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CR1200R

Manual Contents

(Rev. B)

CHAPTER 1 - GENERAL INFORMATION

A general description of the CR1200R display , controls, connectors and user interfaces.

Introduction 7

Manual Overview 7

Instrument Overview 8

Front Panel Drawing 9

Connectors, controls and displays 10

CHAPTER 2 - PREPARATION FOR USE.

Instructions for unpacking, inspecting and preparing the CR1200R for use.

Introduction..... 13

Unpacking and initial inspection..... 13

Shipment Contents 13

Operator Maintenance..... 14

Power Requirements 14

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Battery Replacement 14

CHAPTER 3 - OPERATION

Step-by-step detailed operating instructions for the CR1200R are provided in depth along with information on the advanced features of the unit.

Getting Started.....15

F1 through F5 Function Keys.....15

The Escape button.....15

Checking system status.....16

I/O Connections 17

RF Input 17

AC Adapter.....17

Connecting to a Serial Printer.....18

Connecting to a Computer Serial Port 18

Setup Button functions 19

System 19

Set the Contrast.....19

Speaker on/off.....20

Backlight control 20

Automatic Power Down.....20

Set time 20

Set date.....20

Serial Port Speed 20

Serial Format 21

Site Name.....21

Channel Table Setup.....22

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Copy Channel Table 23
Editing Channel Table 24
Modulation 25
Frequency offset 25
Active 25
Auto Test 25
Invert Spectrum 25
Symbol Rate 26
FEC info 26
Measurement BW 26
Channel Presets 26
Insert and Delete Channels 27
Level Mode 28
Tuning 29
Channel Tuning 29
Frequency Tuning 29
Five Channel Presets 30
Force NTSC / DIGITAL Modulation Change 30
Measurement BW change 31
Scan Mode 31
Knob Ref 32
Knob Marker 32
Knob Scale 33
Log Data 33
Data Log 33
View Test 34

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Print Test 34

SPECTRUM / RETURN TESTING 35

Spectrum menu screen one 36

Knob Reference 36

Markers 36

Knob Span 36

Spectrum menu screen two. ..... …37

Knob Scale 37

Average/Peak detector 37

Max. Hold 37

Misc. Setups 38

Resolution BW…… ..... .38

Video BW 38

Averages 39

Measurement BW 39

Spectrum menu screen three 39

Zero Span mode 40

Time Domain 40

Knob Trigger Threshold 42

Trigger Setup 42

Sweep mode 42

Edge trigger 42

Averaging 42

Frequency domain 43

Run/Stop 43

Knob Reference 44

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Knob MKR1 and MKR2.....44
Knob Span.....44

DIGITAL 45
Force QAM Modulations.....45
FEC Testing.....46
Modulation Error Ratio.....47
FEC 48
Constellation.....48
Digital Setup.....49
Constellation samples.....50
Log Errored or Severely Err. Seconds.....50
Auto Diagnosis 50
Digital Measurements 51
Restart 51
Zoom Mode.....52
Log on/off.....52
Adaptive Equalizer 53
High Pass Filter.....54

AUTOMATIC TESTING 55
RUN ANALOG & RUN DIGITAL.....55
Auto Test Results 56
Analog Results.....56
Digital Results.....56
24 Hr. FCC Tests.....58
Enter Start Time.....58
Enter Site Name.....58

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Start Test.....59
SETUP Auto Tests 60
Remote Software 60

CHAPTER 4 - SPECIFICATIONS

Specifications.....63

CHAPTER 5 - OPTIONS AND ACCESSORIES

Options 65
Accessories.....65

CHAPTER 6 - MAINTENANCE AND SERVICE

MAINTENANCE 66
Battery Replacement 66
Cleaning 66
TROUBLESHOOTING 67
SERVICE.....67
Warranty 67
Returning Equipment 68
CONTACT Sunrise, Hukk Division 68

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CHAPTER 1

GENERAL INFORMATION

INTRODUCTION

The Hukk Engineering Model CR1200R Digital Signal Analyzer allows monitoring and testing of Quadrature Amplitude Modulation (QAM) signal transmissions as well as typical Cable TV NTSC television signals.

QAM signaling is used on broadband systems to deliver compressed digital video signals and is also used with DOCSIS compatible cable modems. The CR1200R demodulates the carrier and performs error detection on the live program data stream.

In addition, the CR1200R performs analog tests on NTSC, HRC and IRC signals, providing video and audio measurements of these signals.

The return path option allows a fully functioned spectrum analyzer display of both the forward and return path. The zero span analyzer function allows accurate measurements of return path TDMA/QPSK signals.

MANUAL OVERVIEW

This operating manual describes the physical and functional features, operation, and specifications of the Sunrise Telecom, Hukk Division Model CR1200R Digital Signal Analyzer.

