Tektronix

RFM150
SignalScout ™
Instruction Manual
Firmware Ver. 1.9 and Up

070-9006-04

This document supports firmware version 1.9 and above.

Warning

The servicing instructions are for use by qualified personnel only. To avoid personal injury, do not perform any servicing unless you are qualified to do so. Refer to the Safety Summary prior to performing service.

CE

Printed in the U.S.A.

Tektronix, Inc., P.O. Box 1000, Wilsonville, OR 97070–1000

WARRANTY

Tektronix warrants that this product will be free from defects in materials and workmanship for a period of three (3) years from the date of shipment. If any such product proves defective during this warranty period, Tektronix, at its option, either will repair the defective product without charge for parts and labor, or will provide a replacement in exchange for the defective product.

In order to obtain service under this warranty, Customer must notify Tektronix of the defect before the expiration of the warranty period and make suitable arrangements for the performance of service. Customer shall be responsible for packaging and shipping the defective product to the service center designated by Tektronix, with shipping charges prepaid. Tektronix shall pay for the return of the product to Customer if the shipment is to a location within the country in which the Tektronix service center is located. Customer shall be responsible for paying all shipping charges, duties, taxes, and any other charges for products returned to any other locations.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. Tektronix shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than Tektronix representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; c) to repair any damage or malfunction caused by the use of non-Tektronix supplies; or d) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

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Table of Contents

Getting Started

Operating Basics

Replaceable Electrical Parts

Replaceable Mechanical Parts

Appendices

List of Figures

List of Tables

General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To avoid potential hazards, use this product only as specified. *Only qualified personnel should perform service procedures.*

Safety Terms and Symbols

Terms in This Manual
These terms may appear in this manual:

WARNING. *Warning statements identify conditions or practices that could result in injury or loss of life.*

CAUTION. *Caution statements identify conditions or practices that could result in damage to this product or other property.*

Terms on the Product

These terms may appear on the product:

Danger indicates an injury hazard immediately accessible as you read the marking.

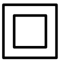
Warning indicates an injury hazard not immediately accessible as you read the marking.

Caution indicates a hazard to property including the product.

Symbols on the Product

The following symbols may appear on the product:

ATTENTION
Refer to Manual



Double
Insulated

To Avoid Fire or Shock Hazards

Use the Proper AC Adapter

Use only the specified AC adapter provided with this product to connect it to the mains (local AC) supply.

Use an Appropriate Power Source

Do not operate this product from any power source that applies more than the specified voltage.

Do Not Open the RFM150 Case

This instrument contains weatherproofing seals, which, if damaged or not installed properly, may fail to protect the instrument.

Do not open the instrument during the warranty period; return it to a Tektronix Service Center for all service.

After the warranty period, the instrument may be opened by qualified service personnel who have read the service instructions in this manual.

Do Not Replace the Battery

This instrument uses a smart charge system, which prolongs battery life. If the operating time from a full charge seems significantly shortened during the warranty period, contact a Tektronix Service Center to have the battery replaced.

After the warranty period, the battery may be replaced by qualified service personnel who have read the service instructions in this manual.

Recharge Batteries Properly

Recharge NiCad batteries only in accordance with the instructions provided in this manual. Do not continue recharging for longer periods than recommended in the instructions.

Observe All Ratings

Observe and follow all ratings and markings on the product. Consult the product manual for further ratings information before making any connections to the product.

This product is intended to be connected to electrical devices with their common voltage at ground potential. Do not connect to elevated or floating common voltages.

Use in a Suitable Environment

This product is designed to resist the effects of rain and moisture, to allow accurate functioning of the product without hazard to the user under conditions of moderately inclement weather. Sealing gaskets and weatherproofing plugs are used to ensure this level of water resistance. Damage to the seals or failure to replace the weather-proofing plugs could allow rain to enter and possibly damage the product.

This product is not designed for use in an explosive atmosphere.

Service Safety Summary

Only qualified personnel should perform service procedures. Read this *Service Safety Summary* and the *General Safety Summary* before performing any service procedures.

Do Not Service Alone. Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

Disconnect Power. To avoid electric shock, disconnect the main power by means of the power cord and power switch.

Disconnect RF Signal. Opening the RFM150 case while an RF signal is applied can expose the operator to hazardous voltages. Always disconnect the RF INPUT connector from the RFM150 before opening the case.

To avoid electric shock, do not touch exposed connections.

Preface

This manual contains operating and service information for the RFM150; information following the Service Safety Warning page is for qualified service technicians only. Operators should be familiar with basic television terms and measurements, and qualified service technicians should have moderate experience repairing analog and logic circuits.

Manual Organization

The manual is organized as follows:

Getting Started: instrument options, accessories, and first-time operation

Operating Basics: controls and connectors, basic operating information, and making measurements

Reference: detailed menu discussions, in alphabetical order by topic

Specifications: electrical and mechanical specifications

Service Safety Warning: the beginning of the service part of the manual

Performance Check: performance check procedure with a form for recording data

Maintenance: Calibrated Board Set replacement, battery charging, battery replacement, and instrument cleaning

Replaceable Electrical Parts Lists: module-level replaceable electrical parts

Replaceable Mechanical Parts Lists: exploded-view diagram and replaceable mechanical parts

Appendix A: channel table information

Appendix B: remote communication information

Index: an alphabetical index of topics

Documentation Conventions

The word *press* is used when referring to a front-panel key, and *select* is used when referring to an on-screen label.

Key names and labels are shown in uppercase letters when instructions are active, but are spelled out in lowercase during general discussions. For example, "Press SEQ," but "The sequence menu is used to activate measurement routines."

Getting Started

Product Description

The RFM150 SignalScout is a high-performance RF signal meter designed for cable television applications. It provides level measurement capabilities and other features necessary to install and maintain a cable television system. In-service carrier-to-noise and hum measurements are provided, as well as a spectral display, an FM detector, and a speaker.

Compatibility

The RFM150 is designed to be compatible with NTSC, PAL, and SECAM cable television systems. Channel tables for most countries are built in, and you can load additional tables from a computer (using the companion CSS150 software) or from another RFM150.

The RFM150 can measure the levels of dual-carrier sound systems, including NICAM, analog dual carrier, and Korean dual carrier. It can also measure the average level of digitally modulated carriers.

Level Measurement Modes

The RFM150 supports the following measurement modes.

1 Channel Mode. This mode displays visual carrier level (in dBmV or dBuV), aural carrier difference (in dBc), channel number, and frequency.

Pilots Mode. This mode simultaneously displays the levels of two channels.

5 Channel Mode. This mode simultaneously displays the levels of five channels.

Meter Mode. This is a general purpose level measurement mode which you can use for peaking and/or nulling adjustments. The results are displayed on a simulated analog meter.

All Channel Mode. This mode provides a graphic display of the visual carrier levels of all the channels defined in the selected channel table.

Other Operating Modes

In addition to the level measurement modes, the following modes are available:

Measure. This mode measures carrier-to-noise, hum, and FM deviation measurements. The visual carrier level of the tuned channel is also displayed.

Spectrum. This mode provides a spectrum display of the selected channel using a 30 kHz or 300 kHz resolution bandwidth filter and selectable span. You can use a reference marker to measure the level and frequency of any point in the spectrum. Using this mode, you can troubleshoot in-channel anomalies.

Sweep. This mode makes reference sweeps. First, measure the carrier levels of a point upstream and store the results as a reference. Then you can measure the response of a point downstream relative to the reference.

Help. This mode provides context-sensitive help. Use the knob to scroll through the various help screens.

User Interface

By pressing a menu key, you display choices that you can make with the function keys (F1–F5), with the knob, or with the numeric keypad. You can tune the instrument by selecting a preset channel that you have defined. You can also tune by channel or frequency using the knob or numeric keypad.

Automated Test Sequences

The 24 Hour test is already loaded in the RFM150. You can load additional test sequences from a PC (using the companion CSS150 software), or from another RFM150. You can set these test sequences to begin immediately, or to begin at a programmed time. The instrument will turn itself on, perform the sequence of measurements, then turn itself off to extend battery life.

Results Storage / Printing

You can store individual measurement results and test sequence results in the non-volatile memory. Time, date, temperature, and site identification are included with each record.

You can print stored measurement results through the CSS150 and a PC, or directly from the RFM150 to a printer. You can also send measurement results to a PC for long-term storage of maintenance records.

Options

You can order the RFM150 with the following options.

Option 01 (Memory Upgrade)

The RFM150 is equipped with 32K of nonvolatile memory. This is enough for most applications, but you can purchase additional nonvolatile memory by ordering Option 01. Option 01 upgrades the NVRAM to 160K (32K + 128K). This allows you to store large test sequence results and create many new channel tables.

Power Plug Options

- Option A1: Universal Euro 220 VAC Power Pack (119-4856-00)
- Option A2: UK 220 VAC Power Pack (119-4857-00)
- Option A3: Australian 220 VAC Power Pack (119-4858-00)
- Option A6: Japan 100 VAC Power Pack (119-4859-00)

Rugged Construction

The rugged mechanical construction, high-impact material, and internal shock system provide excellent resistance to damage. Weather-tight construction guarantees operation in varying weather conditions. The padded carrying case protects the RFM150 during transit.

Accessories

The following standard accessories are shipped with each RFM150.

Standard Accessories

Manual, Instruction: RFM150 SignalScout (070-9006-XX)

Label, instruction (334-8899-00)

Carrying case, padded, with shoulder strap (016-1345-00)

120 VAC power pack (119-4855-00)

Cigarette lighter adapter (119-4860-00)

RS-232-C DC-9 female-female cable assembly (174-3269-00)

Precision female-female type F adapter (103-0301-00)

The following optional accessories can be ordered for use with the RFM150.

Optional Accessories

CSS150 software package with CSS150 User Manual (063-2225-00)

Adapter, BNC to F Series (103-0310-00)

Tutorial

This procedure will guide you through instrument power-up, making measurements, and basic configuration.

A. Power-Up

***NOTE**. To assure proper operation under all conditions, always plug the AC adapter into the RFM150 before connecting to the AC power source.*

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1. Connect the supplied power adapter to the RFM150 power input. Connect the adapter plug to an appropriate AC power source. (For battery operation, skip this step.)

2. Press the front-panel POWER key to turn on the RFM150.

3. A beep will signal that the instrument is initializing, and the instrument software version information will be displayed briefly.

4. Using a television signal from either cable feed or antenna, connect the signal to the RF input on the RFM150.

B. Display Contrast

When using the RFM150 for the first time, adjust the LCD setup to provide best viewing in your environment as follows:

1. Press DISP. Three editable fields are displayed in the upper portion of the screen.

2. Press F1 to select BACKLIGHT. (The cursor arrow moves to backlight, indicating that it is selected for edit.) Turn the knob to set the backlight ON or OFF, as desired. It is usually best to turn the backlight on under low lighting conditions.

3. Using the same method as for backlight, change the CONTRAST MODE setting if desired, based on the type of use and operator preference.

a. If you select AUTO, the instrument will continually adjust the contrast level for best viewing at differing temperatures.

b. To use the MANUAL mode, select CONTRAST, then turn the knob to achieve best contrast. A beep will sound if you exceed either end of the range (0% to 100%).

C. Channel Table Setup

When making measurements with the RFM150, you must have the correct channel table setup.

1. Select the active table as follows:

   a. Press UTIL, then press F2 (CHAN TABLE). A list of all channel tables will be displayed, with the active channel table name displayed above the list. (Nine fixed channel tables are loaded in the RFM150, and they are defined in Appendix A. The factory setting is the CATV–STD table.)

   b. Use the knob to select a table that is appropriate for your RF input signal. Press F1 (MAKE ACTIVE). The selected channel table now becomes the active table. This is the channel table that will be used when making measurements.

2. Edit the Skip, Scrambled, Dwell Time, and Amplitude Offset fields of the channel table if desired.

3. Create custom tables, if desired, using the companion CSS150 package. For information, refer to the *CSS150 SignalScout Software User Manual*.

D. Using Help Screens

1. Enter the 1 channel mode, then press the HELP key. The help screen is displayed. The percent of remaining battery charge is indicated in the upper right portion of the help screen. After a full 8 hour charge, 99% or 100% should be displayed.

2. Use the knob to scroll through the lines of this help screen. The help screen begins with a description of the measurement portion of the 1 channel display (Mode Help), and ends with a description of the preset keys (Function Keys Help).

3. Press ESC to exit the help screen.

4. Press the UTIL key, and press HELP again. Since entering the utility menu does not affect the measurement display, the first part of the help screen will be the same as in step 2. The last part of the help screen, however, will now describe the utility menu function keys rather than presets as in 1 channel mode.

5. Exit help by pressing ESC.

E. Measurements Overview

Steps F–J guide a new user through some basic measurements. Refer also to an explanation of readouts, on pages 2–8 and 2–8. Here is a list of the measurements that can be made:

1 CHAN provides the visual and aural carrier levels for one channel you select.

PILOTS mode provides graphic and numeric readouts of the visual levels at two frequencies you define as low and high pilots.

5 CHAN displays the visual levels of the five preset frequencies you define.

ALL CHAN provides an overview of all the channels in the active channel table (selected through the UTIL menu). All channel mode measurement results are used as sweep references.

METER is a simulated analog display which also allows monitoring of the FM audio signal.

C/N simultaneously displays the carrier level and carrier-to-noise ratio for the tuned channel.

HUM displays the visual carrier level and percent of peak-to-peak hum for the tuned channel.

FM DEV measures the peak deviation of the aural carrier.

SPECT has a tunable marker and readout of the marker frequency and signal amplitude.

SWEEP provides system-referenced sweep measurements, with a peak-to-valley readout between two tunable marker frequencies.

SEQ allows execution of automated test sequences.

F. 1 Channel Measurements

1. Press LEVEL, then press F1 (1 CHAN). The 1 CHAN label should appear in the upper right corner of the screen.

2. Press CHAN. This ensures that the knob is assigned to tune the instrument by channel. It also outlines the channel number (in the upper left corner of the screen) to show that the channel entry mode is selected.

3. Turn the knob until the instrument is tuned to the desired channel.

4. The instrument makes two measurements on the tuned channel. These measurements appear in large type on the left side of the screen, followed by the unit of measure. The measurements vary depending on signal type:

- For an analog channel, the measurement near the top of the display is the visual carrier, and the measurement below it is the aural carrier level difference, expressed relative to the visual carrier level. (If the analog channel is a two-carrier sound channel, both of the aural carrier level differences are measured, relative to the visual carrier.)
- For a digital channel, the average power is displayed at the top of the screen, and there is no aural carrier measurement.

G. Pilots Measurement Mode

1. Press LEVEL, then press F2 (PILOTS). The PILOTS label appears in the upper right corner of the screen. Tuning is inactive in this mode.

2. The instrument displays a graph and numeric readout of the visual carrier level for the high and low pilot channels. The vertical screen resolution is displayed in the upper right portion of the screen.

3. The REF LVL value in the upper left corner of the screen represents the level at the top of the measurement screen, and is set automatically by the instrument. The offset below it represents the probe loss value.

You can change the probe loss value and the high and low pilot frequencies through the Measure Setup Menu, which is accessed with the following key sequence: UTIL–CONFIG–MEAS SETUP. After making changes, press ESC as necessary to return to the pilots mode.

H. 5 Channel Mode

1. From pilots mode, press F3 to select 5 Channel mode. The 5 CHAN label will appear in the upper right corner of the screen.

2. The instrument displays the signal levels for the five preset frequencies in bar graphs and in numeric readouts. The preset frequencies are displayed under the preset labels across the bottom of the screen. The vertical screen resolution is displayed in the upper right portion of the screen.

3. The REF LVL value in the upper left corner of the screen represents the level at the top of the measurement screen, and is set automatically by the instrument. The offset below it represents the probe loss value.

You can change the probe loss value and the high and low pilot frequencies through the Measure Setup Menu, which is accessed with the following key sequence: UTIL–CONFIG–MEAS SETUP. After making changes, press ESC as necessary to return to the pilots mode.

I. All Channel Mode

1. Press LEVEL, then press F4 to enter the ALL CHAN mode. The ALL CHAN label will appear in the upper right corner of the screen.

2. The instrument displays all channels in the active channel table, in the form of a vertical line graph. The vertical screen resolution is displayed in the upper right portion of the screen.

You can change the active channel table, as described in Step C on page 1–6.

3. You can set the REF LVL (in the upper left corner of the screen) by pressing F1, then turning the knob. Since the reference level represents the value at the top of the measurement screen, changing it will effectively move the graph vertically with respect to the screen.

4. This mode has two markers. Position the markers as follows:

   a. Press F2 to toggle the active marker to MKR1.

   b. Turn the knob to move marker 1, and note that it appears as a solid line. The frequency readout in the lower left portion of the measurement screen changes as you tune the marker 1 frequency.

   c. Press F2 again to toggle the active marker to MKR2.

   d. Turn the knob to move marker 2, and note that it appears as a dashed line. The readout for marker 2 is in the bottom right corner of the measurement screen.

J. Meter Mode

1. Press LEVEL, then press F5 to select meter mode. The METER label should be displayed in the upper right corner of the screen.

2. Press CHAN to ensure that the knob is assigned to tune by channel. Turn the knob to tune the instrument, and view the channel number in the upper left corner of the screen. The letter V following the channel number indicates a visual carrier is selected. As you turn the knob 1 click, the instrument tunes to the aural carrier, and the V is replaced by an A.

3. Use function keys F1–F4 to adjust the display components as follows:

   a. Press F1 to assign the knob to control REF level. Turn the knob to adjust the reference level so that the signal on the meter is near the middle of the range.

   b. Press F2, then use the knob to adjust the speaker volume. (The instrument must be tuned to an aural carrier in order to monitor audio.)

   c. Press F3, and note that the RBW (resolution bandwidth) toggles between 30 kHz and 300 kHz.

   d. Press F4 and note that the detector toggles between peak and average.

K. Carrier-to-Noise Measurements

1. Press MEAS, then press F1 to select C/N (carrier-to-noise measurement). The C/N label should be displayed in the upper right corner of the screen.
2. Press CHAN. This ensures that the knob is assigned to tune the instrument by channel. It also outlines the channel number (in the upper left corner of the screen) to show that the channel entry mode is selected.
3. Turn the knob until the instrument is tuned to the desired channel.
4. This mode displays two measurement results. The upper portion of the screen displays the same as the 1 channel mode (visual carrier or average power). The lower portion of the screen displays the carrier-to-noise ratio for the tuned channel. The two measurement results appear in large type.

L. Hum Measurements

1. Press MEAS, then press F2 to select HUM. The HUM label should be displayed in the upper right corner of the screen.
2. Press CHAN. This ensures that the knob is assigned to tune the instrument by channel. It also outlines the channel number (in the upper left corner of the screen) to show that the channel entry mode is selected.
3. Turn the knob until the instrument is tuned to the desired channel.
4. This mode displays two measurement results. The upper portion of the screen displays the same as the 1 channel mode (visual carrier or average power). The lower portion of the screen displays the peak-to-peak hum (low frequency disturbance) for the tuned channel. The two measurement results appear in large type.

M. FM Deviation Measurements

1. Press MEAS, then press F3 to select FM DEV. The FM DEV label should be displayed in the upper right corner of the screen.
2. Press CHAN. This ensures that the knob is assigned to tune the instrument by channel. It also outlines the channel number (in the

upper left corner of the screen) to show that the channel entry mode is selected.

3. Turn the knob until the instrument is tuned to the desired channel.

4. The display in the upper portion of the screen is the same as the 1 channel display. The lower portion of the screen displays the peak FM deviation of the aural carrier. These two readings appear in large type. Note that the FM deviation is channel program-content dependent, so the size of the number is proportional to the relative loudness of the signal.

5. This mode displays two measurement results. The upper portion of the screen displays the same as the 1 channel mode (visual carrier or average power). The lower portion of the screen displays the peak FM deviation of the aural carrier.

6. The two measurement results appear in large type. The FM deviation is channel program-content dependent, so the size of the number is proportional to the relative loudness of the signal.

   The FM deviation measurement accumulates and displays the highest peak. To restart the measurement, change modes or tune the instrument. There is no FM deviation measurement for digital or dual-carrier audio channels.

N. Sweep Measurements

1. Before making a sweep measurement, store an ‘all channel’ measurement as the sweep reference.

   a. Press LEVEL, then select ALL CHAN. This will make a measurement in the all channel mode.

   b. Press SWEEP, and select LVL/REF MENU, followed by REF MENU.

   c. Select STORE NEW to add this measurement result to the end of the list of stored sweep references.

   d. To name this new reference, use the knob to select a letter from the on-screen alphabet, then press ENTER. Repeat until the desired reference name is entered. Numbers can also be entered; just press the desired number(s). To correct a mistake, press the backspace key (left arrow), then enter the correct character(s). To cancel the entry entirely, press F5 (ABORT ENTRY). After the reference name is entered, press ESC twice.

2. Center the trace. If the trace is off screen vertically, an arrow will appear next to the CENTER TRACE readout, indicating the direction of the trace.

   If the trace is off screen or is not well centered vertically, use one of the two following methods to center the trace:

   - To adjust the center level, press F1 (LVL), then turn the knob to adjust the center level in 1 dB steps. This will move the trace up and down on the screen.
   - To center the trace and adjust the center level automatically, press F3 (LVL/REF MENU), followed by F1 (CENTER TRACE).

3. View the SWEEP display as follows:

   a. Refer to the sample display shown in Figure 1–1.

   b. The display plots the difference between the sweep reference and the present signal, with the horizontal axis representing frequency and the vertical axis representing amplitude. Each horizontal line (division) on screen represents 1 dB or 2 dB of amplitude, depending on the vertical resolution setting.

4. Set the vertical resolution as follows:

   a. Press F3 (LVL/REF MENU). In this submenu, F2 and F3 control the vertical resolution. The present setting is outlined just above the F2 or F3 key, and is also noted in the upper right corner of the screen.

   b. Press F2 or F3 to change the setting, and note the difference in the display. Set the vertical resolution as desired, then press ESC.

5. Use the markers to read amplitude as follows:

   a. Press F2 until MKR1 is displayed on-screen above the F2 key. This selects MKR1 as the active marker, and assigns the knob to tune the marker frequency.

b. Turn the knob until marker 1 (a solid vertical line) is moved to the desired frequency. The signal level at that frequency will be displayed in the lower left portion of the measurement screen, below the marker 1 frequency.

c. Press F2 again to select MKR2. Turn the knob to set marker 2 (a dashed line) as desired. The signal level at the marker 2 frequency will appear in the lower right corner of the measurement screen, below the marker 2 frequency.

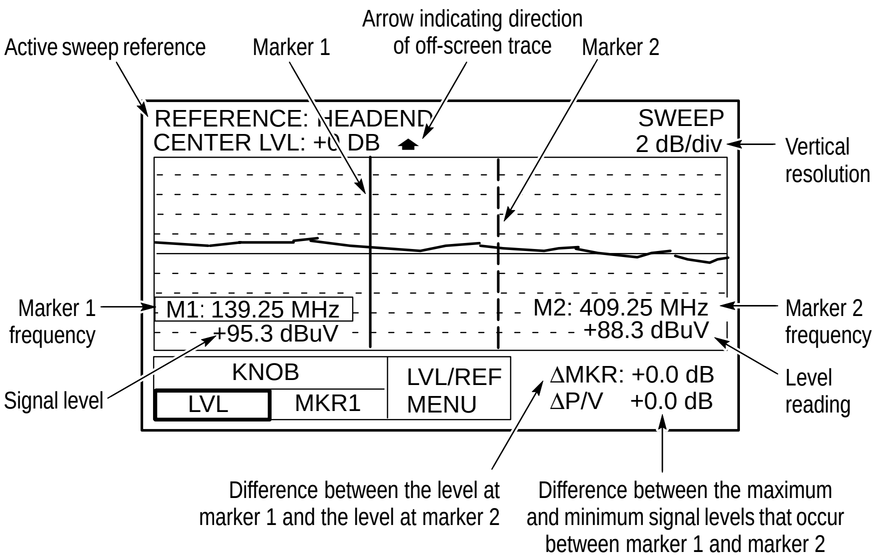

Figure 1–1: The Sweep display

O. Spectrum Mode

In this mode, the instrument uses very fine steps to plot points and provide a spectrum of the signal frequency on the horizontal axis and amplitude on the vertical axis. One of the applications for this display is spotting signals which should not be present.

1. Press the front-panel SPECT key to access the spectrum mode display, as shown in Figure 1–2.

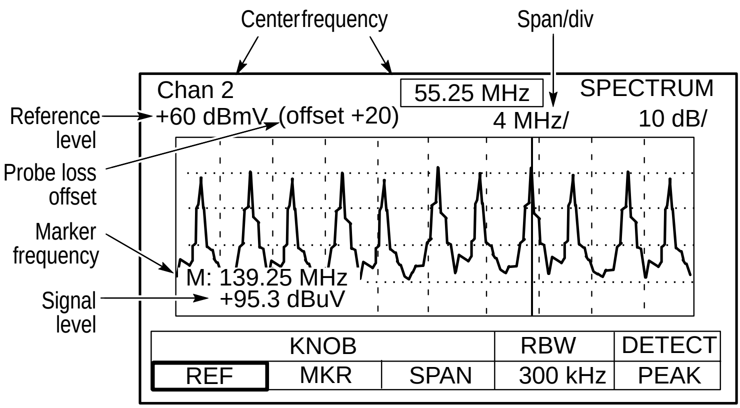

Figure 1–2: Spectrum display with knob assigned to Reference Level

2. Press F5 to select PEAK or AVG detection. Typically, average detection is used for measuring digital signals and noise, and peak is used when measuring analog modulated video carriers.
3. Select SPAN/DIV and RBW as follows:
   a. Press F4 until the label above the F4 key reads 300 kHz. (The 300 kHz RBW is required to correctly measure visual carrier amplitudes. The 30 kHz RBW can be used for resolving closely-spaced signals.)
   b. Press F3 (SPAN) and turn the knob until the span/division readout above the measurement display reads 4 MHz. (A beep sounds as you reach the upper and lower limits of the range.)
   c. Now turn the knob slowly to the left, and the span/division value will decrease.
4. Set the reference level (the amplitude level at the top of the display) as follows:
   a. Press F1 until REF is selected (the REF label is outlined).
   b. Turn the knob to adjust the reference level, and note that the reference value readout near the upper left corner of the screen changes. Adjusting the reference level moves the trace

vertically on the screen. If the signal at the marker frequency is greater than the reference level, the word OVER will be displayed in place of the level readout. If this happens, increase the reference level until the entire signal appears vertically on screen.

5. Select center frequency (the frequency at the horizontal center of the display) as follows:

a. Press CHAN to assure that the knob is not assigned to REF, MKR, or SPAN. (This also assigns the knob to tune by channel. For frequency tuning, press MHz instead of CHAN.)

b. Turn the knob and note that the channel readout in the upper left corner of the screen changes. This will move the trace horizontally on the screen.

6. Use the marker to read the signal level as follows:

a. Press F2 until MKR is selected (the MKR label is outlined).

b. Turn the knob to move the marker (the solid vertical line). Note that this changes the marker frequency readout near the lower left corner of the measurement display. The signal level at the marker frequency is displayed directly below the marker frequency readout.

P. Executing the 24 Hour Test Sequence

A series of measurements can be made by executing one of the automated test sequences that are loaded in the RFM150. The results of the tests will be stored, and can be accessed through the store menu.

The following procedure shows you how to enter the site name and temperature that will be stored with the test results, how to execute the factory-installed 24 hour test sequence, how to abort the sequence, and how to access the results of the sequence.

For information on creating and importing new sequences, refer to the user manual for the companion CSS150 software.

1. Press STORE, then press F3 to select SITE NAME. Check the ACTIVE SITE NAME near the upper left corner of the screen. If this is correct, proceed to step 2.

If it is not correct, turn the knob to highlight the desired site name from the displayed list, then press F1 for MAKE ACTIVE.

If you require a new site name, press F2 to select NEW SITE. Turn the knob to highlight each desired letter on screen, pressing ENTER after each letter. Numbers can also be entered, using the numeric keyboard. When the new site name appears as desired, press F4 to select ACCEPT ENTRY. Now press F1 to make it active.

2. Press STORE, then press F4 to select SET TEMP. The temperature and temperature units will be displayed. If they are correct, proceed to step 3. If they are not correct, use the knob or keypad to enter the current ambient temperature. Keypad entries must be followed by pressing ENTER; partial keypad entries can be cancelled by backspacing.

3. Press SEQ to enter the sequence menu. All sequences stored in the instrument will be displayed. Turn the knob, if necessary, to select the 24 hour sequence.

4. Press F1 (EXEC). The execute sequence menu will appear, with the name of the selected sequence displayed at the top of the screen.

   (The 24 hour test is always set to start NOW and to repeat 4 times, in 6 hour intervals.)

5. Press F1 for START SEQ. An All Channel measurement will occur, measuring levels for all channels that are in the active channel table, except those that have been set to skip. When the measurement is completed, the screen will go blank.

   (In normal use, the instrument is left alone to repeat the test four times. For this procedure, however, we will interrupt the test and view the results of the initial measurement.)

6. Press the POWER key. A confirmation screen will appear. Press F1 to abort.

7. Press the STORE key, then press F2 to select RSLTS MENU. Use the knob to select the result of the test you just executed. You can recognize it by the date and time, and because the TYPE will be SEQUENCE.

8. Press F1 to select VIEW. The result of the test will be displayed.
9. Press F1 to view the additional data that is stored with the test result. Press ESC.

Q. Instrument Configuration

The following configuration items are not necessary for first-time use, but will customize the RFM150 for special applications.

1. The instrument can be programmed to power up in any of the 10 measurement modes, or in the last mode used before powering down (LAST). Select the desired power up mode as follows:
   a. Press UTIL, then press F1 (CONFIG).
   b. Press F2 (PWR UP/DN). Two editable fields are displayed, with POWER UP MODE selected. The current setting for this field is outlined. Turn the knob to the left or right until the desired setting is outlined.
2. By default, the RFM150 powers up with the auto power down feature enabled. This powers down the instrument after 10 minutes of no instrument activity, to preserve battery life. (Auto power down will not occur while a print job is active.)
   Disable this feature as follows:
   a. Press F2 (AUTO PWR DN). The cursor arrow along the left side of the screen will move to show that the auto power down field is selected for edit.
   b. Turn the knob until DISABLE is outlined. Now the instrument will stay on, even if there is no instrument activity.
   c. Press ESC to exit the menu, one level at a time. The new settings will be saved.
3. Probe loss is the amount by which the level measurement displays will be offset. Power Units determines whether the level measurements will be displayed in units of dBmV or dBuV. Set the probe loss and power units as follows:
   a. Press UTIL. The function key labels across the bottom of the screen will indicate the utility menu actions, without changing the measurement portion of the screen.

b. Press F1 (CONFIG), then press F1 again (MEAS SETUP). Four editable fields will be displayed: probe loss, power units, low pilot, and high pilot.

c. Press F1 (PROBE LOSS) to select the probe loss field for edit. Use the knob to select a probe loss value in the range of –60.0 dB through +60.0 dB. This is the amount by which the level measurement displays will be offset. For example, if you select +20.0 dB probe loss, then go to 1 channel mode, the following label will appear in the upper right portion of the screen: (offset +20.0 dB).

d. Press F2 (POWER UNITS) to select the power units field for edit. Turn the knob to the right to select dBuV. This setting determines the display in measurement modes. Press ESC until you have exited all levels of the menu (a measurement screen will be displayed). Press LEVEL, then select 1CHAN. Note that the level readout (largest type size) appears in dBuV units. Use the following key sequence to reset the power units to dBmV if desired: UTIL–CONFIG–MEAS SETUP–POWER UNITS.

e. Press F3 (LOW PILOT) to select low pilot frequency for edit. Use the knob to enter the desired frequency. This frequency will be used to make measurements in the pilots measurement mode. Press F4 (HIGH PILOT) and repeat.

4. Pressing a preset key (F1–F5) will tune the instrument in modes where presets are available. You can edit the preset labels and frequencies, or you can set a preset to auto, then program its frequency by the press-and-hold method. For information on how to do this, refer to *Presets* on page 3–14.

5. Configure the RFM150 Interface port for remote communications with the CSS150 or between RFM150 with another RFM150 as follows:

a. Press UTIL, then press F4 (RS232). Five editable fields will be displayed, with the present setting for each field indicated by an outline cursor. Figure 1–3 shows the RS232 menu with the factory default settings.

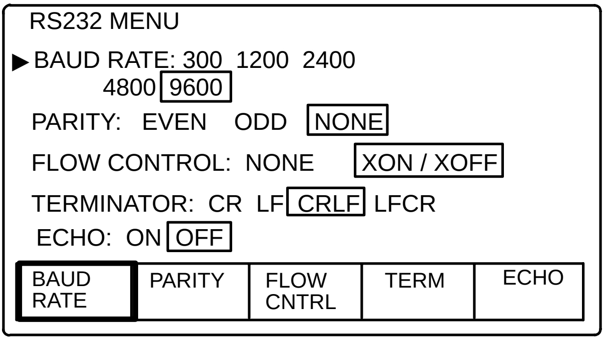

Figure 1–3: RS232 menu showing factory settings

b. Press F1 (BAUD RATE), then turn the knob until the desired baud rate is outlined.

c. Press F2 (PARITY), then turn the knob until the desired parity setting is outlined.

d. Continue changing settings for FLOW CONTROL, TERMINATOR, and ECHO, until all settings are satisfactory. Press ESC to exit the menu, one level at a time, until a measurement mode is displayed. The new settings will be saved.

6. Configure the RFM150 Interface port for communications with a printer as follows:

a. Press UTIL, then press F5 (PRINTER). The printer menu will be displayed. Figure 1–4 shows the printer menu, with the factory default settings.

b. Change the settings for baud rate, flow control, and parity as needed to match your printer settings, using the same method as for the RS232 menu (in step 5).

The RFM150 will automatically use these printer settings when a print job is active. (If no print job is active, the RFM150 communication mode is determined by the RS232 menu settings.)

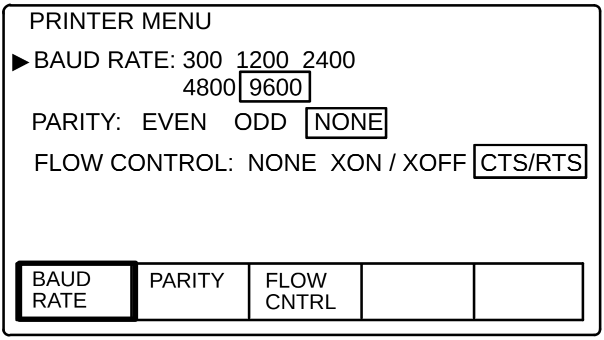

Figure 1–4: PRINTER menu showing factory settings

7. The internal clock is used to tag a stored measurement result with the time and date. It is also used to determine when to start an automated sequence. The clock keeps time whether the instrument power is on or off. Set the clock as follows:

a. Press UTIL, then press F3 (CLOCK). The clock menu will display five editable fields.

b. Press F1 (HOUR), then turn the knob until the current hour is outlined. A beep sounds if you exceed the range (00 to 23).

c. Press F2 (MINUTE), then turn the knob until the current minute is outlined. A beep will sound if you exceed the range (00 to 59).

d. Press F3 (DAY OF WEEK), then turn the knob until today's day is outlined.

e. Press F4 (DAY–MONTH), then turn the knob until the current date and month are displayed. A beep will sound if you exceed the 1-year range.

f. Press F5 (YEAR), then turn the knob until the current year is displayed. A beep will sound if you exceed the range (1994 through 2025).

g. Press ESC until you return to the UTIL menu.

8. Enable auto power down

Turn the RFM 150 power off, then on again. The instrument will initialize with the auto power down feature enabled.

R. Printing Stored Measurement Results

Stored measurement results can be printed directly from an RFM 150 to a printer (as well as through the CSS150). To print a report directly to a printer, proceed as follows:

1. Connect the RFM 150 to an appropriate printer. (Refer to Appendix B, page B–5.) You should already have configured your printer parameters in step Q of this procedure.

2. Make a 1 Channel measurement.

3. Press STORE, then press F1 (STORE RSLT).

4. Press F2 (RSLTS MENU). A list of the stored results will be displayed.

5. Use the knob to select the 1 Channel measurement.

6. Press F2 (PRINT). You should see a message screen stating that the print job is in process. To stop the print job, press F5 (ABORT).

7. The printed report should resemble Figure 1–5.

```
----------------------------------------
Result Type:   1 CHAN    Ch Tbl:CATV-STD
22-May-96  14:14    72F
Site: Tektronix
----------------------------------------
Chan   2     55.25MHz              NTSC
Visual:     +35.2dBmV   (offset  +0.0dB)
Aural:      -10.6dBC    (+4.5MHz)
```

Figure 1–5: Printout of 1 Channel measurement

Operating Basics

Functional Overview

Connectors

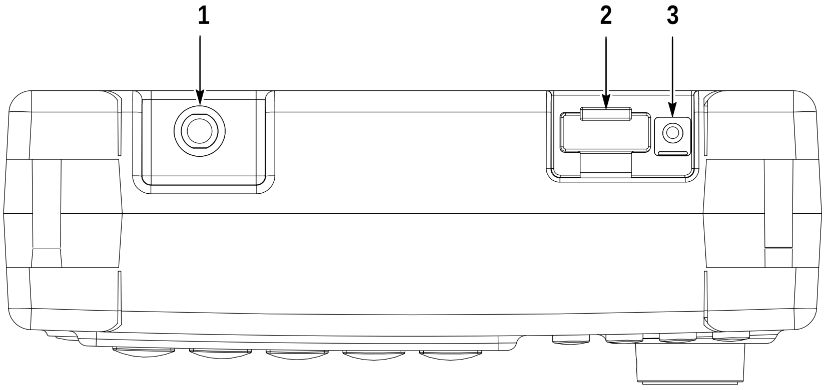

Figure 2–1: Top view of the RFM150, showing connector locations

See Figure 2–1 for connector locations.

