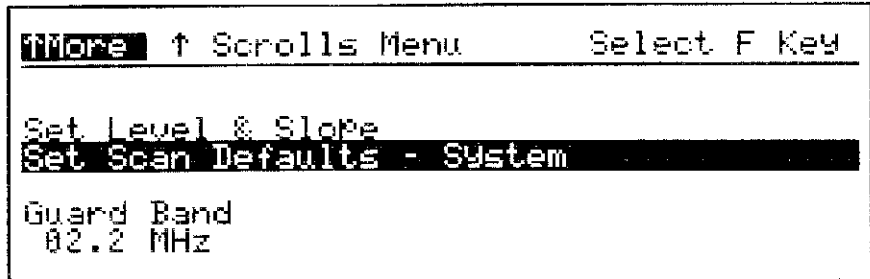
Press \blacktriangledown (3 times) to highlight the **Set Scan Defaults** option.



pi7154

Figure 12-8 Set Scan Defaults Screen

To view the system scan default guard band, press **F1**.

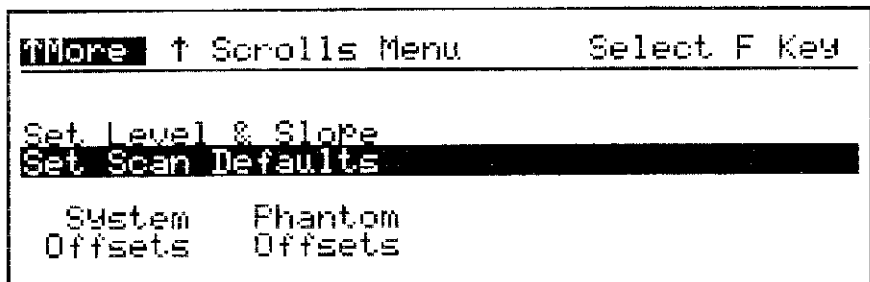


pi7155

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. Press **Enter** to save the change and return to the Option menu.

To change the Phantom Scan defaults, from the Main menu, press **▲ F3 ▼** (3 times).

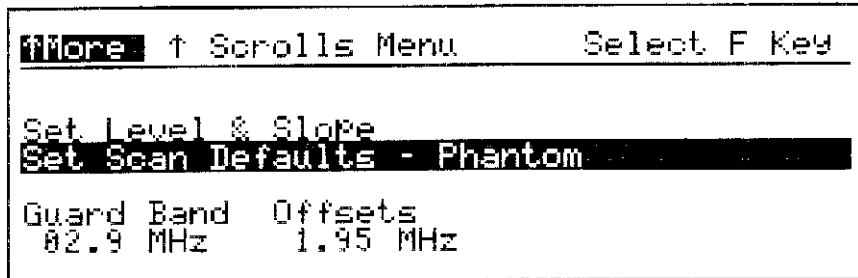


pi7154

Figure 12-10 Set Scan Defaults Screen

To view the Phantom Offset values, press **F2**.

Setting the Forward Sweep Scan Defaults



pi7156

Figure 12-11 View Phantom Scan Offsets Screen

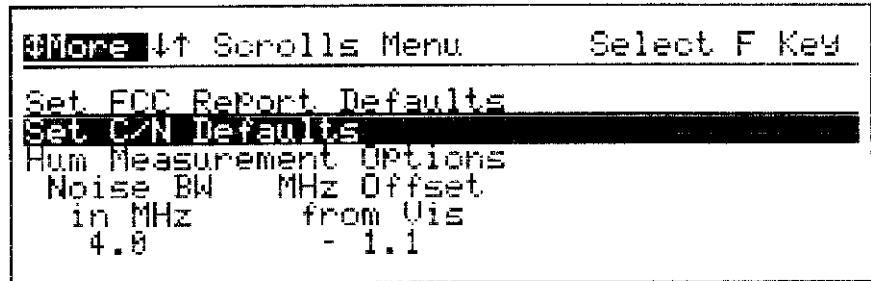
To change the guard band, press **F1** and use the arrow keys to change the values. For an NTSC channel, the value should be 2.9 MHz. Press **Enter** to save the changes.

To change the frequency offset, press **F2** and use the arrow keys to change the values. For an NTSC channel, the value should be 1.95 MHz. Press **Enter** to save the changes.

Press **Enter** to save the changes and return to the Sweep Setup menu. You can proceed to set up the transmitter or press **Menu** to return to the Main menu.

Setting the 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 12-12 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

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).

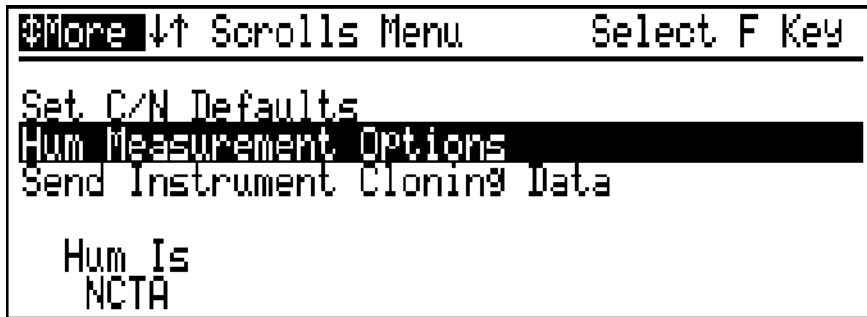
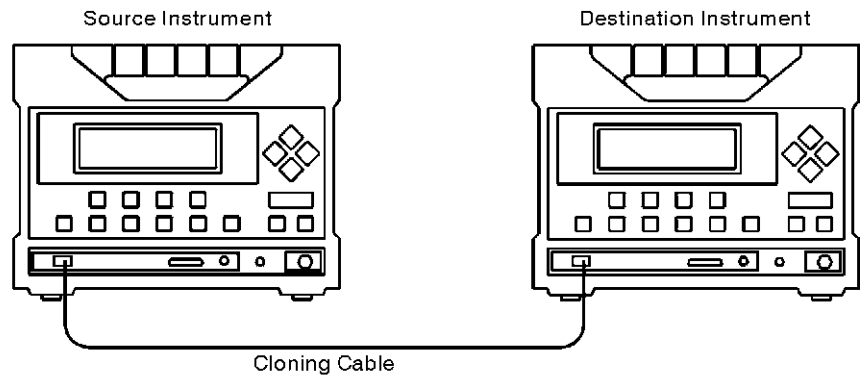


Figure 12-13 Hum Measurement Option Screen

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 12-14 shows the cable connection between the two instruments.



pn27a

Figure 12-14 Cable Connections for Instrument Cloning

The instrument cloning cable used to connect the instruments is CaLan 85960B Option 044. Figure 12-15 shows the pin configuration of the cloning cable. The part number of the instrument cloning cable is SB103.

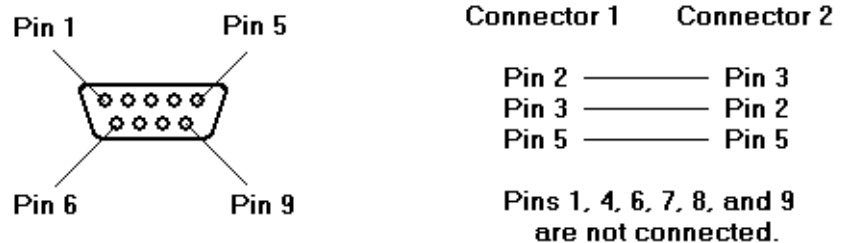


Figure 12-15 Cloning Cable Configuration

Cloning the Instrument Settings

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	
Forward Sweep			
Forward Pilot Frequency			X
Preset Scaling Test Point			X
Sweep Speed Normal / Fast			X

Cloning the Instrument Settings

Table 12-1 Instrument Cloning Options (Continued)

Data Types	Channel Plans	Sweep Tables	All Data
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 / dB μ V Setting			X
Date and Time			X
FCC Report Defaults			X

With both instruments turned on and connected as shown in Figure 12-14, access the source instrument's Send Instrument Cloning Data screen by pressing **Menu Option** and \blacktriangledown (7 times). It is recommended that the destination instrument be set to the Main menu prior to starting the cloning procedure.

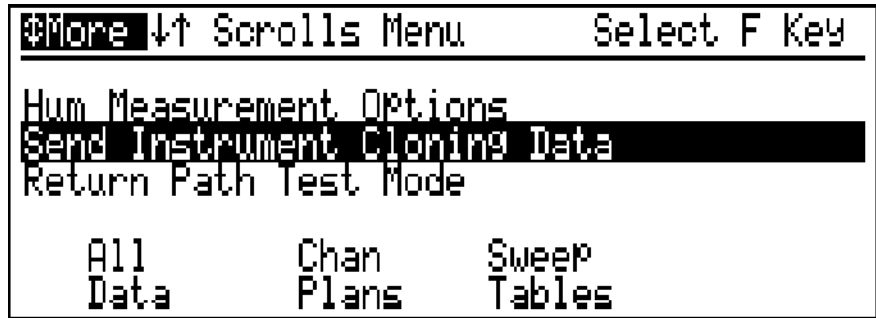


Figure 12-16 Send Instrument Cloning Data Screen

The source instrument's Send Instrument Cloning Data screen shows the three selections detailed in Table 12-1.

- To copy all of the source instrument's configuration data to the destination instrument, press **F1**.
- To copy the source instrument's Channel Plan data to a destination instrument, press **F2**. 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 **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 needs to be repeated.

Setting the Unit of Measurement

Setting the Unit of Measurement

The 3010 can convert the unit of measurement from dBmV to dB μ V. To set the unit of measurement, press **Option** and \blacktriangledown .

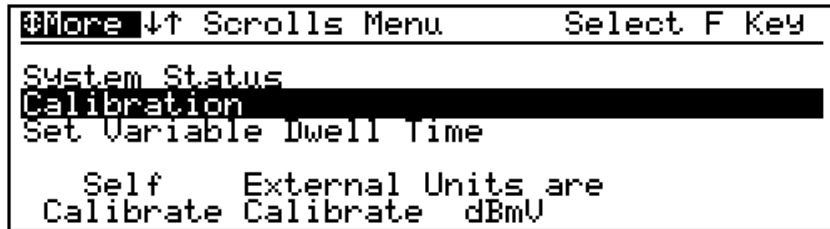


Figure 12-17 Calibration and Unit of Measurement Screen

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**.

Name	Visual	Aural1	Aural2	U	A1	A2
K86	991.25	996.75	997.80	I	I	I
K82	048.25	053.75	054.80	N	N	N
K83	055.25	060.75	061.80	N	N	N

More **↑** To Scroll Edit Table \downarrow

Edit Insert Delete State

pi7159

Figure 12-18 Table View Screen with 2 Aural Carriers

Figure 12-18 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.

IRC		Select F Key	
Set Channel Spread Defaults (MHz)			
Aurals	U-U	A1-U	A2-U
2	7.00	5.50	6.55

pi7160

Figure 12-19 Dual Aural Carrier Default Option Screen

IRC		Select F Key	
Set Channel Spread Defaults (MHz)			
Aurals	U-U	A-U	
1	6.00	5.50	

pi7203

Figure 12-20 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 12-19. An NTSC channel plan should be set to 6.00 MHz as shown in Figure 12-20. To change the value, press **F2** and use the arrow keys to set the new value. Press **Enter** to save the change.

Programming a Table with a Second Aural Carrier

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

Name	Visual	Aural1	Aural2	U	A1	A2
K06	991.25	996.75	997.80	I	I	I
K02	048.25	053.75	054.80	N	N	N
K03	055.25	060.75	061.80	N	N	N
		←---F3---→			Dwell	
K02	048.25	053.75	054.80	N	N	N

pi7162

Figure 12-21 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.

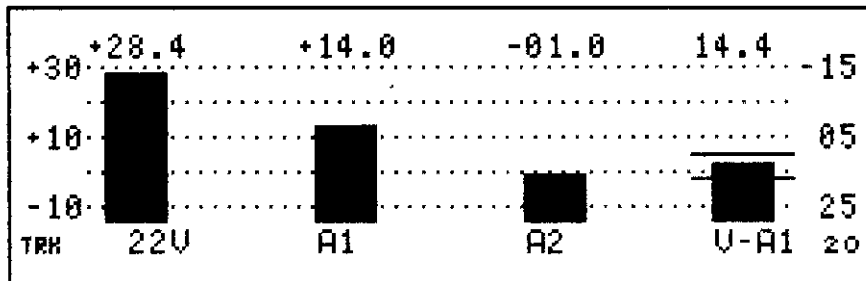
The length of time the 3010 will measure a frequency depends on the dwell time. With the Dual Aural Carrier option, you will also have a dwell time for the second aural carrier. To adjust the dwell times, press **F4** and use the **←** **→** keys to select the visual, aural 1, or aural 2 dwell time and 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

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.



pi7182

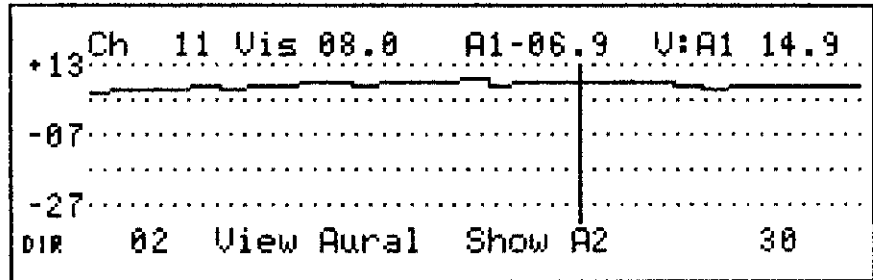
Figure 12-22 Single Channel Display with Dual Aural Carriers

Press **F4** to toggle the difference measurement bar between V-A1, V-A2, or A1-A2.

Please refer to Chapter 3 for information on the other features available.

Channel Scan Mode

In the Channel Scan mode, the selected aural carrier level and the visual to selected aural carrier at the marker frequency is displayed in the message line at the top of the screen.

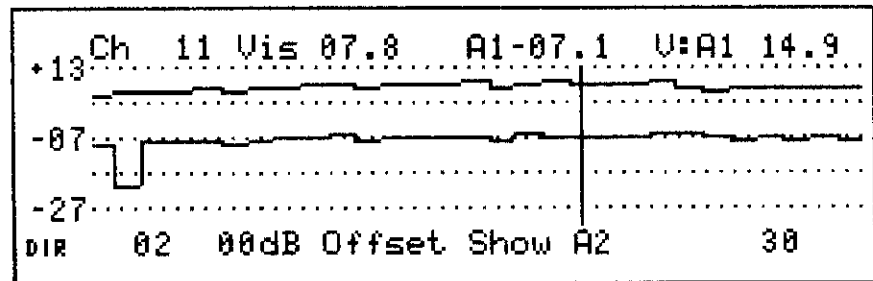


pi7183

Figure 12-23 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 12-24 Dual Aural Carrier Channel Scan Display with Aural Carriers Shown

To offset the aural carrier from the visual carriers, press **F2** and use the \blacktriangle \blacktriangledown 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.

Selecting the Operational Mode

Selecting the Operational Mode

The 3010R can operate as a 3010H by changing the mode of operation. With the 3010R in the headend mode, it has all of the features of the 3010H. It is important to note that when you are changing the mode of operation, you must confirm all of the setup parameters before making measurements. To change the operational mode, from the Main Menu, press **Option**  (8 times).

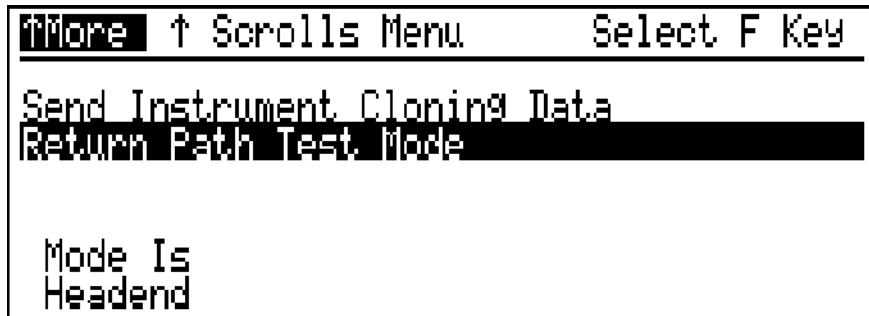


Figure 12-25 Return Path Test Mode Switch

To change the mode of operation between Remote or Headend, press **F1**.

Press **Menu** to return to the main menu with the select mode active.

Setting Up the 3010R to Operate in the Headend Mode

Considering the system organization, the 3010H is the master or controller and the 3010R, the slave. Therefore, the setup of the return sweep table with the appropriate start and stop frequencies is done with the 3010R in the headend mode.

NOTE:

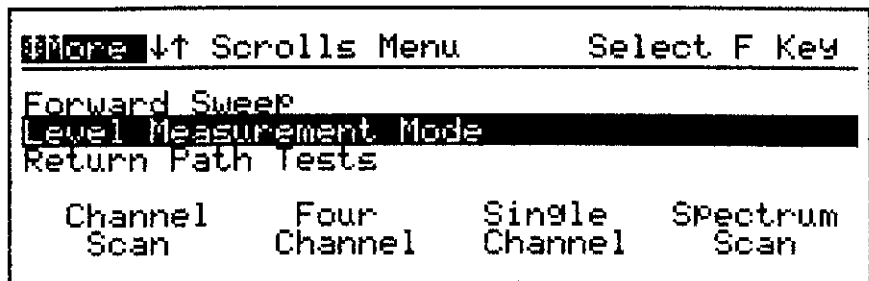
To Avoid Confusion

In this section, when the 3010H is referred to, it is also referring to the 3010R in the headend mode.

Setting the Input Level

It is important to set the proper input attenuator setting for the measurements made on the return path so that the 3010H has enough dynamic range to make the measurement without overload. The input sensitivity used in the Return Monitor mode for the 3010H is set by the full scale reference selected in the Spectrum Scan mode.

Turn the 3010 on. The unit will calibrate itself and enter the main menu screen. The **Menu** key also selects the same screen.

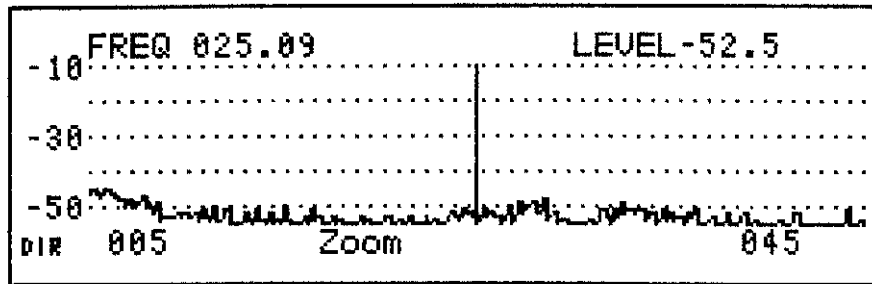


pd29b

Figure 12-26 Main Menu

Setting the Input Level

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

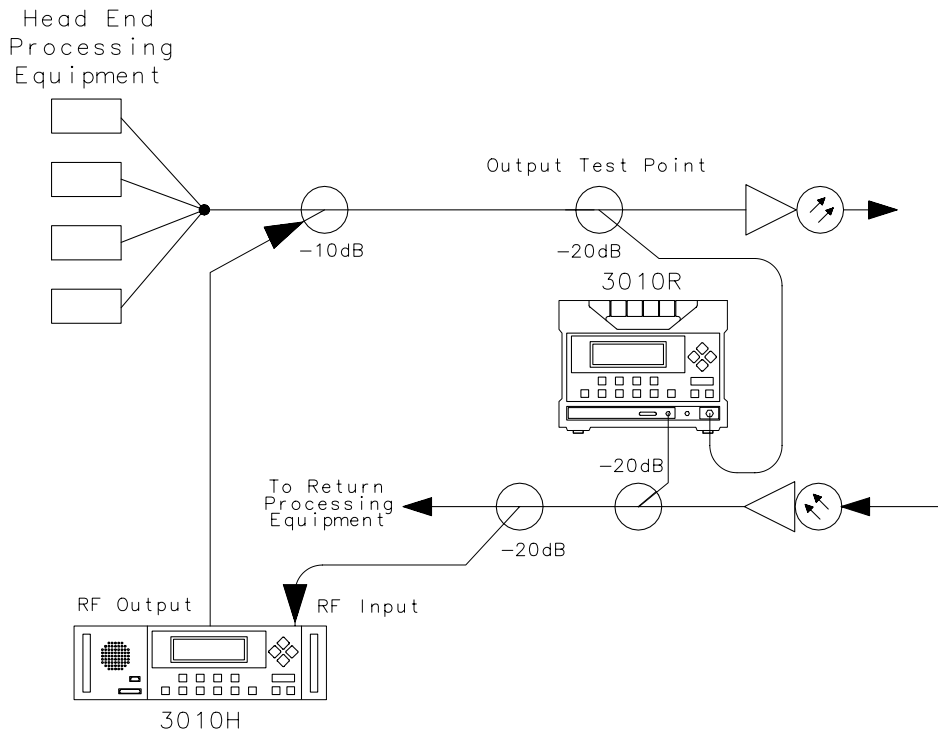


pe22h

Figure 12-27 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 many new systems, there may be no consistent signals on the system. For these networks, you will set the Full Scale (FS) a few dB above the expected signal levels at the monitor point.