1. The RF input is a precision 75 Ω F connector with a replaceable F-style or BNC-style adapter.
2. The interface port has a 9-pin, subminiature D-type connector that provides a serial interface for remote control. Pin connections are listed in Appendix B.
3. The DC jack input is a 2.5 mm plug that allows recharging of the internal NiCad batteries and operation of the instrument with an external AC/DC adapter. If AC power is connected, and the instrument is turned off or in sleep mode, the battery is charging. Use only the Tektronix adapter supplied with this product.

Controls and Indicators

This section provides a general description of each control's function. See Figure 2–2 for control locations.

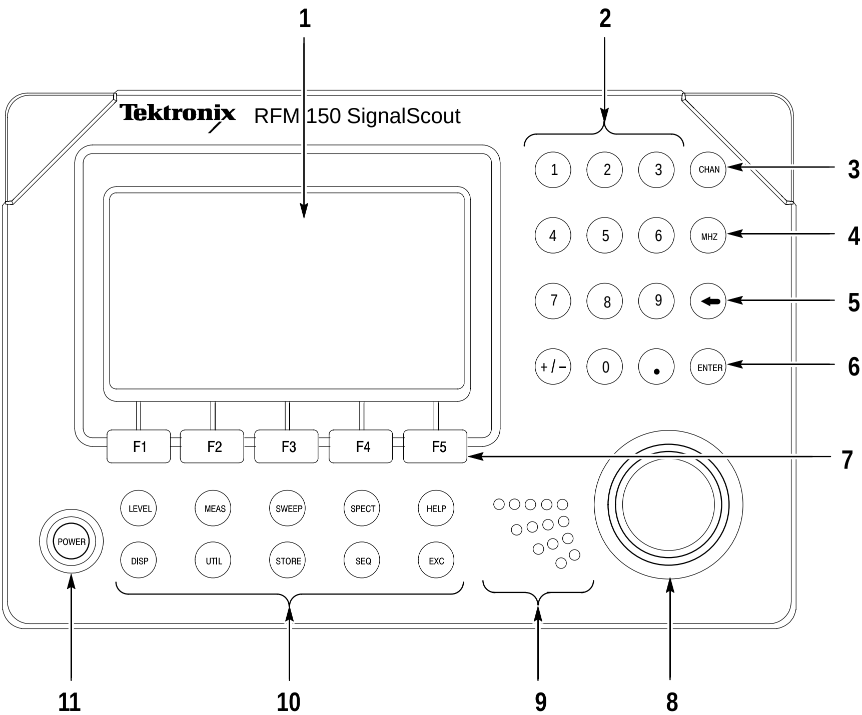

Figure 2–2: The RFM 150 front panel, showing controls

1. The LCD display provides graphic and numeric readouts for selected measurement and menu modes. The display readouts are described on page 2–8. To adjust the display for best viewing, see page 3–8.

2. Use the numeric keypad to enter a channel number or frequency value. Terminate such an entry with CHAN, MHz, or ENTER. You can also use the keypad to enter numbers in alphanumeric text strings.

3. CHAN switches the instrument to channel entry mode. If CHAN is used to terminate a keypad entry, it will switch the instrument to the channel entry mode and tune the instrument to the keyed channel.

4. MHz switches the instrument to frequency entry mode. If MHz is used to terminate a keypad entry, it will switch the instrument to frequency entry mode and tune the instrument to the keyed frequency.

5. During a keypad entry, the backspace key will erase the character preceding the cursor. A pending keypad entry can be aborted by back spacing 1 click beyond an empty entry.

6. ENTER is used to terminate a keypad entry in channel or frequency mode.

7. Keys F1 through F5 are referred to as function keys or soft keys because their functions vary, based on the instrument operating mode. In this manual, they are also referred to as F keys. Key assignments are displayed along the bottom of the LCD screen. Pressing one of the F keys will abort a keypad entry in progress.

8. The knob function varies, based on the selected instrument mode. Knob functions include channel tuning, frequency tuning, speaker volume, reference level, and span. In some modes, the knob chooses among several items displayed on screen. In modes that allow text string entry, the knob selects letters from a displayed alphabet. ENTER must be pressed after each letter. The knob overrides a partial keypad entry.

9. In meter mode, the speaker is automatically turned on to monitor FM audio. To control the speaker volume in meter mode, select the function key assigned to KNOB VOL and turn the knob. The speaker also provides a warning for error conditions.

10. There are 10 menu keys, which provide access to on-screen menus and submenus. Selecting any menu key will abort a keypad entry in progress. The following is a general description of menu functions:

    - LEVEL accesses the signal level measurements submenu. In LEVEL mode, the five function keys are assigned to: 1 CHAN, PILOTS, 5 CHAN, ALL CHAN, and METER.

- MEAS accesses additional measurements such as Hum and C/N ratio.
- SWEEP allows referenced sweep measurements with peak-to-valley readout between two tuneable marker frequencies.
- SPECT provides a spectral display with a tuneable marker and readout of the tuned frequency and signal amplitude.
- HELP displays context-sensitive help. Use the knob to scroll through the help text, and press the ESC key to exit the help screen.
- DISP lets you adjust the display contrast and back light.
- UTIL accesses menus for instrument configuration such as probe loss, display units, and pilot frequencies. UTIL is also used for channel table editing.
- STORE lets you store and view measurement results. You can also use the results as a reference when making measurements in the sweep mode.
- SEQ lets you select and execute sequences that you created using the CSS 150 SignalScout software.
- ESC causes the instrument to exit a submenu or menu. In effect, it displays one level higher on the menu structure. ESC is also used to exit help screens. ESC aborts a keypad entry in progress, restoring the previous contents of the field.

***NOTE**. To ensure proper operation under all conditions, always plug the AC adapter into the RFM 150 before connecting to the AC power source.*

---

11. POWER turns the instrument power on and off. Important information about instrument power up and the power switch appears on pages 1–5, 1–18, and 3–11.

Menu Hierarchy

The menu structure is shown in Figure 2–3, a three-part illustration.

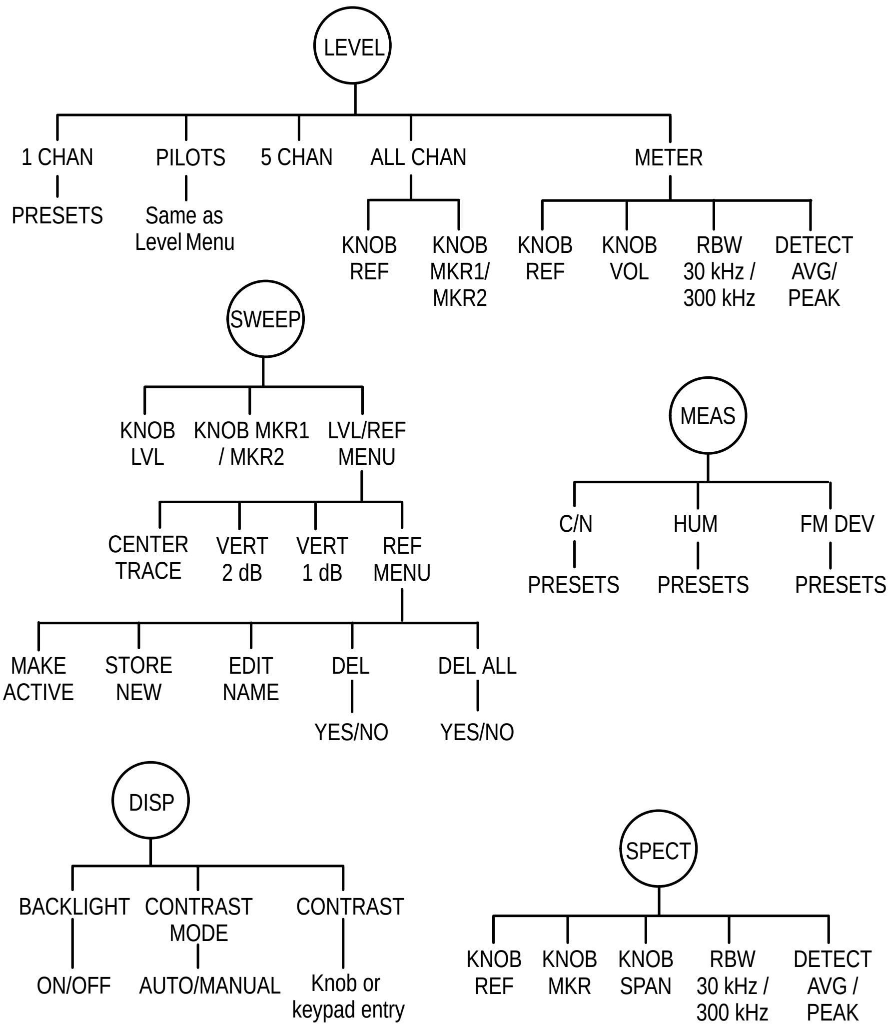

Figure 2–3: Menu hierarchy

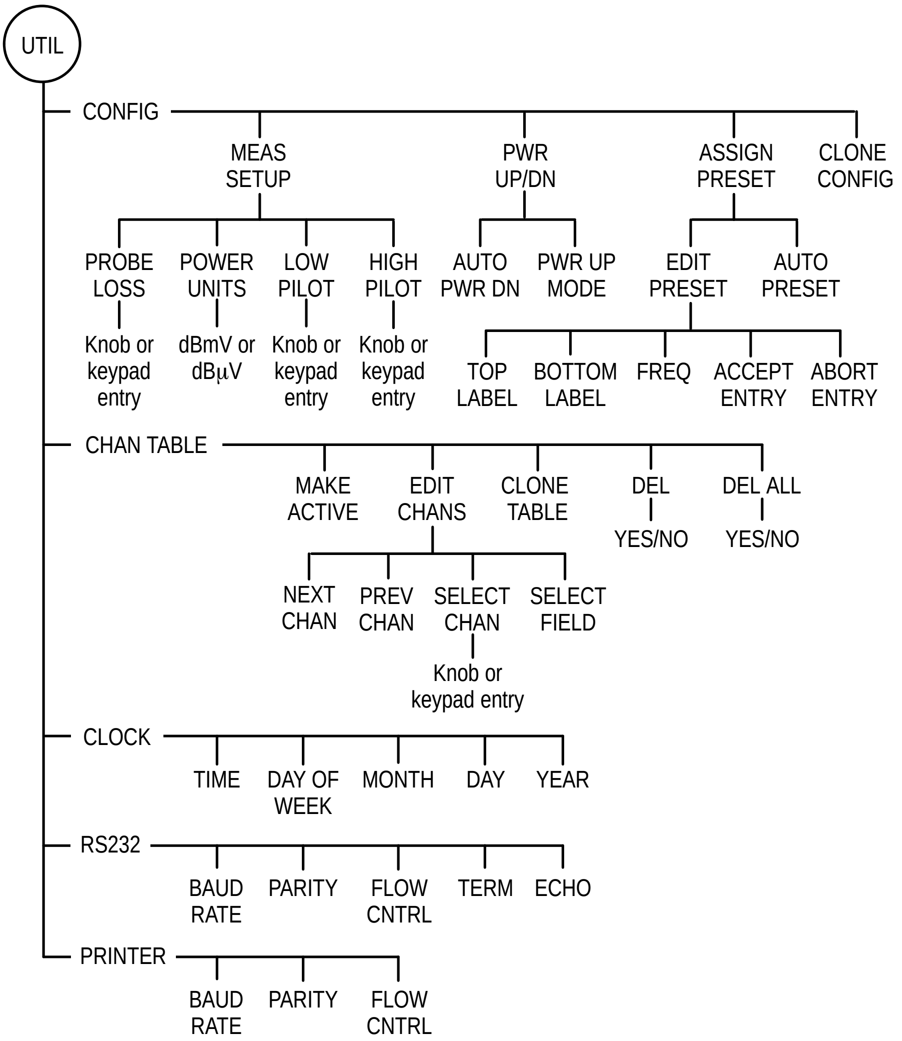

Figure 2–3: Menu hierarchy (Cont.)

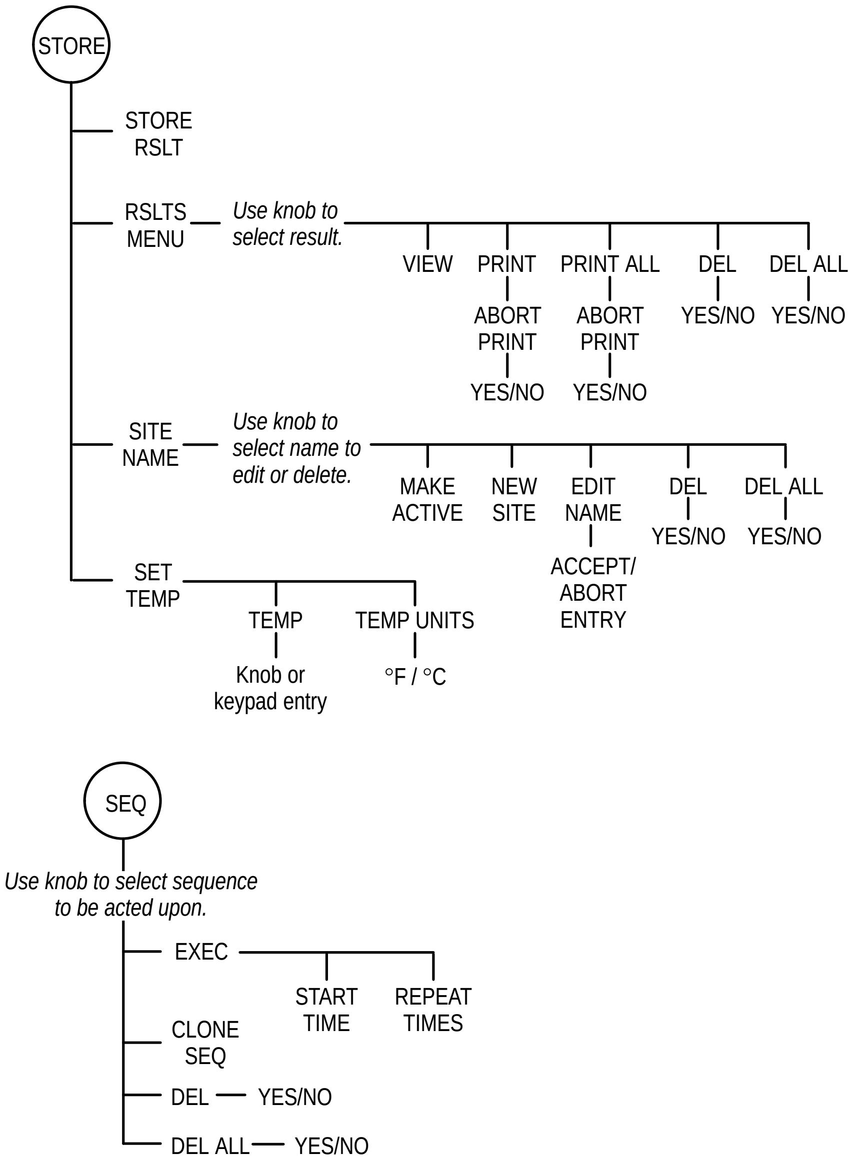

Figure 2–3: Menu hierarchy (Cont.)

Explanation of Readouts

Refer to the sample measurement screen in Figure 2–4 while reading this list of commonly-used display readouts and labels.

1. The measurement mode is shown in the upper right corner, and the screen scale factor (if applicable) appears below it.
2. The top line of the screen shows the channel number and frequency of the signal being measured.
3. An outline around either the channel number or frequency indicates the entry mode. (A dashed outline indicates that the knob and keypad are uncoupled.) In Figure 2–4, the frequency is outlined, so keypad or knob entries will be interpreted as frequency, unless CHAN is pressed to change the entry mode to channel.
4. Typically, this measurement is the visual carrier level. It is displayed in a larger type size than the rest of the display, with the units appearing next to the measured value.

   An asterisk (*) next to a measured level indicates that a channel-specific amplitude offset (as set in the channel table) has been applied to the measured value. To find the actual offsets, press UTIL, then CHAN TABLE and EDIT CHANS. Note that this is different than the probe loss offset.
5. In this example, the second measurement on the screen is the aural carrier level difference. It is displayed in a larger type size than the rest of the display, with the units appearing next to the measured value. Other measurements, such as C/N and Hum, can appear here.
6. Labels across the bottom of the screen define function key actions. When the corresponding function key is pressed, the labeled action will occur, or the labeled submenu will be entered. When the function keys are assigned to the presets, as in Figure 2–4, pressing a function key tunes the instrument to the programmed preset frequency. (Programming the Presets is described on page 3–14.)
7. When a function key is selected, its label is highlighted. When the function keys control the knob assignment, the highlighted

label indicates the current knob action. If the function keys are assigned to the presets, as in Figure 2–4, the highlighted label represents the instrument tuning.

8. When a remote signal is sent to the RFM150, it places the instrument in remote operating mode. The remote indicator (an outlined R) will appear to the right of the frequency at the top of the display. When any front-panel control is used (other than the POWER key), it will convert the instrument to local operation; all front-panel controls will be functional and the remote indicator will be removed.

When a remote command for local lock-out is sent to the RFM150, the local lock-out indicator (an outlined L) will appear to the right of the frequency. There will be no action when a front-panel control is used, except for the POWER key. This condition will remain until the remote command is sent to remove the local lock-out.

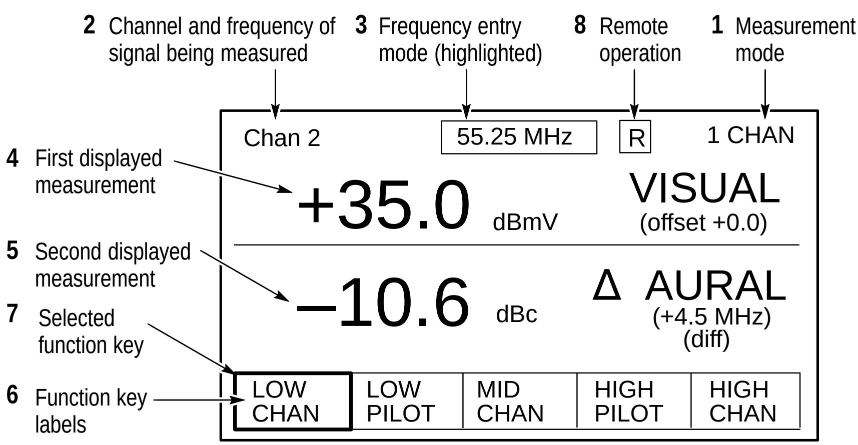

Figure 2–4: Display readouts and labels

Tuning

You can tune the instrument with either the knob or the numeric keypad. In some modes, you can also tune by pressing an F key.

Entry mode. You can set the instrument to channel or frequency entry mode by pressing CHAN or MHz. The selected mode is indicated by an outline around either the channel or the frequency in the top line of the display.

Tuning by knob. If channel entry mode is selected, turning the knob sequences through the channels in the active channel table. If frequency entry is selected, turning the knob tunes by frequency.

In some modes, the function keys determine the knob action. In this case, tuning by knob may only be possible when none of the function key labels are highlighted.

Tuning by keypad. Key in the channel number or frequency, then press CHAN for channel entries, MHz for frequency entries, or ENTER to use the current entry mode.

Tuning by preset. To tune the instrument to a preset frequency, press and release the function key below the desired on-screen label. Refer to page 3–14 for instructions on programming the presets.

In some measurement modes, you measure the signal at a frequency that you have selected through another menu. For example, pilots mode measures high and low pilots, which you can set through the utility/configure menu. (You can also use the default settings.)

If you attempt to tune out of the specified frequency range (5 MHz to 1080 MHz), no change to tuning will occur (if using the keypad, an out-of-range message will be displayed momentarily). If you tune to a frequency that does not correspond to a channel in the active channel table, the channel readout is replaced with ‘???’ and the secondary measurement is not displayed.

Editing Methods

The next few pages describe the general editing methods used to change instrument parameters.

Selecting an item. In a list of items, the selected item is highlighted by an outline cursor (see Figure 2–5). This is the item that will be acted upon when a function key (such as delete) is pressed. Turning the knob will allow you to select different items, and scroll the list as needed.

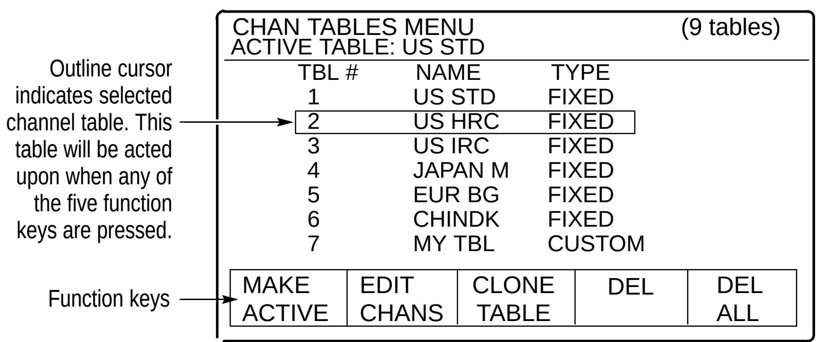

Figure 2–5: Sample menu screen showing use of the outline cursor

Selecting a field. In a display with editable fields, the selected field is indicated by a cursor arrow to the left of the field (see Figure 2–6). The function keys select the field to edit. In some menus, each field is assigned to a corresponding function key. In other menus, one key is pressed repeatedly to sequence through the fields. The function key labels along the bottom of the screen will guide you.

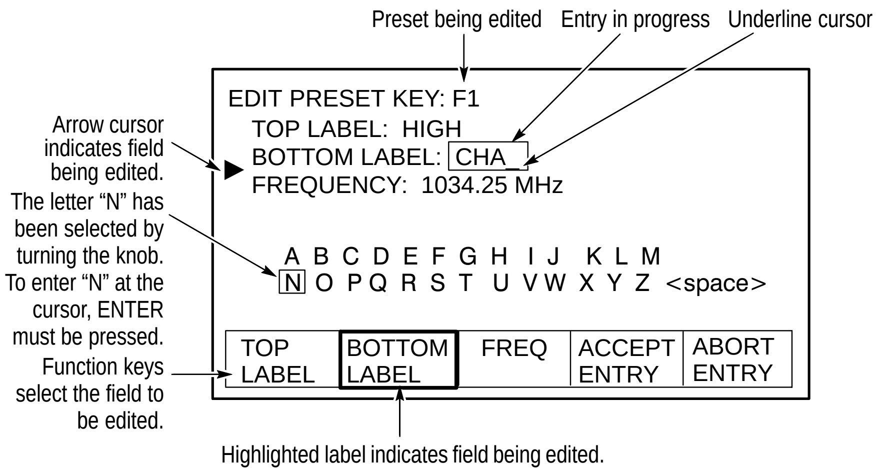

Figure 2–6: Sample menu screen showing text editing

Editing Alpha-Numeric Text Fields

Some fields contain letters and numbers that can be edited by the operator. Preset name is an example of this type of field.

The back space key (⬅) is used to erase characters.

A partial or incorrect entry can be cancelled by pressing ESC, by selecting ABORT ENTRY, or by back spacing one click past an empty field. The stored name will reappear, unchanged.

Entering letters. Use the knob to highlight the desired letter on screen, then press ENTER. The previous name will disappear and the selected letter will appear, followed by an underline cursor. As additional letters are entered, they will appear at the cursor.

Entering numbers. Use the keypad (ENTER is not used for numbers in text strings). When a field has been correctly entered, select ACCEPT ENTRY.

Exit. When all fields on the screen have been correctly entered and accepted by pressing ACCEPT ENTRY, press ESC to exit the menu, one level at a time.

Editing Numeric Fields

A numeric field can be edited using either the knob or the numeric keypad. To use the knob, just turn the knob until the desired value is displayed, and the new value will be automatically entered. To use the keypad, key in the desired value, then terminate the entry with ENTER. If it is a frequency field, CHAN or MHz can also be used to terminate the entry. Partial keypad entries can be aborted by backspacing or pressing ESC.

Editing Fields With On-Screen Choices

Some fields have on-screen choices, with the current setting indicated by an outline cursor. These fields are edited by turning the knob to the left or right until the desired setting is outlined.

Making Measurements

Please read pages 2–8 through 2–10 before proceeding. These pages contain general information that applies to all measurements and is not repeated in the measurement discussions.

Figure 2–3 shows the menu hierarchy, with circles representing front-panel menu keys.

Each measurement mode discussion begins with a small menu hierarchy diagram, showing how to access that mode. The round key at the top of the diagram indicates the front-panel key that must be pressed to enter that menu. If submenus are present, they will be represented by row(s) of rectangular keys. If a key is shaded, it will be used in the accompanying discussion.

Each measurement mode discussion is accompanied by a table, which describes all key actions for that mode. If a key has no action in that mode, it will not be listed in the table.

The measurement discussions are organized in alphabetical order by measurement name.

1 Channel Mode

To enter the 1 channel mode, press the front-panel LEVEL key. The function keys will be assigned to the five signal level measurement modes, but the measurement portion of the screen will not be affected. Select 1 CHAN; the 1 channel measurement display will appear (Figure 2–7). The instrument mode (1 CHAN) is displayed in the upper right corner of the screen, and the function key labels indicate the five presets. Table 2–1 defines the key actions.

Table 2–1: Functions of active keys in 1 channel mode

Key	Action
Menu keys	Enters selected menu. (Aborts a partial keypad entry.)
Function keys	Tune instrument to preset frequencies. Override partial keypad entry.
Knob	Tunes instrument according to entry mode. Overrides partial keypad entry.
Numeric keypad	Keying in either channel or frequency, followed by CHAN, MHz, or ENTER, tunes the instrument if the keyed channel or frequency corresponds to a channel in the active channel table.
CHAN	Terminates keypad entry as channel. Switches to channel entry mode.
MHz	Terminates keypad entry as frequency. Switches to frequency entry mode.
ENTER	Terminates a keypad entry in the active entry mode (channel or frequency, as outlined in the top line of the display).
←	Pressing backspace during a keypad entry erases the character preceding the cursor. Backspacing 1 click after field is empty aborts partial entry.
HELP	Displays context-sensitive help screen; aborts a partial keypad entry.
ESC	Aborts a partial keypad entry without changing the instrument setup. Escape has no function when the preset keys are displayed.

Tuning. The signal being measured is determined by instrument tuning. Use the knob, numeric keypad, or presets to tune by channel or frequency. (Refer to *Tuning* on page 2–10.) The tuned channel number and frequency appear on the top line of the display.

Analog Channel Measurement. The instrument makes two measurements on the tuned channel (shown in Figure 2–7). The top portion of the display is the visual carrier (taken as a sine wave at the peak of the modulating envelope). The lower portion of the screen displays the aural carrier level difference, expressed relative to the visual carrier level. If the analog channel is a two-carrier sound channel, both of the aural carrier level differences are measured, relative to the visual carrier.

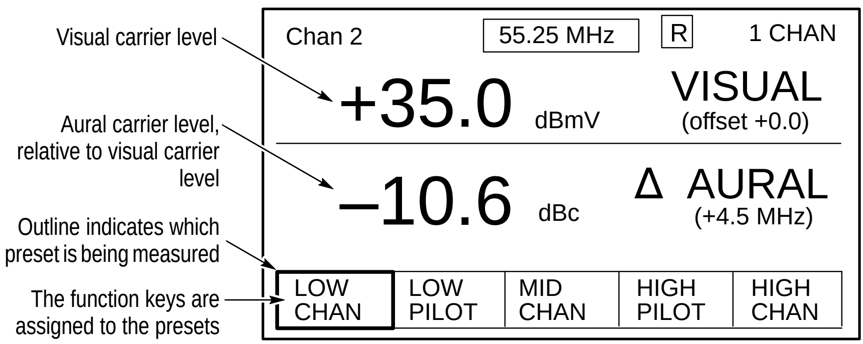

Figure 2–7: The 1 channel mode (analog channel)

Digital Channel Measurement. The RFM150 1 Channel mode measures the average power of a digital channel.

***NOTE**. To prepare for measuring the power of a digital channel, you must use the CSS150 software. Refer to the CSS150 User Manual for instructions on creating a custom channel table (channel table editing) and loading channel tables into the RFM150.*

To measure a digital channel, proceed as follows.

1. Use the CSS150 software to create a custom channel table with the following information:

Table 2–2:

Channel Table Item	User Action
Visual Freq (MHz)	Enter the measurement frequency (the frequency at the center of the modulation envelope)
RFM150 Channel Type	Select DIGITAL
C/N Bandwidth (MHz)	Enter the symbol rate in mega-symbols per sec. (F_{sym}). (Refer to your encoder/modulator equipment documentation for this information.)
Ampl. Offset (dB)	Enter the filter truncation error. If spectrum shaping has been used to *reduce* the transmitted power, this number should be negative. (Refer to your encoder/modulator equipment documentation for this information.)
Channel Edge, Channel Offset, Aural Offset, Second Aural Offset, Scramble, Dwell Time	Ignore

2. After all channels in the system have been correctly specified, load the custom channel table into the RFM 150.

3. Make the custom channel table the active table as follows:

  a. On the RFM 150 front panel, press UTIL.

  b. Press by F2 to select CHAN TABLE.

  c. Select the custom channel table using the knob.

  d. Press F1 to make it active.

4. Take an average power measurement on a digitally-modulated channel as follows:

  a. Press LEVEL, then press F1 to select the 1 channel measurement mode.

  b. Tune to the digital channel. The measurement is displayed.

The average power is displayed on the top portion of the screen (shown in Figure 2–8). The measurement result of a digital channel is about 10 dB lower than the peak analog measurement. There is no secondary measurement for digital channels, so aural carrier information is not shown for them.

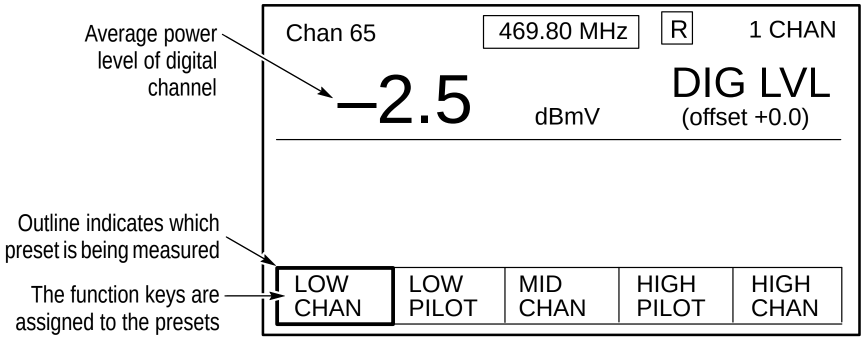

Figure 2–8: The 1 channel mode (digital channel)

NOTE*. Digital channels may be specified as Pilot channels or channels in the 5 Chan display. They will also appear in All Channel and Sweep displays. In these modes, the level readout will be the same as that for an ANALOG channel. (DIG LVL will not be displayed.)*

Exit. To change to another menu, press the new menu key. Pressing certain menu keys will reassign the function keys while leaving the meter mode display on screen (for example, pressing STORE to store a measurement result). Press ESC to exit the other menu and restore the 1 channel mode function keys. To change to another level measurement mode, press LEVEL.

Pilots Mode

To enter the pilots mode, press the LEVEL key. The function keys will be assigned to the signal level measurement modes. The measurement portion of the display will be the last-selected measurement mode, which will be highlighted. Select PILOTS. The pilots measurement screen will appear (see Figure 2–9), with the mode (PILOTS) displayed in the upper right corner of the screen.

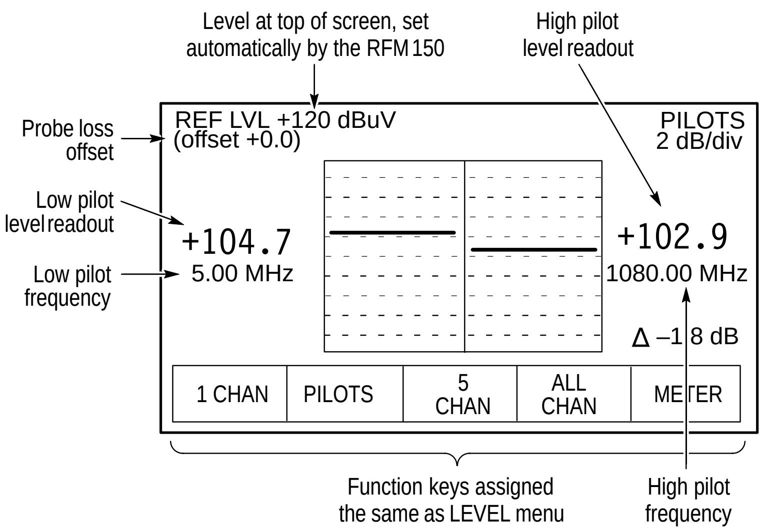

Figure 2–9: The pilots mode display

Tuning is inactive in this mode. Table 2–3 defines the key actions.

Table 2–3: Functions of active keys in pilots mode

Key	Action
Menu keys	Enters selected menu. (Aborts a partial keypad entry.)
HELP	Displays context-sensitive help screen; aborts a partial keypad entry.
ESC	Aborts a partial keypad entry without changing the instrument setup.

Instead of making two measurements on one channel as in the 1 channel mode, the pilots mode provides a graph and numeric readout of the visual carrier level for two different channels. The vertical range is 20 dB; 10 divisions at 2 dB per division.

Pressing certain menu keys will reassign the function keys while leaving the pilots measurement display on screen (for example, pressing STORE to store a measurement result). Press ESC to exit the other menu and return the full pilots display.

To change to another level measurement mode, press LEVEL. To change to another menu, press the desired menu key.

Editing the Pilot Frequencies

The channels being measured are the high and low pilots. To change the high and low pilot frequencies, press UTIL, select CONFIG, then MEAS SETUP. The function keys will be assigned to the four fields available for edit. An arrow cursor along the left edge of the screen will indicate the selected parameter. Select high or low pilot by pressing the corresponding function key, then use the knob or keypad to edit the frequency. A keypad entry must be terminated with CHAN, MHz, or ENTER. A partial keypad entry can be cancelled by pressing ESC or backspacing one space past an empty field. The previous frequency will be restored, without change.

Exit. To change to another menu, press the new menu key. Pressing certain menu keys will reassign the function keys while leaving the meter mode display on screen (for example, pressing STORE to store a measurement result). Press ESC to exit the other menu and restore the pilots mode function keys. To change to another level measurement mode, press the corresponding function key.

5 Channel Mode

To enter the 5 channel mode, press the front-panel LEVEL key. The function keys will be assigned to the five signal level measurement modes, but the measurement portion of the screen will not be affected. Select 5 CHAN; the 5 channel measurement screen, shown in Figure 2–10, will appear.

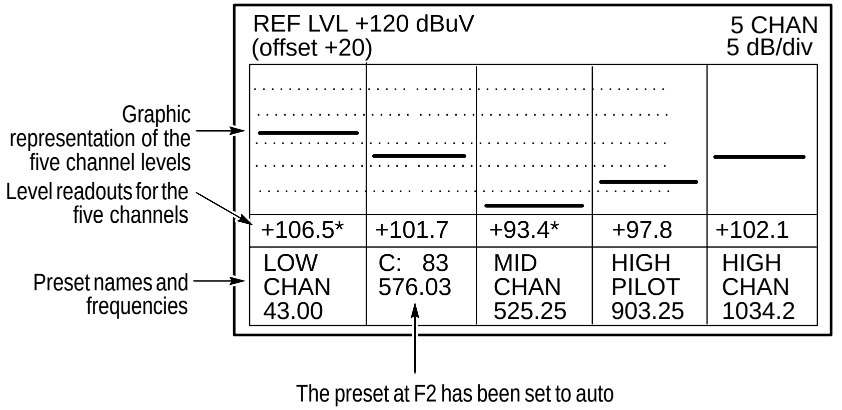

Figure 2–10: The 5 channel mode display

The instrument mode (5 CHAN) will be displayed in the upper right corner of the screen. The function keys and tuning are inactive in this mode. Table 2–4 defines the key actions.

Table 2–4: Functions of active keys in 5 channel mode

Key	Action
Menu keys	Enters selected menu.
HELP	Displays context-sensitive help screen.

The 5 channel measurement screen provides a graph and numeric readout of the visual carrier level on five preset frequencies. The vertical range is 30 dB; 6 divisions at 5 dB per division.

Reference level. This is the level at the top of the screen, and is displayed in the upper left corner of the screen (REF LVL). The RFM150 automatically selects the optimum reference level, based on the five channel level measurements.

Signal frequencies. The five preset names and frequencies are displayed across the bottom of the screen. These are the frequencies of the signals being measured, and they can be reprogrammed through the utility menu or by the press-and-hold method. The auto presets notation is 'C:'**.** See page 3–14 for instructions on programming the presets.

Exit. To change to another menu, press the new menu key. Pressing certain menu keys will reassign the function keys while leaving the meter mode display on screen (for example, pressing STORE to store a measurement result). Press ESC to exit the other menu and restore the preset name and frequency labels. To change to another level measurement mode, press LEVEL.

All Channel Mode

All channel mode gives an overview of all channels in the active channel table. This may be useful as the first measurement made at a new location. For example, if you spot a channel in the graphic display that looks low, you can tune the markers to that channel to check its level. You can check at a glance to see if channels at the high end are rolled off.

To enter the all channel mode, press the front-panel LEVEL key. The function keys will be assigned to the five signal level measurement modes. Select ALL CHAN. The all channel measurement screen, shown in Figure 2–11, will appear, with the instrument mode (ALL CHAN) displayed in the upper right corner of the screen.