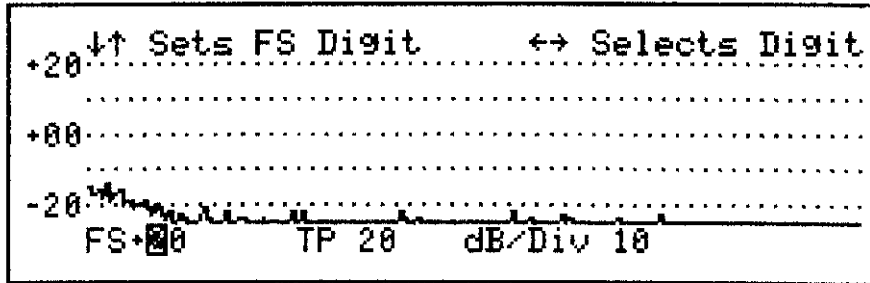
ps29a

Figure 12-28 Headend Connection Diagram

In Figure 12-28, 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 **▶** and **◀** to select the digit and use the **▲** and **▼** to set the value.

Setting the Input Level

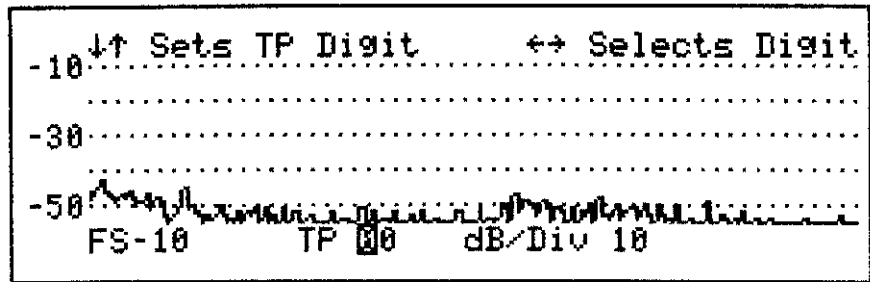


ps23h

Figure 12-29 Spectrum Scan Scale Screen

Measurements are normally related to the levels at the input or output of a device and not the absolute levels measured after the test point. The 3010H allows you to correct the measurements for the test point loss. In Figure 12-27, the RF input of the 3010H is connected through a 20 dB 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 input of the equipment.

To change the TP, press **F2**. Use the **◀** and **▶** to select the digit and use the **▲** and **▼** to set the value. When you change the TP value, the FS will automatically change.



ps24h

Figure 12-30 Spectrum Scan Mode

Unaligned systems may have ingress. High levels of ingress can effect the performance of the return sweep, however the 3010 will make ingress measurements to help the technician find the problem.

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

Press **Menu** to display the main menu and continue the setup of the 3010H.

Entering the Setup Mode

Entering the Setup Mode

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

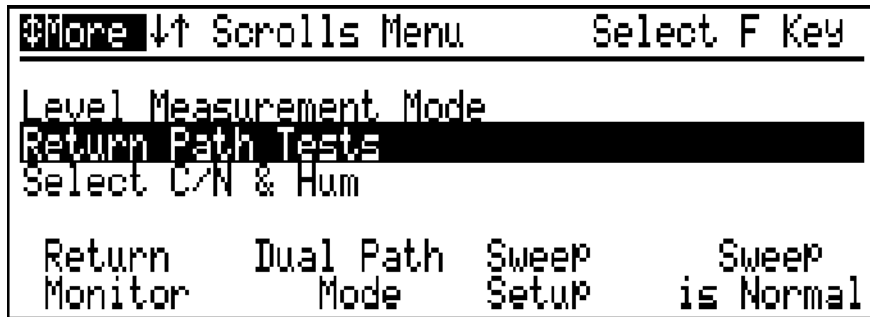
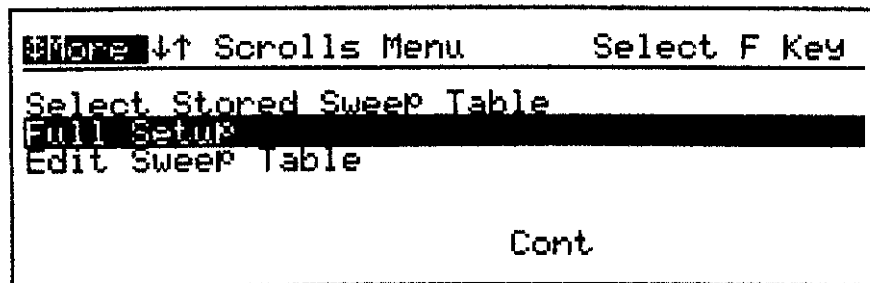


Figure 12-31 Return Path Test Menu

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



ps26h

Figure 12-32 Return Setup Menu

Press **F3** to select Full Setup and enter the Return Path Parameters screen.

Entering the Return Sweep Parameters Screen

Current Return Sweep Parameters		
Start Freq	0005	Forward Pilot 0051.00
Stop Freq	0045	Return Pilot 0015.00
		Ret Swp Table - None
Edit	New Table	Abort

Figure 12-33 Return Path Parameters Screen with Start Frequency Highlighted

The 3010H/R is 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 of concern is 5 MHz to 45 MHz.

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

If the start frequency is correct, use the down arrow to select the Stop frequency.

Current Return Sweep Parameters		
Start Freq	0005	Forward Pilot 0051.00
Stop Freq	0045	Return Pilot 0015.00
		Ret Swp Table - None
Edit	New Table	Abort

Figure 12-34 Return Path Parameters Screen with Stop Frequency Highlighted

Entering the Return Sweep Parameters Screen

Similar to the forward sweep setup, in the return sweep you may view the response of the diplex filters. Therefore, in this example we will 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 **▶** and **◀** to select the digit and the **▲** and **▼** to set the value. Press **Enter** to save the changes and move to the forward pilot frequency.

Current Return Sweep Parameters			
Start Freq	0005	Forward Pilot	0051.00
Stop Freq	0045	Return Pilot	0015.00
		Ret Swp Table	- None
Edit		New Table	Abort

Figure 12-35 Return Path Parameters Screen with Forward Pilot Frequency Highlighted

The forward pilot is used to communicate or poll and to transmit the measurement display data to the remote units 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 pass band of the forward path of the system and away from other carriers on the system. It should be greater than 300 kHz away from a CW carrier at the same level. If the 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, or 51 MHz.

NOTE:

The pilot in the 3010H can be set to any frequency between 5 MHz and 1 GHz. As with any agile pilot, 2nd and 3rd order products will be produced. If this is a concern, an appropriate tubular band pass or low pass filter can be installed to filter unwanted spurious signals.

Entering the Return Sweep Parameters Screen

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

Current Return Sweep Parameters			
Start Freq	0005	Forward Pilot	0051.00
Stop Freq	0045	Return Pilot	0015.00
		Ret Swp Table	- None
Edit		New Table	Abort

Figure 12-36 Return Path Parameters Screen with Return Pilot Frequency Highlighted

The return pilot provides communication from the remote units (3010R's) in the field to the headend unit (3010H). Therefore, it must be within the pass band 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, therefore, it should be placed in a portion of the return path where this is possible.

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

Entering the Return Sweep Parameters Screen

Current Return Sweep Parameters			
Start Freq	0005	Forward Pilot	0051.00
Stop Freq	0045	Return Pilot	0015.00
		Ret SWP Table	<input checked="" type="checkbox"/> None
Edit		New Table	Abort

Figure 12-37 Return Path Parameters Screen with Return Sweep Table Highlighted

If you are creating a new sweep, this item should be set to **None** as shown in Figure 12-37. To change the Return Sweep Table, selection press **F1**. Use the **▲** and **▼** 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 the stop frequency. Refer to the Storing and Retrieving Data chapter for more information about storing and retrieving sweep tables.

Press **F3** to continue to the Review Sweep Table Screen.

Creating a Return Sweep Table

Review Return Sweep Table			
Item	Freq	Guard Band	Dwell

Edit Freq Insert Freq Cont Delete Freq

ps2'2h

Figure 12-38 Review Return Sweep Table Screen (A Blank Table)

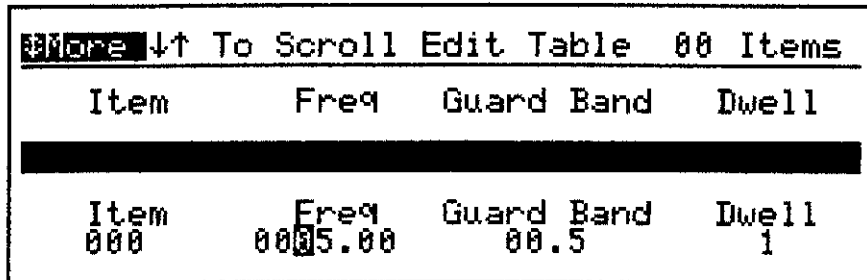
Inserting a Frequency into the Return Sweep Table

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 system do not have carriers present on the system at all times, therefore, the scan function does not help create the table. This reason increases the importance of knowing the frequencies that will be used 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 when 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. However, in the return path 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**.

Creating a Return Sweep Table



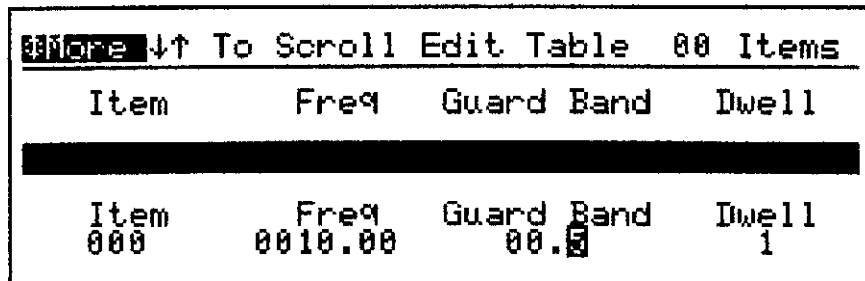
The screenshot shows a terminal-style interface for editing a table. At the top, it says "More ↓↑ To Scroll Edit Table 00 Items". Below this is a header row: "Item Freq Guard Band Dwell". A thick black horizontal bar is positioned below the header. The data row shows "Item 000", "Freq 0005.00", "Guard Band 00.5", and "Dwell 1". The "5" in "0005.00" is highlighted with a white background.

Item	Freq	Guard Band	Dwell
000	0005.00	00.5	1

ps213f

Figure 12-39 Review Return Sweep Table Screen (A Blank Table in the Insert Mode with the Frequency Highlighted)

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



The screenshot shows the same terminal-style interface as Figure 12-39. The data row now shows "Item 000", "Freq 0010.00", "Guard Band 00.0", and "Dwell 1". The "0" in "00.0" is highlighted with a white background.

Item	Freq	Guard Band	Dwell
000	0010.00	00.0	1

ps214h

Figure 12-40 Review Return Sweep Table Screen (A Blank Table in the Insert Mode with the Guard Band Highlighted)

NOTE:

The value of the guard band and dwell time are set to the default values programmed in the Set Default item in the Return Sweep Setup menu. Refer to "Setting the Forward Sweep Scan Defaults" for the procedure to change these values.

To change the guard band, use the **▶** and **◀** to select the digit and the **▲** and **▼** to set the value. Press **Enter** to save the changes and move to the Dwell Time.

Item	Freq	Guard Band	Dwell
000	0010.00	00.5	1

ps215h

Figure 12-41 Review Return Sweep Table Screen (A Blank Table in the Insert Mode with Dwell Time Highlighted)

The dwell time tells the receiver how long to measure the peak level of the frequency. The following is a list of the dwell time values.

Creating a Return Sweep Table

Table 12-2 Dwell Time List as Shown in the Forward Sweep Section

Dwell Time	Time	Application
0	NO READ	Phantom and unstable carriers
1	100 μ s	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 0 dwell time. Most of the carriers on the return are intermittent and if they are on consistently, their level will not change at the headend as you move through the system. Therefore, the only valid dwell time is 0.

To change the dwell time, use the \blacktriangle and \blacktriangledown . Press **Enter** to save the changes and insert the frequency into the return sweep table. 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.

Review Return Sweep Table			
Item	Freq	Guard Band	Dwell
000	0010.00	00.5	0
Edit Freq	Insert Freq	Cont	Delete Freq

ps216h

Figure 12-42 Review Return Sweep Table Screen with One Frequency Inserted

NOTE:

If only one frequency is in the table it will appear in all three view fields. As other frequencies are added, the screen will show the other items. If there are more than three items in the table, use the ▲ and ▼ to scroll from item to item.

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

Item	Freq	Guard Band	Dwell
001	0020.00	00.5	0
002	0030.00	00.5	0
000	0010.00	00.5	0

Edit Freq Insert Freq Cont Delete Freq

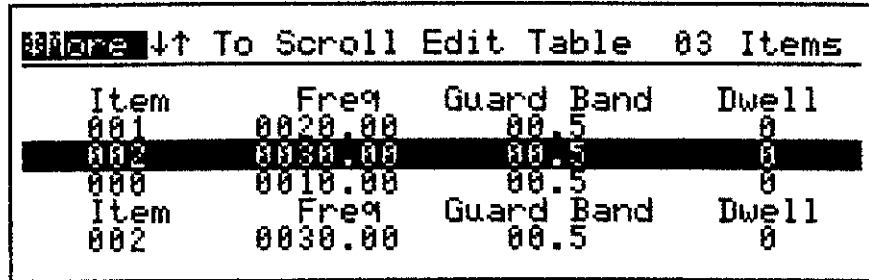
ps21.r/h

Figure 12-43 Review Return Sweep Table Screen with Three Frequencies Inserted

Editing a Frequency in the Return Sweep Table

If you made a mistake or just want to change a value for any of the frequencies, you may do so. First use the ▲ and ▼ to select the frequency. Press **F1** to edit the highlighted frequency.

Creating a Return Sweep Table



Item	Freq	Guard Band	Dwell
001	0020.00	00.5	0
002	0030.00	00.5	0
000	0010.00	00.5	0

More ↓↑ To Scroll Edit Table 03 Items

Item	Freq	Guard Band	Dwell
002	0030.00	00.5	0

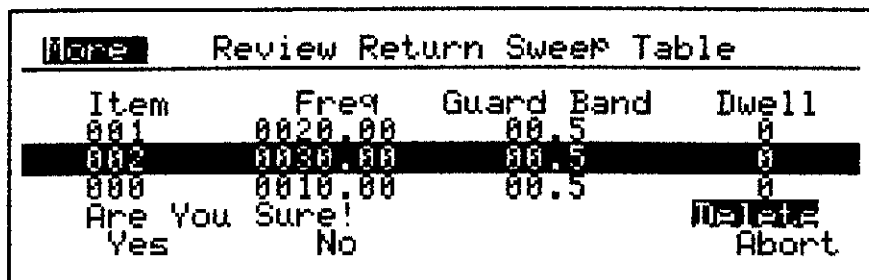
ps216h

Figure 12-44 Review Return Sweep Table Screen with Three Frequencies Inserted in the Edit Mode

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 the same way frequencies can be deleted from the forward sweep table. To delete a frequency from the table, use the **▲** and **▼** to select the frequency and press **F4**.



Item	Freq	Guard Band	Dwell
001	0020.00	00.5	0
002	0030.00	00.5	0
000	0010.00	00.5	0

More Review Return Sweep Table

Are You Sure!
Yes No

Delete Abort

ps216h

Figure 12-45 Review Return Sweep Table Screen with Three Frequencies Inserted and One Selected to be Deleted

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

Editing Using the 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.

Item	Freq	Guard Band	Dwell
002	0030.00	00.5	0
000	0010.00	00.5	0
001	0020.00	00.5	0

Guard Band Dwell Store
02.2 1 Cont Table

ps220h

Figure 12-46 Global Return Sweep Table Edit Screen with Three Frequencies Inserted

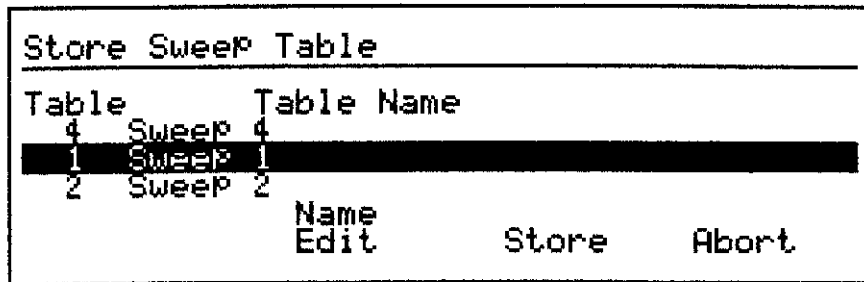
The global edit screen allows you to change the guard band or dwell time of all the frequencies in the table with minimal key strokes. Since we have edited individual frequencies in the table, these functions will not be used at this time, however, you should be aware of their function when creating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

To change all of the guard bands, press **F1**, or all of the dwell 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 time range is 0 to 3. Press **Enter** to save the changes.

Storing a Return Sweep Table

Storing a Return 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**.



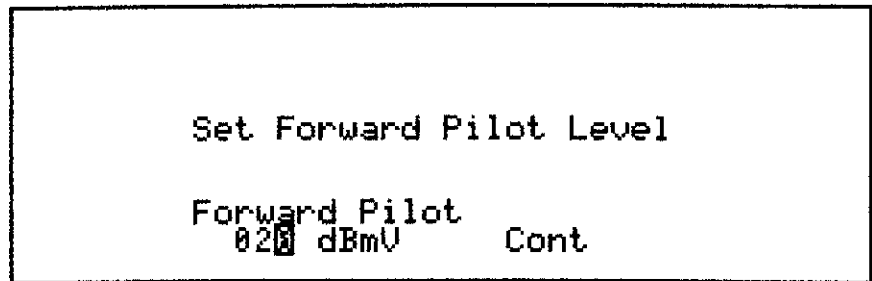
ps221h

Figure 12-47 Store Return Sweep Table Screen

Use the ▲ and ▼ 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.

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 12-48 Set Forward Pilot Level Screen

The output range of the Forward Pilot in the 3010H is adjustable from +10 dBmV to +50 dBmV. Typically, the Pilot level is set approximately 10 dB below the visual carriers on the system. Referring to the sample system in Figure 12-28, since the visual carrier levels at the input to the laser are +20 dBmV, the level of the pilot should be +10 dBmV. The loss between the 3010H and the input to the laser is equal to the loss of the cabling, the insertion loss of the 20 dB test point, and the 10 dB loss of the directional coupler used as the combiner. If we assume the through loss of the 20 dB test point and the cabling to be negligible at this frequency, the output of the 3010H is equal to the sweep level at the input to the laser, plus the loss between the 3010H and the laser input, or:

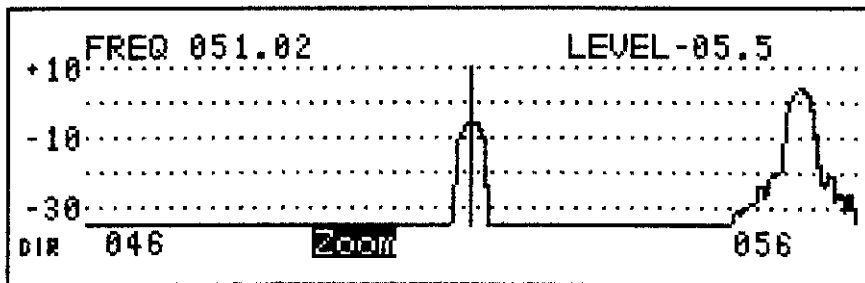
Sweep Level + Loss between 3010H & Laser input = 20 dBmV

10 dBmV + 10 dB = 20 dBmV

To adjust the pilot level, press **F2**. Use the **◀** and **▶** to select the digit and the **▲** and **▼** to change the value.

Measuring the Forward Pilot Level

With the level adjust digits highlighted, the pilot is turned on so the level can be easily measured using the 3010R or any spectrum analyzer. Figure 12-28 shows a test point 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 12-49.



ps222h

Figure 12-49 Spectrum Scan Screen Measuring the 3010H Forward Pilot

Exiting the Return Sweep Setup

This completes the set up of the 3010R in the headend mode. Press **F3** to begin monitoring the system.



ps224h

Figure 12-50 Return Monitor Mode

Exiting the Return Sweep Setup

Options

Options

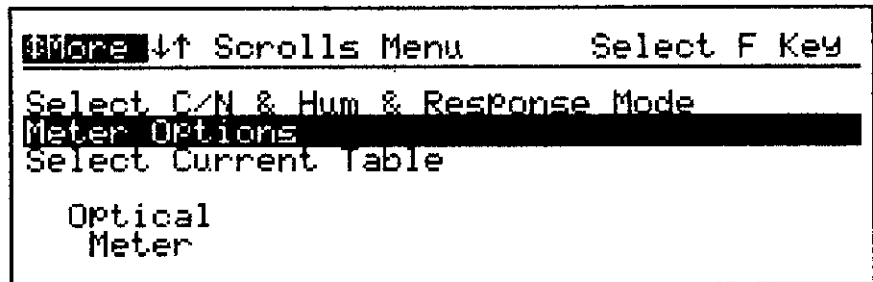
This chapter provides information about the options available for your instrument. The options described are as follows:

- Fiber Power Meter, Option 020
- Dual Path Mode, Option 052

Fiber Power Meter Option, Option 020

The fiber power meter option is a dual measurement meter for 1300 or 1550 nanometer wavelengths. The power range is from -38 dBm to $+18$ dBm at 1300 nanometer and -38 to $+20$ dBm at 1550 nanometers. Readings are displayed in units of dB, dBm, mW, μ W or nW with an accuracy of $\pm 5\%$ and may be measured in absolute or relative measurements. The relative measurement is displayed in dB and is referenced to values in dBm.

To access the power meter option, press \blacktriangledown 3 times.