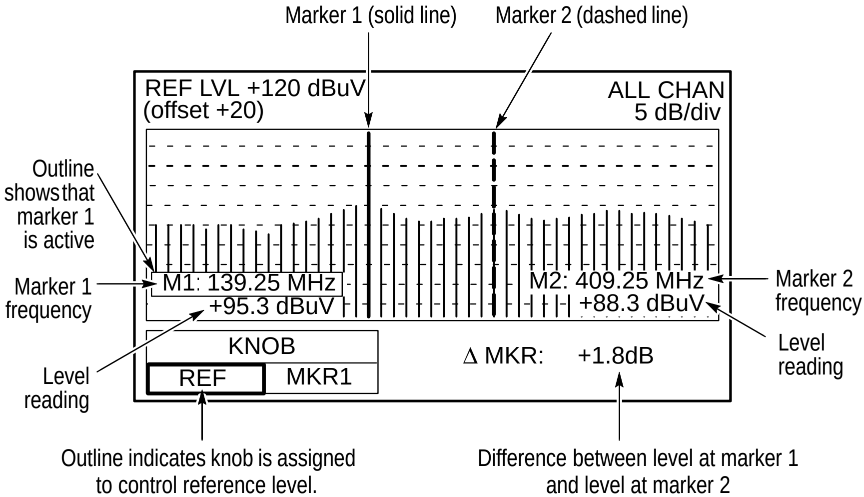

Figure 2–11: The all channel mode display

Table 2–5 defines the key actions.

Table 2–5: Functions of active keys in all channel mode

Key	Action
Menu keys	Enters selected menu. (Aborts a partial keypad entry.)
Function keys	F1 assigns the knob to select the reference level. F2 toggles the active marker between marker 1 and marker 2, and assigns the knob and numeric keypad to tune that marker. (The knob and keypad can be uncoupled.)
Knob	If F1 is selected, turning the knob will select the reference level. If F2 is selected, turning the knob will tune the active marker (1 or 2).
Numeric keypad	Keying in a channel or frequency, followed by CHAN, MHz, or ENTER, tunes the active marker if the keyed channel or frequency corresponds to a channel in the active channel table.
CHAN	Terminates a keypad entry as channel.
MHz	Terminates a keypad entry as frequency.
ENTER	Terminates a keypad entry as frequency.
←	Pressing backspace during a keypad entry erases the character preceding the cursor. Backspacing 1 click after field is empty aborts partial entry.
HELP	Displays context-sensitive help screen; aborts a partial keypad entry.
ESC	Aborts a partial keypad entry without changing the instrument setup.

Display. In the all-channel mode, the instrument continuously scans all the channels in the channel table and produces a graphical display where the visual carrier level of each channel is plotted as a vertical bar. The vertical range is 50 dB, 10 divisions at 5 dB per division.

If the higher frequencies are not used, the all channel display will fill only the left portion of the screen. The companion CSS150 software can be used to create a custom channel table that does not contain unused frequencies. After making this custom channel table active, screen utilization will be significantly improved for most systems.

Markers. The two marker readouts, located in the bottom corners of the measurement display, show the frequency setting of each marker and the signal level reading in the current power units (dBmV or dBuV) at that frequency. No level reading will be given for channels that are set to SKIP through the channel table menu, although the marker can be moved to a skipped channel.

If the level reading is replaced by OVER, the reference level should be increased. The difference between the levels at the two marker frequencies appears in the lower right portion of the screen.

If F1 is pressed and its on-screen label (REF) is highlighted, the knob controls the reference level, but the keypad can be used to enter the active marker frequency. To change the knob action to marker frequency, press F2. The knob and keypad are now coupled, both controlling marker frequency. Pressing F2 again selects the active marker (toggles between 1 and 2). The on-screen label reflects the active marker name (MKR1 or MKR2), and an outline appears around the active marker readout. Marker 1 appears on screen as a solid line, and marker 2 is a dashed line.

Keypad entries must be followed by CHAN for channel entries, or MHz or ENTER for frequency entries. (In this application, ENTER is equivalent to MHz.) Tuning is limited to frequencies that correspond to channels in the active channel table. If another frequency is attempted, an error message will be displayed, and the tuning will not be changed.

Exit. To change to another menu, press the new menu key. Pressing certain menu keys will reassign the function keys while leaving the meter mode display on screen (for example, pressing STORE to store a measurement result). Press ESC to exit the other menu and restore the all channel mode function keys. To change to another level measurement mode, press LEVEL. If 1 channel or meter mode is entered following all channel mode, the instrument will be tuned to the same frequency as the active marker.

Meter Mode

METER provides general purpose level measurement capabilities, with a simulated analog meter and FM signal monitoring. The speaker is driven by the FM-demodulated tuned signal, and is always turned on in the meter mode. Manual configuration of many features in the meter mode provides flexibility for special applications. If you do not require these features, signal level monitoring may be more easily accomplished with the 1 channel mode. The instrument does not autorange in meter mode; the user must select an appropriate reference level. Table 2–6 defines the key actions in this mode.

Table 2–6: Functions of active keys in meter mode

Key	Action
Menu keys	Enters selected menu. (Aborts a partial keypad entry.)
Function keys	Tune instrument to preset frequencies. Override partial keypad entry.
Knob	Controls reference level if F1 is highlighted; speaker volume if F2 is selected. If neither of these two functions is highlighted, then the knob controls tuning according to the active entry mode (either chan. or freq., as outlined in the top line of the display). Overrides partial keypad entry.
Numeric keypad	Keying either channel or frequency, followed by CHAN, MHz, or ENTER, tunes the instrument – if chan. or freq. is in the active channel table.
CHAN	Terminates keypad entry as channel. Switches to channel entry mode.
MHz	Terminates keypad entry as frequency. Switches to frequency entry mode.
ENTER	Terminates a keypad entry in the active entry mode (channel or frequency, as outlined in the top line of the display).
←	Pressing backspace during a keypad entry erases the character preceding the cursor. Backspacing 1 click after field is empty aborts partial entry.
HELP	Displays context-sensitive help screen; aborts a partial keypad entry.
ESC	Aborts a partial keypad entry without changing the instrument setup.

Press the LEVEL key, then select METER. The meter measurement screen, shown in Figure 2–12, will appear, with the instrument mode (METER) displayed in the upper right corner of the screen. The level readout (largest type size on screen) represents the detected energy within the selected RBW filter, centered at the tuned frequency. The offset value (representing probe loss) appears under the level readout, and can be edited (refer to *Probe Loss*, page 3–19).

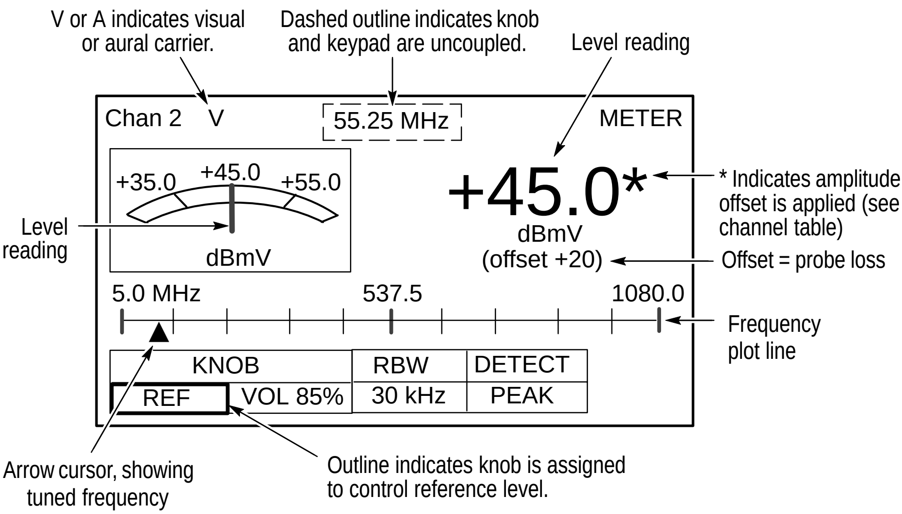

Figure 2–12: The meter mode display

The simulated analog meter displays the same value as the level readout. The value can be read according to the meter's numbered scale. The following paragraph tells how to set the reference level for this scale.

Reference level. Press F1 to assign the knob to REF (the label should be outlined). Use the knob to set the reference level so that the level readout (dark line) is within the central area of the meter scale, not off either end of the scale.

Instrument tuning. The keypad controls instrument tuning. If the knob is not assigned to REF or VOL, then the knob also controls instrument tuning (the knob and keypad functions are coupled). The knob assignments can be deselected by pressing CHAN or MHz (without a keypad entry), or by pressing the current knob assignment again. For example, if KNOB REF is selected, pressing F1 again will deselect it and assign the knob to control instrument tuning.

If the knob is assigned to REF or VOL, the keypad still controls instrument tuning. (The knob and keypad functions are uncoupled.) Tuning by preset is not available in this mode.

In meter mode, the channel number at the top of the screen is followed by a V or an A to indicate whether the instrument is tuned to a visual or an aural carrier.

Volume. In meter mode, FM audio can be monitored. Pressing F2 assigns the knob to control the speaker volume, from 0% to 100%. A beep will sound if you exceed either end of the range. Note that the instrument must be tuned to an aural carrier in order to monitor audio.

Resolution bandwidth. Pressing F4 toggles the resolution bandwidth between 30 kHz and 300 kHz. Control of RBW can be used in 2-carrier sound systems to resolve the aural carriers.

Detection. Pressing F5 toggles between peak and average detection.

Exit. To change to another menu, press the new menu key. Pressing certain menu keys will reassign the function keys while leaving the meter mode display on screen (for example, pressing STORE to store a measurement result). Press ESC to exit the other menu and restore the meter mode function keys. To change to another level measurement mode, press LEVEL.

Carrier-to-Noise Ratio

In this mode, the instrument measures both the visual carrier level and the carrier-to-noise ratio. Table 2–7 defines the key actions in this mode.

Table 2–7: Functions of active keys in C/N measurement mode

Key	Action
Menu keys	Enters selected menu. (Aborts a partial keypad entry.)
Function keys	Tune instrument to preset frequencies. Override partial keypad entry.
Knob	Tunes instrument according to entry mode. Overrides partial keypad entry.
Numeric keypad	Keying either channel or frequency, followed by CHAN, MHz, or ENTER, tunes the instrument – if chan. or freq. is in the active channel table.
CHAN	Terminates keypad entry as channel. Switches to channel entry mode.
MHz	Terminates keypad entry as frequency. Switches to frequency entry mode.
ENTER	Terminates a keypad entry in the active entry mode (channel or frequency, as outlined in the top line of the display).
←	Pressing backspace during a keypad entry erases the character preceding the cursor. Backspacing 1 click after field is empty aborts partial entry.
HELP	Displays context-sensitive help screen; aborts a partial keypad entry.
ESC	Aborts a partial keypad entry without changing the instrument setup.

For an analog channel, the measurement on the top of the display is the visual carrier level. The bottom measurement is the carrier-to-noise level. When performing C/N measurements, the RFM 150 automatically compensates for the effects of its own equivalent input noise. If the noise at the RFM 150 input is so low that the noise proximity correction can no longer be accurately applied, then a “>” will precede the C/N readout.

Making carrier-to-noise measurements. Press MEAS, then select C/N. The carrier-to-noise measurement screen (Figure 2–13) will be displayed.

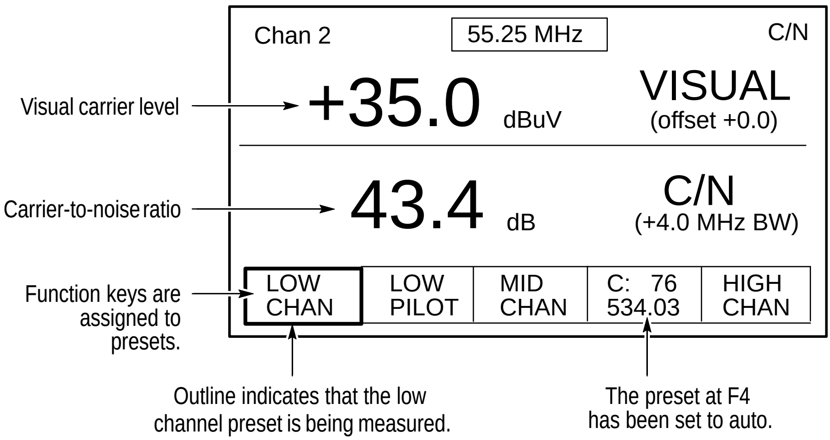

Figure 2–13: The carrier-to-noise measurement screen (analog channel)

The top line of the screen shows the channel number and frequency of the channel being measured, along with the instrument mode (C/N). The function key labels indicate the five presets.

Tuning. You can use the knob, the numeric keypad, or the presets to tune the instrument to the channel you want to measure. (For more information, refer to *Tuning* on page 2–10 and *Presets* on page 3–14.)

Digital Channel. Before making any digital measurements, you must set up a channel table as described on page 2–17. A sample digital channel measurement is shown in Figure 2–14. The top measurement is the average signal power, and the bottom measurement is the ratio of desired to undesired signal.

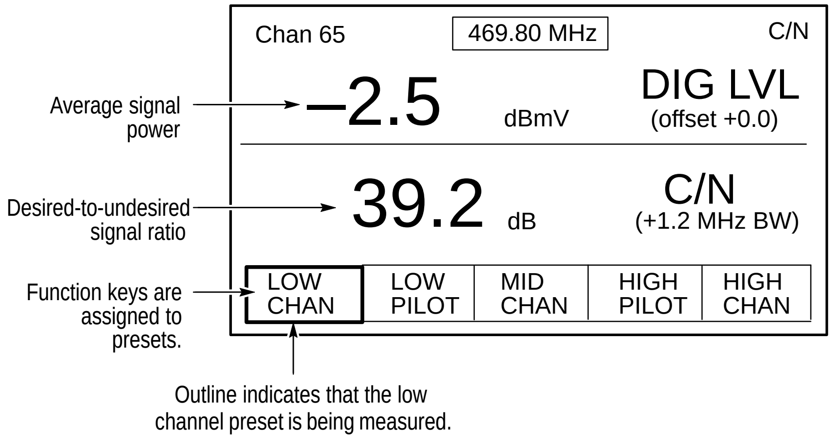

Figure 2–14: The carrier-to-noise measurement screen (digital channel)

Exit. To change to another menu, press the new menu key. Pressing certain menu keys will reassign the function keys while leaving the meter mode display on screen (for example, pressing STORE to store a measurement result). Press ESC to exit the other menu and restore the C/N mode function keys. To change to the hum or FM deviation menus, press MEAS again.

Hum

Measuring hum. Press the front-panel MEAS key. The function keys are assigned to HUM, C/N, and FM DEV; select HUM. The hum measurement screen (Figure 2–15) is displayed.

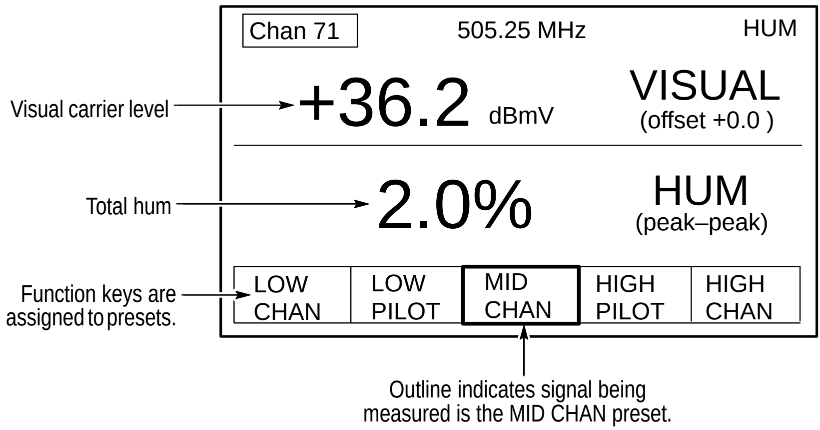

Figure 2–15: The hum measurement mode display

The top line of the screen shows the channel number and frequency of the channel being measured, along with the instrument mode (HUM). The function key labels indicate the five preset frequencies. Table 2–8 shows the key actions in this mode.

Table 2–8: Functions of active keys in hum measurement mode

Key	Action
Menu keys	Enters selected menu. (Aborts a partial keypad entry.)
Function keys	Tune instrument to preset frequencies. Override partial keypad entry.
Knob	Tunes instrument according to entry mode. Overrides partial keypad entry.
Numeric keypad	Keying either channel or frequency, followed by CHAN, MHz, or ENTER, tunes the instrument – if chan. or freq. is in the active channel table.

Table 2–8: Functions of active keys in hum measurement mode (Cont.)

Key	Action
CHAN	Terminates keypad entry as channel. Switches to channel entry mode.
MHz	Terminates keypad entry as frequency. Switches to frequency entry mode.
ENTER	Terminates a keypad entry in the active entry mode (channel or frequency, as outlined in the top line of the display).
←	Pressing backspace during a keypad entry erases the character preceding the cursor. Backspacing 1 click after field is empty aborts partial entry.
HELP	Displays context-sensitive help screen; aborts a partial keypad entry.
ESC	Aborts a partial keypad entry without changing the instrument setup.

Tuning. The instrument measures both the visual carrier level and the total hum for the tuned channel. You can use the knob, the numeric keypad, or the presets to tune the instrument, which will determine the signal to be measured. (Instructions for instrument tuning are on page 2–10 and instructions for programming the presets are on page 3–14.)

The measurement on the top of the display is the visual carrier level. This portion of the display is the same as the 1 channel signal level mode. The measurement below it is the peak-to-peak hum (low frequency disturbance). There is no hum measurement for digital channels.

Exit. To change to another menu, press the new menu key. Pressing certain menu keys will reassign the function keys while leaving the meter mode display on screen (for example, pressing STORE to store a measurement result). Press ESC to exit the other menu and restore the C/N mode function keys. To change to the C/N or FM deviation menus, press MEAS again.

FM Deviation

The instrument measures both the visual carrier level and the peak FM deviation of the aural carrier. The FM deviation is the peak deviation of the aural carrier. Note that the FM deviation is dependent on the content of the programming; its value reflects the fluctuating volume of the signal.

Table 2–9 defines the key actions in this mode.

Table 2–9: Functions of active keys in FM deviation measurement mode

Key	Action
Menu keys	Enters selected menu. (Aborts a partial keypad entry.)
Function keys	Tune instrument to preset frequencies. Override partial keypad entry.
Knob	Tunes instrument according to entry mode. Overrides partial keypad entry.
Numeric keypad	Keying either channel or frequency, followed by CHAN, MHz, or ENTER, tunes the instrument – if chan. or freq. is in the active channel table.
CHAN	Terminates keypad entry as channel. Switches to channel entry mode.
MHz	Terminates keypad entry as frequency. Switches to frequency entry mode.
ENTER	Terminates a keypad entry in the active entry mode (channel or frequency, as outlined in the top line of the display).
←	Pressing backspace during a keypad entry erases the character preceding the cursor. Backspacing 1 click after field is empty aborts partial entry.
HELP	Displays context-sensitive help screen; aborts a partial keypad entry.
ESC	Exits the submenu or menu, one level at a time. Aborts a partial keypad entry without changing the instrument setup.

Measuring FM deviation. Press MEAS. The function keys are reassigned to HUM, C/N, and FM DEV. Select FM DEV. The FM deviation measurement screen, illustrated in Figure 2–16, will be displayed. The top line of the display shows the channel number and frequency of the channel being measured, along with the instrument mode (FM DEV). The function key labels will indicate the five presets.

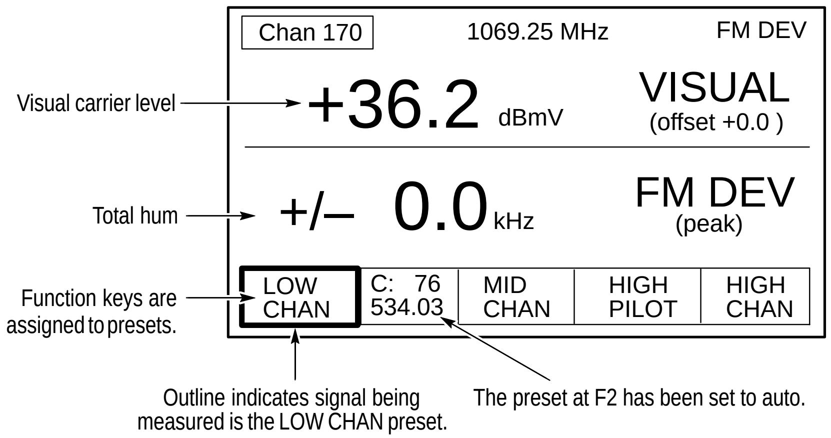

Figure 2–16: The FM deviation measurement mode display

For an analog channel, the top portion of the display is the visual carrier level. The peak FM deviation of the aural carrier is displayed on the bottom portion of the screen. There is no FM deviation measurement for digital or dual-carrier audio channels.

Tuning. You can use the knob, the numeric keypad, or the presets to tune the instrument to the channel you want to measure. (For more information, refer to *Tuning* on page 2–10 and *Presets* on page 3–14.)

Exit. To change to another menu, press the new menu key. Pressing certain menu keys will reassign the function keys while leaving the meter mode display on screen (for example, pressing STORE to store a measurement result). Press ESC to exit the other menu and restore the C/N mode function keys. To change to the C/N or hum menus, press MEAS again.

Executing Sequences

A series of measurements can be made by executing one of the automated measurement sequences that are loaded in the RFM 150. The results of the measurements will be stored, and can be accessed through the store menu. (To create or import a sequence, refer to page 3–20.)

24 hour test. The 24 hour test sequence is installed in the RFM 150 at the factory and cannot be deleted. When the 24 hour test is executed, it will make an all channel measurement, using the active channel table, once every 6 hours. The test is programmed to be performed 4 times. The measurement results will be tagged with the date and time, and stored as SEQUENCE type.

Editing the sequence parameters. Press the front-panel SEQ key, then use the knob to scroll to and select the desired sequence from the list (Figure 2–17).

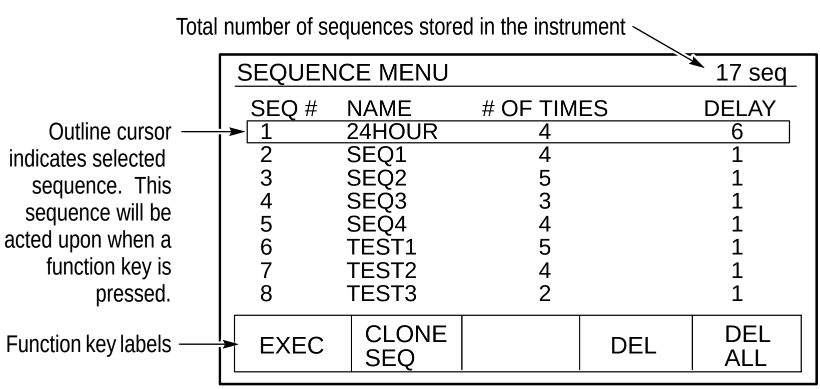

Figure 2–17: Sequence menu

Select EXEC. A submenu, similar to the one shown in Figure 2–18, will appear. Displayed on this screen are the current site name and temperature values with which stored measurement results will be tagged. If these values are not correct, go to the STORE menu and enter the correct values now.

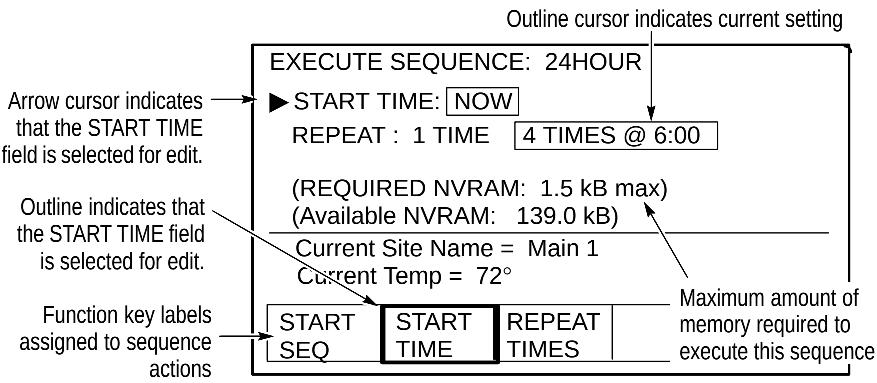

Figure 2–18: Execute sequence menu

Press F2 to select START TIME, and use the knob to select NOW, or the programmed time. Press F3 to select REPEAT TIMES, and use the knob to select REPEAT: 1 TIME, or the programmed number of times. (CSS 150 software is needed to program the time and repeats.)

Start the sequence. Select START SEQ. If the start time is NOW, the sequence begins immediately. If the start time is other than NOW, the RFM 150 enters a sleep state until the start time. It attempts to load the channel table associated with the sequence as the active channel table, and present a confirmation screen. If that channel table is not available, or has been modified, an error message is displayed, and the sequence is aborted.

Interrupting a sequence. While the instrument is in a sleep state, press the POWER key. A menu screen will give you the opportunity to abort the sequence or exit the screen without aborting.

Viewing / archiving the measurement results. After the measurement sequence is complete, press STORE and select RSLTS MENU. Use the knob to scroll to and select the first record created by the sequence. It can be identified by the word SEQUENCE in the TYPE column, and by the date and time displayed next to it. To view a the record, select VIEW. To archive using the CSS 150 software and a computer, refer to the *CSS 150 SignalScout Software User Manual*.

Exit. To exit the menu or submenu, including the viewed result, one level at a time, press ESC.

Spectrum Mode

In this mode, the instrument sweeps a frequency band specified by the center frequency and span/division, then uses fine steps to plot points and create a graph. This limited spectral display can be used for spotting signals which should not be present. Press the front-panel SPECT key to access the spectral display, shown in Figure 2–19.

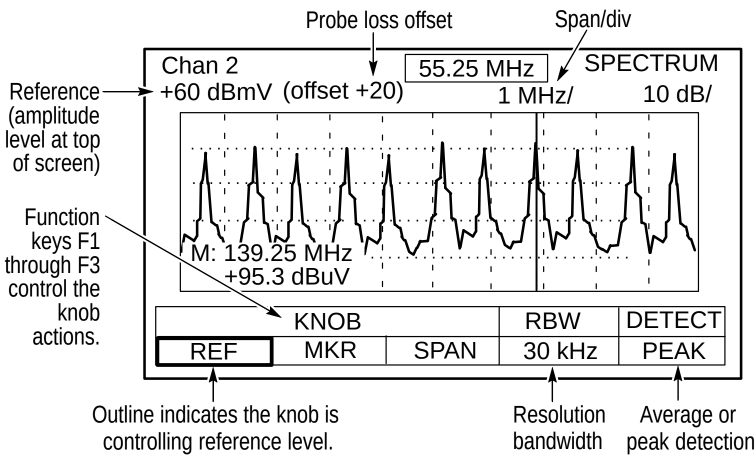

Figure 2–19: The Spectrum mode display (analog channel)

Table 2–10 defines key actions.

Table 2–10: Functions of active keys in spectrum mode

Key	Action
Menu keys	Enters selected menu. (Aborts a partial keypad entry.)
Function keys	Perform the action labeled on screen: either assigning knob function or selecting RBW. Override partial keypad entry.
Knob	Controls ref level, marker, or span/div. If none selected, tunes center frequency, according to active entry mode. Overrides partial keypad entry.
Numeric keypad	Keying either channel or frequency, followed by CHAN, MHz, or ENTER, tunes the instrument – if chan. or freq. is in the active channel table.

Table 2–10: Functions of active keys in spectrum mode (continued)

Key	Action
CHAN	Terminates keypad entry as channel. Switches to channel entry mode.
MHz	Terminates keypad entry as frequency. Switches to frequency entry mode.
ENTER	Terminates a keypad entry in the active entry mode (chan. or freq.).
←	Pressing backspace during a keypad entry erases the character preceding the cursor. Backspacing 1 click after field is empty aborts partial entry.
HELP	Displays context-sensitive help screen; aborts a partial keypad entry.
ESC	Exits the submenu or menu, one level at a time. Aborts a partial keypad entry without changing the instrument setup.

Center frequency. If the knob is assigned to REF, MKR, or SPAN, the keypad controls center frequency. If the knob is not assigned to REF, MKR, or SPAN, then both the knob and the keypad control center frequency. Deselect knob assignments by pressing CHAN or MHz (without a keypad entry), or by pressing the current assignment again. For example, with KNOB REF selected, press F1 to deselect it and set the knob to control center frequency.

Span/division. The span/div (displayed above the measurement area) is controlled, in a 1-2-4 sequence, by selecting KNOB SPAN, then turning the knob. Minimum span is 200kHz/div; maximum is 4 MHz/div (300 kHz RBW), or 400 kHz/div (30 kHz RBW).

Resolution bandwidth. Pressing F4 toggles the resolution bandwidth between 30 kHz and 300 kHz.

Reference level. The REF level is the level at the top of the screen. The present setting is displayed in the upper left corner of the screen. It can be changed by selecting KNOB REF and turning the knob.

Detection. Pressing F5 toggles between peak and average detection.

Marker. A single marker is available for precise readouts at any frequency. The marker frequency, which is displayed in the lower left corner of the measurement screen, is controlled by selecting KNOB MKR, then turning the knob. Marker frequency is changed in pixel steps, with the value of a step depending on the span.

Digital Channel. You can use the Spectrum mode to view a digital signal graphically. To measure the average power of a digital channel, use the 1 Channel mode. (Refer to the instructions on page 2–17).

Sweep Mode

To access the sweep display, shown in Figure 2–20, press the front-panel SWEEP key. The instrument mode (SWEEP) is shown in the upper right corner of the screen.

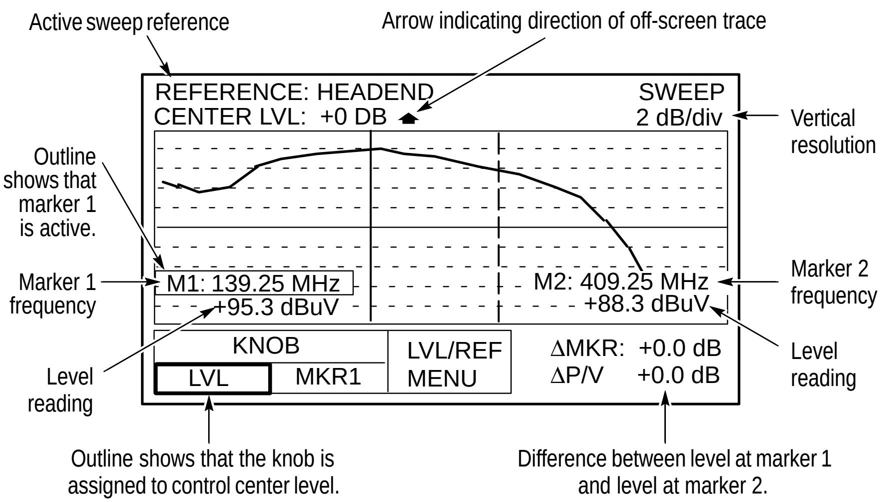

Figure 2–20: The sweep display

Table 2–11 defines the key actions that are effective for this mode.

Table 2–11: Functions of active keys in sweep display mode

Key	Action
Menu keys	Enters selected menu. (Aborts a partial keypad entry.)
Function keys	Assign knob to level, marker 1 or marker 2. Can enter the level/reference submenu. Override partial keypad entry.
Knob	Tunes the active marker or changes the center level. Overrides partial keypad entry.
Numeric keypad	Keying either channel or frequency, followed by CHAN, MHz, or ENTER, tunes the instrument – if the chan. or freq. is in the active channel table.

Table 2–11: Functions of active keys in sweep display mode (continued)

Key	Action
CHAN	Terminates keypad entry as channel. Switches to channel entry mode.
MHz	Terminates keypad entry as frequency. Switches to frequency entry mode.
←	Pressing backspace during a keypad entry erases the character preceding the cursor. Backspacing 1 click after field is empty aborts partial entry.
HELP	Displays context-sensitive help screen; aborts a partial keypad entry.
ESC	Exits the submenu or menu, one level at a time. Aborts a partial keypad entry without changing the instrument setup.

Markers. The sweep display has two tunable frequency markers. Readouts in the lower portion of the measurement screen show the marker 1 and marker 2 frequencies and the level (in dB) at those frequencies. Additionally, a readout in the lower right corner of the screen shows the difference between the markers and a peak-to-valley readout.

If F1 is pressed and its on-screen label (LVL) is highlighted, the keypad can be used to enter the active marker frequency, but the knob controls the center level. To change the knob action to marker frequency, press F2. The knob and keypad are now coupled, both controlling marker frequency. Pressing F2 again selects the active marker (toggles between 1 and 2). The on-screen label reflects the active marker name (MKR1 or MKR2), and an outline appears around the active marker readout. Marker 1 appears on screen as a solid line, and marker 2 is a dashed line.

A marker can be tuned only while it is active. Tune with the knob or by a keypad entry terminated with CHAN for channel and MHz or ENTER for frequency. Tuning is limited to frequencies that correspond to channels in the instrument’s channel tables. Entering other frequencies will cause an error message, leaving the marker frequency unchanged. The inactive marker is the boundary for tuning the active marker; the active marker cannot cross the inactive marker.

Centering the trace. If the trace is off-screen, an arrow next to the CENTER LVL readout (upper left corner of the screen) indicates the direction of the trace position (see Figure 2–20).

Selecting KNOB–LVL assigns the knob to control the center level in 1 dB steps. This will effectively move the trace up and down on the screen. The CENTER LVL readout value will indicate the new center screen reference value.

Selecting LVL/REF MENU, then CENTER TRACE will center the trace on screen, and adjust the center level accordingly.

Vertical resolution. The resolution can be set to 1 dB or 2 dB per division. Select LVL/REF MENU, then select 2 dB/ or 1 dB/. The present setting is indicated below the instrument mode in the upper right corner of the display. See Figure 2–21.

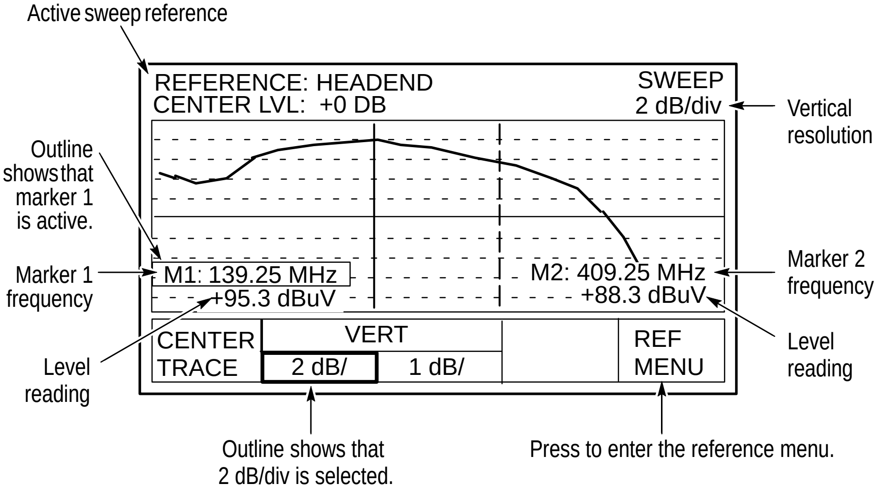

Figure 2–21: The sweep LVL/REF submenu display

Store a sweep reference. The results of 'all channel' measurements are used for the sweep references. For example, you can store an all channel mode record at the head end, and use it as a reference for field measurements.

Press LEVEL, then select ALL CHAN. This will make a measurement in the all channel mode. (The maximum signal level is 5 dB down from the reference level.) Then press SWEEP, and select LVL/REF MENU, followed by REF MENU. Select STORE NEW to add the most recent all channel mode measurement to the end of the list of stored sweep references (see Figure 2–22).

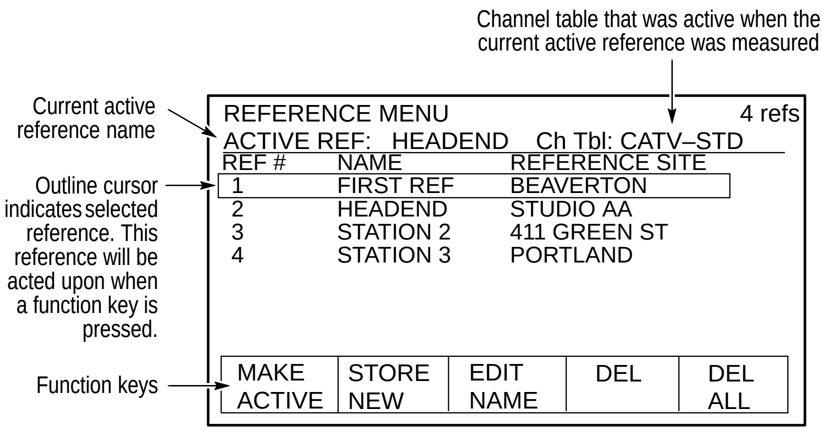

Figure 2–22: Reference menu

Select the active sweep reference. You can select any of the stored references to be active. The currently active reference appears above the list of references. To change this, turn the knob to select the reference that you will make active, then select MAKE ACTIVE. The selected reference will become the active reference, and it will now appear above the list. Press ESC to exit the reference menu. Now the sweep menu is displayed, and the reference that you have just selected will appear as the active reference in the upper left corner of the screen.

Exit. Press ESC to exit the menu or submenus, one level at a time.

Reference

Reference

Before using this section, you should read *Getting Started* and *Operating Basics*.

Reference is organized in alphabetical order by topic name.

Channel Tables

The RFM150 uses fixed and custom channel tables. Each instrument is loaded with the nine fixed channel tables, which can be edited, but can not be deleted. These tables are defined in Appendix A, with space allowed in the tables for you to write in modifications. A blank table is also provided for you to photocopy and document custom channel tables.

Channel numbers entered in measurement modes will be interpreted in terms of the active channel table. For example, in the 1 channel measurement mode, with CATV–STD channel table active and the instrument tuned to channel 2, the frequency will be 55.25 MHz.