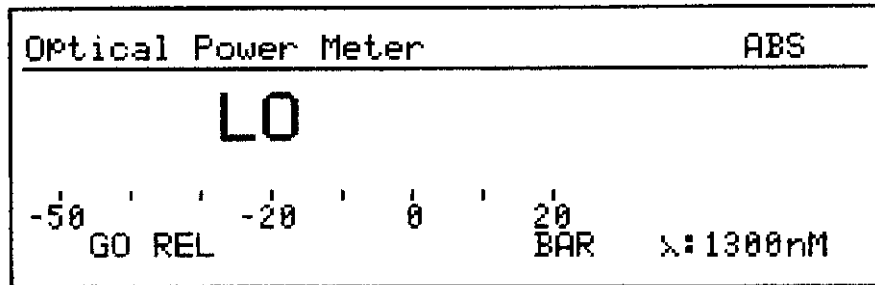


pi7185

Figure 13-1 Optical Meter Selection Menu

Press **F1**. The instrument accesses the fiber power meter option in the absolute measurement mode with the wavelength set for 1300 nm. The mode of operation is displayed on the upper right-hand side of the display. **ABS** indicates the absolute measurement mode.

Making Absolute Measurements



pi7186

Figure 13-2 Optical Power Meter Absolute Measurement Screen

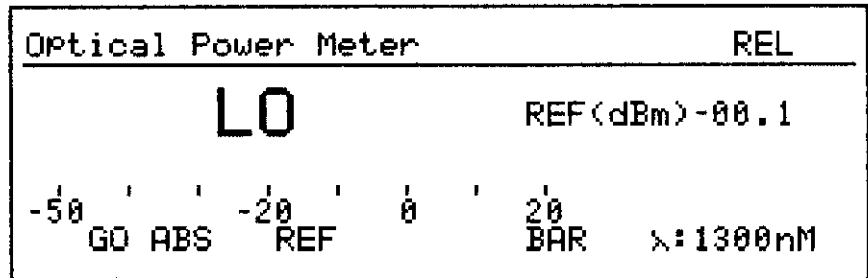
Making Absolute Measurements

The opening operational mode of the optical power meter option is the absolute measurement mode with the wavelength set to 1300 nanometers, and the analog bar toggled to the on position. See Figure 13-2. To toggle the wavelength between 1550 and 1300 nanometers, press **F4**.

By connecting a light input through an adapter cap on the instrument, the level is displayed in units of dB and wattage. The analog bar displays variations in level. To toggle the analog bar on or off, press **F3**.

Making Relative Measurements

The Relative Measurement mode of the fiber option helps you easily make loss and gain measurements. To access the Relative Measurement mode, from the absolute measurement screen, press **F1**.



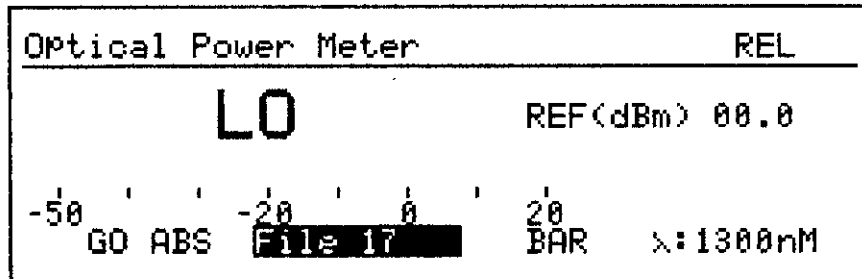
pi7187

Figure 13-3 Optical Power Meter Relative Measurement Screen

The instrument uses the current absolute measurement as the reference and displays it on the screen. Measurements are made relative to the selected reference.

Stored measurements can also be used as references. To select a previously stored measurement as a reference, press **F2**.

Making Relative Measurements



pi7188

Figure 13-4 Relative Measure Screen with Stored Reference

The reference changes to the stored name for that file. The reference value is displayed on the right side of the display. If a fiber measurement is not stored in the selected file, the value will be 0 dBm. With the file highlighted, use the arrow keys to select the file.

Relative measurements can also be stored to the file server using the same procedure as absolute measurements.

Saving and Retrieving Measurements With the File Server

Fiber measurements can be stored with the file server for documentation and for use as a reference in the relative measurement mode. To store a light measurement, with the measurement displayed on the screen, press **Print/Save**.

File	File Name	Time	Date
17	File 17	18:48	19JUN95
18	File 18		
19	File 19		

More ↓↑ Scrolls Menu Select F Key

Save Screen More View Print
To 18 Choices File 18 File 18

pi7189

Figure 13-5 File Server

Use the arrow keys to select a file and press **F1** to save the measurements. Saved measurements are recalled and printed from the same screen. To recall the fiber measurement, from the file server menu, use the arrow keys to select a file. Press **F3** to view the selected file. To print the file, press **F4**.

Select Screen to View Data in File 17 ⌘			
REL	: ---ABS/REF---		λ
LOW	+00.0dBm	000.mW	1300nm
			Print Raw Data

pi7190

Figure 13-6 Viewing a Stored Optical Measurement

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 of the forward path, both the forward transmitter pilot and the forward return path pilot can be set to the same frequency.

NOTE:

The forward path sweep table may be set up more than one way. However, the following procedure is based on setting up the sweep table with the 3010R set in the headend mode.

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 the "Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)" section later in this chapter 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 on 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 "Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)" section at the end of this chapter 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** \blacktriangledown 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.

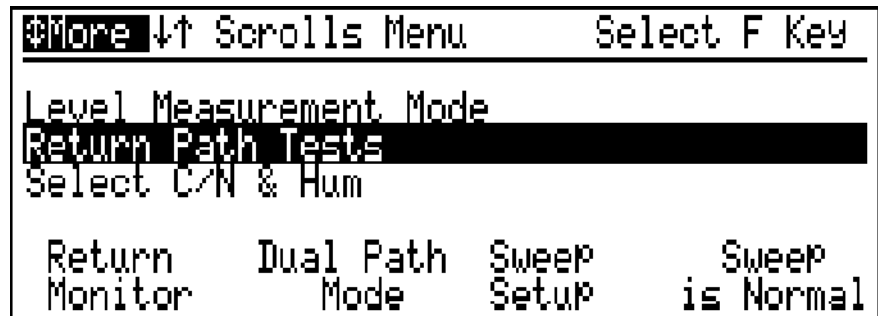


Figure 13-7 Return Path Tests Screen

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.

Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)

NOTE:

To Avoid Confusion

When the terms **3010R transmitter** or **3010H** are referred to in this chapter, they refer to the *3010R in the Headend Mode with the forward sweep transmit mode activated*.

When the term **3010 receiver** is referred to in this chapter, it refers to either the *3010B or the 3010R that is being used as a receiver*.

Sweep Installation

The 3010R transmitter contains three types of tables, the **frequency plan table**, the **forward sweep table**, and the **return sweep table**.

Frequency plan table

relates visual and aural frequencies to channels and is used to make level measurements and to create the forward sweep table.

Forward sweep table

is made up of frequencies, guard bands, and dwell times and is used by the 2010 receiver and the 3010R transmitter to produce the sweep response.

Return sweep table

is downloaded from the 3010R transmitter 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 points in the spectrum. The guard band tells the transmitter where not to put sweep energy and the dwell tells the 3010 receiver when and how long to measure the frequency.

NOTE:

When the term **sweep table** is referred to in this section, it refers to the *forward sweep table*.

Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)

We will take you through the steps for installing the 3010R transmitter and 3010 receiver, creating a sweep table using the selected frequency table, setting the output level and slope of the 3010R transmitter, evaluation of the response for stability, editing of the set up parameters for sweep stability and storing the reference.

NOTE:

If your 3010R transmitter is already setup, you can download your sweep tables to the 3010 receivers in the field. Refer to "Downloading the Sweep Table" for the 3010 receiver setup information and press **F4** on the 3010R transmitter to download the sweep table to the receivers.

There are two methods that can be used to create and setup a forward sweep table. Both methods accomplish the same result.

- The method described in this section uses the 3010R transmitter to create a forward sweep table. The sweep table is downloaded to the 3010 receiver in the field.
- The method described in Chapter 5.

3010R Transmitter Installation

The 3010R 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.

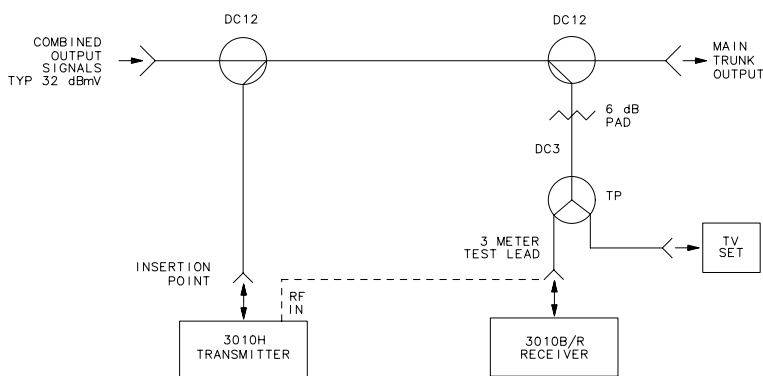


Figure 13-8 The Directional Couplers Used as Combiners

Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)

The monitor test point used by the 3010 receiver must be located after all of the channels and the 3010R 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. However, in hybrid fiber coax (HFC) systems you may use the output test point for the drive amplifier for the forward path laser.

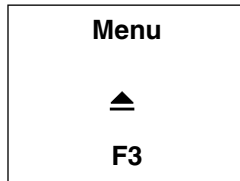
Next, locate the sweep insertion point for the 3010R transmitter and the monitor test point for the 3010 receiver in your system.

NOTE:

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

Viewing Existing Sweep Setup Parameters

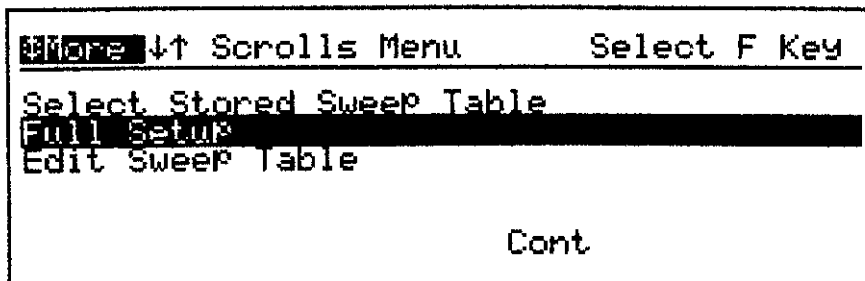
Quick Reference



The Measurement mode screen is the start up screen for the 3010R transmitter.

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

Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)



ps26h

Figure 13-9 Sweep Setup Menu

The Sweep Setup menu allows you to recall a previously stored sweep table, edit an existing sweep table, 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 3010R transmitter, select **Full Setup** and press **F3**.

Setting Sweep Parameter Control

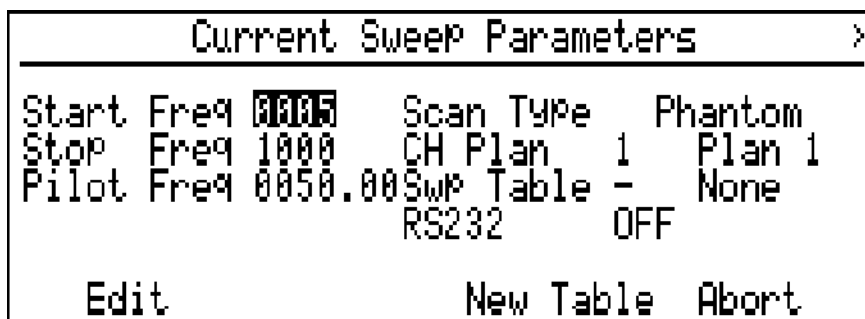


Figure 13-10 Sweep Parameter Control Screen

Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)

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 15 MHz below the lowest visual carrier and 20 MHz above the highest aural carrier on your system to observe the band edge of your system.

To calculate the start frequency for testing your system, subtract 15 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 3010R 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.

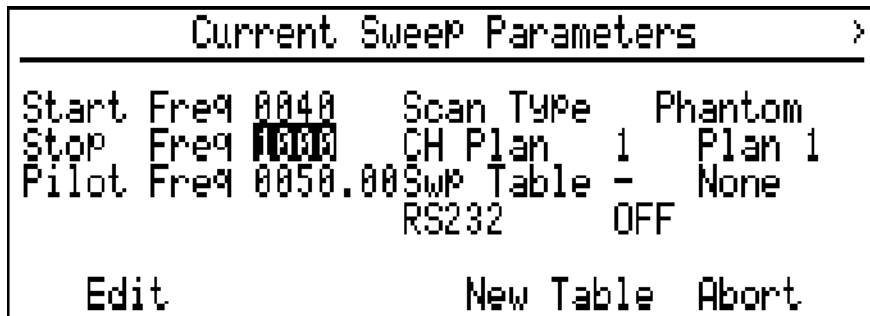


Figure 13-11 Current Sweep Parameters

To calculate the stop frequency for your system, add 20 MHz to the highest carrier frequency on your system. Example: the 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.

Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)

Current Sweep Parameters				>
Start Freq	0040	Scan Type	Phantom	
Stop Freq	0470	CH Plan	1	Plan 1
Pilot Freq	0050.00	Swp Table	-	None
		RS232	OFF	
Edit		New Table		Abort

Figure 13-12 Current Sweep Parameters

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

To change the forward sweep pilot frequency programmed in the 3010R transmitter, press **F1**. Use the **◀▶** keys to change 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 3010R transmitter, remember to change forward sweep pilot frequency in the 3010 receivers.

Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)

Current Sweep Parameters				>
Start Freq	0040	Scan Type	Phantom	
Stop Freq	0470	CH Plan	1	Plan 1
Pilot Freq	0050.00	Swp Table	-	None
		RS232	OFF	
Edit		New Table		Abort

Figure 13-13 Current Sweep Parameters

The last 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 3010 receiver scans the RF input using the selected frequency table. 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.

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, except 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

Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)

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 broad-band 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.

Current Sweep Parameters				>
Start Freq	0040	Scan Type	Phantom	
Stop Freq	0470	CH Plan	Plan 1	
Pilot Freq	0050.00	Swp Table	None	
		RS232	OFF	
Edit		New Table		Abort

Figure 13-14 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 table is table 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.

Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)

Current Sweep Parameters				>
Start Freq	0040	Scan Type	Phantom	
Stop Freq	0470	CH Plan	1	Plan 1
Pilot Freq	0050.00	Swp Table	<input checked="" type="checkbox"/>	None
		RS232	OFF	
Edit		New Table		Abort

Figure 13-15 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 3010R transmitter input to the output test point of the headend.

Scanning and Creating a Sweep Table

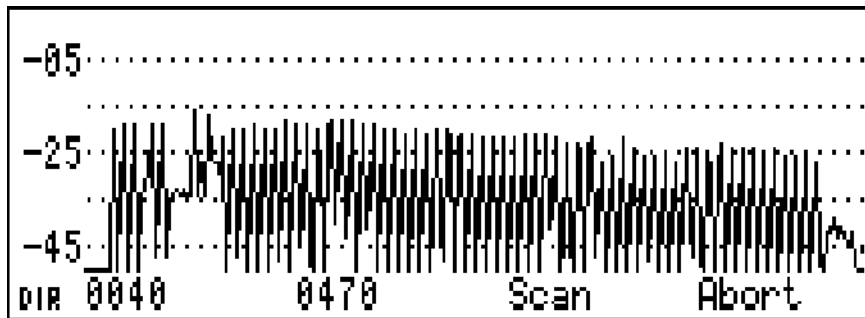


Figure 13-16 The Start, Stop, Scan Screen

NOTE:

If the current or 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. In this screen you can graphically view in the Spectrum Scan mode, the channel spectrum of the system. Now you can easily see that all of the channels present on the system are going to be 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 3010R transmitter will detect all of the carriers present on the system, the attenuation or full scale level must be set so that all of the carriers are in the upper portion of the display without going off the display.

Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)

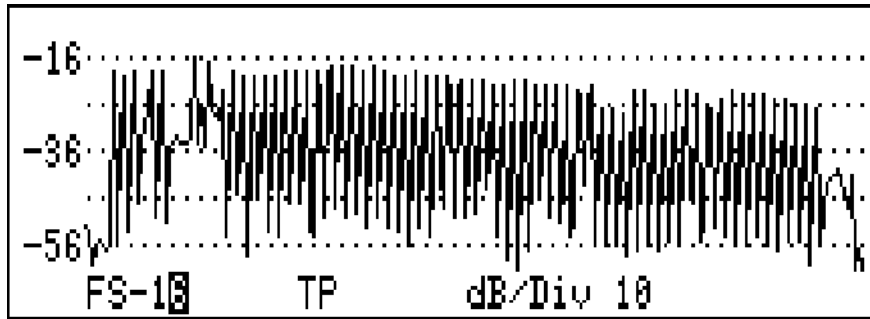


Figure 13-17 Sweep Parameter Sweep

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. Press **Enter** to save the change.

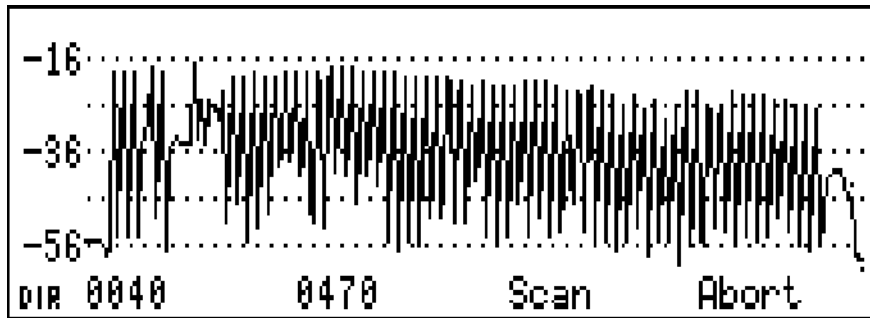
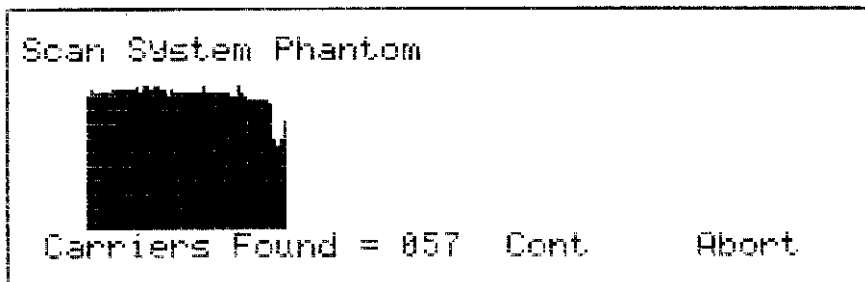


Figure 13-18 Start Stop Scan Screen

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



pi7134

Figure 13-19 Scan Screen

The scan screen displays the number of carriers entered into the sweep table at the bottom of the display. When using the Phantom Scan function, the numbers 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 3010R 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 on 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**.

Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)

More ↓↑ To Scroll Edit Table 57 Items			
Item	Freq	Guard Band	Dwell
000	0057.20	02.9	0
001	0063.20	02.9	0
002	0069.20	02.9	0
Item	Freq	Guard Band	Dwell
001	0063.20	02.9	0

pi7136

Figure 13-20 Edit Sweep Frequency Screen

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

To change the guard band, press **F3** and use the ◀ ▶ keys to change 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 screen.

Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)

More Review Sweep Table			
Item	Freq	Guard Band	Dwell
056	0429.20	02.9	0
000	0057.20	02.9	0
001	0059.20	02.9	0
Edit	Insert		Delete
Freq	Freq	Cont	Freq

pi7135

Figure 13-21 Review Sweep Table Screen

Inserting a New Frequency

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

More ↓↑ To Scroll Edit Table 57 Items			
Item	Freq	Guard Band	Dwell
001	0059.20	02.9	0
002	0059.20	02.9	0
Item	Freq	Guard Band	Dwell
001	0059.20	02.9	0

pi7137

Figure 13-22 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 change and move the cursor to the guard band value.

Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)

Item	Freq	Guard Band	Dwell
001	0063.20	02.9	0
002	0069.20	02.9	0
001	0098.00	02.9	0

pi7138

Figure 13-23 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.

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

Item	Freq	Guard Band	Dwell
001	0063.20	10.9	0
002	0069.20	02.9	0
001	0098.00	10.9	0

pi7139

Figure 13-24 Setting the Dwell

Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)

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.

More				Review Sweep Table			
Item	Freq	Guard	Band	Dwell			
004	0085.20	02.9		0			
005	0098.00	10.0		0			
006	0123.20	02.9		0			
Edit	Insert			Delete			
Freq	Freq	Cont		Freq			

pi7140

Figure 13-25 Review Sweep Table Screen with New Frequency

Deleting a Frequency in the Sweep Table

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

Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)

The screenshot shows a terminal window titled 'Review Sweep Table'. At the top left, there is a 'More' button. The table contains the following data:

Item	Freq	Guard Band	Dwell
004	0085.20	02.9	0
005	0098.00	10.0	0
006	0123.20	02.9	0

Below the table, the text 'Are You Sure!' is displayed, with 'Yes' and 'No' options. To the right, there are 'Delete' and 'Abort' options.

pi7141

Figure 13-26 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 screen displays the list of frequencies found by the scan of your system in frequency order. Each frequency has a guard band and dwell associated with it. The guard band protects the area, \pm the guard band value, around the frequency from sweep energy and the dwell tells the 3010 receiver how long to measure the peak level of the frequency. Table 13-1 lists dwell time for settings:

Table 13-1 Dwells, Times, and Applications

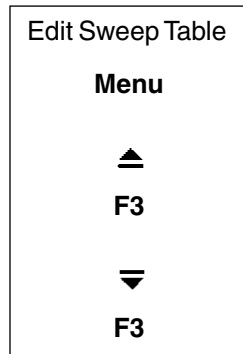
Dwell	Time	Application
0	NO READ	Phantom and unstable carriers
1	100 μ s	Normal visual carriers
2	4 ms	FM carriers
3	24 ms	Scrambled carriers

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

Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)

Although phantom scan was used to create the basic sweep table, any frequency using any dwell or guard band between 0 and 20 can be inserted in the table. The following is a list of many of the channel types present on system today with programming information. Check each of the items and edit your table if needed. You can return to the edit table screen from the Sweep menu after you have completed the setup if you need to change the table. Follow the steps in the quick reference block below.