Selecting the active channel table. Press UTIL, then select CHAN TABLE. The list of channel tables (Figure 3–1) is displayed. Use the knob to scroll to and select the channel table to become active, then press MAKE ACTIVE. The new active channel table will appear above the list of channel tables.

Editing Channel Tables

To edit channel tables, press the front-panel UTIL key, then select CHAN TABLE. A list of all channel tables that are loaded in the instrument will appear (Figure 3–1).

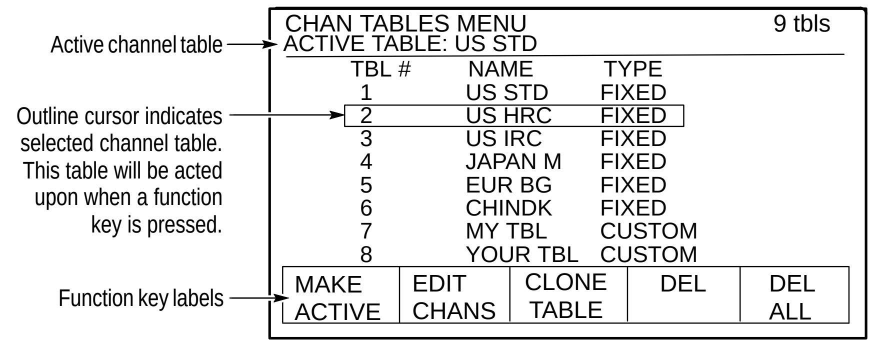

Figure 3–1: Channel tables menu

Use the knob to select the channel table to be edited, then select EDIT CHANS. This provides the edit channels menu display, shown in Figure 3–2, which allows editing of fixed or custom tables in the following fields: scrambled, amplitude offset, dwell time, and skip. (With the CSS150, additional fields can be edited.)

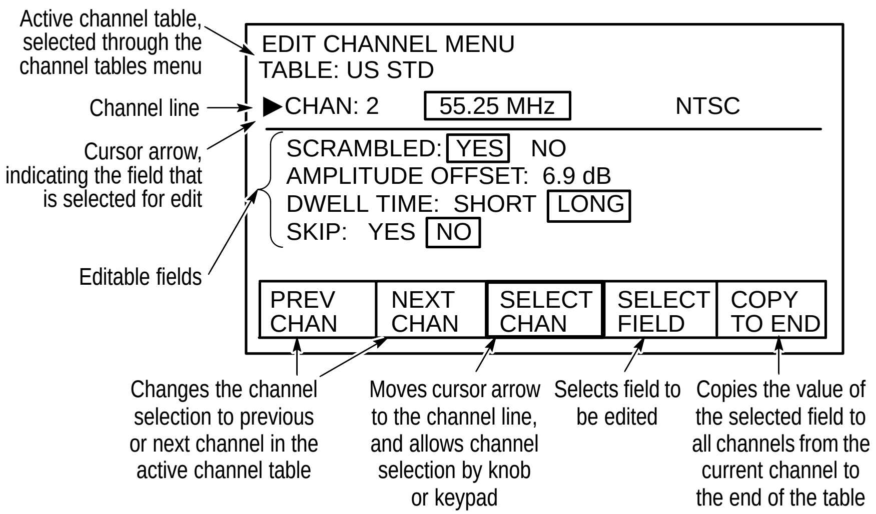

Figure 3–2: Editing channel tables

Table 3–1 defines all the fields that can be edited through this menu as well as those that are edited through the CSS150.

Table 3–1: Channel table fields for editing

Field	Units	Range	Editing	Comments
Number	None	0–511	CSS150	Maximum of 200 total channels allowed.
Primary Freq	MHz	4.50–1080.00 (10 kHz min. resolution)	CSS150	Can be the analog visual carrier or the digital carrier.
Aural Offset	MHz	4.5, 5.5, 6.0, or 6.5 only	CSS150	Offset to the aural carrier (from visual carrier). N/A for digital channels.
Second Aural Offset	MHz	None, 4.72, 5.74, 5.85, or 6.55 only	CSS150	Offset to the second aural carrier (from visual carrier). N/A for digital channels.
Type	None	NTSC, PAL, SECAM, or DIGITAL only	CSS150	
C/N Bandwidth	MHz	0.1 to 25.5	CSS150	Per channel to accommodate mixed channel systems.
Channel Edge	MHz	–327.6 to +327.6 (10 kHz min. resolution)	CSS150	Frequency offset from primary carrier to the channel edge (guard band). Used to locate the noise measurement point in C/N measurement.
Scrambled	None	Yes/No	CSS150 or RFM150	Allows tracking of which channels are scrambled.
Amplitude Offset	dB	–12.5 to +12.5	CSS150 or RFM150	Value added to absolute visual carrier level measurements. Usually used to correct for scrambled channel levels.

Table 3–1: Channel table fields for editing (Cont.)

Field	Units	Range	Editing	Comments
Dwell Time	None	Short/Long	CSS150 or RFM150	Time to dwell at visual and aural carriers to get level reading: short for NTSC/PAL, long for SECAM and some scrambling types. N/A for digital channels.
Skip	None	Yes/No	CSS150RFM150	If yes, channel is skipped in all channels and sweep mode.

Select channel. Channel tables are edited one channel at a time. To change the channel being displayed/edited, select SELECT CHAN. The arrow cursor will move up to the channel line, and the channel number can be tuned with the knob or by keypad entry followed by CHAN, MHz, or ENTER. You can only tune to channels that are stored in that channel table. If other entries are attempted, an error message is displayed and the present channel does not change.

Select field. In the edit channel menu, an arrow cursor along the left side of the screen indicates the selected field. This field can be edited with the knob (or keypad for amplitude offset). To change the selected field, select SELECT FIELD, repeating as necessary to reach the desired field.

Copy to end. Selecting COPY TO END copies the value of the selected field (indicated by the arrow cursor position) to all channels from the current channel to the end of the table. After the key is pressed, a confirmation screen will appear. You must select YES to copy. To return to the edit channels menu without copying, select NO or press ESC.

Deleting Channel Tables

Only custom channel tables can be deleted. If you attempt to delete a fixed channel table, an error message will be displayed and the table will not be deleted. Stored measurement results are dependent on the channel table that was active when they were stored. When you delete a channel table, be sure there are no records dependent on that table. If there are, they will be labeled as “orphans.”

Delete a (custom) channel table. Press the front-panel UTIL key, then select CHAN TABLE. A list of all channel tables that are loaded in the instrument will be displayed, with the selected table outlined. Use the knob to select the table that will be deleted, then select DEL. A confirmation screen will appear. Select YES to delete. To cancel the request, select NO or press ESC.

Delete all (custom) channel tables. Press the front-panel UTIL key, select CHAN TABLE, then select DEL ALL. A confirmation screen will appear. Select YES to delete. To cancel the request, select NO or press ESC.

Exit. Press ESC to exit the menu, one level at a time.

Importing Channel Tables

Channel tables can be imported from another RFM150 or from a PC. The number of channel tables that can be stored is limited only by the instrument’s available non-volatile memory. Note that adding channel tables reduces the available non-volatile memory.

Using the CSS150 software package. A fixed table can be used as the basis for creating a custom table. Custom channel tables are created with the companion software, CSS150; refer to the *CSS150 SignalScout Software User Manual* for instructions.

Using another RFM150. Connect the two instruments according to the instructions on page 0–1. With the source instrument, press the front-panel UTIL key, then select CHAN TABLE. A list of all channel tables that are loaded in the instrument will be displayed, with the selected table highlighted by an outline cursor. Using the knob, select the channel table that will be sent. Select CLONE TABLE. The table will now be sent to the destination RFM150 and placed at the end of the list of tables. To display this list on the destination instrument, press UTIL, then select CHAN TABLE. Use the knob if needed to scroll. To edit or delete the table, select EDIT CHAN or DEL.

Exit. Press ESC to exit the menu, one level at a time.

Clock

The clock determines the date and time that will be associated with a stored measurement result. It is also used to begin timed sequences, such as the 24 hour test. To display the clock menu (Figure 3–3), press UTIL, then select CLOCK. To select a field for edit, press the corresponding function key. An arrow points to the selected field.

The HOUR, MINUTE, and YEAR fields can be edited either with the knob or with the keypad followed by ENTER. A partial keypad entry can be aborted by pressing ESC or by backspacing. In the hour and minute fields, enter the current time using a 24-hour day. HOUR can be 00 to 23, and MINUTE can be 00 to 59. In the YEAR field, enter the current year as a four-digit number (1994 through 2025).

The DAY OF WEEK field has an outline cursor showing the current setting. Turn the knob left or right to select the correct day, and the outline cursor moves to show the new choice. The DAY–MONTH field is controlled by turning the knob to select the correct date.

Exit. After editing, press ESC to exit the menu, one level at a time. The new settings will be saved.

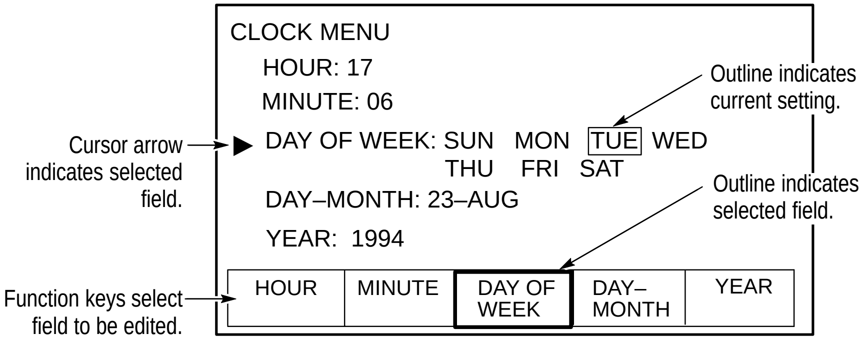

Figure 3–3: The Clock menu

Clone Configuration

A quick way to configure an instrument is to copy the configuration of another RFM150.

Enter the RS232 menu by pressing UTIL, then F4 (RS232). Make sure both instruments are set up the same. Connect the supplied RS-232 cable between the two instruments.

On the source instrument, press UTIL, followed by F1 (CONFIG), then F5 (CLONE CONFIG). The following instrument parameters will be sent to the destination instrument:

Active channel table
Active site name
Backlight mode (on/off)
Center level for sweep mode
Center level sensitivity (1 dB/2 dB) for sweep mode
Channel
Detection (average/peak) for meter and spectrum modes
Frequency
High and low pilot frequencies
Measurement mode currently selected
Power down mode
Power units
Power up mode
Preset labels and frequencies
Probe loss
Reference for all channels, meter, and spectrum modes
Resolution bandwidth (RBW) for meter and spectrum modes
Screen contrast level
Screen contrast mode (manual/auto)
Span for spectrum mode
Speaker volume in meter mode
Temperature units

Display Adjustment

The front-panel LCD screen provides measurement and menu displays. Through the DISP menu, the display can be adjusted for optimal viewing under different conditions.

To adjust the display, press the front-panel DISP key. The function keys will be assigned to backlight, contrast mode, and contrast.

Selecting BACKLIGHT moves the arrow cursor to BACKLIGHT. The present condition (ON or OFF) will be outlined. Turning the knob will toggle the backlight condition between ON and OFF. It may be desirable to turn the backlight on under low ambient light conditions.

Selecting CONTRAST MODE moves the arrow cursor to CONTRAST MODE. The selected condition (MANUAL or AUTO) will be outlined. Turning the knob will toggle the contrast mode between MANUAL and AUTO.

The auto mode continually adjusts the display for optimum contrast under varying ambient temperature conditions.

The manual mode is used by selecting CONTRAST, then using either the knob or keypad to select a contrast value between 0% and 100%. If the instrument is set to auto mode when a contrast value is selected, it will automatically switch to manual mode.

Help

The RFM150 is equipped with context-sensitive help screens. If you require additional information after reading the help screen, look up the subject in the alphabetical index at the end of this manual.

Organization of Help Screens

During normal instrument operation, measurements or configuration parameters appear on the top portion of the screen. Function key labels (if any) appear across the bottom of the screen. The help screens follow that organization.

Each help screen describes the upper and lower portions of the screen that were displayed at the time HELP was pressed. Help for the top portion of the screen appears first (Mode Help). Turning the knob will scroll to help for the bottom portion of the screen (Function Keys Help).

Note that combinations sometimes occur, such as having 1 channel measurement mode displayed on the top portion of the screen, and the store menu displayed across the bottom. In this case, the help screen would consist of Mode Help for 1 channel mode, followed by Function Keys Help for the store menu.

Using the Help Screens

Help screens are accessed by pressing the front-panel HELP key. Note that pressing HELP can abort a partial keypad entry in some modes.

Mode Help. Help for the top portion of the screen is referred to as Mode Help. For example, if HELP is pressed during 1 channel mode operation, the help screen that will appear is entitled: “1 Channel Mode Help.”

Immediately below the title are reminders to use the knob to scroll to additional lines of help, and to press ESC to exit the help screen. Turning off the instrument power will also exit the help screen.

In the upper right of every Mode Help screen is a battery charge indicator. This is the percent of charge remaining in the battery, with 100% indicating a full charge.

The following lines of help tell you how to use the instrument mode that was displayed when HELP was pressed. When you are instructed to perform a key or knob action, press the ESC key first.

Use the knob to scroll through all lines of Mode Help, then continue on to the Function Keys Help, if there is a function key assignment for that display.

Function Keys Help. After scrolling past the Mode Help, the title for the function keys portion of the help screen will appear. For example, the title for the store menu will be "Store Function Keys Help." This portion of the help screen will describe the action of the function keys (F1 through F5). When you are instructed to press a function key, press the ESC key first.

Exit. When you are finished with the help screen, press the ESC key to exit. Turning off the instrument power will also exit the help screen.

Power Mode

The RFM150 has three basic power modes: on, off, and sleep. Table 3–2 gives the possible combinations of instrument state and power switch actions.

Table 3–2: POWER key modes

State	Event	Destination State
OFF	POWER key is pressed	ON
ON	POWER key is pressed	OFF
	Timeout (no activity for 10 minutes)	OFF
	Select sequence with delayed start time	SLEEP
	Loss of power	OFF
SLEEP	POWER key is pressed	QUERY
	Programmed repeat of the sequence	ON
QUERY	ABORT	ON
	Do not abort	SLEEP
	Timeout (no activity for 10 minutes)	SLEEP

Sleep State. During automated sequences, the instrument waits for the scheduled time to begin a measurement, and this is called the sleep state. If the instrument is in a sleep state, pressing POWER will provide a query screen. The query screen (shown in Figure 3–4) identifies the sequence and its scheduled start time, and provides an opportunity to abort the sequence.

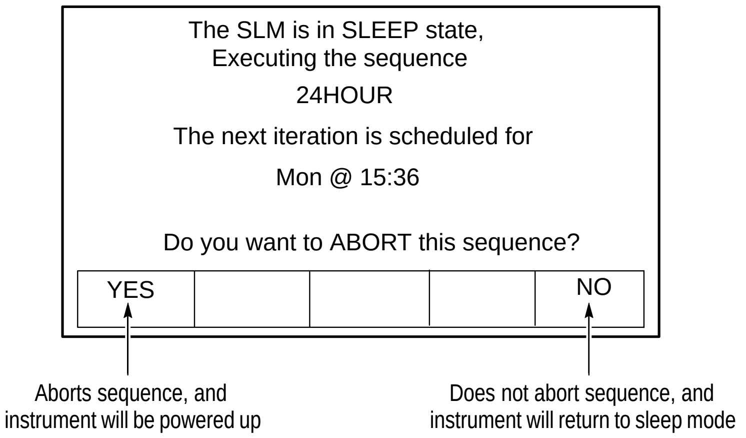

Figure 3–4: The sleep state query screen

After performing a scheduled measurement sequence, the instrument will either power down or return to the sleep state to wait for the next sequence.

Power Up / Power Down Modes

You can configure the power up and power down modes of the RFM150.

Power up mode. The RFM150 can be set to power up in any of the 10 measurement modes, or in the last measurement mode that was used before power down. When auto power down is enabled, LAST is useful because the instrument will power up in the same mode.

Auto power down. If this feature is enabled, the instrument powers down after 10 minutes with no activity, to preserve battery life.

Changing the modes. Press UTIL, then select CONFIG followed by PWR UP/DN. The power up / down parameters are displayed (Figure 3–5).

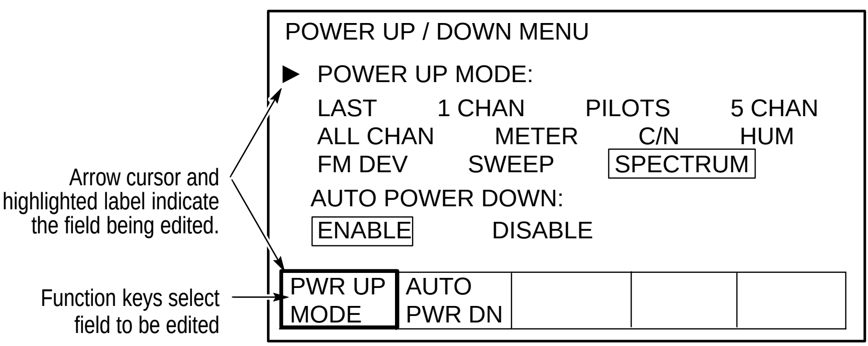

Figure 3–5: The power up / down menu

Press F1 or F2 to select the field, then turn the knob to change the setting. The outline cursor moves to the new setting.

Exit. Press ESC to exit the menu, one level at a time. The new settings will be saved.

Powering Up From an AC Source

Use only the AC adapter that is supplied with the RFM150. When powering up the instrument, follow this sequence to assure proper operation under all conditions:

1. Attach the AC adapter to the RFM150 power input connector.
2. Connect the adapter plug to an appropriate AC power source (see Table 4–7 on page 4–6 for power source requirements).
3. Press the front-panel POWER key to turn on the RFM150. A beep will signal that the instrument is initializing, and the software version will be displayed momentarily.
4. Connect the television signal to the RF input on the RFM150, and proceed with normal instrument operation.

Presets

There are five presets, corresponding to the five function keys, which are available to tune the instrument in certain measurement modes, such as 1 channel mode. The preset labels are displayed along the bottom of the screen.

To tune the instrument to a preset frequency, press and release the function key below the desired on-screen label. When the key is pressed, nothing appears to change. When the key is released, instrument tuning will occur: the channel and frequency readouts in the top line of the display will change, and the function key label will be highlighted. Any other function keys set to the same frequency will also be highlighted. A function key label will be highlighted even if you tune to its preset frequency using the knob or keypad.

You can define the on-screen labels that will be displayed when the presets are available, and you can choose the frequencies to which the instrument will be tuned when one of those keys is pressed.

You can also set the preset to auto, allowing its preset channel and frequency to be programmed by the press-and-hold method. When auto is used, the on-screen labels will be controlled by the RFM150.

While the preset key assignments are displayed, pressing another menu key displays the new menu. ESC has no function.

Editing the Presets

Press the front-panel UTIL key, then select CONFIG and ASSIGN PRESET. A list of the five presets will be displayed (Figure 3–6). Use the knob to select the preset to be edited. (The selected preset will be indicated by an arrow cursor along the left side of the screen.)

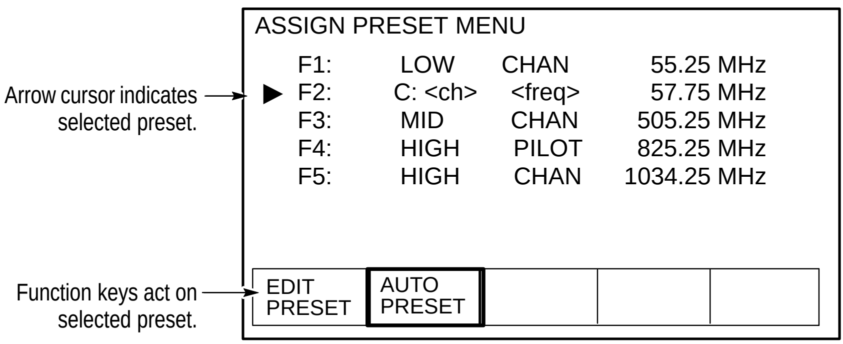

Figure 3–6: Assign preset menu

To edit the preset, select EDIT PRESET. An editing menu similar to Figure 3–7 will be displayed.

An arrow cursor along the left side of the screen indicates the selected field. Use the function keys to select the field to be edited: TOP LABEL (the top line of the on-screen label), BOTTOM LABEL (the bottom line of the label), or FREQ (frequency to which the preset will tune the instrument). Edit the fields as desired, using the standard editing techniques. Refer to *Editing Methods* on page 2–11.

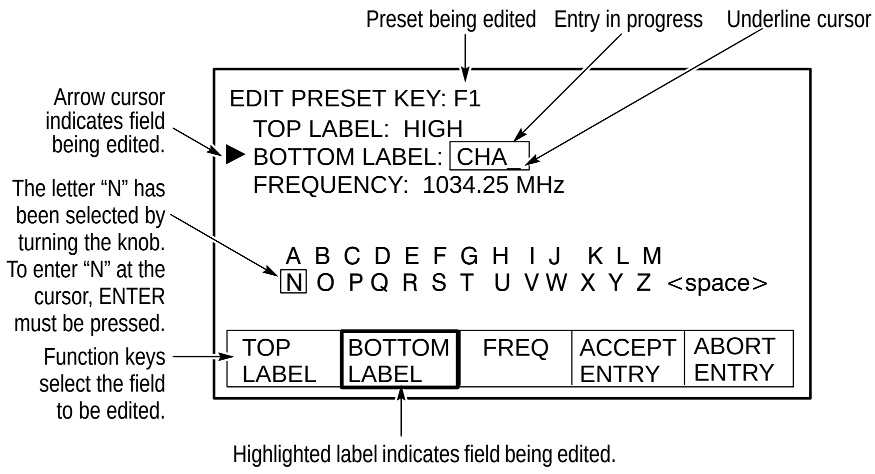

Figure 3–7: Editing Preset F1

Auto Preset / Press-and-Hold Programming of Presets

To set the preset to auto, select AUTO PRESET. Internally generated auto channel/frequency labels will replace the previous labels for this preset. See F2 in Figure 3–6.

If a preset has been set to auto, it can be programmed with the press-and-hold method, as follows.

1. Enter a mode that has presets available, such as 1 channel mode. The five presets appear along the bottom of the screen; choose the preset you want to program, and locate the function key (F1–F5) that is assigned to it.

2. Use the knob or keypad to tune the instrument to the desired channel or frequency, then press and hold the chosen function key for 3 seconds.

3. When the preset is programmed, the on-screen channel / frequency label will change automatically. If you release the key in under 3 seconds, it will not be programmed; it will tune the instrument as usual.

Printing Stored Measurement Results

You can print stored measurement results through the CSS150 software and a PC, or through a direct hookup between the RFM150 and a printer. The following paragraphs contain reference information about the direct print feature.

Printer Types

The line length is limited to 40 characters to ensure compatibility with portable, battery-operated printers, although traditional line printers can also be used. Printer types are described in *Appendix B.*

Printing

Before printing, hook up the printer and configure the printer interface parameters as shown in *Appendix B.*

NOTE*. The printer interface parameters that you set are automatically in effect while the direct print job is in process. When the print job is complete, the RFM150 returns to the interface parameters that you set in the UTIL–RS232 menu.*

To ensure that the clone mode will work between instruments with different software versions, printer interface parameters are not included as part of instrument clone mode.

To print a stored measurement result, enter the STORE menu and select RSLTS MENU followed by PRINT or PRINT ALL. For details on these menu descriptions and illustrations, refer to *Stored Measurement Results* on page 3–24.

A step-by-step procedure is given in the *Tutorial* on page 1–22 and printed report samples are provided in *Appendix C*.

Auto Power Down

Auto power down will not occur while a direct print job is in process. If enabled, auto power down will occur after 10 minutes of no instrument activity, including printing.

Error Messages

In order to properly print a measurement result, the channel table that was used when the measurement was stored must still be present in the instrument when the result is printed. If the channel table has been deleted, an error message will be generated when the report is printed. If the fixed portion of the channel table has been changed since the measurement was stored, an error message will be generated. The report will be printed; however, the errors could result in blank fields or an incorrect measurement type report.

If the RFM150 is not connected to a printer when PRINT or PRINT ALL is selected, and CTS/RTS handshaking is selected, the instrument will display the print message. To clear this message, select ABORT PRINT and YES.

Probe Loss

The offset value for probe loss can be set through the measure setup menu as follows:

Press UTIL, select CONFIG, then MEAS SETUP. An arrow cursor along the left edge of the screen, as well as a highlighted function key label, will indicate the field that is presently selected for edit. If probe loss is not already selected, press the corresponding function key (F1) to select probe loss for edit. Probe loss can be entered using either the knob or the keypad.

Using the keypad. If using the keypad, ENTER must be pressed following the entry. A partial keypad entry can be cancelled by pressing ESC or backspacing one space past an empty field. This will restore the previous frequency.

Using the knob. The knob changes the value in increments of 0.1 dB. A knob entry is not cancelled by pressing ESC.

Exit. When edit is complete, press ESC to exit the menu, one level at a time.

Sequences (Adding and Deleting)

Sequences are automated routines that can perform tests at programmed times. The number of sequences that can be stored is limited only by the instrument's available non-volatile memory; adding sequences reduces that memory. Executing sequences is described in the *Making Measurements* section on page 2–37.

Adding Sequences

24 hour test. The 24 hour test sequence is installed in the RFM150 at the factory and can not be deleted. Additional sequences can be imported using either another RFM150 or the CSS150 software package.

Using another RFM150. Connect the two instruments, using the instructions in Appendix B. On the source instrument, press SEQ to display the list of sequences (Figure 3–8).

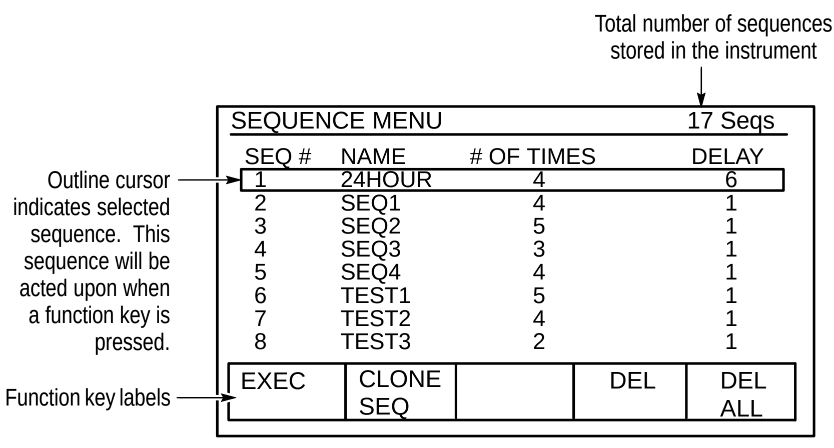

Figure 3–8: Sequence menu

Turn the knob to select the sequence to be sent, then select CLONE SEQ. The sequence is sent to the destination RFM150 and placed at the end of the list of sequences. To display this list on the destination monitor, press SEQ. Use the knob to scroll if needed.

Using the CSS150 software package. Predefined sequences can easily be selected and imported to the RFM150, and other sequences can be quickly set up by turning fields on or off with the mouse. Refer to the *CSS150 SignalScout Software User Manual* for instructions.

Deleting Sequences

Delete all. To delete all sequences stored in the instrument, press SEQ, then select DEL ALL. A confirmation screen will appear; select YES to delete all sequences. Selecting NO or ESC will cancel the request.

Delete a selected sequence. To delete a specific sequence, press SEQ, then turn the knob to scroll to and highlight the desired sequence. Select DEL. A confirmation screen will appear; select YES to delete all sequences. Selecting NO or ESC will cancel the request.

Exit. Press ESC to exit the menu, one level at a time.

Site Name

The results of measurements made with the RFM150 can be stored in the internal non-volatile memory. The active site name is attached to results as they are stored.

Selecting the active site name. Press STORE, then select SITE NAME. A list of site names will be displayed (Figure 3–9). Use the knob to select the site name to become active, then select MAKE ACTIVE. The new active site name appears above the list.

Entering site name. Press STORE, then select SITE NAME. If entering a new site name, select NEW SITE now. If editing an existing site name, use the knob to select the name to be edited, then select EDIT NAME.

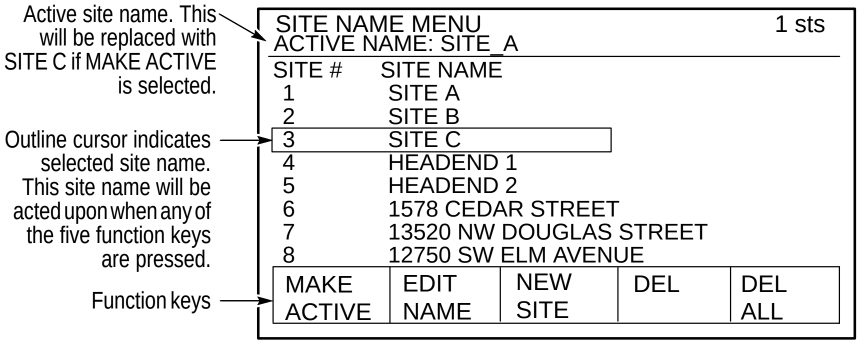

Figure 3–9: Site name menu

After selecting either EDIT NAME or NEW SITE, an underscore cursor appears. Enter the desired site name. A site name can contain numbers and letters, up to 20 characters. New site names are added to the end of the list of site names. The number of site names that can be stored is limited only by the amount of available non-volatile memory.

Delete a site name. Press the front-panel STORE key, then select SITE NAME. A list of all site names that are stored in the instrument will be displayed. Using the knob, highlight the site name that will be deleted. Select DEL. A confirmation screen will appear. Select YES to delete. To cancel the delete request, select NO or press ESC.

Delete all site names. To delete all site names, press the front-panel STORE key, then select SITE NAME. Select DEL ALL. A confirmation screen will appear. Select YES to delete all site names. To cancel the delete request, select NO or press ESC.

Note that stored measurement results are tagged with a site name. As a site name is deleted, the site information will also be deleted from any stored measurement records that were tagged with that site name.

Exit. Press ESC to exit the menu, one level at a time.

Stored Measurement Results

The results of measurements made with the RFM150 can be stored in intermediate non-volatile memory. The results of all measurements except pilot and 5 channel measurements can also be downloaded to a computer, using the companion CSS150 software. Stored measurement results can also be sent directly from the RFM150 to a printer.

Store a measurement result. After making a measurement, press STORE, then select STORE RSLT. This stores the most recent measurement result from the current measurement mode. The result will be numbered, time and date stamped, and stored at the end of the list of stored measurement results. The message, “Result Storage Complete,” will appear briefly to indicate that the record has been stored.

View a measurement result. Press STORE and select RSLTS MENU. A list of all stored measurement results will be displayed (Figure 3–10). Use the knob to highlight the desired measurement result. The list will scroll as you turn the knob, if needed.

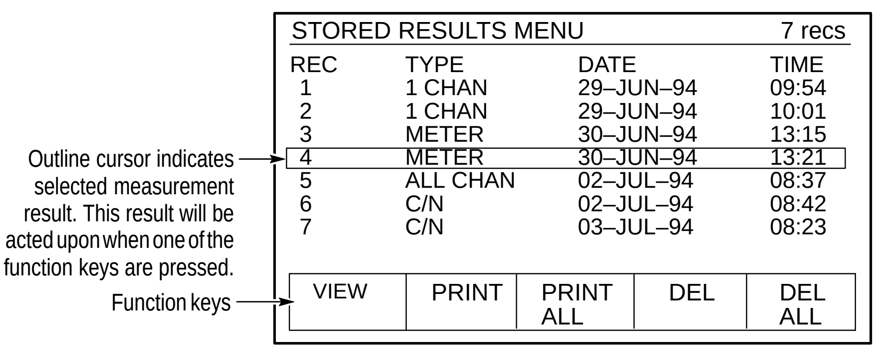

Figure 3–10: Results menu

Select VIEW to view the highlighted measurement result. The display components will be the same as the normal measurement display, except that function keys F1 through F4 will be reassigned to STORE RSLT, RSLTS MENU, SITE NAME, and SET TEMP. Function key F5 is unassigned.

If the viewed result is part of a sequence of measurement results, turning the knob will advance through the sequence, one measurement at a time. Pressing ESC will exit the view screen.

From the view screen, selecting STORED INFO displays additional information about the stored result, such as the site name and temperature (Figure 3–11). If the stored result is part of a sequence, the repetition number is also displayed. Pressing ESC will exit the additional stored information screen.

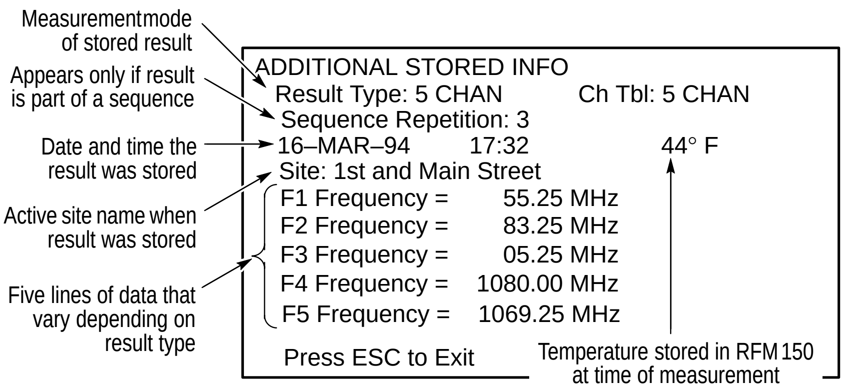

Figure 3–11: Additional information screen for 5 channel measurement type

Print a stored measurement result. Press STORE and select RSLTS MENU. A list of all stored measurement results will be displayed (Figure 3–10). Use the knob to highlight the desired measurement result. To scroll the list, turn the knob.

Press F2 (PRINT) to print the selected measurement result. While the result is printing, a print in progress message is displayed, as shown in Figure 3–12. To stop the print job, press ABORT PRINT and select YES.

General reference information about printing appears on page 3–17.

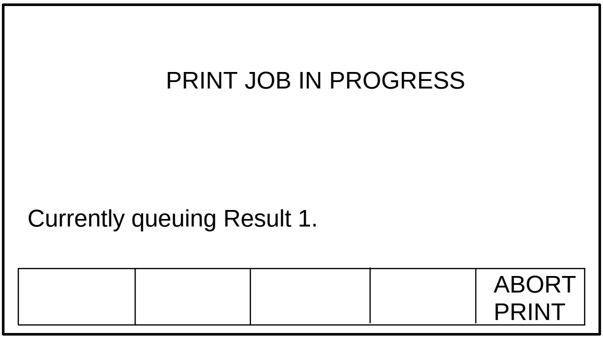

Figure 3–12: The print in progress message

Print all stored measurement results. Press STORE and select RSLTS MENU. Press F3 (PRINT ALL) to print all stored measurement results. While the result is printing, a print in progress message is displayed, as shown in Figure 3–12. To stop the print job, press ABORT PRINT and select YES.

Delete all stored measurement results. Press STORE and select RSLTS MENU. Select DELETE ALL. A confirmation screen will appear. Select YES to delete. To cancel the request without deleting any records, select NO or press ESC.

Delete a selected measurement result. Press STORE and select RSLTS MENU to enter the results menu. A list of all stored measurement results will be displayed (Figure 3–10). Use the knob to move the outline cursor to the desired measurement result. To scroll the list, turn the knob. Select DELETE to delete the selected result. A confirmation screen will appear. Select YES to delete. To cancel the request without deleting any records, select NO or press ESC. When a result is deleted, the list is automatically compacted and the records are renumbered.

Temperature

Stored measurement results are tagged with a user-entered temperature. To enter the temperature menu, press STORE, then select SET TEMP. The two editable fields are displayed (Figure 3–13), with the arrow cursor pointing to the field that is selected for edit.

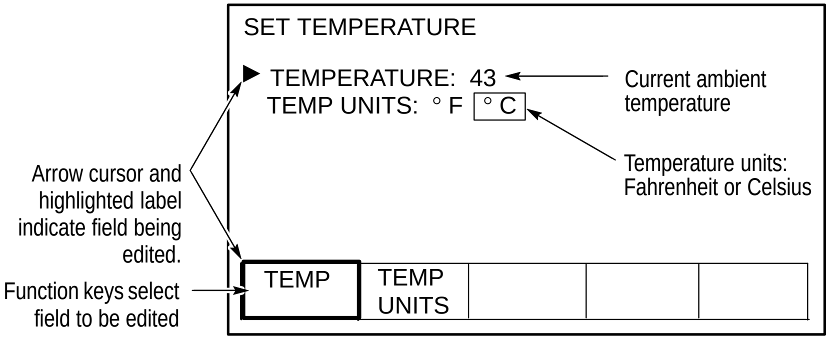

Figure 3–13: Set Temperature menu

Temperature units. Press F2 to select the temperature units field, then turn the knob to toggle between degrees Fahrenheit and degrees Celsius, with the outline cursor indicating the current selection.

Temperature. Press F1 to select the temperature field, then enter the present ambient temperature, either with the knob, or by keypad entry followed by ENTER. A partial keypad entry can be aborted by pressing ESC or by backspacing one click after the field is empty.

Exit. When editing is complete, press ESC to exit the menu, one level at a time. The new settings will be saved.

Units

The power units can be set to dBmV or dBuV. This determines the readout units for the visual carrier in the measurement modes.

To change the power units, press UTIL and select CONFIG, followed by MEAS SETUP. The function keys will be assigned to the four fields available for edit in this mode. The upper portion of the screen will display the present settings for these four fields. An arrow cursor along the left edge of the screen, as well as a highlighted function key label, indicate which field is selected for edit.

Press F2 to select power units for edit. The present setting for power units is indicated by an outline cursor. Turning the knob back and forth toggles the setting between dBmV and dBuV.

Exit. After editing the level units as desired, press ESC to exit the menu, one level at a time. The new setting will be saved.

Specifications

Specifications

The following terms are used in this section:

Characteristic. A characteristic refers to a property of the product.

Performance requirement [REQ]. Performance requirements define characteristics that are essential to the intended application of the product, usually in limit form.

Reference information [REF]. Reference information explains the performance requirements or stipulates conditions under which the performance requirements are effective. Reference information is not considered to be a statement of guaranteed performance.

Specification. A specification is a document or a section of a document that lists and describes characteristics and performance requirements of a product. A specification also may contain reference information.

Typical. Typical refers to instrument performance that can be expected, but is not guaranteed.

Performance Conditions

The performance requirements listed in the *Electrical Specification* apply over an ambient temperature range of 0° C to +50° C. The rated accuracies are valid over the entire 0° C to 50° C range, and become “typical” for temperatures from –10° C to 0° C. Test equipment used to verify performance requirements must be calibrated and working within the limits specified in the *Required Equipment* list on page 5–3.

Installation Requirements

This is a portable unit, and has no special installation requirements.

Electrical Specification

Table 4–1: Input signal requirements

Name	Description
Frequency Range	**REQ:** 5 MHz[1] to 1080 MHz **REF:** Use a precision 75 Ω connector.
Amplitude Range	**REQ:** –35 dBmV to +60 dBmV (+25 dBuV to +120 dBuV)
Maximum Input Power	**REQ:** +68 dBmV **REF:** Total input power sum of all channels.

Table 4–2: Measurement accuracy

Name	Description
Carrier Amplitude	**REQ:** ± 1 dB –20 dBmV to +60 dBmV. Visual carrier-to-noise ≥ 25 dB. [1, 2, 3] ± 1.5 dB –35 dBmV to – 20 dBmV. Visual carrier-to-noise ≥ 25 dB. [1, 2] **REF:** Carrier amplitude is the rms voltage of a channel's visual carrier at the peak of the modulation envelope, measured across a termination impedance that matches the internal impedance of the cable system.

1 **Amplitude accuracy specification below 20 MHz is typical.**

2 **To meet measurement accuracy specifications, the system visual carrier amplitude variation must be less than 10 dB over 300 MHz plus 1 dB for each additional 100 MHz up to 17 dB total.**

3 **For input signals > 50 dBmV and > 500 MHz, the input must be disconnected during self calibration.**

Table 4–2: Measurement accuracy (Cont.)

Name	Description
Carrier Difference	**REQ:** ± 1 dB Aural carrier-to-noise ≥ 15 dB (300 kHz bandwidth). **REF:** Specification applies to visual-to-aural carrier difference on any channel, where the amplitude of the aural carrier is greater than –20 dBmV.
Carrier-to-Noise	**REQ:** ± 2 dB up to 47 dB (49 dB typical) for carrier amplitude ≥ 0 dBmV. [4, 5, 6] **REF:** C/N ratio is the ratio of the rms voltage of the carrier, measured at the peak of the modulation envelope, divided by the average noise voltage in a 4.0 MHz bandwidth.
Hum	**REQ:** ± 1 % for visual carrier amplitude ≥ 0 dBmV, visual carrier-to-noise ≥ 25 dB. [4] **REF:** Range: 1% to 5%. **REF:** Hum is the peak-to-peak variation in visual signal level caused by undesired low frequency disturbances. It is expressed as the percentage of the level of the peak-to-peak interference compared to the peak level of the RF signal.

[4] **Performance verified by measuring according to NCTA recommended practice.**

[5] **For channel video bandwidths greater than 4 MHz, carrier-to-noise range is decreased by 10 log (video bandwidth / 4 MHz).**

[6] **For system B/G, with the lower adjacent channel carrying NICAM, C/N measurement accuracy guaranteed for out-of-service measurements only.**

Table 4–2: Measurement accuracy (Cont.)

Name	Description
Average Power Digitally Modulated Carriers	**REQ:** ± 1 dB. Signal-to-noise ratio ≥ 25 dB. [7] **REF:** This is the power measured at band center referenced to a user-defined “information” bandwidth.
FM Deviation	**REQ:** 10% of peak deviation of main aural carrier, ± 2 kHz.[8] **REF:** Rates: 20 Hz to 7.5 kHz Deviations: 5 kHz to 25 kHz[9]

Table 4–3: Measurement repeatability

Name	Description
Carrier Amplitude	**REQ:** ± 0.5 dB **REF:** For external temperature changes of less than ± 5° C.
Carrier Difference	**REQ:** ± 0.5 dB **REF:** For external temperature changes of less than ± 5° C.

[7] **Assumes that signals are random or closely resemble truly random data streams, have a voltage amplitude spectral density between –74 dBmV/Hz and –4 dBmV/Hz, and have a signaling rate greater than 300 K symbols/sec. Transmitted power variation due to spectrum shaping (filter truncation error) must be specified as the amplitude offset value in the channel table. In-channel response must not vary by more than ± 0.5 dB.**

[8] **Measurement accuracy guaranteed from 10° to 50° C.**

[9] **Accuracy for deviations less than 12 kHz is typical.**

Table 4–4: Spectral display mode

Name	Description
Display Dynamic Range	**REQ:** 50 dB **REF:** The vertical scale for the Spectral Display mode is five divisions at 10 dB / div.
Display Reference Level Range	**REQ:** 0 dBmV to +60 dBmV **REF:** Variable in 1 dB steps.
Spurious Free Dynamic Range	**REQ:** –50 dBc (20 MHz to 1080 MHz) –45 dBc (5 MHz to 20 MHz) **REF:** WIth equal visual carrier levels or with external preselection filter of 3 channels or less. (–40 dBc, 5 MHz to 1080 MHz, no preselection. [10])
Frequency Accuracy	**REQ:** ± 5 kHz, $\pm 10^{-5}$ of tuned frequency **REF:** From 5 MHz to 1080 MHz

Table 4–5: RF input

Name	Description
Input Impedance	**REQ:** 75 Ω, nominal
Return Loss	**REQ:** > 14 dB (20 MHz to 1080 MHz) > 8 dB, typical (5 MHz to 20 MHz) **REF:** With internal attenuation set to 0 dB. Use precision F-style connector.

[10] **To meet measurement accuracy specifications, the system visual carrier amplitude variation must be less than 10 dB over 300 MHz plus 1 dB for each additional 100 MHz up to 17 dB total.**

Table 4–6: DC jack input

Name	Description
Nominal Power	**REF:** Typically 10 watts at 12 volts

Table 4–7: AC power source

Name	Description
Mains Voltage Range	
Std – US	**REQ:** 108 – 132 volts, 60 Hz
A1 – Universal Euro	**REQ:** 198 – 242 volts, 50 Hz
A2 – UK	**REQ:** 216 – 264 volts, 50 Hz
A3 – Australia	**REQ:** 216 – 264 volts, 50 Hz
A6 – Japan	**REQ:** 90 – 110 volts, 50/60 Hz

Table 4–8: Internal NiCad battery

Name	Description
Nominal Battery Life:	
Operating	**REQ:** 3.5 hours **REF:** Backlight off, typical use
Non-Operating	**REQ:** 6 months
Sleep State	**REQ:** 36 hours **REF:** No connection to the Interface Port
Charge Time	**REQ:** 8 hours **REF:** Battery temp. between +10° and +45° C

Table 4–9: Environmental characteristics

Name	Description
Operating Temperature	**REQ:** 0 to +50° C (32 to 122° F) **REF:** Electrical specifications are guaranteed when the instrument is operated in this temperature range.
Operating Temperature: Typical	**REQ:** –10 to 0° C (14 to 32° F) **REF:** Electrical specifications are considered typical when the instrument is operated in this temperature range.
Storage Temperature	**REQ:** –20 to +60° C (–4 to +140° F) **REF:** Limited by LCD display
Altitude (Operating)	**REQ:** 15,000 feet (4572 meters)
Altitude (Non-operating)	**REQ:** 50,000 feet (15240 meters)
Humidity	**REQ:** Meets Tektronix Class 3 (062-2853-00) 5% to 95% over 0 to + 50° C
Shock (Operating)	**REQ:** Meets Tektronix Class 3 (062-2853-00) **REF:** Three drops on each face of 50 G, 11 m duration, half-sine pulse shape. There is a total of 18 drops.
Package Drop	**REQ:** Meets Tektronix 062-2858-00
Water Resistance	**REQ:** The RFM150 is designed to resist the effects of rain and moisture, to allow accurate functioning of the product without hazard to the user under conditions of moderately inclement weather. **REF:** Sealing gaskets and weatherproofing plugs ensure this level of water resistance. Damage to the seals or failure to replace the weatherproofing plugs could allow rain to enter and possibly damage the product should such exposure occur.

Table 4–9: Environmental characteristics (Cont.)

Name	Description
Shock and Vibration (Non-operating)	**REQ:** Meets Tektronix 062-2858-00 Repetitive Shock Test (Loose Load Vibration): Platform vibration frequency adjusted until package repeatedly leaves the platform about 1/8 in or until acceleration of platform is 1.1 G. Resonance Vibration Test: Vibrate package vertically at 0.75 G, sweeping from 5 to 100 to 5 Hz two times at a slow sweep rate, such as 1/2 octave/minute. Resonance Dwell: Dwell for 20 minutes at each of the resonance frequencies.

Table 4–10: Physical characteristics

Name	Description
Dimensions	**REQ:** Height: 8 in (20.32 cm) Nominal Width: 11.2 in (28.45 cm) Nominal Depth: 4 in (10.16) Nominal
Weight	**REQ:** Weight: < 8 pounds

Table 4–11: Certification

Name	Description
EC Declaration of Conformity – EMC	EN 50081-1 Emissions: EN 55022 Class B Radiated and Conducted Emissions EN 50082-1 Immunity: IEC 801-2 Electrostatic Discharge Immunity IEC 801-3 RF Electromagnetic Field Immunity IEC 801-4 Electrical Fast Transient/Burst Immunity
FCC Compliance	Emissions comply with FCC Code of Federal Regulations 47, Part 15, Subpart B, Class A Limits

Table 4–11: Certification (Cont.)

Name	Description	
EC Declaration of Conformity – Low Voltage	Compliance was demonstrated to the following specification as listed in the Official Journal of the European Communities: Low Voltage Directive 73/23/EEC EN 61010-1/A1 Safety requirements for electrical equipment for measurement, control, and laboratory use	
Conditions for Safety Certification	Operating temperature:	+5 to +40° C
	Max. Operating altitude:	2000 m
	Equipment Type:	Test and measuring
	Safety Class:	Class II, Double insulated (IEC 1010-1, Annex H)
	Overvoltage Category Power In:	Cat I (IEC 1010-1)
	Measuring Inputs:	Cat II (IEC 1010-1)
	Pollution Degree:	Pollution Degree 3 (IEC 1010-1) International Protection Code IP44 (IEC 529)
Installation Category Descriptions	Terminals on this product may have different installation category designations. The installation categories are:	
	CAT III	Distribution-level mains (usually permanently connected). Equipment at this level is typically in a fixed industrial location
	CAT II	Local-level mains (wall sockets). Equipment at this level includes appliances, portable tools, and similar products. Equipment is usually cord-connected
	CAT I	Secondary (signal level) or battery operated circuits of electronic equipment

WARNING

The following servicing instructions are for use only by qualified personnel. To avoid injury, do not perform any servicing other than that stated in the operating instructions unless you are qualified to do so. Refer to all Safety Summaries before performing any service.

Performance Check

Performance Check

Perform this procedure after installing a Calibrated Board Set, or any time you require a check of instrument performance. The following specifications and functions are checked:

Specifications

- Carrier amplitude measurement accuracy
- Hum measurement accuracy
- FM deviation measurement accuracy

Partially Verified Calibration Tables

- Noise Calibrator Bias
- Noise Calibrator Correction
- 5 dB, 10 dB, and first 20 dB attenuator steps
- IF1GAIN adjustment
- IF3GAIN adjustment
- Log Detector
- Resolution BW Filter Insertion Loss
- Lin Detector
- FM Detector
- Reference Oscillator Correction

Other Instrument Functions Checked

- Battery Operation
- External Power Operation
- Communications Port
- Front Panel Operation

Table 5–1: Test record for RFM150

Serial number:		Date:	
	Procedure step	**Test result**	
1.	Verify battery & power key oper.		
2.	Verify oper. from ext. power source		
	Nominal input frequency: Power	**Power meter (dBmV)**	**RFM150 (dBmV)**
5c.	10 MHz: +38.7 dBmV		
5d.	110 MHz: +38.7 dBmV		
5d.	210 MHz: +38.7 dBmV		
5d.	310 MHz: +38.7 dBmV		
5d.	410 MHz: +38.7 dBmV		
5d.	510 MHz: +38.7 dBmV		
5d.	610 MHz: +38.7 dBmV		
5d.	710 MHz: +38.7 dBmV		
5d.	810 MHz: +38.7 dBmV		
5d.	910 MHz: +38.7 dBmV		
5d.	1000 MHz: +38.7 dBmV		
	Procedure step	**Expected result**	**Test result**
6d.	Check residual hum	less than 0.5%.	
6f.	Verify hum measurement	5% ± 1% (4% to 6%)	
7c.	Verify FM deviation measurement accuracy with 12 kHz of deviation input	12 kHz ± 3.2 kHz	
7e.	Verify FM deviation measurement accuracy with 25 kHz of deviation input	25 kHz ± 4.5 kHz	
8.	IF filter amplitude calibration	Change between 30 kHz and 300 kHz. BW is 1 dB or less.	

Required Equipment

RF Signal Source

Frequency Range: 10 MHz to 1000 MHz

Accuracy: ± 500 Hz

Amplitude Range: 0 dBm maximum output (50 Ω or 75 Ω)

FM Modulation (internal or external): Deviation range 5 kHz to 25 kHz. Rate between 20 Hz and 7.5 kHz.

AM Modulation (internal or external): Amplitude range 0 to 2.5% (corresponds to 0 to 5% RFM150 reading). Rate 50, 60, 100 or 120 Hz.

Example: Hewlett-Packard 8657A Signal Generator with a Tektronix CFG250 Function Generator

The function generator is used when testing hum accuracy, to drive the external modulation input to generate the 50, 60, 100, or 120 Hz AM modulation rate.

Function Generator

For testing hum accuracy, use a function generator to drive the external modulation input of the RF signal source to generate a 60 Hz sine wave.

Example: Tektronix CFG250 Function Generator

Power Meter With 75 Ω Sensor Head

Sensitivity: –20 dBm

Frequency Range: 10 MHz to 1 GHz

Accuracy: ± 0.1 dB

Example: Hewlett-Packard 438A Power Meter with Hewlett-Packard 8483A Sensor Head

50 Ω to 75 Ω Matching Pad

Required only if RF signal source output impedance is 50 Ω.

Frequency Range: 10 MHz to 1 GHz

Nominal Insertion Loss: 5.7 dB

Return Loss: 75 Ω or 50 Ω ≥20 dB

Example: Hewlett-Packard 11852B

Interconnecting Cables

50 Ω if RF signal source output impedance is 50 Ω.
75 Ω if RF signal source output impedance is 75 Ω.
RS-232 cable

Signal Characterization

1. Connect the test equipment as shown in Figure 5–1, 5–2, or 5–3.

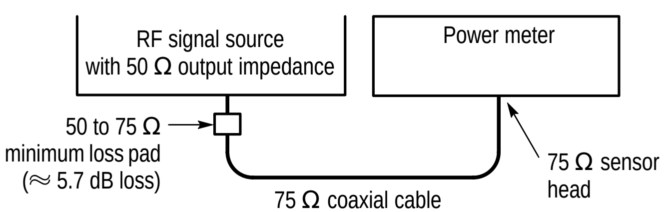

Figure 5–1: Hookup for 50 Ω source output

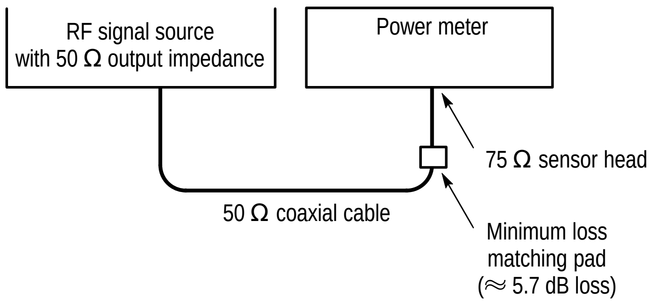

Figure 5–2: Alternate hookup for 50 Ω source output

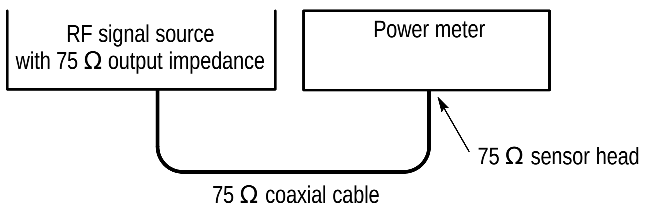

Figure 5–3: Hookup for 75 Ω source output

2. Set up the RF signal source as follows:

- Frequency: 10 MHz
- Amplitude: Adjust for –10 dBm (+38.7 dBmV) power meter reading. (If a matching pad is being used, the output power of the generator must be increased to compensate for this loss.)

3. Make a copy of Table 5–1 (see page 5–2). Record the power meter reading in row 5c. of the column labeled “Power Meter (dBmV).”

If your power meter does not display amplitude in dBmV, add +48.7 to the reading in dBm to convert to dBmV.

4. Repeat steps 2 and 3 for frequencies of 110, 210, 310, 410, 510, 610, 710, 810, 910 and 1000 MHz.

Performance Check Procedure

Record the results of this procedure on your copy of Table 5–1.

1. Verify battery and POWER key operation as follows:

   a. With the AC adapter disconnected from the instrument, press **[POWER]** to turn on the RFM150.

   b. A low-pitched beep followed by a high-pitched beep will signal that the instrument is initializing. The instrument title screen will be displayed briefly, followed by a measurement screen.

   c. Press **[POWER]** to turn off the instrument. Check that the screen is blank.

2. Verify operation from an external power source as follows:

   a. With the instrument turned off, plug the AC adapter into the DC input connector.

   b. Plug the AC adapter into a compatible power source.

   c. The instrument will emit two short beeps, and the screen will remain blank.

   d. Press **[POWER]** to turn on the RFM150.

   e. A low-pitched beep followed by a high-pitched beep will signal that the instrument is initializing. The instrument title screen will be displayed briefly, followed by a measurement screen.

3. Use the following key sequence to make the CATV–STD channel table the active table:
   [UTIL] [F2] {use knob to select CATV–STD} [F1] [ESC].

4. Use the following key sequence to select the 1 channel measurement mode:
   [LEVEL] [F1].

5. Verify amplitude accuracy

   a. Use the following key sequence to tune the RFM150 to 10 MHz: **[1] [0] [MHz]**.

b. Apply a 10 MHz sinusoidal signal at a characterized amplitude of +38.7 dBmV (in 75 Ω) to the RF input.

c. Record the RFM150 reading in your copy of Table 5–1. Verify that this value is within 1 dB of the power meter reading.

d. Repeat for frequencies of 110, 210, 310, 410, 510, 610, 710, 810, 910 and 1000 MHz.

6. Verify hum measurement accuracy as follows:

a. Use the following key sequence to tune the RFM150 to 511.25 MHz: **[5] [1] [1] [.] [2] [5] [MHz]**.

b. Input a +38.7 dBmV, 511.25 MHz sinusoidal signal.

c. Use the following key sequence to select hum measurement mode: **[MEAS] [F2]**.

d. Verify that the residual hum reading is less than 0.5%. Record the RFM150 reading in your copy of Table 5–1.

e. Apply 2.5% AM modulation at a rate of either 50, 60, 100, or 120 Hz.

***NOTE**. If the AM modulation rate cannot be set to these values on the signal generator, use an external modulation source and adjust the amplitude according to that manufacturer's setup procedure.*

---

f. Verify that the displayed hum reading is 5 ± 1%. Record the RFM150 reading in your copy of Table 5–1.

***NOTE**. The RFM150 Hum reading is the ratio of peak-to-peak AM modulation to carrier level, per the NCTA standard. The displayed result will be twice the percent modulation setting on the generator.*

---

7. Verify FM deviation measurement accuracy as follows:

a. With the instrument still tuned to 511.25 MHz, apply a +38.7 dBmV, 515.75 MHz sinusoidal signal with 12 kHz of deviation at a rate between 20 Hz and 7.5 kHz.

b. Use the following key sequence to select FM deviation measurement mode: **[MEAS] [F3]**.

c. Verify that the reading is 12 kHz ± 3.2 kHz. Record the RFM150 reading in your copy of Table 5–1.

d. Increase the FM deviation of the input signal to 25 kHz.

e. Verify that the reading is 25 kHz ± 4.5 kHz. Record the RFM150 reading in your copy of Table 5–1.

8. Verify IF filter amplitude calibration as follows:

a. Apply a +38.7 dBmV, 511.25 MHz signal.

b. With the instrument still tuned to 511.25 MHz, use the following key sequence to select Meter mode: **[LEVEL] [F5]**.

c. Press **[F4]** to set the detection mode to AVG**.**

d. Press **[F3]** to change the Resolution BW from 300 kHz to 30 kHz.

e. Verify that the amplitude reading has not changed by more than 1 dB. Record the RFM150 reading in your copy of Table 5–1.

Front Panel / Backlight / Clock Operation Check

9. If the RFM150 is already in use, proceed to step 10. Otherwise, power up the RFM150 as follows:

a. With the instrument turned off, plug the AC adapter into the DC input connector.

b. Plug the AC adapter into a compatible power source.

c. Press **[POWER]** to turn the instrument on.

10. Press **[DISP]** to enter the Display menu.

a. Check that the words “DISPLAY MENU” appear in the upper left portion of the screen.

b. Use the knob to turn the backlight off and on. Leave it set as desired.

11. Press **[LEVEL]** to enter the Level menu. Check that the five function key assignments appear along the bottom of the screen, as shown in Figure 5–4.

1 CHAN	PILOTS	5 CHAN	ALL CHAN	METER

Figure 5–4: Level menu function key assignments

12. Press **[MEAS]** to enter the Measurement menu. Check that the function key assignments appear along the bottom of the screen, as shown in Figure 5–5.

C/N	HUM	FM DEV		

Figure 5–5: Measurement menu function key assignments

13. Press **[UTIL]** to enter the Utility menu. Check that the function key assignments appear along the bottom of the screen, as shown in Figure 5–6.

CONFIG	CHAN TABLE	CLOCK	RS232	PRINTER

Figure 5–6: Utility menu function key assignments

a. Press **[F3]** to display the clock menu. Verify that the clock is functional by checking that the day, month, and year are correct.

b. Crossing a dateline can cause the date to be inaccurate by one day. If the clock is incorrect, you can reset it after completing this procedure. See page 3–6 for instructions.

14. Press **[SWEEP]** to enter the Sweep mode. Check that the word “SWEEP” appears in the upper right corner of the screen.

15. Press **[STORE]** to enter the Store menu. Check that the function key assignments appear along the bottom of the screen, as shown in Figure 5–7.

STORE RSLT	RSLTS MENU	SITE NAME	SET TEMP	

Figure 5–7: Store menu function key assignments

a. Press **[F3]** to enter the Site Name sub-menu. Check that “SITE NAME MENU” appears in the upper left corner of the screen.

b. Press **[F2]** to select a new site. Check that “EDIT SITE NAME” appears in the upper left corner of the screen.

c. Note that the character “A” of the on-screen alphabet has a box around it. Turn the knob clockwise to circle each of the letters, one letter for each detent click of the knob. Turn the knob counter-clockwise and return to the character “A.”

d. Press **[ENTER]** to enter the “A” as the first character in the site name. Check that an “A” appears in the site name box.

e. Press the following key sequence:
[1] [2] [3] [4] [5] [6] [7] [8] [9] [0] [.]

Check that all of these characters appear in the site name box. (It is not necessary to press ENTER when entering characters from the numeric keypad.)

f. Press **[←]** to remove the “.” from the display. Check that it is removed.

g. Press **[F4]** to accept the site name entry. Check that the instrument returns to the Site Name menu (“SITE NAME MENU” appears in the upper left corner of the screen) and that the new site name (A1234567890) is the last site name in the list.

h. With the last site name still selected, press **[F4]** to delete it. A query screen will appear. Press **[F1]** to confirm. Check that the site name (A1234567890) has been removed from the list.

i. Press **[+/–]** and check that the instrument emits a beep. (The key is not valid in this mode.)

16. Press **[SPECT]** to enter the Spectrum mode. Check that the word "SPECTRUM" appears in the upper right corner of the screen.

17. Press **[MHz]** and check that the frequency readout at the top of the screen appears outlined. Press **[CHAN]** and check that the channel readout is outlined. Press **[MHz]** again and check that the frequency readout is outlined.

18. Press **[SEQ]** to enter the Sequence menu. Check that the words "SEQUENCE MENU" appear in the upper left corner of the screen.

19. Press **[HELP]** to access the help screen. Check that the words "Sequence Mode Help" appear in the upper left corner of the screen.

20. Press **[ESC]** once to exit Help mode, and again to return to the Spectrum mode.

Communications Port Function Check

21. Use the supplied RS-232 cable to connect the RFM150 to the serial port of a computer or terminal. (More information is given in Appendix B.)

22. Press **[UTIL]** to enter the Utility menu, then press **[F4]** to select the RS232 menu.

a. Press **[F1]** to select BAUD RATE, then turn the knob to select (outline) the baud rate setting of 9600. Use this method to configure the RFM150 communications port as follows:

F1	BAUD RATE	9600
F2	PARITY	NONE
F3	FLOW CONTROL	XON/XOFF
F4	TERMINATOR	CRLF
F5	ECHO	OFF

b. Check that the parameters on your computer or terminal match those given above.

23. On your computer, type the following sequence:
***IDN? <ENTER>**

a. This sends a request for identification to the RFM150. Verify that an identification response is received by your computer, beginning with “TEKTRONIX,RFM150.”

b. Check that an R appears in the top line of the RFM150 screen, indicating that the instrument is in the remote operating mode.

24. Connect the RS-232 cable from the RFM150 to a serial printer.

25. Press **[UTIL]** to enter the Utility menu, then press **[F5]** to select the Printer menu.

a. Press **[F1]** to select BAUD RATE, then turn the knob to select (outline) the baud rate setting of 9600. Use this method to configure the RFM150 communications port as follows:

F1	BAUD RATE	9600
F2	PARITY	NONE
F3	FLOW CONTROL	CTS/RTS

b. Check that the parameters on your printer match those given above.

26. Store and print a Spectrum measurement result (tutorial appears on page 1–22). Check that the printed report is complete and accurate (report format appears on page 0–15).

This completes the *Performance Check.*

Maintenance

Replacement Procedures

Required Equipment

- Torx® screwdriver: #10 and #15 tips (#15 unless noted)
- 9/16 in torque wrench for the RF input connector
- 7/16 in torque wrench for the encoder switch and RF input adapter
- 5/64 in hex wrench (for gasket inspection/replacement)
- Soldering iron if replacing the Front Panel circuit board assembly, speaker, or encoder

WARNING. *Opening the RFM150 case while an RF signal is applied can expose the operator to hazardous voltages. Always disconnect the RF INPUT connector from the RFM150 before opening the case.*

CAUTION. *The only service that you should perform during the warranty period is battery replacement. For board replacement during the warranty period, return the instrument to a Tektronix Service Center.*

When installing new circuit boards, or returning boards to Tektronix for exchange, be sure to use a clean, static-free work area, and follow anti-static handling methods. Be sure to place the exchange boards in an anti-static bag.

NOTE. *Work in a clean, static-free area and use proper anti-static procedures.*

Instrument Disassembly

1. Turn off the instrument. Disconnect the AC power and the RF input signal. If this is not done, hazardous voltages may be

present in the instrument. Make sure there is no connection to the interface port.

2. Remove the instrument from its soft case and place it upside down on a padded surface to protect the large knob on the front of the instrument.
3. Remove the RF input adapter (if installed), using a 7/16 in wrench. Remove the nut and the two washers from the RF connector, using a 9/16 in wrench, and push the RF connector through to the inside of the instrument. To protect the instrument from water damage, be careful not to misplace the rubber gasket on the end of the RF connector.
4. Working from the back of the instrument, remove the ten screws that hold the instrument together.
5. Tip the rear part of the instrument back to partially open the instrument case, without stressing the ribbon cables or the RF input cable. Remove the instrument carrying strap and set it aside. Separate the instrument into two parts and lay them next to each other on the work surface, as shown in Figure 6–1.

   Note the water-resistant gasket in the instrument front casing. Inspect the gasket for damage, and replace if necessary. Make sure that the gasket is firmly seated in the groove all the way around the front casing, and locked in place by small plastic tabs along the groove.
6. Disconnect the ribbon cable from the Back Board circuit board assembly.
7. Proceed to the instructions for replacing the desired module.

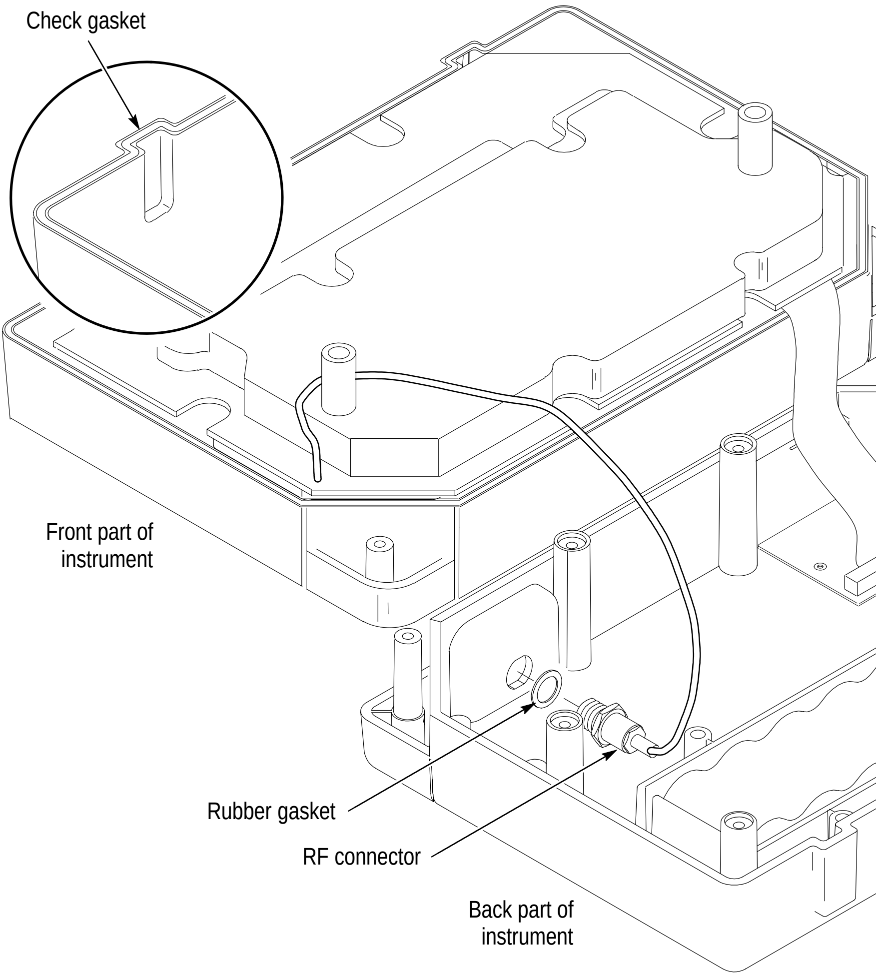

Figure 6–1: Separating the instrument into two parts

Replacing the Calibrated Board Set

Use this procedure to install a replacement Calibrated Board Set, consisting of the Processor/Power Supply circuit board assembly and the Analog Converter circuit board assembly. Return the exchange board set in the packaging in which you received the replacement board set. For questions regarding board exchange, contact your local Tektronix office, or call the Tektronix Beaverton Service Depot at 1-800-835-9433.

1. Perform *Instrument Disassembly* on page 6–1. This includes turning off the instrument and making sure there is no connection to AC power, RF input, or interface port.
2. Without removing any screws, lift the board set (consisting of the the Analog Converter circuit board assembly and the Processor/ Power Supply circuit board assembly) from the instrument housing just enough to reach the cable that connects the board set to the Front Panel circuit board assembly. Disconnect the cable.
3. Remove the board set from the instrument.
4. Place the board set on a static-free surface with the LCD Display module facing up. Disconnect the dual-wire connector from J5 on the Processor board. Figure 6–2 shows the LCD Display module being removed from the Processor/Power Supply circuit board assembly. The Analog Converter circuit board assembly (not shown) is still connected to the Processor/Power Supply circuit board assembly.
5. Remove the four screws (#10 Torx® with attached locking washers) that hold the LCD Display module in place. Hold the LCD Display module near the bottom left corner, and remove it from the board set by working the pins loose. (The pins fit into a connector that is mounted on the other side of the Processor/Power Supply circuit board assembly.)
6. Place the board set in the static-safe bag.
7. Position the LCD Display module on the replacement Calibrated Board Set, inserting the pins into the Processor/Power Supply circuit board assembly. Install the four screws that secure the LCD Display module and tighten to 4 in-lbs.

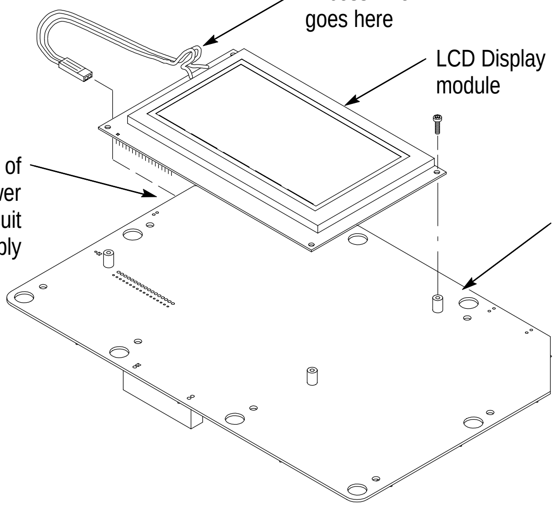

Figure 6–2: Removing the LCD Display module

8. Attach the dual-wire connector from the LCD Display module to J5 on the Processor/Power Supply circuit board assembly. Check that the wires are close to the Processor/Power Supply circuit board assembly, so that they will not be pinched during instrument assembly.
9. Clean the LCD Display and the clear filter on the front instrument casing with a soft, lint-free cloth dampened with a non-abrasive liquid glass cleaner.
10. Perform *Instrument Assembly* on page 6–15.
11. Complete the *Performance Check*, beginning on page 5–1.
12. Return the exchange board set, using the packaging in which you received the replacement board set.

Replacing the Front Panel Circuit Board Assembly, Speaker, Encoder, or Keypads

Use this procedure to replace the Front Panel circuit board assembly, the speaker and speaker gasket, the encoder and encoder gasket, and the keypads.

1. Perform *Instrument Disassembly* on page 6–1. This includes turning off the instrument and making sure there is no connection to AC power, RF input, or Interface Port.
2. Without removing any screws, lift the board set (consisting of the Processor/Power Supply circuit board assembly and the Analog Converter circuit board assembly) from the instrument housing just enough to reach the cable that connects the board set to the Front Panel circuit board assembly. Disconnect the cable.
3. Remove the board set from the instrument.
4. Desolder the speaker and encoder switch leads from the Front Panel circuit board assembly at J2, J3, and J4, as shown in Figure 6–3. (They will later be soldered to the replacement Front Panel circuit board assembly.)
5. Remove the 15 screws that hold the Front Panel circuit board assembly to the instrument. See Figure 6–3. Remove the stiffener, then lift the Front Panel circuit board assembly out of the instrument housing.
6. Replace the encoder (optional):
   a. Using a 5/64 in hex wrench, remove the large knob from the front panel. Remove the spacer, if installed.
   b. Using a 9/16 in wrench, remove the nut and two washers from the encoder.
   c. Working from the inside of the front panel, lift out the encoder. Inspect the gasket and replace if necessary.

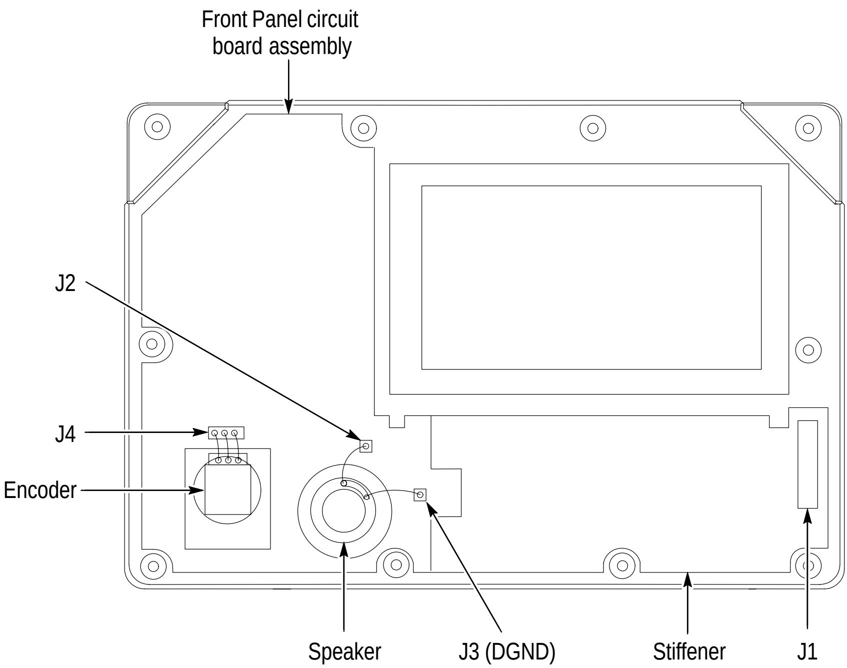

Figure 6–3: The front of the RFM150 as seen from the inside

d. Install the encoder gasket on the encoder. Insert the encoder through the inside of the front case, aligning the key tab on the encoder switch with the key slot on the front case. Make sure the leads are oriented toward the top of the instrument.

e. Working from the outside of the instrument, place the flat washer, lock washer, then the nut on the outside of the shaft. Tighten the nut to 2 in-lbs. (Do not overtighten.) Turn the shaft to be sure the detent is functional.

f. Place the large knob spacer (if available) on the post, then replace the large knob. (If the spacer is not available, while installing the knob, hold it slightly above the instrument to prevent it from binding.) Tighten the set screw.