Quick Reference



FM Band

The FM radio band is found between 88 MHz and 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)

Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)

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

Many systems use data carriers to control devices in the systems 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 Time
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 Time
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 on the screen during the sweep and normalize sweep displays. System amplifier pilot frequencies are measured to set the AGC 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 3010 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.

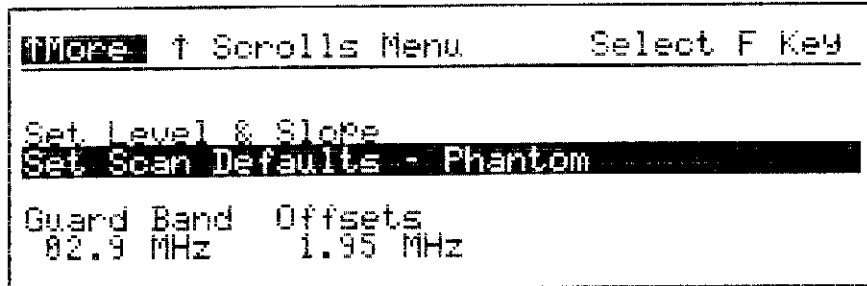
Frequency	Guard Band	Dwell
Lower System Amplifier Pilot Carrier	2.2 MHz	1
Upper System Amplifier Pilot Carrier	2.2 MHz	1

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.

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 13-27.

Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)



pi7142

Figure 13-27 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 and 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 below 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 3010 receiver will measure the level of the aural carrier instead.

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 3010R 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 3010R 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 bands 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 3010 receiver must wait longer than the 100 μ s 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.

Item	Freq	Guard Band	Dwell
063	0435.20	02.9	0
000	0057.20	02.9	0
001	0063.20	02.9	0

Guard Band 02.9 Dwell 0 Cont Store Table

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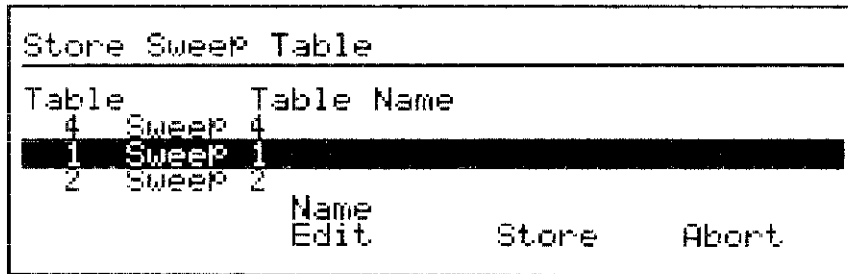
Figure 13-28 Global Edit Screen

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**, or 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.

Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)

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 sweep table to the file server, press **F4**.



pi758

Figure 13-29 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 3010R transmitter to the 3010 receivers in the field via the forward sweep pilot.

Preparing the 3010 Receiver for the Download

The following procedure sets the 3010 receiver’s mode so the receiver will accept the sweep table download from the 3010R transmitter.

1. With a 3010 receiver 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.

Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)

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

- c. Press **F1** to save the start frequency and highlight the stop frequency.
- d. Press **F1** to edit the stop frequency and then **▲ ▼** to change the stop frequency to a frequency *greater than* the forward sweep pilot frequency.

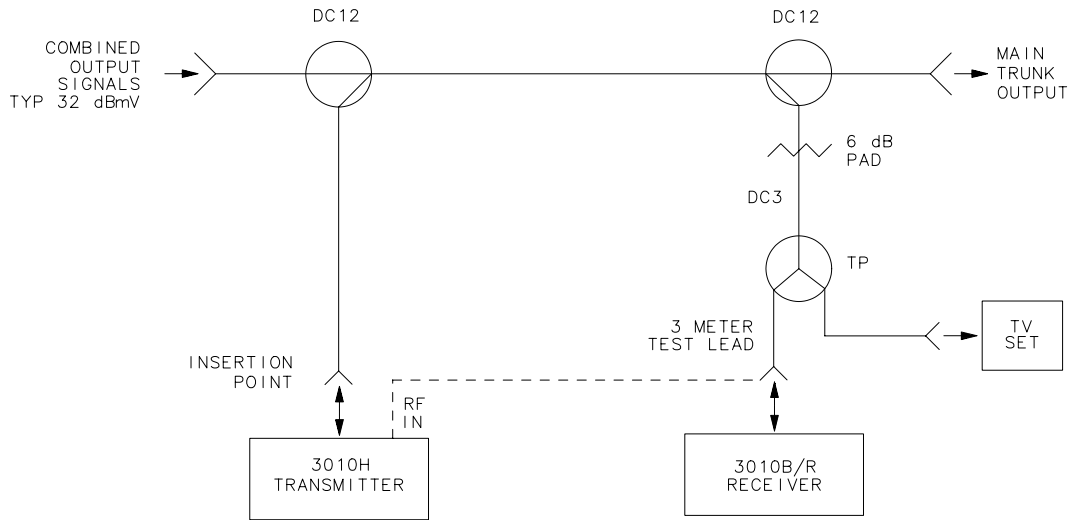
The receiver stop frequency must *not* be set to a frequency equal to the stop frequency of the 3010R transmitter. The span between start and stop frequencies should be between 100–200 MHz.

- 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 3010R transmitter (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. Verify the sweep table is set to "None".
- j. 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".
- k. Press **F1** to save the selection and press **F3** to create a new table.
- l. Press **F3** to scan the input. This results in no carriers being found because it is not connected to the system.
- m. Press **F3 F3** to continue to the global edit screen.
- n. Press **F3** to continue.

A message is displayed advising that the 3010 receiver is unable to communicate.

- o. Press **F2** to save blank table to local and return to main menu.
2. Connect the 3010 receiver to a test point at the headend.

Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)



ps210a

Figure 13-30 Sweep Insertion Setup

3. On the 3010 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 upper division of display.
 - d. Note the FS and TP values.
 - e. Press enter to save changes.
 - f. Set it 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 is same as values previously noted.
 - k. Press **Enter**.

Downloading the Sweep Table from Setup Mode in the 3010R Transmitter

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

Pressing **F3** downloads the sweep table via the RF to the 3010 receiver. The 3010R transmitter and the receiver should start sweeping. If they don't start sweeping, wait until the next download is indicated on the 3010R transmitter display.

After the data is transferred from the 3010R transmitter to the 3010 receiver, the receiver looks for the forward sweep pilot from the transmitter. Refer to Figure 13-32.

Notice the flashing ">" in the upper right corner of the screen of the 3010 receiver indicating the presence of the forward sweep pilot information from the 3010R transmitter. If the flashing ">" is not flashing, you may not have the forward sweep pilot frequency matched between the transmitter 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 data transfer, Figure 13-31 is displayed on the 3010R transmitter. Using this screen, the output level and the slope of the transmitter sweep is set while monitoring the sweep displayed on the 3010 receiver.

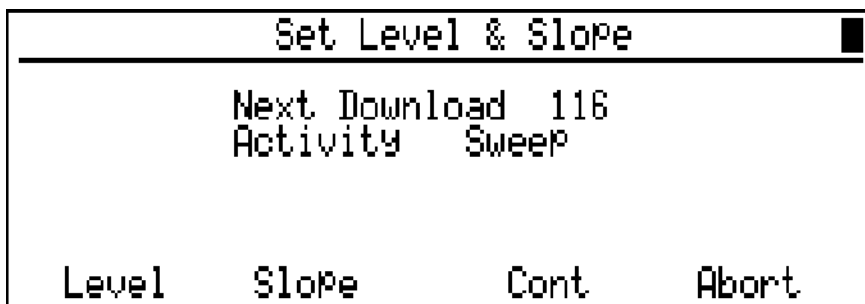


Figure 13-31 3010R Transmitter Level and Slope Screen

Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)

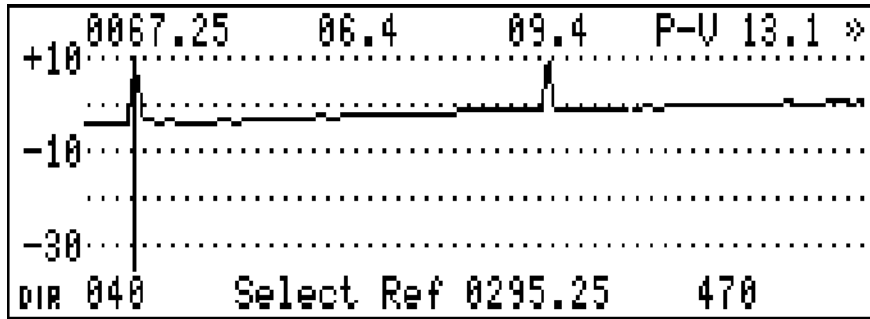


Figure 13-32 Raw Sweep Display with Marker on Lower System Amplifier Pilot Channel

Figure 13-32 shows a phantom carrier sweep response screen with the visual frequency of two system amplifier pilot channels 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 13-32. 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.

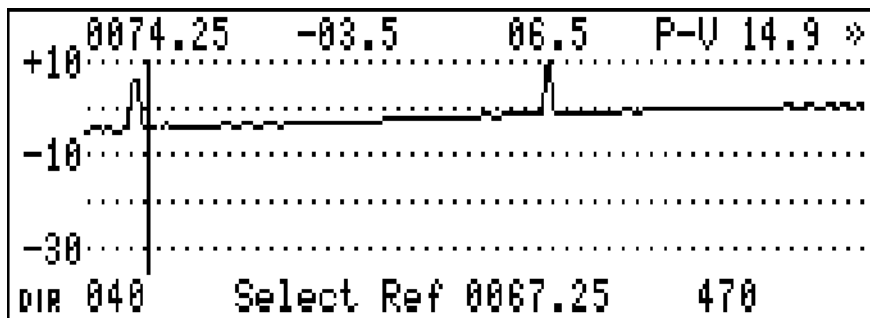


Figure 13-33 Sweep Display With Marker Next to the Lower System Amplifier Pilot Channel

Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)

With the marker in this position, you are reading the absolute level of the sweep points produced from the 3010R 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 3010R transmitter 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 high frequency with respect to the low frequency. For example, if the transmitter is set for 45 dBmV, you can set the high frequency 5 dB higher in level using the slope adjustment. If the transmitter 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 3010R transmitter can be changed by pressing **F1** and using its \blacktriangle \blacktriangledown keys. When changing the output level of the transmitter and note the change on the screen of the 3010 receiver. Note that the level shown at the marker frequency changes. The marker reads the frequency and the level of the measurement point represented onscreen.

The 3010R transmitter 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 3010 receiver screen. The adjustment is easily made by observing the relationship between the upper system amplifier pilot channel 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 3010R transmitter until a difference of approximately 10 dB is achieved.