7. Replace speaker or speaker gasket (optional):

a. Remove the speaker and gasket.

b. Install the replacement gasket. Position the speaker on the gasket.

8. Replace the keypads (optional):

a. Lift out the two keypads.

b. Install the replacement keypads in the front instrument casing, using a dental pick or similar instrument to press the keypad under the speaker housing.

9. Place the replacement Front Panel circuit board assembly in position. Place the stiffener on top of the Front Panel circuit board assembly. Install and partially tighten the 15 Front Panel circuit board assembly screws. From the front of the instrument, check the alignment of the keypads by pressing firmly on each key. Make sure the keys are making contact and adjust if necessary. Tighten all Front Panel circuit board assembly screws, beginning with those around the speaker, to 4 in-lbs.

10. Solder the speaker and encoder switch leads to the replacement Front Panel circuit board set, as shown in Figure 6–3.

11. Clean the clear filter on the instrument front case with a soft, lint-free cloth dampened with a non-abrasive liquid glass cleaner.

12. Perform *Instrument Assembly* on page 6–15.

13. Perform the following steps from the *Performance Check*, beginning on page 5–6:
Step 1, Step 2, and Steps 9 through 20.

Replacing the LCD Display Module

1. Perform *Instrument Disassembly* on page 6–1. This includes turning off the instrument and making sure there is no connection to AC power, RF input, or Interface Port.
2. Without removing any screws, lift the board set (consisting of the Processor/Power Supply circuit board assembly and the Analog Converter circuit board assembly) from the instrument housing just enough to reach the cable that connects the board set to the Front Panel circuit board assembly. Disconnect the cable.
3. Remove the board set from the instrument.
4. Place the board set on a static-free surface with the LCD Display module facing up. Disconnect the dual-wire connector from J5 on the Processor board. Figure 6–4 shows the LCD Display module being removed from the Processor/Power Supply circuit board assembly. The Analog Converter circuit board assembly (not shown) is still connected to the Processor/Power Supply circuit board assembly.
5. Remove the four screws (#10 Torx® with attached locking washers) that hold the LCD Display module in place. Hold the LCD Display module near the bottom left corner, and remove it from the board set by working the pins loose. (The pins fit into a connector that is mounted on the other side of the Processor/Power Supply circuit board assembly.)
6. Position the replacement LCD Display module on the board set, inserting the pins into the Processor/Power Supply circuit board assembly. Install the four screws that secure the LCD Display module and tighten to 4 in-lbs.

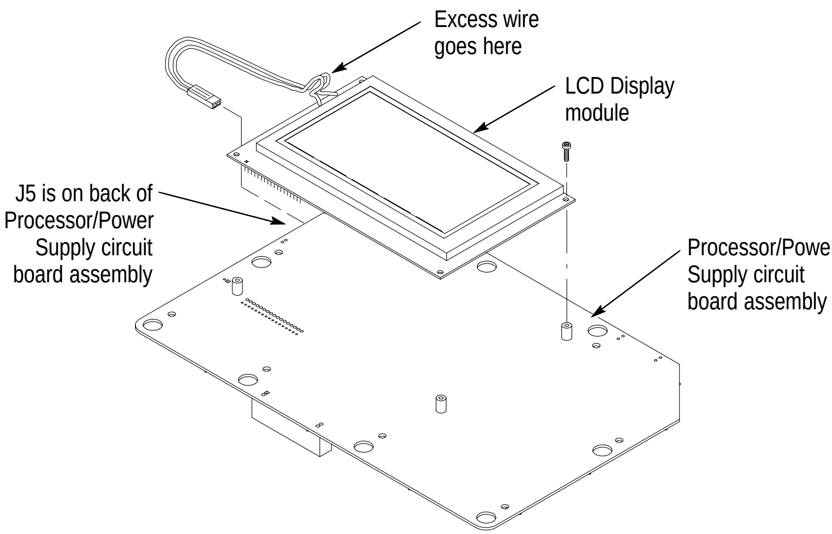

Figure 6–4: Removing the LCD Display module

7. Attach the dual-wire connector from the replacement LCD Display module to J5 on the Processor/Power Supply circuit board assembly. Check that the wires are close to the Processor/ Power Supply circuit board assembly, so that they will not be pinched during instrument assembly.
8. Clean the LCD Display and the clear filter on the front instrument casing with a soft, lint-free cloth dampened with a non-abrasive liquid glass cleaner.
9. Perform *Instrument Assembly* on page 6–15.
10. Perform the following steps from the *Performance Check*, beginning on page 5–6:
Step 1, Step 2, and Steps 9 through 20.

Replacing the Back Board Circuit Board Assembly

1. Perform *Instrument Disassembly* on page 6–1. This includes turning off the instrument and making sure there is no connection to AC power, RF input, or Interface Port.
2. Referring to Figure 6–5, note the position of the battery pack. There is a two-wire lead that connects the battery to the Back Board circuit board assembly at J502. Press the clip down to release the jumper, and slide the jumper off the pins.
3. Working from the outside of the instrument, lift the soft cover from the communication port connector and remove the two screws from the connector.
4. Remove the two screws (#10 Torx®) from the Back Board circuit board assembly.
5. Pull the Back Board circuit board assembly away from the top of the instrument casing, and out of the instrument.
6. Install the new Back Board circuit board assembly by aligning the communication connector with the hole in the instrument casing. Make sure that the gasket around the connector lays flat when installed.
7. Partially install the two screws that attach the Back Board circuit board assembly to the instrument, but do not tighten.
8. Install and tighten the two screws on the communication port.
9. Tighten the two screws on the Back Board circuit board assembly to 4 in-lbs.

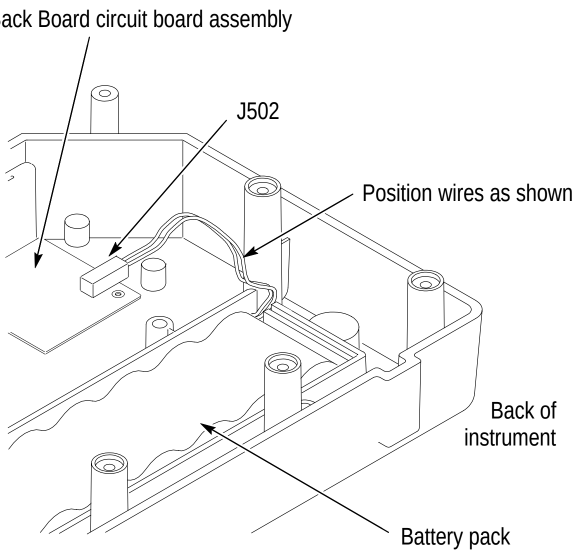

Figure 6–5: Removing the Back Board circuit board assembly

10. Install the battery cable to J502, being careful to position the lead as shown in Figure 6–5, so that it will not be pinched during instrument assembly. Check that the clip is locked on the pins.

11. Perform *Instrument Assembly* on page 6–15.

12. Perform the following steps from the *Performance Check*, beginning on page 5–6:
Step 1, Step 2, and Steps 21 through 23.

Replacing the Battery

1. Perform *Instrument Disassembly* on page 6–1. This includes turning off the instrument and making sure there is no connection to AC power, RF input, or Interface Port.
2. Referring to Figure 6–5, note the position of the battery pack. There is a two-wire lead that connects the battery to the Back Board circuit board assembly at J502. Note the position of the lead, so that you can reinstall it in the same position. (Do not wrap the lead around the post.) The jumper plug at J502 has a small locking clip. Press the clip down to release the jumper, and slide the jumper off the pins.
3. Remove the four screws that hold the battery cover in place, and remove the battery cover. For reference, note how the battery lead is positioned in the notch in the battery housing.
4. Turn the back cover upside down, place your hand under the battery pack, then tap the back cover to remove the battery pack from its housing and catch it with your hand. (Do not pull on the battery lead.)
5. Install a new battery pack. Be sure to use only the battery recommended for use with this product. Refer to the *Replaceable Mechanical Parts* list in this manual for the part number. Ensure that the cushioning foam is under the new battery and extends up around the battery on both ends.
6. Place the lead from the new battery down through the notch in the battery housing, and connect it to J502 on the Back Board circuit board assembly. (The connector can only be installed when the orientation is correct.) Be sure that the battery lead is installed as shown in Figure 6–5, so that it will not be pinched during instrument assembly. Check that the clip is locked on the pins.

CAUTION. *A damaged battery lead can cause serious equipment damage.*

7. Replace the battery cover, ensuring that the battery lead is not caught between the housing and the cover. Install and tighten the four screws.
8. Perform *Instrument Assembly* on page 6–15.
9. Perform the *Performance Check* on page 5–6.

Instrument Assembly

1. Position the two parts of the instrument next to each other on the work surface.

2. If the Calibrated Board Set has been removed from the instrument, perform sub-steps a through d:

   a. Attach the cable leading from J11 on the replacement Calibrated Board Set to J1 on the Front Panel circuit board assembly.

   b. Install the Calibrated Board Set, folding the excess cable length (from J1) between the Front Panel circuit board assembly and the Calibrated Board Set, so that the cable does not come between the edge of the circuit board assemblies and the instrument case. See Figure 6–6.

   c. Check that the two wires coming from the LCD Display module are not pinched when installing the Calibrated Board Set. Make sure that the ribbon cable leading from J10 on the Processor/Power Supply circuit board assembly is extended so that it can be attached to the Back Board circuit board assembly in a later step.

   d. Align the Calibrated Board Set with the eight posts in the instrument front casing.

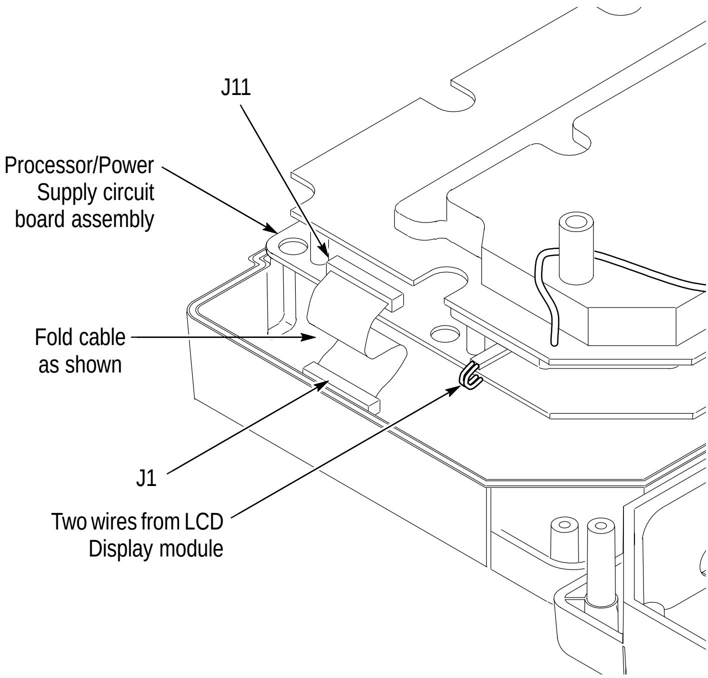

Figure 6–6: Positioning the ribbon cable

3. Insert the RF input connector through the keyhole in the back part of the instrument case. To maintain the weather-resistant quality of the product, be sure to keep the rubber gasket on the end of the RF connector in place. See Figure 6–7. Secure the RF connector from the outside of the case by installing first the flat washer, then the lock washer, and finally the nut. With the 9/16 in wrench, tighten the nut to 20 in-lbs.
4. Connect the ribbon cable from J10 on the Processor/Power Supply circuit board assembly to J500 on the Back Board circuit board assembly.
5. Slip the instrument carrying strap over the two posts on the back cover of the instrument.

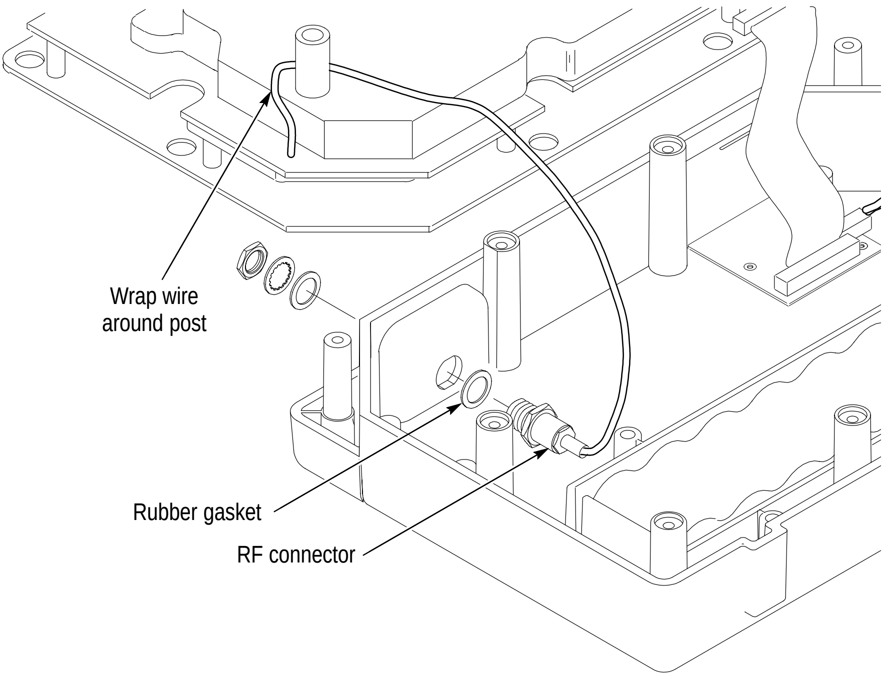

Figure 6–7: Installing the RF connector

6. Position the RF connector cable around the posts on the Processor board so that the cable will not be caught between the posts and the instrument case when the case is assembled. See Figure 6–7.
7. Connect the two parts of the instrument, aligning the posts. Be careful not to damage the water-resistant gasket that is installed in the front instrument casing.
8. Install the ten screws on the rear cover and tighten to 8 in-lbs.
9. If you are using an RF adapter, install it on the RF connector with the 7/16 in wrench. Tighten to 15 in-lbs.
10. This completes *Instrument Assembly.*

Recharging the Battery

***NOTE**. To assure proper operation under all conditions, always plug the AC adapter into the RFM150 before connecting to the AC power source.*

1. Connect the supplied Tektronix AC adapter to the RFM150 power input. Connect the adapter plug to an appropriate AC power source. The instrument will emit two short beeps, and the screen will remain blank. If this does not happen, check your power source. (See Table 4–7 on page 4–6 for power source requirements).
2. With the instrument power off, allow the RFM150 to charge for eight hours. Note that the battery will not charge if the instrument is turned on or in the sleep mode.
3. Turn the instrument power on, and press the HELP key. The percent of remaining battery charge is indicated in the upper right portion of the help screen. The reading after a full eight hour charge should be 99% or 100%.
4. If the operating time from a full charge seems significantly shortened, the battery should be replaced, using the procedure on page 6–13.

Cleaning the Instrument

CAUTION. *Do not allow water to get inside any enclosed assembly or component. Do not clean any plastic materials with benzene, toluene, xylene, acetone, or similar compounds, because they may damage the plastic.*

Exterior Cleaning

Recommended Supplies

- Soft, non-abrasive cloths for cleaning the exterior and the LCD
- Non-abrasive liquid glass cleaner for cleaning the LCD
- Solution of water and mild liquid detergent or non-abrasive liquid glass cleaner (optional)
- Small, soft brush (optional)

Cleaning Procedure

1. Clean the outside of the instrument by wiping with the soft cloth. You may use a brush to remove dust from around control buttons, knobs, and connectors. Hardened dirt may be removed with a cloth dampened in water that contains a mild detergent or non-abrasive glass cleaner. Do not use abrasive cleaners.

2. Clean the LCD display with a soft, lint-free cloth dampened in non-abrasive glass cleaner. Do not use tissue or paper products. Do not use abrasive cleaners.

Interior Cleaning

This instrument is equipped with special seals and gaskets which eliminate the need for routine interior cleaning. However, if dirt has entered the instrument, it should be removed. Dirt acts as a thermal insulator, preventing effective heat dissipation, and can also provide high-resistance electrical leakage paths between conductors or components in a humid environment.

WARNING. *Opening the RFM150 case while an RF signal is applied can expose the operator to hazardous voltages. Always disconnect the RF INPUT connector from the RFM150 before opening the case.*

CAUTION. *Do not allow water to get inside any enclosed assembly or component. Do not clean any plastic materials with benzene, toluene, xylene, acetone, or similar compounds, because they may damage the plastic.*

After interior cleaning, allow the instrument to dry thoroughly before applying power.

Cleaning of rosin residue is not recommended for this product. Most cleaning solvents tend to reactivate the rosin and spread it under components where it may cause corrosion under humid conditions. The rosin residue, if left alone, does not exhibit these corrosive properties.

Required Equipment

- Torx® screwdriver: #10 and #15 tips (#15 unless noted)
- 9/16 in torque wrench for the RF Input connector
- 7/16 in torque wrench for the encoder switch and RF input adapter

Recommended Supplies

- Soft, lint-free, non-abrasive cloth for LCD screen
- Non-abrasive liquid glass cleaner for LCD screen
- Isopropyl alcohol (optional)
- Cotton swab (optional)
- Static-free vacuum cleaner with small brush attachment

Cleaning Procedure

Work at a clean, static-free work area, and use proper anti-static procedures.

1. Perform *Instrument Disassembly* on page 6–1. This includes turning off the instrument and making sure there is no connection to AC power, RF input, or Interface Port.
2. Without removing any screws, lift the board set (consisting of the the Analog Converter circuit board assembly and the Processor/ Power Supply circuit board assembly) from the instrument housing just enough to reach the cable that connects the board set to the Front Panel circuit board assembly. Disconnect the cable.
3. Remove the board set from the instrument.
4. Use low-pressure dry air to remove accumulated dust and dirt from the inside of the instrument (high-velocity air can damage some parts). Hardened dirt or grease can be removed with a cotton swab dampened with isopropyl alcohol. Do not use abrasive cleaners. Do not clean rosin residue.
5. Clean the LCD display with a soft, lint-free cloth dampened with non-abrasive glass cleaner.

WARNING. *Do not assemble, apply power, or apply RF signal input to the instrument until the interior is thoroughly dry.*

6. Allow the interior to dry thoroughly.

7. Perform *Instrument Assembly* on page 6–15.

8. Perform the *Performance Check* on page 5–6.

Replaceable Electrical Parts

Replaceable Electrical Parts

This section contains a list of the components that are replaceable for the RFM150. Use this list to identify and order replacement parts.

Parts Ordering Information

Replacement parts are available through your local Tektronix field office or representative.

Changes to Tektronix products are sometimes made to accommodate improved components as they become available and to give you the benefit of the latest improvements. Therefore, when ordering parts, it is important to include the following information in your order.

- Part number
- Instrument type or model number
- Instrument serial number
- Instrument modification number, if applicable

If you order a part that has been replaced with a different or improved part, your local Tektronix field office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

Module Servicing

Modules can be serviced by selecting one of the following three options. Contact your local Tektronix service center or representative for repair assistance.

Module Exchange. In some cases you may exchange your module for a remanufactured module. These modules cost significantly less than new modules and meet the same factory specifications. For more information about the module exchange program, call 1-800-TEK-WIDE, extension 6630.

Module Repair and Return. You may ship your module to us for repair, after which we will return it to you.

New Modules. You may purchase replacement modules in the same way as other replacement parts.

Using the Replaceable Parts List

This section contains a list of the mechanical and/or electrical components that are replaceable for the <instrument>. Use this list to identify and order replacement parts. The following table describes each column in the parts list.

Parts List Column Descriptions

Column	Column Name	Description
1	Figure & Index Number	Items in this section are referenced by figure and index numbers to the exploded view illustrations that follow.
2	Tektronix Part Number	Use this part number when ordering replacement parts from Tektronix.
3 and 4	Serial Number	Column three indicates the serial number at which the part was first effective. Column four indicates the serial number at which the part was discontinued. No entries indicates the part is good for all serial numbers.
5	Qty	This indicates the quantity of parts used.
6	Name & Description	An item name is separated from the description by a colon (:). Because of space limitations, an item name may sometimes appear as incomplete. Use the U.S. Federal Catalog handbook H6-1 for further item name identification.
7	Mfr. Code	This indicates the code of the actual manufacturer of the part.
8	Mfr. Part Number	This indicates the actual manufacturer's or vendor's part number.

Abbreviations

Abbreviations conform to American National Standard ANSI Y1.1–1972.

Mfr. Code to Manufacturer Cross Index

The table titled Manufacturers Cross Index shows codes, names, and addresses of manufacturers or vendors of components listed in the parts list.

Manufacturers Cross Index

Mfr. code.	Manufacturer	Address	City, state, zip code
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR, PO BOX 500	BEAVERTON, OR 97077–0001

Replaceable Electrical Parts List

Cmpnt. number	Tektronix part number	Serial No. Effective	Serial No. Discont'd	Name & description	Mfr. code	Mfr. part number
A1	671–3101–00			CKT BD ASSY:FRONT PANEL	80009	671–3101–00
A2/A3	020–2111–00	B010100	B010199	CALIBRATED BOARD SET REPLACEMENT (STANDARD)	80009	020–2111–00
				CKT BD ASSY:PROCESSOR/PS		
				CKT BD ASSY:ANALOG CONVERTER		
A2/A3	020–2112–00	B010100	B010199	CALIBRATED BOARD SET REPLACEMENT (OPT 01)	80009	020–2112–00
				CKT BD ASSY:PROCESSOR/PS (OPT 01)		
				CKT BD ASSY:ANALOG CONVERTER		
A2/A3	020–2150–00	B020100	B029999	CALIBRATED BOARD SET REPLACEMENT (STANDARD)	80009	020–2150–00
				CKT BD ASSY:PROCESSOR/PS		
				CKT BD ASSY:ANALOG CONVERTER		
A2/A3	020–2151–00	B020100	B029999	CALIBRATED BOARD SET REPLACEMENT (OPT 01)	80009	020–2151–00
				CKT BD ASSY:PROCESSOR/PS (OPT 01)		

Cmpnt. number	Tektronix part number	Serial No. Effective	Serial No. Discont'd	Name & description	Mfr. code	Mfr. part number
				CKT BD ASSY:ANALOG CONVERTER		
A2/A3	020–2152–00	B030100	B0301300	CALIBRATED BOARD SET REPLACEMENT (STANDARD)	80009	020–2152–00
				CKT BD ASSY:PROCESSOR/PS		
				CKT BD ASSY:ANALOG CONVERTER		
A2/A3	020–2153–00	B030100	B031300	CALIBRATED BOARD SET REPLACEMENT (OPT 01)	80009	020–2153–00
				CKT BD ASSY:PROCESSOR/PS (OPT 01)		
				CKT BD ASSY:ANALOG CONVERTER		
A2/A3	020–2152–01	B0301300		CALIBRATED BOARD SET REPLACEMENT (STANDARD)	80009	020–2152–01
				CKT BD ASSY:PROCESSOR/PS		
				CKT BD ASSY:ANALOG CONVERTER		
A2/A3	020–2153–01	B0301300		CALIBRATED BOARD SET REPLACEMENT (OPT 01)	80009	020–2153–01
				CKT BD ASSY:PROCESSOR/PS (OPT 01)		
				CKT BD ASSY:ANALOG CONVERTER		
A4	671–3466–00			CKT BD ASSY:BACK BOARD	80009	671–3466–00

Replaceable Mechanical Parts

Replaceable Mechanical Parts

This section contains a list of the components that are replaceable for the RFM150. Use this list to identify and order replacement parts.

Parts Ordering Information

Replacement parts are available through your local Tektronix field office or representative.

Changes to Tektronix products are sometimes made to accommodate improved components as they become available and to give you the benefit of the latest improvements. Therefore, when ordering parts, it is important to include the following information in your order.

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- Instrument type or model number
- Instrument serial number
- Instrument modification number, if applicable

If you order a part that has been replaced with a different or improved part, your local Tektronix field office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

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Modules can be serviced by selecting one of the following three options. Contact your local Tektronix service center or representative for repair assistance.

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Module Repair and Return. You may ship your module to us for repair, after which we will return it to you.

New Modules. You may purchase replacement modules in the same way as other replacement parts.

Using the Replaceable Parts List

This section contains a list of the mechanical and/or electrical components that are replaceable for the <instrument>. Use this list to identify and order replacement parts. The following table describes each column in the parts list.

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5	Qty	This indicates the quantity of parts used.
6	Name & Description	An item name is separated from the description by a colon (:). Because of space limitations, an item name may sometimes appear as incomplete. Use the U.S. Federal Catalog handbook H6-1 for further item name identification.
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Mfr. Code to Manufacturer Cross Index

The table titled Manufacturers Cross Index shows codes, names, and addresses of manufacturers or vendors of components listed in the parts list.

Manufacturers Cross Index

Mfr. Code	Manufacturer	Address	City, State, Zip Code
TK1386	PYRAMID ELECTRONICS SUPPLY INC	9757 JUANITA DRIVE NE	KIRKLAND WA 98034
TK1547	MOORE ELECTRONICS INC (DIST)	19500 SW 90TH COURT PO BOX 1030	TUALATIN OR 97062
TK1617	CRAFT FACTORY PLASTICS	17145 SW ALEXANDER	ALOHA, OR 97007
TK2495	CF PLASTICS	2820 SE 39TH ST LOOP H	HILLSBORO OR 97123
TK2548	XEROX BUSINESS SERVICES DIV OF XEROX CORPORATION	14181 SW MILLIKAN WAY	BEAVERTON OR 97077
0GV90	GLOBTEK INC	186 VETERANS DRIVE	NORTHVALE, NJ 07647
0KB01	STAUFFER SUPPLY	810 SE SHERMAN	PORTLAND OR 97214
0LXM2	LZR ELECTRONICS INC	8051 CESSNA AVENUE	GAITHERSBURG MD 20879
22526	BERG ELECTRONICS INC. (DUPONT)	857 OLD TRAIL RD.	ETTERS PA 17319
32997	BOURNS INC TRIMPOT DIV	1200 COLUMBIA AVE	RIVERSIDE CA 92507–2114
55611	SPECTRA–STRIP CORPORATION AN ELTRA CORP	720 SHERMAN AVE	HAMDEN, CT 06514–1118
62786	HITACHI AMERICA LTD HITACHI PLAZA	2000 SIERRA POINT PARKWAY	BRISBANE CA 94005
80009	TEKTRONIX INC	14150 SW KARL BRAUN DR PO BOX 500	BEAVERTON OR 97077–0001

Replaceable Mechanical Parts List

Fig. & index number	Tektronix part number	Serial number discont	Serial number discont	Qty	Name & description	Mfr. code	Mfr. part number
8–1–1	202–0340–50	B010100	B010299	1	CASE,FRONT:FINISHED,CASE,POLY	80009	202034050
	202–0340–51	B010300	B020386	1	CASE,FRONT:FINISHED,CASE,POLY	80009	202034051
	202–0340–52	B020387	B031799		CASE,FRONT:FINISHED,CASE,POLY	80009	202034052
	202–0340–53	B031800			CASE,FRONT:FINISHED,CASE,POLY *MOUNTING PARTS*	80009	202034053
–2	211–0858–00			10	SCREW,MACHINE:6–32 X 2.5,PNH,T–15, TORX,STEEL,BLACK OXIDE *END MOUNTING PARTS*	0KB01	211–0858–00
–3	366–0754–00	B010100	B010299	1	KNOB:GY,1.500 OD,0.250 ID,0.600H	80009	366075400
	366–0754–01	B010300		1	KNOB:GY,1.500 OD,0.250 ID,0.600	80009	366075401
–4	210–0895–00	B010790		1	WASHER,SHLDR:0.255 ID X 0.375 OD X 0.105 THK,NYL BLACK	TK1617	NA
–5	———————			1	CKT BD ASSY:FRONT PANEL (SEE REPL A1 ONLY) *MOUNTING PARTS*		
–6	211–0408–00			15	SCR,ASSEM WSHR:4–40 X 0.250,PNH, STL,ZINC,T–10 TORX DR,SEMS *END MOUNTING PARTS*	0KB01	211–0408–00
–7	311–2512–00			1	ENCODER,DIGITAL:PNL,CONTACTING; 24 CYCLES PER REV,DETENTED,0.875 FMS,0.25 BUSHING	32997	ECL1J–B28–S E0/0
–8	119–4794–00			1	SPEAKER:DYNAMIC;45MM DIA,8 OHM, 600–7KHZ,MYLAR CONE,W/1” LEADS	0LXM2	45RM
–9	348–1414–00			1	GASKET:SPKR,PORON,DUROMETER	80009	348141400
–10	119–4792–00			1	KEYPAD:FRONT PANEL	80009	119479200

Replaceable Mechanical Parts List (Cont.)

Fig. & index number	Tektronix part number	Serial number discont	Serial number discont	Qty	Name & description	Mfr. code	Mfr. part number
–11	331–0545–00			1	LENS,FRONT:PLASTIC	80009	331054500
–12	119–4795–00			1	KEY PAD:FRONT PANEL	80009	119479500
–13	119–4965–00			1	DISPLAY MODULE:LCD;240 X 128, DOT MATRIX,W/CONNECTORS *MOUNTING PARTS*	62786	LMG6401PLGE
–14	211–0408–00			4	SCR,ASSEM WSHR:4–40 X 0.250,PNH, STL,ZINC,T–10 TORX DR,SEMS *END MOUNTING PARTS*	0KB01	211–0408–00
–15	–––––––––––			1	CKT BD ASSY:PROCESSOR PS (SEE REPL) *MOUNTING PARTS*		
–16	211–0711–00			8	SCR,ASSEM WSHR:6–32 X 0.250,PNH, STL,CDPL,T–15 TORX DR,MACHINE *END MOUNTING PARTS*	0KB01	ORDER BY DESC
–17	–––––––––––			1	CKT BD ASSY:ANALOG CONVERTER (SEE REPL)		
–18	–––––––––––			1	SHIELD,ELECT:ANALOG CONVERTER 1		
–19	–––––––––––			1	SHIELD,ELECT:ANALOG CONVERTER 2		
–20	346–0273–00			1	HANDLE,STRAP:2–1 1/2 INCH A.C.W. MOLDEDSTRAP,NYLON WEBBING	80009	346027300
–21	200–4199–00			1	COVER,BATTERY:ALUM *MOUNTING PARTS*	80009	200419900

Replaceable Mechanical Parts List (Cont.)

Fig. & index number	Tektronix part number	Serial number discont	Serial number discont	Qty	Name & description	Mfr. code	Mfr. part number
–22	211–0722–00			4	SCREW,MACHINE:6–32 X 0.250,PNH,STL, CDPL,T–15 TORX DR *END MOUNTING PARTS*	0KB01	ORDER BY DESC
–23	016–1313–00	B010100	B020890	1	BATTERY ASSY:9.6V,2800MAH,(8)C CELL,NI-CAD IN A PACK, 8 X 2 X 1	80009	016131300
	016–1313–01	B020891		1	BATTERY ASSY:9.6V,2800MAH,(8)C CELL,NI-CAD IN A PACK, 8 X 2 X 1	80009	016131301
–24	————————			1	CKT BD ASSY:BACK BAORDM150 (SEE REPL A4 ONLY) *MOUNTING PARTS*		
–25	211–0408–00			2	SCR,ASSEM WSHR:4–40 X 0.250,PNH, STL,ZINC,T–10 TORX DR,SEMS	0KB01	211–0408–00
–26	211–0372–00			2	SCREW,MACHINE:4–40 X 0.312,PNH,STL *END MOUNTING PARTS*	0KB01	211–0372–00
–27	202–0341–50	B010100	B010299	1	CASE,BACK:FINISHED,POLY	80009	202034150
	202–0341–51	B010300	B020386	1	CASE,BACK:FINISHED,POLY	80009	202034151
	202–0341–52	B020387	B031799		CASE,BACK:FINISHED,POLY	80009	202034152
	202–0341–53	B031800			CASE,BACK:FINISHED,POLY	80009	202034153
–28	200–4205–00	B010100	B010449	1	CAP:DATA OUTPUT,RFM150	80009	200420500
	200–4205–01	B010450			CAP:DATA OUTPUT,RFM150	80009	200420501
–29	348–1184–00		B020386	1	GASKET,PWR JACK:CT100	TK2495	348–1184–00
–30	348–1413–01			1	GASKET:RFM150 FRONT CASE	80009	348141301
–31	348–1532–00			1	GASKET:SILICON RUBBER 50–60 DUR.CO-LOR:RED ID 0.495 OD 0.625 THICKNESS 0.062	22526	G100–14

Replaceable Mechanical Parts List (Cont.)

Fig. & index number	Tektronix part number	Serial number discont	Serial number discont	Qty	Name & description	Mfr. code	Mfr. part number
–32	220–0203–00			1	HEXNUT:BRASS PLATED IP23 (NICKEL) ID THREAD 1/2–28 UNEF2B OD 0.562 THICK-NESS 0.109	22526	HN100–4
–33	210–0122–00			1	LOCKWASHER:PHOSPHOR BRONZE PLATED IP23 (NICKEL) ID 0.512–0.505 OD 0.630–0.620 THICKNESS 0.022 NOTE:DIAMETER TO CLEAR 1/2	22526	LW101–3
–34	210–0845–00			1	FLATWASHER:0.5 ID X 0.625 OD X 0.02,STL CD PL	80009	210-0845-00
–35	334–8899–00			1	MARKER,IDENT:LABEL,RFM150	80009	334889900
					STANDARD ACCESSORIES		
	016–1345–00		B031564	1	CASE,CARRYING:RFM150	80009	016134500
	016–1345–01	B031565		1	CASE,CARRYING:RFM150	80009	016134501
	070–9006–01			1	MANUAL,TECH:INSTR,RFM150	TK2548	070–9006–01
	119–4855–00			1	POWER SUPPLY:18W;12V 1.5A,UNREG, 120VAC 60HZ,183CM CA W/5.5MM OD, 2.1MM ID CP COAX PLUG (STANDARD ONLY)	0GV90	WD1E1500C12 CP
	119–4860–00			1	CABLE,PWR:MISC;CIGARETTE LIGHTER PLUG,W/180CM CABLE,5.5MM OD 2.1MM ID CP COAX CONNECTOR	0GV90	X001746FC12 CP
	174–3269–00			1	CA ASSY,SP:SHLD CMPST,RS–232;CRC, 8,26AWG,72.O L,DE9S,DSUB,FEM,9 POS, W/JACK SCREWS BOTH ENDS	TK1547	S–389

Replaceable Mechanical Parts List (Cont.)

Fig. & index number	Tektronix part number	Serial number discont	Serial number discont	Qty	Name & description	Mfr. code	Mfr. part number
					OPTIONAL ACCESSORIES		
	119–4856–00			1	POWER SUPPLY:18W;12V 1.5A,UNREG, 220VAC 50HZ,183CM CA W/5.5MM OD, 2.1MM ID CPCOAX PLUG (EUROPEAN OPTION A1 ONLY)	0GV90	WD13E1500C1 2CP
	119–4857–00			1	POWER SUPPLY:18W;12V 1.5A,UNREG, 240VAC 50HZ,183CM CA W/5.5MM OD, 2.1MM ID CP COAX PLUG (UNITED KINGDOM OPTION A2 ONLY)	0GV90	WD35E1500C1 2CP
	119–4858–00			1	POWER SUPPLY:18W;12V 1.5A,UNREG, 240VAC 50HZ,183CM CA W/5.5MM OD, 2.1MM ID CP COAX PLUG (AUSTRALIAN OPTION A3 ONLY)	0GV90	TD377E1500C 12CP
	119–4859–00			1	POWER SUPPLY:18W;12V 1.5A,UNREG, 100VAC 60HZ,183CM CA W/5.5MM OD, 2.1MM ID CP COAX PLUG (JAPANESE OPTION A6 ONLY)	0GV90	WD49E1500C1 2CP

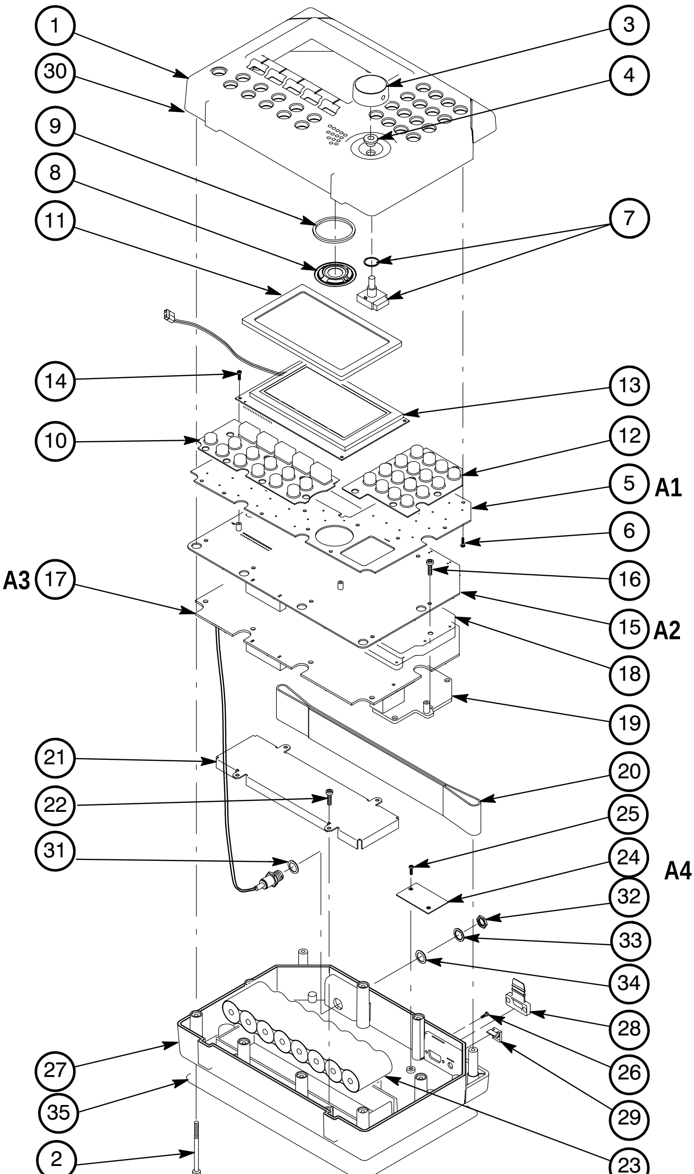

Figure 8–1: Exploded view of the RFM150

Appendices

Appendix A: Channel Tables

The RFM150 contains eleven fixed channel tables, which can be edited, but cannot be deleted. The four fields that can be edited through the RFM150 menus are: skip (yes/no), scrambled (yes/no), dwell time (short or long) and amplitude offset (in dB). The companion CSS150 package allows editing of additional fields, as well as the creation of custom channel tables. Fixed tables can be used as a basis for creating these custom channel tables. Refer to the *CSS150 SignalScout Software User Manual* for instructions. Another way of setting up channel tables is to “clone” the configuration of another RFM150.