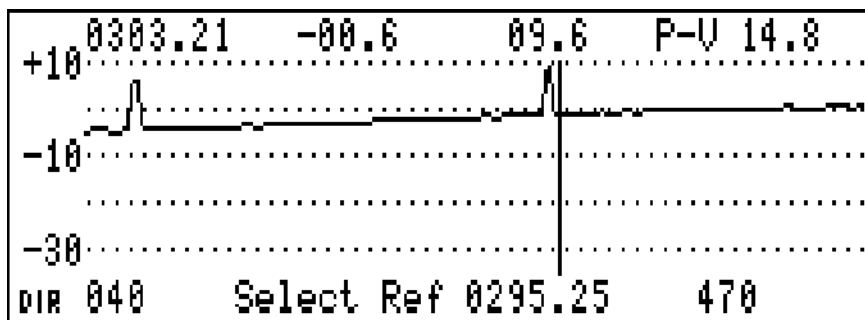


Figure 13-34 Sweep Display With Marker Next to the Higher System Amplifier Pilot Channel

Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)

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 3010R transmitter output level and slope, it may be necessary to use external pads between the transmitter 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 3010R transmitter to insure a correct impedance match.

The 3010R 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 3010R transmitter to save the change. Press **F3** on the transmitter 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 a frequency with a dwell 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 3010 receiver. The Store Reference screen is accessed from the Raw Sweep screen. From the 3010 receiver's Raw Sweep screen, press **Option ▲ F3**.

Notice the **Ref. Avg. in Process...** message that is displayed on the 3010 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 away as the reference.

If there is less than a 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 disappear.

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

Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)

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

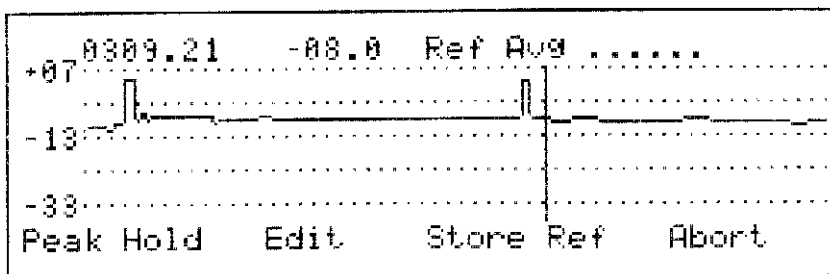


Figure 13-35 3010 Receiver Edit and Store Reference Screen

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

1. **Option** **▲ F3 F3** to access the Store Reference screen.
2. **▲ ▼** keys to select the file.
3. **F3** to store the reference file in the 3010 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 3010 receiver by pressing:

Forward Sweep Setup for the 3010R in the Headend Mode (Option 052 Only)

- a. **F3** to access the Store Reference screen.
 - b. **▲ ▼** keys to select the file.
 - c. **F3** to store the reference file in the 3010 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 in Peak Hold results.
 - b. Using **◀▶** to move the marker to any variations in the sweep that are greater than 1 division (2 dB).
 - c. Recording the frequency of the variation.
 - d. Repeating until the frequency of all variations are recorded.
5. Return to the Edit screen on the 3010R 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, 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 3010R transmitter to the 3010 receiver.

Specifications and Technical Reference

Specifications and Technical Reference

This chapter contains specifications, characteristics, and frequency plan tables for the CaLan 3010R 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.
Option	Option-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 $-20\text{ }^{\circ}\text{C}$ to $55\text{ }^{\circ}\text{C}$ (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	-20 °C to 55 °C
Storage	-20 °C to 70 °C

Power Requirements	+10 to +15 Vdc, 550 mA max
---------------------------	----------------------------

Battery	
Type	12 V @ 2.1 AHr rechargeable sealed lead acid
Usage Time	4 hours continuous; 12 hours typical intermittent duty

Battery Charger Characteristics	
Input	
Voltage	90-130/180-260 VAC
Frequency	50-60 Hz
Connector	3 conductor, IEC-320
Fuse	0.5 A Slo-Blo
Output	
Voltage	13.8 Vdc
Current	480 mA

General Specifications

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

Cable TV Measurement Specifications and Characteristics

<p>Visual Carrier Level</p> <p>Typical Accuracy</p> <p>Absolute Accuracy</p> <p>Relative Accuracy</p>	<p>The peak amplitude of the visual carrier is measured to an absolute standard traceable to the National Institute of Standards and Technology.</p> <p>±1 dB</p> <p>±1.8 dB (ref level >5 dBmV)</p> <p>±2.3 dB (ref level ≤5 dBmV)</p> <p>±0.7 dB relative to adjacent channels in frequency</p> <p>±1.5 dB relative to all other channels (ref level >5 dBmV)</p> <p>±2.0 dB relative to all other channels (ref level ≤5 dBmV)</p>
<p>Visual-to-Aural Carrier Level Difference</p> <p>Difference Range</p> <p>Resolution</p> <p>Accuracy</p>	<p>The difference between peak amplitudes of the visual and aural carrier is measured.</p> <p>0 to 40 dB</p> <p>0.1 dB</p> <p>±0.7 dB</p>

Cable TV Measurement Specifications and Characteristics

<p>Digital Channel Power Characteristic</p> <p>Formats</p> <p>Maximum Channel Bandwidth</p> <p>Amplitude Accuracy (Typical)</p> <p>Measurement Speed (non-bursted)</p> <p>TDMA Measurement Range</p> <p style="padding-left: 20px;">Burst Width</p> <p style="padding-left: 20px;">Burst Repetition Rate</p>	<p>QAM, QPR (DMX), QPSK, VSB, bursted</p> <p>8 MHz</p> <p>±1.5 dB</p> <p>125 ms / 2 MHz of BW</p> <p>>50 μs</p> <p><1.5 s</p>
<p>Hum/Low Frequency Disturbance</p> <p>AM Range</p> <p>Resolution</p> <p>Accuracy</p>	<p>Power line frequency and low frequency disturbance measured on modulated and/or unmodulated carriers; may not be valid for scrambled channels.</p> <p>0.5 to 5%</p> <p>0.1%</p> <p>±0.2%, ±30% of reading</p>
<p>Visual Carrier-to-Noise Ratio (C/N)¹</p> <p>C/N Accuracy</p> <p>Range</p> <p>Repeatability</p>	<p>±2 dB for carriers >5 dBmV</p> <p>50 dBc; 55 dBc with carrier turned off (measured in band)</p> <p>±1 dB</p>

1 A preselector filter may be required to achieve specifications.

Forward/Return Sweep Measurements

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	$\pm 5 \times 10^{-6}$ over full temperature range
Marker Frequency Accuracy Accuracy Resolution	± 25 kHz 10 kHz
Frequency Span Range Resolution	0 MHz to 999 MHz 1 MHz
Resolution Bandwidth	230 kHz, ± 30 kHz
Video Bandwidth Typical Switchable	300 kHz 10 Hz
Internal Calibrator Frequency	113.36 MHz ± 0.2 MHz

Amplitude Specifications

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, dB μ V
Marker Readout Resolution	0.1 dB

Amplitude Specifications

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

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 Resolution Absolute Accuracy Relative Accuracy (100 MHz) Vernier Range Accuracy Output Attenuator Range	+10 to +50 dBmV 1 dB ±1.5 dB ±1.0 dB 10 dB ±0.5 dB over 10 dB range 0 to 30 dB in 10 dB steps
Spurious Outputs Harmonic and Nonharmonic Spurs ≥10 MHz Harmonic and Nonharmonic Spurs <10 MHz	<-30 dBc <-25 dBc
Output Return Loss	>15 dB

Sweep Source Specifications

Blanking During Sweep (characteristic)	>60 dBc
Data Transmission Characteristics Range Data Carrier Modulation Bandwidth Proximity of Equal Amplitude CW Carrier without Communication interference. Frequency Agile with 10 kHz Resolution	5 MHz to 1 GHz -30 dBc <750 kHz -50 dBc <1.8 MHz >300 kHz

Option

Option

Fiber Optic Power Meter Option	
Wavelength	1310 and 1550 nm
Measurement Range	
1310 nm	+20 to -38 dBm
1550 nm	+18 to -38 dBm
Resolution	0.1 dB
Accuracy (characteristic)	±5%
Display Units	dB, dBm, nW, μ W, mW
Optional Connector Styles	ST, FC, biconic, D4, SMA, bare fiber, rotary splice, RM

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	4.9 kg (10.7 lb) with battery
Shipping	8.6 kg (19.0 lb)

Dimensions

H 10.5 in. (267 mm)
W 12.5 in. (318 mm)
D 3.75 in. (95 mm)

The image contains two technical drawings of a device. The top drawing is a top-down view showing a rectangular device with two horizontal slots. A vertical dimension line to the right of this view is labeled 'D'. The bottom drawing is a front view showing a device with a keyboard, a small screen, and various buttons. A horizontal dimension line above this view is labeled 'W', and a vertical dimension line to the right is labeled 'H'. The labels 'TOP' and 'FRONT' are centered below their respective drawings.

pd240b

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

Frequency Plan Tables

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

Frequency Plan Tables

Table 14-2 NTSC Off Air Channel Plan (AIR)

Channel	Visual	Aural	State
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
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

Frequency Plan Tables

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

Frequency Plan Tables

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

Frequency Plan Tables

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

Frequency Plan Tables

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

Frequency Plan Tables

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

Frequency Plan Tables

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

Frequency Plan Tables

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

Frequency Plan Tables

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

Frequency Plan Tables

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

Frequency Plan Tables

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

Frequency Plan Tables

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

Frequency Plan Tables

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

Frequency Plan Tables

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

Frequency Plan Tables

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

Frequency Plan Tables

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

Frequency Plan Tables

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

Frequency Plan Tables

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

Frequency Plan Tables

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

Frequency Plan Tables

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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 1-800-297-9726, 514-725-6652 for international calls, or consult our website (www.sunrisetelecom.com/broadband).

Replacing the Battery

WARNING:

Use only batteries supplied by Sunrise Telecom Broadband, part number SB110-002 in the 3010. Use only batteries supplied by Sunrise Telecom Broadband, part number SB110-002 in the battery pack.

WARNING:

To replace the battery:

1. Turn the instrument Off and unplug the battery charger.
2. Remove the 8 screws and remove the cover from the battery compartment.
3. Note the position of the foam packaging around the battery, then remove the foam.
4. Remove the battery from the compartment, disconnecting the wires.
5. Connect the wires to the new battery as you install it. Connect the **RED** wire to the positive terminal (+) and the **BLACK** wire to the negative terminal (-).
6. Replace the foam packaging.
7. Replace the cover and secure with the 8 screws.
8. Plug in the charger and allow it to charge the battery overnight or at least 10 hours prior to field operation.

CAUTION:

Treat the old battery as chemical waste. If you do not have a process for proper disposal, return the used battery to any Sunrise Telecom Broadband Sales or Service office.

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 1-800-297-9726 in North America or 514-725-6652 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

Returning the Instrument for Service

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