This appendix section defines the eleven fixed channel tables. The information given above each table represents data that is the same for every channel in that table. This includes the defaults for the four editable fields. Blanks are provided to fill in new values when the fields are edited. A blank table appears at the end of the section, to allow for custom channel tables.

Table A–1: CATV–Standard

Editable Fields – Defaults
Amplitude Offset: 0.0 dB Scrambled: No Dwell Time: Short Skip: No

Fixed Fields
Aural Offset: 4.5 MHz Second Aural Offset: None C/N Bandwidth: 4.0 MHz

CATV–Standard channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
2	55.25	NTSC	–1.25	____	________	________	________
3	61.25	NTSC	–1.25	____	________	________	________
4	67.25	NTSC	–1.25	____	________	________	________
5	77.25	NTSC	–1.25	____	________	________	________
6	83.25	NTSC	–1.25	____	________	________	________
95	91.25	NTSC	–1.25	____	________	________	________
96	97.25	NTSC	–1.25	____	________	________	________
97	103.25	NTSC	–1.25	____	________	________	________
98	109.25	NTSC	–1.25	____	________	________	________
99	115.25	NTSC	–1.25	____	________	________	________
14	121.25	NTSC	–1.25	____	________	________	________
15	127.25	NTSC	–1.25	____	________	________	________
16	133.25	NTSC	–1.25	____	________	________	________
17	139.25	NTSC	–1.25	____	________	________	________
18	145.25	NTSC	–1.25	____	________	________	________
19	151.25	NTSC	–1.25	____	________	________	________
20	157.25	NTSC	–1.25	____	________	________	________
21	163.25	NTSC	–1.25	____	________	________	________
22	169.25	NTSC	–1.25	____	________	________	________
7	175.25	NTSC	–1.25	____	________	________	________
8	181.25	NTSC	–1.25	____	________	________	________
9	187.25	NTSC	–1.25	____	________	________	________
10	193.25	NTSC	–1.25	____	________	________	________
11	199.25	NTSC	–1.25	____	________	________	________
12	205.25	NTSC	–1.25	____	________	________	________
13	211.25	NTSC	–1.25	____	________	________	________
23	217.25	NTSC	–1.25	____	________	________	________

CATV–Standard channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
24	223.25	NTSC	–1.25				
25	229.25	NTSC	–1.25				
26	235.25	NTSC	–1.25				
27	241.25	NTSC	–1.25				
28	247.25	NTSC	–1.25				
29	253.25	NTSC	–1.25				
30	259.25	NTSC	–1.25				
31	265.25	NTSC	–1.25				
32	271.25	NTSC	–1.25				
33	277.25	NTSC	–1.25				
34	283.25	NTSC	–1.25				
35	289.25	NTSC	–1.25				
36	295.25	NTSC	–1.25				
37	301.25	NTSC	–1.25				
8	307.25	NTSC	–1.25				
39	313.25	NTSC	–1.25				
40	319.25	NTSC	–1.25				
41	325.25	NTSC	–1.25				
42	331.25	NTSC	–1.25				
43	337.25	NTSC	–1.25				
44	343.25	NTSC	–1.25				
45	349.25	NTSC	–1.25				
46	355.25	NTSC	–1.25				
47	361.25	NTSC	–1.25				
48	367.25	NTSC	–1.25				
9	373.25	NTSC	–1.25				
50	379.25	NTSC	–1.25				
51	385.25	NTSC	–1.25				
52	391.25	NTSC	–1.25				
53	397.25	NTSC	–1.25				
54	403.25	NTSC	–1.25				
55	409.25	NTSC	–1.25				
56	415.25	NTSC	–1.25				
57	421.25	NTSC	–1.25				

CATV–Standard channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
58	427.25	NTSC	–1.25	____	________	________	________
59	433.25	NTSC	–1.25	____	________	________	________
60	439.25	NTSC	–1.25	____	________	________	________
61	445.25	NTSC	–1.25	____	________	________	________
62	451.25	NTSC	–1.25	____	________	________	________
63	457.25	NTSC	–1.25	____	________	________	________
64	463.25	NTSC	–1.25	____	________	________	________
65	469.25	NTSC	–1.25	____	________	________	________
66	475.25	NTSC	–1.25	____	________	________	________
67	481.25	NTSC	–1.25	____	________	________	________
68	487.25	NTSC	–1.25	____	________	________	________
69	493.25	NTSC	–1.25	____	________	________	________
70	499.25	NTSC	–1.25	____	________	________	________
71	505.25	NTSC	–1.25	____	________	________	________
72	511.25	NTSC	–1.25	____	________	________	________
73	517.25	NTSC	–1.25	____	________	________	________
74	523.25	NTSC	–1.25	____	________	________	________
75	529.25	NTSC	–1.25	____	________	________	________
76	535.25	NTSC	–1.25	____	________	________	________
77	541.25	NTSC	–1.25	____	________	________	________
78	547.25	NTSC	–1.25	____	________	________	________
79	553.25	NTSC	–1.25	____	________	________	________
80	559.25	NTSC	–1.25	____	________	________	________
81	565.25	NTSC	–1.25	____	________	________	________
82	571.25	NTSC	–1.25	____	________	________	________
83	577.25	NTSC	–1.25	____	________	________	________
84	583.25	NTSC	–1.25	____	________	________	________
85	589.25	NTSC	–1.25	____	________	________	________
86	595.25	NTSC	–1.25	____	________	________	________
87	601.25	NTSC	–1.25	____	________	________	________
88	607.25	NTSC	–1.25	____	________	________	________
89	613.25	NTSC	–1.25	____	________	________	________
90	619.25	NTSC	–1.25	____	________	________	________
91	625.25	NTSC	–1.25	____	________	________	________

CATV–Standard channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
92	631.25	NTSC	–1.25				
93	637.25	NTSC	–1.25				
94	643.25	NTSC	–1.25				
100	649.25	NTSC	–1.25				
101	655.25	NTSC	–1.25				
102	661.25	NTSC	–1.25				
103	667.25	NTSC	–1.25				
104	673.25	NTSC	–1.25				
105	679.25	NTSC	–1.25				
106	685.25	NTSC	–1.25				
107	691.25	NTSC	–1.25				
108	697.25	NTSC	–1.25				
109	703.25	NTSC	–1.25				
110	709.25	NTSC	–1.25				
111	715.25	NTSC	–1.25				
112	721.25	NTSC	–1.25				
113	727.25	NTSC	–1.25				
114	733.25	NTSC	–1.25				
115	739.25	NTSC	–1.25				
116	745.25	NTSC	–1.25				
117	751.25	NTSC	–1.25				
118	757.25	NTSC	–1.25				
119	763.25	NTSC	–1.25				
120	769.25	NTSC	–1.25				
121	775.25	NTSC	–1.25				
122	781.25	NTSC	–1.25				
123	787.25	NTSC	–1.25				
124	793.25	NTSC	–1.25				
125	799.25	NTSC	–1.25				
126	805.25	NTSC	–1.25				
127	811.25	NTSC	–1.25				
128	817.25	NTSC	–1.25				
129	823.25	NTSC	–1.25				
130	829.25	NTSC	–1.25				

CATV–Standard channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
131	835.25	NTSC	–1.25				
132	841.25	NTSC	–1.25				
133	847.25	NTSC	–1.25				
134	853.25	NTSC	–1.25				
135	859.25	NTSC	–1.25				
136	865.25	NTSC	–1.25				
137	871.25	NTSC	–1.25				
138	877.25	NTSC	–1.25				
139	883.25	NTSC	–1.25				
140	889.25	NTSC	–1.25				
141	895.25	NTSC	–1.25				
142	901.25	NTSC	–1.25				
143	907.25	NTSC	–1.25				
144	913.25	NTSC	–1.25				
145	919.25	NTSC	–1.25				
146	925.25	NTSC	–1.25				
147	931.25	NTSC	–1.25				
148	937.25	NTSC	–1.25				
149	943.25	NTSC	–1.25				
150	949.25	NTSC	–1.25				
151	955.25	NTSC	–1.25				
152	961.25	NTSC	–1.25				
153	967.25	NTSC	–1.25				
154	973.25	NTSC	–1.25				
155	979.25	NTSC	–1.25				
156	985.25	NTSC	–1.25				
157	991.25	NTSC	–1.25				
158	997.25	NTSC	–1.25				
159	1003.25	NTSC	–1.25				
160	1009.25	NTSC	–1.25				
161	1015.25	NTSC	–1.25				
162	1021.25	NTSC	–1.25				
163	1027.25	NTSC	–1.25				
164	1033.25	NTSC	–1.25				

CATV–Standard channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
165	1039.25	NTSC	–1.25	____	__________	___________	__________
166	1045.25	NTSC	–1.25	____	__________	___________	__________
167	1051.25	NTSC	–1.25	____	__________	___________	__________
168	1057.25	NTSC	–1.25	____	__________	___________	__________
169	1063.25	NTSC	–1.25	____	__________	___________	__________
170	1069.25	NTSC	–1.25	____	__________	___________	__________

Table A–2: CATV–500 channel table

Editable Fields – Defaults
Amplitude Offset: 0.0 dB   Scrambled: No   Dwell Time: Short   Skip: No

Fixed Fields
Aural Offset: 4.5 MHz   Second Aural Offset: None   C/N Bandwidth: 4.0 MHz

CATV–500 channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
93	43.00	NTSC	–1.25				
94	49.00	NTSC	–1.25				
2	55.25	NTSC	–1.25				
3	61.25	NTSC	–1.25				
4	67.25	NTSC	–1.25				
5	77.25	NTSC	–1.25				
6	83.25	NTSC	–1.25				
95	91.25	NTSC	–1.25				
96	97.25	NTSC	–1.25				
97	103.25	NTSC	–1.25				
98	109.25	NTSC	–1.25				
99	115.25	NTSC	–1.25				
14	121.25	NTSC	–1.25				
15	127.25	NTSC	–1.25				
16	133.25	NTSC	–1.25				
17	139.25	NTSC	–1.25				
18	145.25	NTSC	–1.25				
19	151.25	NTSC	–1.25				
20	157.25	NTSC	–1.25				
21	163.25	NTSC	–1.25				
22	169.25	NTSC	–1.25				
7	175.25	NTSC	–1.25				
8	181.25	NTSC	–1.25				
9	187.25	NTSC	–1.25				
10	193.25	NTSC	–1.25				
11	199.25	NTSC	–1.25				

CATV–500 channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
12	205.25	NTSC	–1.25				
13	211.25	NTSC	–1.25				
23	217.25	NTSC	–1.25				
24	223.25	NTSC	–1.25				
25	229.25	NTSC	–1.25				
26	235.25	NTSC	–1.25				
27	241.25	NTSC	–1.25				
28	247.25	NTSC	–1.25				
29	253.25	NTSC	–1.25				
30	259.25	NTSC	–1.25				
31	265.25	NTSC	–1.25				
32	271.25	NTSC	–1.25				
33	277.25	NTSC	–1.25				
34	283.25	NTSC	–1.25				
35	289.25	NTSC	–1.25				
36	295.25	NTSC	–1.25				
37	301.25	NTSC	–1.25				
8	307.25	NTSC	–1.25				
39	313.25	NTSC	–1.25				
40	319.25	NTSC	–1.25				
41	325.25	NTSC	–1.25				
42	331.25	NTSC	–1.25				
43	337.25	NTSC	–1.25				
44	343.25	NTSC	–1.25				
45	349.25	NTSC	–1.25				
46	355.25	NTSC	–1.25				
47	361.25	NTSC	–1.25				
48	367.25	NTSC	–1.25				
9	373.25	NTSC	–1.25				
50	379.25	NTSC	–1.25				
51	385.25	NTSC	–1.25				
52	391.25	NTSC	–1.25				
53	397.25	NTSC	–1.25				
54	403.25	NTSC	–1.25				

CATV–500 channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
55	409.25	NTSC	–1.25	____	__________	__________	__________
56	415.25	NTSC	–1.25	____	__________	__________	__________
57	421.25	NTSC	–1.25	____	__________	__________	__________
58	427.25	NTSC	–1.25	____	__________	__________	__________
59	433.25	NTSC	–1.25	____	__________	__________	__________
60	439.25	NTSC	–1.25	____	__________	__________	__________
61	445.25	NTSC	–1.25	____	__________	__________	__________
62	451.25	NTSC	–1.25	____	__________	__________	__________
63	457.25	NTSC	–1.25	____	__________	__________	__________
64	463.25	NTSC	–1.25	____	__________	__________	__________
65	469.25	NTSC	–1.25	____	__________	__________	__________
66	475.25	NTSC	–1.25	____	__________	__________	__________
67	481.25	NTSC	–1.25	____	__________	__________	__________
68	487.25	NTSC	–1.25	____	__________	__________	__________
69	493.25	NTSC	–1.25	____	__________	__________	__________
70	499.25	NTSC	–1.25	____	__________	__________	__________
71	505.25	NTSC	–1.25	____	__________	__________	__________
72	511.25	NTSC	–1.25	____	__________	__________	__________

Table A–3: Broadcast channel table

Editable Fields – Defaults			
Amplitude Offset: 0.0 dB	Scrambled: No	Dwell Time: Short	Skip: No
Fixed Fields			
Aural Offset: 4.5 MHz	Second Aural Offset: None	C/N Bandwidth: 4.0 MHz	

Broadcast channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
2	55.25	NTSC	–1.25				
3	61.25	NTSC	–1.25				
4	67.25	NTSC	–1.25				
5	77.25	NTSC	–1.25				
6	83.25	NTSC	–1.25				
7	175.25	NTSC	–1.25				
8	181.25	NTSC	–1.25				
9	187.25	NTSC	–1.25				
10	193.25	NTSC	–1.25				
11	199.25	NTSC	–1.25				
12	205.25	NTSC	–1.25				
13	211.25	NTSC	–1.25				
14	471.25	NTSC	–1.25				
15	477.25	NTSC	–1.25				
16	483.25	NTSC	–1.25				
17	489.25	NTSC	–1.25				
18	495.25	NTSC	–1.25				
19	501.25	NTSC	–1.25				
20	507.25	NTSC	–1.25				
21	513.25	NTSC	–1.25				
22	519.25	NTSC	–1.25				
23	525.25	NTSC	–1.25				
24	531.25	NTSC	–1.25				
25	537.25	NTSC	–1.25				
26	543.25	NTSC	–1.25				

Broadcast channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
27	549.25	NTSC	–1.25	____	________	________	________
28	555.25	NTSC	–1.25	____	________	________	________
29	561.25	NTSC	–1.25	____	________	________	________
30	567.25	NTSC	–1.25	____	________	________	________
31	573.25	NTSC	–1.25	____	________	________	________
32	579.25	NTSC	–1.25	____	________	________	________
33	585.25	NTSC	–1.25	____	________	________	________
34	591.25	NTSC	–1.25	____	________	________	________
35	597.25	NTSC	–1.25	____	________	________	________
36	603.25	NTSC	–1.25	____	________	________	________
37	609.25	NTSC	–1.25	____	________	________	________
38	615.25	NTSC	–1.25	____	________	________	________
39	621.25	NTSC	–1.25	____	________	________	________
40	627.25	NTSC	–1.25	____	________	________	________
41	633.25	NTSC	–1.25	____	________	________	________
42	639.25	NTSC	–1.25	____	________	________	________
43	645.25	NTSC	–1.25	____	________	________	________
44	651.25	NTSC	–1.25	____	________	________	________
45	657.25	NTSC	–1.25	____	________	________	________
46	663.25	NTSC	–1.25	____	________	________	________
47	669.25	NTSC	–1.25	____	________	________	________
48	675.25	NTSC	–1.25	____	________	________	________
49	681.25	NTSC	–1.25	____	________	________	________
50	687.25	NTSC	–1.25	____	________	________	________
51	693.25	NTSC	–1.25	____	________	________	________
52	699.25	NTSC	–1.25	____	________	________	________
53	705.25	NTSC	–1.25	____	________	________	________
54	711.25	NTSC	–1.25	____	________	________	________
55	717.25	NTSC	–1.25	____	________	________	________
56	723.25	NTSC	–1.25	____	________	________	________
57	729.25	NTSC	–1.25	____	________	________	________
58	735.25	NTSC	–1.25	____	________	________	________
59	741.25	NTSC	–1.25	____	________	________	________
60	747.25	NTSC	–1.25	____	________	________	________

Broadcast channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
61	753.25	NTSC	–1.25	____	________	________	________
62	759.25	NTSC	–1.25	____	________	________	________
63	765.25	NTSC	–1.25	____	________	________	________
64	771.25	NTSC	–1.25	____	________	________	________
65	777.25	NTSC	–1.25	____	________	________	________
66	783.25	NTSC	–1.25	____	________	________	________
67	789.25	NTSC	–1.25	____	________	________	________
68	795.25	NTSC	–1.25	____	________	________	________
69	801.25	NTSC	–1.25	____	________	________	________
70	807.25	NTSC	–1.25	____	________	________	________
71	813.25	NTSC	–1.25	____	________	________	________
72	819.25	NTSC	–1.25	____	________	________	________
73	825.25	NTSC	–1.25	____	________	________	________
74	831.25	NTSC	–1.25	____	________	________	________
75	837.25	NTSC	–1.25	____	________	________	________
76	843.25	NTSC	–1.25	____	________	________	________
77	849.25	NTSC	–1.25	____	________	________	________
78	855.25	NTSC	–1.25	____	________	________	________
79	861.25	NTSC	–1.25	____	________	________	________
80	867.25	NTSC	–1.25	____	________	________	________
81	873.25	NTSC	–1.25	____	________	________	________
82	879.25	NTSC	–1.25	____	________	________	________
83	885.25	NTSC	–1.25	____	________	________	________

Table A–4: CATV–HRC channel table

Editable Fields – Defaults
Amplitude Offset: 0.0 dB   Scrambled: No   Dwell Time: Short   Skip: No

Fixed Fields
Aural Offset: 4.5 MHz   Second Aural Offset: None   C/N Bandwidth: 4.0 MHz

CATV–HRC channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
2	54.00	NTSC	–1.25				
3	60.00	NTSC	–1.25				
4	66.00	NTSC	–1.25				
1	72.00	NTSC	–1.25				
5	78.00	NTSC	–1.25				
6	84.00	NTSC	–1.25				
95	90.00	NTSC	–1.25				
96	96.00	NTSC	–1.25				
97	102.01	NTSC	–1.25				
98	108.01	NTSC	–1.25				
99	114.01	NTSC	–1.25				
14	120.01	NTSC	–1.25				
15	126.01	NTSC	–1.25				
16	132.01	NTSC	–1.25				
17	138.01	NTSC	–1.25				
18	144.01	NTSC	–1.25				
19	150.01	NTSC	–1.25				
20	156.01	NTSC	–1.25				
21	162.01	NTSC	–1.25				
22	168.01	NTSC	–1.25				
7	174.01	NTSC	–1.25				
8	180.01	NTSC	–1.25				
9	186.01	NTSC	–1.25				
10	192.01	NTSC	–1.25				
11	198.01	NTSC	–1.25				
12	204.01	NTSC	–1.25				

CATV–HRC channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
13	210.01	NTSC	–1.25	____	________	________	________
23	216.01	NTSC	–1.25	____	________	________	________
24	222.01	NTSC	–1.25	____	________	________	________
25	228.01	NTSC	–1.25	____	________	________	________
26	234.01	NTSC	–1.25	____	________	________	________
27	240.01	NTSC	–1.25	____	________	________	________
28	246.01	NTSC	–1.25	____	________	________	________
29	252.01	NTSC	–1.25	____	________	________	________
30	258.01	NTSC	–1.25	____	________	________	________
31	264.01	NTSC	–1.25	____	________	________	________
32	270.01	NTSC	–1.25	____	________	________	________
33	276.01	NTSC	–1.25	____	________	________	________
34	282.01	NTSC	–1.25	____	________	________	________
35	288.01	NTSC	–1.25	____	________	________	________
36	294.01	NTSC	–1.25	____	________	________	________
37	300.01	NTSC	–1.25	____	________	________	________
38	306.02	NTSC	–1.25	____	________	________	________
39	312.02	NTSC	–1.25	____	________	________	________
40	318.02	NTSC	–1.25	____	________	________	________
41	324.02	NTSC	–1.25	____	________	________	________
42	330.02	NTSC	–1.25	____	________	________	________
43	336.02	NTSC	–1.25	____	________	________	________
44	342.02	NTSC	–1.25	____	________	________	________
45	348.02	NTSC	–1.25	____	________	________	________
46	354.02	NTSC	–1.25	____	________	________	________
47	360.02	NTSC	–1.25	____	________	________	________
48	366.02	NTSC	–1.25	____	________	________	________
49	372.02	NTSC	–1.25	____	________	________	________
50	378.02	NTSC	–1.25	____	________	________	________
51	384.02	NTSC	–1.25	____	________	________	________
52	390.02	NTSC	–1.25	____	________	________	________
53	396.02	NTSC	–1.25	____	________	________	________
54	402.02	NTSC	–1.25	____	________	________	________
55	408.02	NTSC	–1.25	____	________	________	________

CATV–HRC channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
56	414.02	NTSC	–1.25				
57	420.02	NTSC	–1.25				
58	426.02	NTSC	–1.25				
59	432.02	NTSC	–1.25				
60	438.02	NTSC	–1.25				
61	444.02	NTSC	–1.25				
62	450.02	NTSC	–1.25				
63	456.02	NTSC	–1.25				
64	462.02	NTSC	–1.25				
65	468.02	NTSC	–1.25				
66	474.02	NTSC	–1.25				
67	480.02	NTSC	–1.25				
68	486.02	NTSC	–1.25				
69	492.02	NTSC	–1.25				
70	498.02	NTSC	–1.25				
71	504.02	NTSC	–1.25				
72	510.03	NTSC	–1.25				
73	516.03	NTSC	–1.25				
74	522.03	NTSC	–1.25				
75	528.03	NTSC	–1.25				
76	534.03	NTSC	–1.25				
77	540.03	NTSC	–1.25				
78	546.03	NTSC	–1.25				
79	552.03	NTSC	–1.25				
80	558.03	NTSC	–1.25				
81	564.03	NTSC	–1.25				
82	570.03	NTSC	–1.25				
3	576.03	NTSC	–1.25				
84	582.03	NTSC	–1.25				
85	588.03	NTSC	–1.25				
86	594.03	NTSC	–1.25				
87	600.03	NTSC	–1.25				
88	606.03	NTSC	–1.25				
89	612.03	NTSC	–1.25				

CATV–HRC channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
90	618.03	NTSC	–1.25	____	________	________	________
91	624.03	NTSC	–1.25	____	________	________	________
92	630.03	NTSC	–1.25	____	________	________	________
93	636.03	NTSC	–1.25	____	________	________	________
94	642.03	NTSC	–1.25	____	________	________	________

Table A–5: CATV–IRC channel table

Editable Fields – Defaults			
Amplitude Offset: 0.0 dB	Scrambled: No	Dwell Time: Short	Skip: No
Fixed Fields			
Aural Offset: 4.5 MHz	Second Aural Offset: None	C/N Bandwidth: 4.0 MHz	

CATV–IRC channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
2	55.25	NTSC	–1.25	____	________	________	________
3	61.25	NTSC	–1.25	____	________	________	________
4	67.25	NTSC	–1.25	____	________	________	________
5	79.25	NTSC	–1.25	____	________	________	________
6	85.25	NTSC	–1.25	____	________	________	________
95	91.25	NTSC	–1.25	____	________	________	________
96	97.25	NTSC	–1.25	____	________	________	________
97	103.25	NTSC	–1.25	____	________	________	________
98	109.25	NTSC	–1.25	____	________	________	________
99	115.25	NTSC	–1.25	____	________	________	________
14	121.25	NTSC	–1.25	____	________	________	________
15	127.25	NTSC	–1.25	____	________	________	________
16	133.25	NTSC	–1.25	____	________	________	________
17	139.25	NTSC	–1.25	____	________	________	________
18	145.25	NTSC	–1.25	____	________	________	________
19	151.25	NTSC	–1.25	____	________	________	________
20	157.25	NTSC	–1.25	____	________	________	________
21	163.25	NTSC	–1.25	____	________	________	________
22	169.25	NTSC	–1.25	____	________	________	________
7	175.25	NTSC	–1.25	____	________	________	________
8	181.25	NTSC	–1.25	____	________	________	________
9	187.25	NTSC	–1.25	____	________	________	________
10	193.25	NTSC	–1.25	____	________	________	________
11	199.25	NTSC	–1.25	____	________	________	________
12	205.25	NTSC	–1.25	____	________	________	________
13	211.25	NTSC	–1.25	____	________	________	________

CATV–IRC channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
23	217.25	NTSC	–1.25	____	________	________	________
24	223.25	NTSC	–1.25	____	________	________	________
25	229.25	NTSC	–1.25	____	________	________	________
26	235.25	NTSC	–1.25	____	________	________	________
27	241.25	NTSC	–1.25	____	________	________	________
28	247.25	NTSC	–1.25	____	________	________	________
29	253.25	NTSC	–1.25	____	________	________	________
30	259.25	NTSC	–1.25	____	________	________	________
31	265.25	NTSC	–1.25	____	________	________	________
32	271.25	NTSC	–1.25	____	________	________	________
33	277.25	NTSC	–1.25	____	________	________	________
34	283.25	NTSC	–1.25	____	________	________	________
35	289.25	NTSC	–1.25	____	________	________	________
36	295.25	NTSC	–1.25	____	________	________	________
37	301.25	NTSC	–1.25	____	________	________	________
38	307.25	NTSC	–1.25	____	________	________	________
39	313.25	NTSC	–1.25	____	________	________	________
40	319.25	NTSC	–1.25	____	________	________	________
41	325.25	NTSC	–1.25	____	________	________	________
42	331.25	NTSC	–1.25	____	________	________	________
43	337.25	NTSC	–1.25	____	________	________	________
44	343.25	NTSC	–1.25	____	________	________	________
45	349.25	NTSC	–1.25	____	________	________	________
46	355.25	NTSC	–1.25	____	________	________	________
47	361.25	NTSC	–1.25	____	________	________	________
48	367.25	NTSC	–1.25	____	________	________	________
49	373.25	NTSC	–1.25	____	________	________	________
50	379.25	NTSC	–1.25	____	________	________	________
51	385.25	NTSC	–1.25	____	________	________	________
52	391.25	NTSC	–1.25	____	________	________	________
53	397.25	NTSC	–1.25	____	________	________	________
54	403.25	NTSC	–1.25	____	________	________	________
55	409.25	NTSC	–1.25	____	________	________	________
56	415.25	NTSC	–1.25	____	________	________	________

CATV–IRC channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
57	421.25	NTSC	–1.25	____	________	________	________
58	427.25	NTSC	–1.25	____	________	________	________
59	433.25	NTSC	–1.25	____	________	________	________
60	439.25	NTSC	–1.25	____	________	________	________
61	445.25	NTSC	–1.25	____	________	________	________
62	451.25	NTSC	–1.25	____	________	________	________
63	457.25	NTSC	–1.25	____	________	________	________
64	463.25	NTSC	–1.25	____	________	________	________
65	469.25	NTSC	–1.25	____	________	________	________
66	475.25	NTSC	–1.25	____	________	________	________
67	481.25	NTSC	–1.25	____	________	________	________
68	487.25	NTSC	–1.25	____	________	________	________
69	493.25	NTSC	–1.25	____	________	________	________
70	499.25	NTSC	–1.25	____	________	________	________
71	505.25	NTSC	–1.25	____	________	________	________
72	511.25	NTSC	–1.25	____	________	________	________
73	517.25	NTSC	–1.25	____	________	________	________
74	523.25	NTSC	–1.25	____	________	________	________
75	529.25	NTSC	–1.25	____	________	________	________
76	535.25	NTSC	–1.25	____	________	________	________
77	541.25	NTSC	–1.25	____	________	________	________
78	547.25	NTSC	–1.25	____	________	________	________
79	553.25	NTSC	–1.25	____	________	________	________
80	559.25	NTSC	–1.25	____	________	________	________
81	565.25	NTSC	–1.25	____	________	________	________
82	571.25	NTSC	–1.25	____	________	________	________
83	577.25	NTSC	–1.25	____	________	________	________
84	583.25	NTSC	–1.25	____	________	________	________
85	589.25	NTSC	–1.25	____	________	________	________
86	595.25	NTSC	–1.25	____	________	________	________
87	601.25	NTSC	–1.25	____	________	________	________
88	607.25	NTSC	–1.25	____	________	________	________
89	613.25	NTSC	–1.25	____	________	________	________
90	619.25	NTSC	–1.25	____	________	________	________

CATV–IRC channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
91	625.25	NTSC	–1.25	____	________	________	________
92	631.25	NTSC	–1.25	____	________	________	________
93	637.25	NTSC	–1.25	____	________	________	________
94	643.25	NTSC	–1.25	____	________	________	________

Table A–6: China–DK channel table

Editable Fields – Defaults
Amplitude Offset: 0.0 dB Scrambled: No Dwell Time: Short Skip: No

Fixed Fields
Aural Offset: 6.5 MHz Second Aural Offset: None C/N Bandwidth: 6.0 MHz

China–DK channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
101	49.75	PAL	–1.25				
102	57.75	PAL	–1.25				
103	65.75	PAL	–1.25				
104	77.25	PAL	–1.25				
105	85.25	PAL	–1.25				
1	112.25	PAL	–1.25				
2	120.25	PAL	–1.25				
3	128.25	PAL	–1.25				
4	136.25	PAL	–1.25				
5	144.25	PAL	–1.25				
6	152.25	PAL	–1.25				
7	160.25	PAL	–1.25				
106	168.25	PAL	–1.25				
107	176.25	PAL	–1.25				
108	184.25	PAL	–1.25				
109	192.25	PAL	–1.25				
110	200.25	PAL	–1.25				
111	208.25	PAL	–1.25				
112	216.25	PAL	–1.25				
8	224.25	PAL	–1.25				
9	232.25	PAL	–1.25				
10	240.25	PAL	–1.25				
11	248.25	PAL	–1.25				
12	256.25	PAL	–1.25				
13	264.25	PAL	–1.25				
14	272.25	PAL	–1.25				

China–DK channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
15	280.25	PAL	–1.25	____	________	________	________
16	288.25	PAL	–1.25	____	________	________	________
17	296.25	PAL	–1.25	____	________	________	________
18	304.25	PAL	–1.25	____	________	________	________
19	312.25	PAL	–1.25	____	________	________	________
20	320.25	PAL	–1.25	____	________	________	________
21	328.25	PAL	–1.25	____	________	________	________
22	336.25	PAL	–1.25	____	________	________	________
23	344.25	PAL	–1.25	____	________	________	________
24	352.25	PAL	–1.25	____	________	________	________
25	360.25	PAL	–1.25	____	________	________	________
26	368.25	PAL	–1.25	____	________	________	________
27	376.25	PAL	–1.25	____	________	________	________
28	384.25	PAL	–1.25	____	________	________	________
29	392.25	PAL	–1.25	____	________	________	________
30	400.25	PAL	–1.25	____	________	________	________
31	408.25	PAL	–1.25	____	________	________	________
32	416.25	PAL	–1.25	____	________	________	________
33	424.25	PAL	–1.25	____	________	________	________
34	432.25	PAL	–1.25	____	________	________	________
35	440.25	PAL	–1.25	____	________	________	________

Table A–7: Europe–BG channel table

Editable Fields – Defaults
Amplitude Offset: 0.0 dB   Scrambled: No   Dwell Time: Short   Skip: No

Fixed Fields
Aural Offset: 5.5 MHz   Second Aural Offset: None   C/N Bandwidth: 5.0 MHz

Europe–BG channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
2	48.25	PAL	–1.25				
3	55.25	PAL	–1.25				
4	62.25	PAL	–1.25				
81	105.25	PAL	–1.25				
82	112.25	PAL	–1.25				
83	119.25	PAL	–1.25				
84	126.25	PAL	–1.25				
85	133.25	PAL	–1.25				
86	140.25	PAL	–1.25				
87	147.25	PAL	–1.25				
88	154.25	PAL	–1.25				
89	161.25	PAL	–1.25				
90	168.25	PAL	–1.25				
5	175.25	PAL	–1.25				
6	182.25	PAL	–1.25				
7	189.25	PAL	–1.25				
8	196.25	PAL	–1.25				
9	203.25	PAL	–1.25				
10	210.25	PAL	–1.25				
11	217.25	PAL	–1.25				
12	224.25	PAL	–1.25				
91	231.25	PAL	–1.25				
92	238.25	PAL	–1.25				
93	245.25	PAL	–1.25				
94	252.25	PAL	–1.25				
95	259.25	PAL	–1.25				

Europe–BG channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
96	266.25	PAL	–1.25				
97	273.25	PAL	–1.25				
98	280.25	PAL	–1.25				
99	287.25	PAL	–1.25				
100	294.25	PAL	–1.25				
21	471.25	PAL	–1.25				
22	479.25	PAL	–1.25				
23	487.25	PAL	–1.25				
24	495.25	PAL	–1.25				
25	503.25	PAL	–1.25				
26	511.25	PAL	–1.25				
27	519.25	PAL	–1.25				
28	527.25	PAL	–1.25				
29	535.25	PAL	–1.25				
30	543.25	PAL	–1.25				
31	551.25	PAL	–1.25				
32	559.25	PAL	–1.25				
33	567.25	PAL	–1.25				
34	575.25	PAL	–1.25				
35	583.25	PAL	–1.25				
36	591.25	PAL	–1.25				
37	599.25	PAL	–1.25				
38	607.25	PAL	–1.25				
39	615.25	PAL	–1.25				
40	623.25	PAL	–1.25				
41	631.25	PAL	–1.25				
42	639.25	PAL	–1.25				
43	647.25	PAL	–1.25				
44	655.25	PAL	–1.25				
45	663.25	PAL	–1.25				
46	671.25	PAL	–1.25				
47	679.25	PAL	–1.25				
48	687.25	PAL	–1.25				
49	695.25	PAL	–1.25				

Europe–BG channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
50	703.25	PAL	–1.25	____	________	________	________
51	711.25	PAL	–1.25	____	________	________	________
52	719.25	PAL	–1.25	____	________	________	________
53	727.25	PAL	–1.25	____	________	________	________
54	735.25	PAL	–1.25	____	________	________	________
55	743.25	PAL	–1.25	____	________	________	________
56	751.25	PAL	–1.25	____	________	________	________
57	759.25	PAL	–1.25	____	________	________	________
58	767.25	PAL	–1.25	____	________	________	________
59	775.25	PAL	–1.25	____	________	________	________
60	783.25	PAL	–1.25	____	________	________	________
61	791.25	PAL	–1.25	____	________	________	________
62	799.25	PAL	–1.25	____	________	________	________
63	807.25	PAL	–1.25	____	________	________	________
64	815.25	PAL	–1.25	____	________	________	________
65	823.25	PAL	–1.25	____	________	________	________
66	831.25	PAL	–1.25	____	________	________	________
67	839.25	PAL	–1.25	____	________	________	________
68	847.25	PAL	–1..25	____	________	________	________

Table A–8: Europe–DK channel table

Editable Fields – Defaults

Amplitude Offset: 0.0 dB   Scrambled: No   Dwell Time: Short   Skip: No

Fixed Fields

Aural Offset: 6.5 MHz   Second Aural Offset: None   C/N Bandwidth: 6.0 MHz

Europe–DK channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
101	49.75	PAL	–1.25				
102	59.25	PAL	–1.25				
103	77.25	PAL	–1.25				
104	85.25	PAL	–1.25				
105	93.25	PAL	–1.25				
1	111.25	PAL	–1.25				
2	119.25	PAL	–1.25				
3	127.25	PAL	–1.25				
4	135.25	PAL	–1.25				
5	143.25	PAL	–1.25				
6	151.25	PAL	–1.25				
7	159.25	PAL	–1.25				
8	167.25	PAL	–1.25				
106	175.25	PAL	–1.25				
107	183.25	PAL	–1.25				
108	191.25	PAL	–1.25				
109	199.25	PAL	–1.25				
110	207.25	PAL	–1.25				
111	215.25	PAL	–1.25				
112	223.25	PAL	–1.25				
9	231.25	PAL	–1.25				
10	239.25	PAL	–1.25				
11	247.25	PAL	–1.25				
12	255.25	PAL	–1.25				
13	263.25	PAL	–1.25				
14	271.25	PAL	–1.25				

Europe–DK channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
15	279.25	PAL	–1.25	____	________	________	________
16	287.25	PAL	–1.25	____	________	________	________
17	295.25	PAL	–1.25	____	________	________	________
18	303.25	PAL	–1.25	____	________	________	________
19	311.25	PAL	–1.25	____	________	________	________
20	319.25	PAL	–1.25	____	________	________	________
21	327.25	PAL	–1.25	____	________	________	________
22	335.25	PAL	–1.25	____	________	________	________
23	343.25	PAL	–1.25	____	________	________	________
24	351.25	PAL	–1.25	____	________	________	________
25	359.25	PAL	–1.25	____	________	________	________
26	367.25	PAL	–1.25	____	________	________	________
27	375.25	PAL	–1.25	____	________	________	________
28	383.25	PAL	–1.25	____	________	________	________
29	391.25	PAL	–1.25	____	________	________	________
30	399.25	PAL	–1.25	____	________	________	________
31	407.25	PAL	–1.25	____	________	________	________
32	415.25	PAL	–1.25	____	________	________	________
33	423.25	PAL	–1.25	____	________	________	________
34	431.25	PAL	–1.25	____	________	________	________
35	439.25	PAL	–1.25	____	________	________	________
36	447.25	PAL	–1.25	____	________	________	________
37	455.25	PAL	–1.25	____	________	________	________
38	463.25	PAL	–1.25	____	________	________	________
121	471.25	PAL	–1.25	____	________	________	________
122	479.25	PAL	–1.25	____	________	________	________
123	487.25	PAL	–1.25	____	________	________	________
124	495.25	PAL	–1.25	____	________	________	________
125	503.25	PAL	–1.25	____	________	________	________
126	511.25	PAL	–1.25	____	________	________	________
127	519.25	PAL	–1.25	____	________	________	________
128	527.25	PAL	–1.25	____	________	________	________
129	535.25	PAL	–1.25	____	________	________	________
130	543.25	PAL	–1.25	____	________	________	________

Europe–DK channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
131	551.25	PAL	–1.25				
132	559.25	PAL	–1.25				
133	567.25	PAL	–1.25				
134	575.25	PAL	–1.25				
135	583.25	PAL	–1.25				
136	591.25	PAL	–1.25				
137	599.25	PAL	–1.25				
138	607.25	PAL	–1.25				
139	615.25	PAL	–1.25				
140	623.25	PAL	–1.25				
141	631.25	PAL	–1.25				
142	639.25	PAL	–1.25				
143	647.25	PAL	–1.25				
144	655.25	PAL	–1.25				
145	663.25	PAL	–1.25				
146	671.25	PAL	–1.25				
147	679.25	PAL	–1.25				
148	687.25	PAL	–1.25				
149	695.25	PAL	–1.25				
150	703.25	PAL	–1.25				
151	711.25	PAL	–1.25				
152	719.25	PAL	–1.25				
153	727.25	PAL	–1.25				
154	735.25	PAL	–1.25				
155	743.25	PAL	–1.25				
156	751.25	PAL	–1.25				
157	759.25	PAL	–1.25				
158	767.25	PAL	–1.25				
159	775.25	PAL	–1.25				
160	783.25	PAL	–1.25				
161	791.25	PAL	–1.25				
162	799.25	PAL	–1.25				
163	807.25	PAL	–1.25				
164	815.25	PAL	–1.25				

Europe–DK channel table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
165	823.25	PAL	–1.25	____	__________	___________	__________
166	831.25	PAL	–1.25	____	__________	___________	__________
167	839.25	PAL	–1.25	____	__________	___________	__________
168	847.25	PAL	–1.25	____	__________	___________	__________
169	855.25	PAL	–1.25	____	__________	___________	__________

Table A–9: Europe–I channel table

Editable Fields – Defaults
Amplitude Offset: 0.0 dB   Scrambled: No   Dwell Time: Short   Skip: No

Fixed Fields
Aural Offset: 6.0 MHz   Second Aural Offset: None   C/N Bandwidth: 5.5 MHz

Europe–I Channel Table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
21	471.25	PAL	–1.25				
22	479.25	PAL	–1.25				
23	487.25	PAL	–1.25				
24	495.25	PAL	–1.25				
25	503.25	PAL	–1.25				
26	511.25	PAL	–1.25				
27	519.25	PAL	–1.25				
28	527.25	PAL	–1.25				
29	535.25	PAL	–1.25				
30	543.25	PAL	–1.25				
31	551.25	PAL	–1.25				
32	559.25	PAL	–1.25				
33	567.25	PAL	–1.25				
34	575.25	PAL	–1.25				
35	583.25	PAL	–1.25				
36	591.25	PAL	–1.25				
37	599.25	PAL	–1.25				
38	607.25	PAL	–1.25				
39	615.25	PAL	–1.25				
40	623.25	PAL	–1.25				
41	631.25	PAL	–1.25				
42	639.25	PAL	–1.25				
43	647.25	PAL	–1.25				
44	655.25	PAL	–1.25				
45	663.25	PAL	–1.25				
46	671.25	PAL	–1.25				

Europe–I Channel Table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
47	679.25	PAL	–1.25	____	________	________	________
48	687.25	PAL	–1.25	____	________	________	________
49	695.25	PAL	–1.25	____	________	________	________
50	703.25	PAL	–1.25	____	________	________	________
51	711.25	PAL	–1.25	____	________	________	________
52	719.25	PAL	–1.25	____	________	________	________
53	727.25	PAL	–1.25	____	________	________	________
54	735.25	PAL	–1.25	____	________	________	________
55	743.25	PAL	–1.25	____	________	________	________
56	751.25	PAL	–1.25	____	________	________	________
57	759.25	PAL	–1.25	____	________	________	________
58	767.25	PAL	–1.25	____	________	________	________
59	775.25	PAL	–1.25	____	________	________	________
60	783.25	PAL	–1.25	____	________	________	________
61	791.25	PAL	–1.25	____	________	________	________
62	799.25	PAL	–1.25	____	________	________	________
63	807.25	PAL	–1.25	____	________	________	________
64	815.25	PAL	–1.25	____	________	________	________
65	823.25	PAL	–1.25	____	________	________	________
66	831.25	PAL	–1.25	____	________	________	________
67	839.25	PAL	–1.25	____	________	________	________
68	847.25	PAL	–1.25	____	________	________	________

Table A–10: France–L channel table

Editable Fields – Defaults			
Skip: No	Scrambled: No	Dwell Time: Short if DIGITAL Dwell Time: Long if SECAM	Amplitude Offset: 0.0 dB
Fixed Fields			
Aural Offset: 6.5 MHz	Second Aural Offset: None	C/N Bandwidth: 6.0 MHz	

France–L Channel Table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
120	120.00	SECAM	–1.25	____	________	________	________
128	128.00	SECAM	–1.25	____	________	________	________
136	136.00	SECAM	–1.25	____	________	________	________
144	144.00	SECAM	–1.25	____	________	________	________
160	160.00	SECAM	–1.25	____	________	________	________
168	168.00	SECAM	–1.25	____	________	________	________
5	176.00	SECAM	–1.25	____	________	________	________
6	184.00	SECAM	–1.25	____	________	________	________
7	192.00	SECAM	–1.25	____	________	________	________
8	200.00	SECAM	–1.25	____	________	________	________
9	208.00	SECAM	–1.25	____	________	________	________
10	216.00	SECAM	–1.25	____	________	________	________
224	224.00	SECAM	–1.25	____	________	________	________
232	232.00	SECAM	–1.25	____	________	________	________
240	240.00	SECAM	–1.25	____	________	________	________
248	248.00	DIGITAL	–1.25	____	________	________	________
256	256.00	DIGITAL	–1.25	____	________	________	________
264	264.00	DIGITAL	–1.25	____	________	________	________
272	272.00	DIGITAL	–1.25	____	________	________	________
280	280.00	DIGITAL	–1.25	____	________	________	________
288	288.00	DIGITAL	–1.25	____	________	________	________
303	303.00	DIGITAL	–1.25	____	________	________	________
315	315.00	DIGITAL	–1.25	____	________	________	________
327	327.00	DIGITAL	–1.25	____	________	________	________
339	339.00	SECAM	–1.25	____	________	________	________
351	351.00	SECAM	–1.25	____	________	________	________

France–L Channel Table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
363	363.00	SECAM	–1.25	____	________	________	________
375	375.00	SECAM	–1.25	____	________	________	________
387	387.00	SECAM	–1.25	____	________	________	________
399	399.00	SECAM	–1.25	____	________	________	________
420	420.00	SECAM	–1.25	____	________	________	________
21	471.25	SECAM	–1.25	____	________	________	________
22	479.25	SECAM	–1.25	____	________	________	________
23	487.25	SECAM	–1.25	____	________	________	________
24	495.25	SECAM	–1.25	____	________	________	________
25	503.25	SECAM	–1.25	____	________	________	________
26	511.25	SECAM	–1.25	____	________	________	________
27	519.25	SECAM	–1.25	____	________	________	________
28	527.25	SECAM	–1.25	____	________	________	________
29	535.25	SECAM	–1.25	____	________	________	________
30	543.25	SECAM	–1.25	____	________	________	________
31	551.25	SECAM	–1.25	____	________	________	________
32	559.25	SECAM	–1.25	____	________	________	________
33	567.25	SECAM	–1.25	____	________	________	________
34	575.25	SECAM	–1.25	____	________	________	________
35	583.25	SECAM	–1.25	____	________	________	________
36	591.25	SECAM	–1.25	____	________	________	________
37	599.25	SECAM	–1.25	____	________	________	________
38	607.25	SECAM	–1.25	____	________	________	________
39	615.25	SECAM	–1.25	____	________	________	________
40	623.25	SECAM	–1.25	____	________	________	________
41	631.25	SECAM	–1.25	____	________	________	________
42	639.25	SECAM	–1.25	____	________	________	________
43	647.25	SECAM	–1.25	____	________	________	________
44	655.25	SECAM	–1.25	____	________	________	________
45	663.25	SECAM	–1.25	____	________	________	________
46	671.25	SECAM	–1.25	____	________	________	________
47	679.25	SECAM	–1.25	____	________	________	________
48	687.25	SECAM	–1.25	____	________	________	________
49	695.25	SECAM	–1.25	____	________	________	________

France–L Channel Table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
50	703.25	SECAM	–1.25	____	________	________	________
51	711.25	SECAM	–1.25	____	________	________	________
52	719.25	SECAM	–1.25	____	________	________	________
53	727.25	SECAM	–1.25	____	________	________	________
54	735.25	SECAM	–1.25	____	________	________	________
55	743.25	SECAM	–1.25	____	________	________	________
56	751.25	SECAM	–1.25	____	________	________	________
57	759.25	SECAM	–1.25	____	________	________	________
58	767.25	SECAM	–1.25	____	________	________	________
59	775.25	SECAM	–1.25	____	________	________	________
60	783.25	SECAM	–1.25	____	________	________	________
61	791.25	SECAM	–1.25	____	________	________	________
62	799.25	SECAM	–1.25	____	________	________	________
63	807.25	SECAM	–1.25	____	________	________	________
64	815.25	SECAM	–1.25	____	________	________	________
65	823.25	SECAM	–1.25	____	________	________	________
66	831.25	SECAM	–1.25	____	________	________	________
67	839.25	SECAM	–1.25	____	________	________	________
68	847.25	SECAM	–1.25	____	________	________	________
69	855.25	SECAM	–1.25	____	________	________	________

Table A–11: Japan–M channel table

Editable Fields – Defaults
Amplitude Offset: 0.0 dB   Scrambled: No   Dwell Time: Short   Skip: No

Fixed Fields
Aural Offset: 6.5 MHz   Second Aural Offset: None   C/N Bandwidth: 6.0 MHz

Japan–M Channel Table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
1	91.25	NTSC	–1.25				
2	97.25	NTSC	–1.25				
3	103.25	NTSC	–1.25				
4	171.25	NTSC	–1.25				
5	177.25	NTSC	–1.25				
6	183.25	NTSC	–1.25				
7	189.25	NTSC	–1.25				
8	193.25	NTSC	–1.25				
9	199.25	NTSC	–1.25				
10	205.25	NTSC	–1.25				
11	211.25	NTSC	–1.25				
12	217.25	NTSC	–1.25				
13	471.25	NTSC	–1.25				
14	477.25	NTSC	–1.25				
15	483.25	NTSC	–1.25				
16	489.25	NTSC	–1.25				
17	495.25	NTSC	–1.25				
18	501.25	NTSC	–1.25				
19	507.25	NTSC	–1.25				
20	513.25	NTSC	–1.25				
21	519.25	NTSC	–1.25				
22	525.25	NTSC	–1.25				
23	531.25	NTSC	–1.25				
24	537.25	NTSC	–1.25				
25	543.25	NTSC	–1.25				
26	549.25	NTSC	–1.25				
27	555.25	NTSC	–1.25				

Japan–M Channel Table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
28	561.25	NTSC	–1.25	____	________	________	________
29	567.25	NTSC	–1.25	____	________	________	________
30	573.25	NTSC	–1.25	____	________	________	________
31	579.25	NTSC	–1.25	____	________	________	________
32	585.25	NTSC	–1.25	____	________	________	________
33	591.25	NTSC	–1.25	____	________	________	________
34	597.25	NTSC	–1.25	____	________	________	________
35	603.25	NTSC	–1.25	____	________	________	________
36	609.25	NTSC	–1.25	____	________	________	________
37	615.25	NTSC	–1.25	____	________	________	________
38	621.25	NTSC	–1.25	____	________	________	________
39	627.25	NTSC	–1.25	____	________	________	________
40	633.25	NTSC	–1.25	____	________	________	________
41	639.25	NTSC	–1.25	____	________	________	________
42	645.25	NTSC	–1.25	____	________	________	________
43	651.25	NTSC	–1.25	____	________	________	________
44	657.25	NTSC	–1.25	____	________	________	________
45	663.25	NTSC	–1.25	____	________	________	________
46	669.25	NTSC	–1.25	____	________	________	________
47	675.25	NTSC	–1.25	____	________	________	________
48	681.25	NTSC	–1.25	____	________	________	________
49	687.25	NTSC	–1.25	____	________	________	________
50	693.25	NTSC	–1.25	____	________	________	________
51	699.25	NTSC	–1.25	____	________	________	________
52	705.25	NTSC	–1.25	____	________	________	________
53	711.25	NTSC	–1.25	____	________	________	________
54	717.25	NTSC	–1.25	____	________	________	________
55	723.25	NTSC	–1.25	____	________	________	________
56	729.25	NTSC	–1.25	____	________	________	________
57	735.25	NTSC	–1.25	____	________	________	________
58	741.25	NTSC	–1.25	____	________	________	________
59	747.25	NTSC	–1.25	____	________	________	________
60	753.25	NTSC	–1.25	____	________	________	________

Japan–M Channel Table

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset
61	759.25	NTSC	–1.25	____	__________	__________	__________
62	765.25	NTSC	–1.25	____	__________	__________	__________

Table A–12: Custom channel table worksheet

Skip: ___ Scrambled: ____ Dwell Time: _______________ Amplitude Offset: ____

Aural Offset: ____MHz Second Aural Offset: C/N Bandwidth: ____MHz

Custom Channel Table ____

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset

Custom Channel Table ____

Channel Number	Frequency (MHz)	Channel Type	Channel Edge (MHz)	Skip Y/N	Scrambled Y/N	Dwell Time	Amplitude Offset

Appendix B: Remote Communications

The RFM150 has an RS-232 driver, which provides a serial binary data interchange, using a 9-pin D-type connector. The connector is configured to use a standard AT-compatible PC interconnecting cable, which is included as a standard accessory with the RFM150.

The RFM150 can communicate with another RFM150, a printer, or a computer.

Communicating with Another RFM150

Before communication can occur between two instruments, they must be configured and connected as follows:

1. Press UTIL, then select RS232. The RS232 menu will be displayed. See Figure B–1.

2. Press any function key to select the corresponding field for edit, then turn the knob to the left or right to change the setting to match the setting of the other RFM150.

3. After all fields have been edited, press ESC to exit the menu, one level at a time. The new settings will be saved.

4. Connect the supplied RS-232 cable between the source and destination instruments. Pin assignments are shown in Table B–1, and the connector location is shown in Figure B–2.

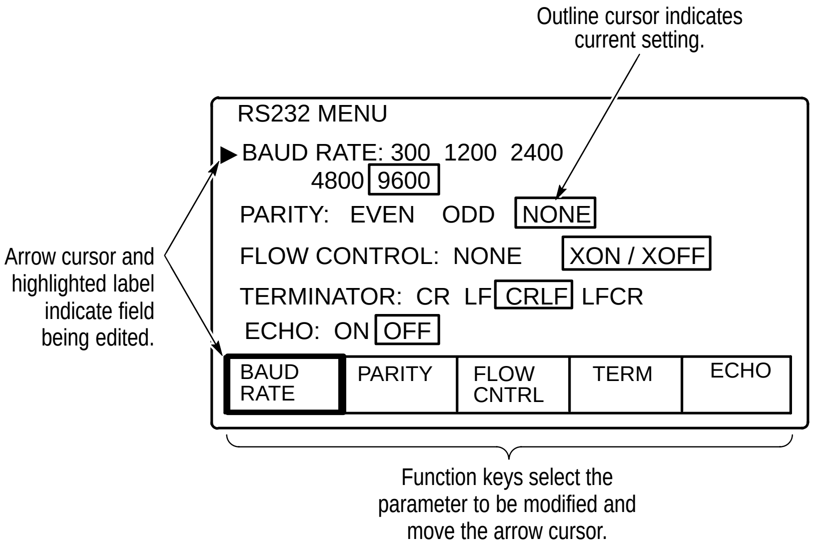

Figure B–1: RS232 menu showing factory settings

Table B–1: Pin assignments for interface port

Pin Number	Signal Name	RS-232C Name
1	Not connected	
2	RX (Receive Data)	BB
3	TX (Transmit Data)	BA
4	DTR (Data Terminal Ready)	CD
5	GND (Signal Ground)	AB
6	DSR (Data Set Ready)	CC
7	RTS (Request to Send)	CA
8	CTS (Clear to Send)	CB
9	Reserved	

5. Use the interface port as desired to import channel tables, sequences, or instrument configuration from one RFM150 to another RFM150. Instructions appear under the following topic headings: *Channel Tables* (refer to page 3–1), *Sequences* (refer to page 3–20), and *Clone Configuration* (refer to page 3–20).

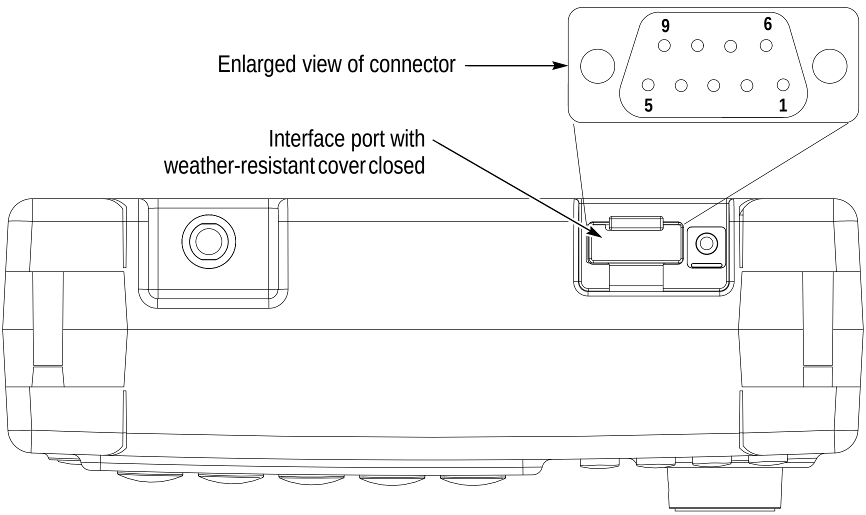

Figure B–2: Top view of RFM150, showing the interface port

Communicating with a Computer (Using the CSS150)

Using the companion CSS150 software, the following applications are possible:

- Control all front-panel functions remotely
- Import channel tables or sequences from a computer
- Download measurement results to a computer for archival or use with another application, such as a spreadsheet
- Print stored measurement results

***NOTE**. Pilot and 5 channel measurements will not be downloaded.*

The hookup and operational instructions are in the *CSS150 SignalScout Software User Manual*.

Communicating with a Printer

The RFM150 can send stored measurement results through the serial interface to a printer.

Printer Requirements

The RFM150 supports Epson FX and Epson FX compatible printers that support the following RS-232 parameters.

- SW (XON/XOFF via ^Q/^S) or HW (CTS/RTS) handshaking
- Baud rate of 9600, 4800, 2400, 1200, or 300 bits per second
- Parity mode of even, odd, or none
- 8 data bits

The RFM150 reports will be no more than 40 columns wide so that portable printers can be used. Larger printers can be used; however, the printer must support at least 40 columns.

Setting the Parameters

Configure the RFM150 as follows:

1. Press UTIL. Five soft key selections appear, as shown in Figure B–3.

CONFIG	CHAN TABLE	CLOCK	RS232	PRINTER

Figure B–3: UTIL menu

2. Select PRINTER. The PRINTER menu will be displayed. The factory default settings are shown in Figure B–4.
3. Press any function key to select the corresponding field for edit, then turn the knob to the left or right to change the setting to match your printer.

4. After all fields have been edited, press ESC to exit the menu, one level at a time. The new settings will be saved.

The RFM150 will automatically use these printer settings when a print job is active. (If no print job is active, the RFM150 communication mode is determined by the RS232 menu settings.)

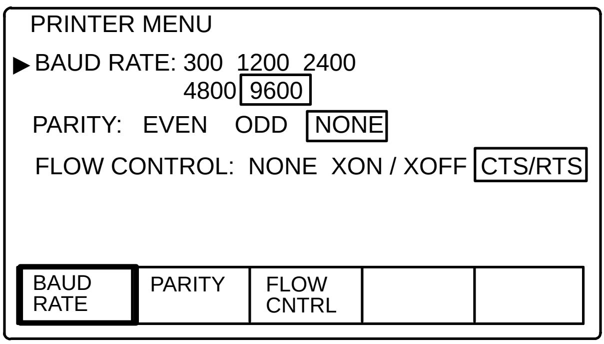

Figure B–4: RS232 menu showing factory settings

Hookup

Connect the supplied 9 pin RS-232 cable between the RFM150 Interface port and the printer port. If your printer has a 25-pin serial port, use a 9-pin to 25-pin adapter. Pin assignments are shown in Table B–1, and the connector location is shown in Figure B–2.

Printing Stored Results

Instructions for printing stored results are given in the *Tutorial* on page 1–22. More information about the print function appears in the *Reference* section, on pages 3–17 and 3–25.

Appendix C: Printed Report Formats

The RFM150 can send printed reports directly to a portable printer or a traditional line printer.

This manual section describes the printed reports. For more information on printer types and hookups, refer to Appendix B.

Line Length

To ensure compatibility with portable, battery-operated printers, line length is limited to 40 characters.

Header

Each print report begins with a header, which is preceded and followed by a horizontal line of 40 dash characters. The header contains three lines for a stand-alone measurement or four lines for a measurement that is part of a sequence. Header information includes the result type, channel table name, date and time of measurement, temperature, site name, and sequence information (if applicable).

To view the information that will be printed in the header, press the following sequence: STORE–RSLTS MENU–VIEW–STORED INFO. To ensure that the correct temperature and site name will be printed, enter this information in the Store menu before you take the measurement. If you have not entered a temperature, the temperature field will be replaced by the text “???”. If you have not entered a site name, the site name field will be left blank.

Measurement Information

Measurement information follows the header. To view this information on screen, press STORE, then select RSLTS MENU and VIEW.

When graphics are involved, the printed report will display the measurement information in a textual format.

Under certain conditions, an error or over range condition may occur while making a measurement. The print report replaces the measurement value with the text “ERR” or “OVER”.

1 Channel Measurement

A sample 1 Channel measurement report is shown in Figure C–1.

The report for a dual aural analog channel stored measurement contains the following information. The report for a single aural analog channel stored measurement contains all except numbers 8 and 9.

1. Channel number and frequency
2. Channel type (in this case NTSC, PAL, SECAM)
3. Visual level and its measurement results
4. Probe loss offset
5. Visual carrier amplitude offset indicator (optional asterisk after visual level)
6. First aural carrier difference (always in dBc units)
7. First aural carrier frequency offset
8. Second aural carrier difference (always in dBc units)
9. Second aural carrier frequency offset

The report for a digital channel contains the following information:

1. Channel number and frequency
2. Channel type (in this case, DIGITAL)
3. Digital level and its measurement units
4. Probe loss offset
5. Digital carrier amplitude offset indicator (optional asterisk after digital level)
6. Normalization bandwidth

```
----------------------------------------
Result Type:   1 CHAN    Ch Tbl:CATV-STD
22-May-96  14:14    72F
Site: Tektronix
----------------------------------------
Chan   2     55.25MHz              NTSC
Visual:     +35.2dBmV   (offset  +0.0dB)
Aural:      -10.6dBC    (+4.5MHz)
```

Figure C–1: Printed report of 1 Channel measurement (single aural analog channel)

Pilots Measurement

A sample Pilots measurement print report is shown in Figure C–2. The report contains the following information:

1. Low and high pilot channel numbers and frequencies
2. Low and high pilot measured levels
3. Pilot level amplitude offset indicator (optional asterisk after level)
4. Low/high pilot delta amplitude
5. Probe loss offset

```
----------------------------------------
Result Type:   PILOTS    Ch Tbl:CATV-STD
23-MAY-96  11:24    72F
Site: Tektronix
----------------------------------------
Probe Loss:         +0.6dB
Delta Level:        -1.8dB

Low Pilot:    6    83.25MHz   +35.3dBmV
High Pilot: 159  1003.25MHz   +33.5dBmV
```

Figure C–2: Printed report of Pilots measurement

5 Channel Measurement

A sample 5 Channel measurement print report is shown in Figure C–3. The report contains the following information:

1. Channel numbers and frequencies of all five measurements
2. Measured levels of all five measurements
3. Level amplitude offset indicator (optional asterisk after each level)
4. Probe loss offset

```
----------------------------------------
Result Type:   5 CHAN    Ch Tbl:CATV-STD
23-MAY-96  11:24    72F
Site: Tektronix
----------------------------------------
Probe Loss:         +0.6dB

Chan:   2    55.25MHz     +35.2dBmV
Chan:   6    83.25MHz     +34.8dBmV
Chan:  71   505.25MHz     +36.3dBmV
Chan: 159  1003.25MHz     +33.2dBmV
Chan: 170  1069.25MHz     -63.7dBmV
```

Figure C–3: Printed report of 5 Channel measurement

Meter Measurement

A sample Meter measurement print report is shown in Figure C–4. The report contains the following information:

1. Measurement frequency
2. Measured level
3. Level amplitude offset indicator (optional asterisk after level)
4. Reference level
5. Probe loss offset
6. Measurement resolution bandwidth

```
----------------------------------------
Result Type:    METER    Ch Tbl:CATV-STD
22-MAY-96  14:15    72F
Site:
----------------------------------------
Frequency:                     55.25MHz
Level:                        +35.2dBmV
Reference Level:              +50.0dBmV
Probe Loss:                     +0.0dB
Resolution BW:                 300kHz
```

Figure C–4: Printed report of Meter measurement

All Channel Measurement

A sample All Channel measurement print report is shown in Figure C–5. The report contains the following information:

1. Channel number and frequency of each marker
2. Measured level and measurement units at each marker
3. Marker measured level amplitude offset indicator (optional asterisk after level) for each marker
4. Reference level
5. Probe loss offset (for all measurements)
6. Channel number and frequency of each All Channel measurement
7. Measured level and measurement units of each All Channel measurement
8. Measured level amplitude offset indicator (optional asterisk after level) for each All Channel measurement
9. Delta marker amplitude

The number of All Channel measurements in the report is dependent on the channel table. Note that skipped channels are not listed. If a marker is on a skipped channel, the marker level and delta marker amplitude fields will be blank.

```
----------------------------------------
Result Type: ALL CHAN    Ch Tbl:CATV-STD
23-MAY-96  11:23    72F
Site: Tektronix
----------------------------------------
Marker 1: Chan 159     1003.25MHz
          Level:        +33.4dBmV
Marker 2: Chan   2       55.25MHz
          Level:        +35.8dBmV
Delta Marker Amplitude:  -2.4dB
Reference Level:        +60.6dBmV
Probe Loss:              +0.6dB

Chan:   2    55.25MHz   +35.8dBmV
Chan:   3    61.25MHz   +35.7dBmV
Chan:   4    67.25MHz   +35.8dBmV
Chan:   5    77.25MHz   +35.7dBmV
Chan:   6    83.25MHz   +35.8dBmV
Chan:  95    91.25MHz   +35.6dBmV
Chan:  96    97.25MHz   +35.4dBmV
Chan:  97   103.25MHz   +35.5dBmV
Chan:  98   109.25MHz   +35.6dBmV
Chan:  99   115.25MHz   +35.5dBmV
Chan:  14   121.25MHz   +35.0dBmV
Chan:  15   127.25MHz   +35.0dBmV
Chan:  16   133.25MHz   +34.9dBmV
Chan:  17   139.25MHz   +34.6dBmV
Chan:  18   145.25MHz   +34.6dBmV
Chan:  19   151.25MHz   +34.7dBmV
Chan:  20   157.25MHz   +34.9dBmV
Chan:  21   163.25MHz   +34.3dBmV
Chan:  22   169.25MHz   +34.5dBmV
Chan:   7   175.25MHz   +34.0dBmV
Chan:   8   181.25MHz   +34.1dBmV
Chan:   9   187.25MHz   +33.8dBmV
Chan:  10   193.25MHz   +33.9dBmV
Chan:  11   199.25MHz   +33.8dBmV
Chan:  12   205.25MHz   +34.0dBmV
Chan:  13   211.25MHz   +33.8dBmV
```

Figure C–5: Partial printed report of All Channel measurement

Carrier-to-Noise Measurement

A sample analog Carrier-to-Noise measurement print report is shown in Figure C–6. The report contains the following information:

1. Channel number and frequency
2. Channel type (in this case, NTSC, PAL, or SECAM)
3. Visual level and its measurement units
4. Visual carrier amplitude offset indicator (optional asterisk after visual level)
5. Noise near noise indicator (optional “>” before C/N value)
6. Probe loss offset
7. C/N value
8. Normalization bandwidth

The report for a digital channel contains the following information.

1. Channel number and frequency
2. Channel type (in this case, DIGITAL)
3. Digital level and its measurement units
4. Digital carrier amplitude offset indicator (optional asterisk after visual level)
5. Noise near noise indicator (optional “>” before C/N value)
6. Probe loss offset
7. C/N value
8. Normalization bandwidth

```
----------------------------------------
Result Type:      C/N    Ch Tbl:CATV-STD
22-MAY-96  14:17    72F
Site: Tektronix
----------------------------------------
Chan  71    505.25MHz               NTSC
Visual:     +35.7dBmV   (offset  +0.0dB)
C/N:        +34.3dB
Normalization BW:  4.0MHz
```

Figure C–6: Printed report of Carrier-to-Noise measurement

Hum Measurement

A sample Hum measurement print report is shown in Figure C–7. The report contains the following information:

1. Channel number and frequency
2. Channel type (in this case, NTSC, PAL, or SECAM)
3. Visual level and its measurement units
4. Visual carrier amplitude offset indicator (optional asterisk after visual level)
5. Probe loss offset
6. Measured hum

```
----------------------------------------
Result Type:      HUM    Ch Tbl:CATV-STD
22-MAY-96  14:17    72F
Site:
----------------------------------------
Chan  71    505.25MHz               NTSC
Visual:     +36.1dBmV   (offset  +0.0dB)
Hum:          2.0%      (peak-peak)
```

Figure C–7: Printed report of Hum measurement

FM Deviation Measurement

A sample FM Deviation measurement print report is shown in Figure C–8. The report contains the following information:

1. Channel number and frequency
2. Channel type (in this case, NTSC, PAL, or SECAM)
3. Visual level and its measurement units
4. Visual carrier amplitude offset indicator (optional asterisk after visual level)
5. Probe loss offset
6. Measured FM deviation

```
----------------------------------------
Result Type:   FM DEV    Ch Tbl:CATV-STD
23-MAY-96  11:32    72F
Site:
----------------------------------------
Chan 159   1003.25MHz               NTSC
Visual:     +33.2dBmV   (offset  +0.6dB)
FM Dev:     +/- 1kHz    (peak)
```

Figure C–8: Printed report of FM Deviation measurement

Off-Channel Stored Measurement

A sample Off-Channel measurement print report is shown in Figure C–9. The report contains the following information:

1. Channel noted as unknown
2. Measurement frequency
3. Measured level and its measurement units
4. Probe loss offset

```
----------------------------------------
Result Type:   HUM    Ch Tbl:CATV-STD
23-MAY-96  11:32    72F
Site:
----------------------------------------
Chan ???   61.07MHz
Level:     +5.5dBmV    (offset  +0.0dB)
```

Figure C–9: Printed report of Off-Channel measurement

Spectrum Measurement

A total of 201 measurements are made in Spectrum mode. A partial Spectrum measurement print report is shown in Figure C–10. The report contains the following information:

1. Frequency of the marker
2. Measured marker level and its measurement units
3. Reference level and its measurement units
4. Span (in MHz or kHz units)
5. Resolution bandwidth (in kHz units)
6. Probe loss offset (for all measurements)
7. Frequency and amplitude level of each individual spectrum measurement

```
----------------------------------------
Result Type: SPECTRUM    Ch Tbl:CATV-STD
22-MAY-96  14:13    72F
Site:
----------------------------------------
Marker Frequency:      55.25MHz
Marker Level:         +35.2dBmV
Reference Level:      +60.0dBmV
Probe Loss:            +0.0dB
Spectrum Span:           1MHz
Spectrum RBW:          300kHz

   50.25MHz:   -9.2dBmV
   50.30MHz:   -9.2dBmV
   50.35MHz:   -9.2dBmV
   50.40MHz:   -9.2dBmV
   50.45MHz:   -9.2dBmV
   50.50MHz:   -9.2dBmV
   50.55MHz:   -9.2dBmV
   50.60MHz:   -9.2dBmV
```

Figure C–10: Partial printed report of Spectrum measurement

Sweep Measurement

The total number of measurements is dependent on the channel table. Skipped channels are not printed. If a marker is on a skipped channel, the marker level and delta marker amplitude fields will be blank.

A sample Sweep measurement print report is shown in Figure C–11. The report contains the following information:

1. Channel number, frequency, and delta amplitude level of each marker
2. Delta marker amplitude level
3. Marker peak-to-valley level
4. Center level
5. Sweep reference name
6. Marker measured level amplitude offset indicator (optional asterisk after level) for each marker
7. Probe loss offset (for all measurements)
8. Channel number and frequency of each individual sweep measurement
9. Delta amplitude level of each individual sweep measurement

```
----------------------------------------
Result Type:    SWEEP    Ch Tbl:CATV-STD
23-MAY-96  11:33    72F
Site:
----------------------------------------
Sweep Reference: ABC
Marker 1: Chan 159      1003.25MHz
         Delta Amp:       +0.5dB
Marker 2: Chan   2        55.25MHz
         Delta Amp:       +0.5dB
Delta Marker Amplitude:   +0.0dB
Center Level:             +0.0dB
Marker Peak to Valley:    +0.1dB
Probe Loss:               +0.6dB

Chan:   2    55.25MHz     +0.5dB
Chan:   3    61.25MHz     +0.5dB
Chan:   4    67.25MHz     +0.5dB
Chan:   5    77.25MHz     +0.5dB
Chan:   6    83.25MHz     +0.5dB
Chan:  95    91.25MHz     +0.5dB
Chan:  96    97.25MHz     +0.5dB
Chan:  97   103.25MHz     +0.6dB
Chan:  98   109.25MHz     +0.5dB
Chan:  99   115.25MHz     +0.6dB
Chan:  14   121.25MHz     +0.6dB
Chan:  15   127.25MHz     +0.5dB
Chan:  16   133.25MHz     +0.5dB
Chan:  17   139.25MHz     +0.5dB
Chan:  18   145.25MHz     +0.5dB
Chan:  19   151.25MHz     +0.6dB
Chan:  20   157.25MHz     +0.5dB
Chan:  21   163.25MHz     +0.6dB
Chan:  22   169.25MHz     +0.5dB
Chan:   7   175.25MHz     +0.5dB
Chan:   8   181.25MHz     +0.5dB
Chan:   9   187.25MHz     +0.6dB
Chan:  10   193.25MHz     +0.6dB
```

Figure C–11: Partial printed report of Sweep measurement

Sequence Measurements

Each measurement type within a sequence will be printed, using the same format as individual measurements. Two blank lines are inserted between each measurement, and a line is added in the header for each measurement. The header line displays the sequence repetition number.

A sample Sequence measurement print report is shown in Figure C–12.

```
----------------------------------------
Result Type:   1 CHAN    Ch Tbl:CATV-STD
22-May-96  14:14    72F
Site: Tektronix
Sequence repetition #1
----------------------------------------
Chan   2     55.25MHz              NTSC
Visual:     +35.2dBmV   (offset  +0.0dB)
Aural:      -10.6dBC    (+4.5MHz)
```

Figure C–12: Printed report of Sequence measurement

Index

Index

Numbers

A

B

C

D

E

F

G

H

I

K

L

M

S

T

U

V

Y