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INSTRUMENT OVERVIEW

Figure 1 on page 6 shows the front panel of the Sunrise Telecom Hukk Division Model CR1200R Digital Signal Analyzer. A large liquid crystal display (LCD) indicates instrument status, signal identification, and measurement values. The controls are pressure-sensitive keypad switches with tactile feedback. A 75-ohm "F" connector accepts the RF input signal. A female DB9 connector interfaces to a computer port. A DC input accepts power from the supplied AC adapter or a 12 volt DC source. The CR1200R is packaged in a rugged weatherized, hard plastic case.



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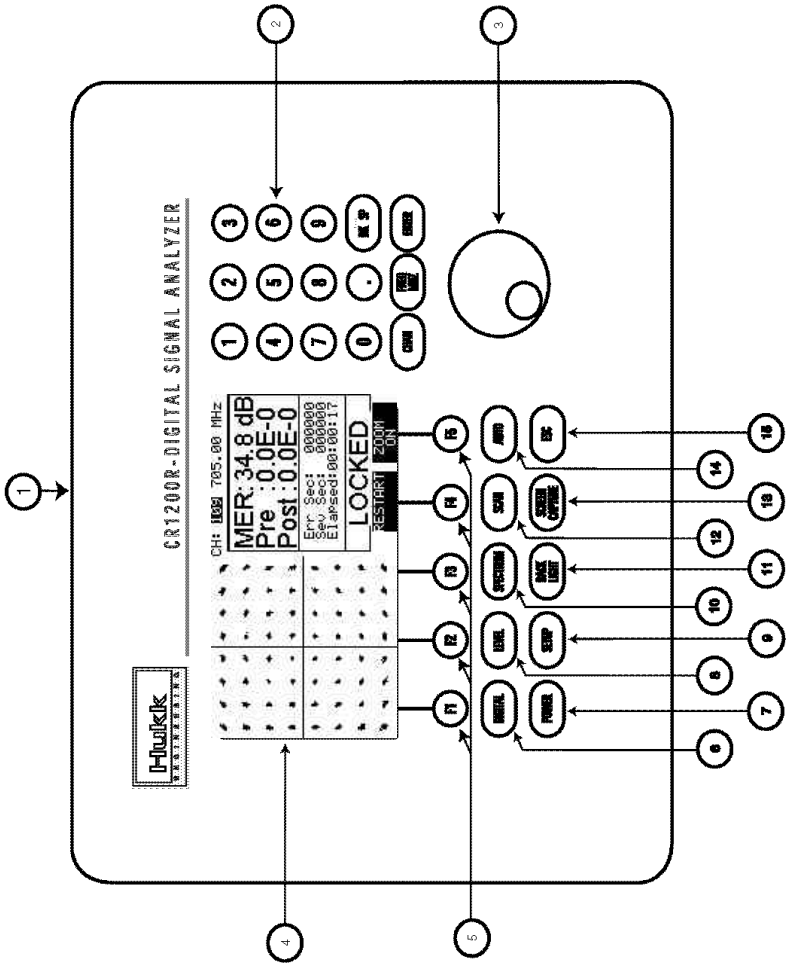


Figure 2-1

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CONNECTORS, CONTROLS, AND DISPLAYS

The following descriptions are keyed to the callout numbers in Figure 2-1. Refer to Chapter 3 *Operation* for detailed instructions on utilizing each feature.

1 I/O Section—Connections for 75-ohm "F", RS-232 printer/ computer and DC power are located on the rear panel of the unit.

2 Numeric Keypad - Programming of user functions and/or selection of carrier frequencies and channels.

3 Knob - Moves cursors across the screen and selects options within the menu.

4 Display - Backlit liquid crystal.

5 Function Keys F1 through F5 - Soft keys to perform various tests and setups per the screen display.

6 DIGITAL Button. Places the CR1200R in "Digital" mode. This mode is used for performing digital tests including bit error rate, modulation error rate, adaptive equalizer stress and constellation.

7 POWER button - Turns unit on/off.

8 LEVEL Button - Places the CR1200R in "Level" mode. In this mode the unit becomes a fully functional signal level meter which can be used to measure both analog and digital carriers.

9 SETUP Button - Takes the user to the Main Setup screen. This screen allows access to the Main System Setup screen, Channel Tables, Data logs, System Status and other system parameters.

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10 SPECTRUM Button - Places the CR1200R in "Spectrum Analyzer" mode. In this mode the unit becomes a fully functional spectrum analyzer.

11 BACKLIGHT Button. For operations in low light conditions.

12 SCAN button. Provides a graphic display of the entire system spectrum.

13 SCREEN CAPTURE. Captures current screen in memory for later review.

14 AUTO button - Takes the user to the Automatic measurement screen where parameters for automatic testing can be set. This includes visual carrier level, visual to aural carrier difference, digital level and a special setup for 24 hour FCC testing.

15 ESC Button - Escape key to cancel current test and/or move up one operation level.

NOTE: THE CR1200R IS WATER-RESISTANT WHEN THE TOP COVER IS SECURED WITH ITS BUILT-IN LATCHES AND THE PURGE KNOB NEAR THE HANDLE IS CLOSED. THE UNIT IS WEATHER RESISTANT BUT NOT WATERPROOF DURING NORMAL OPERATION WHEN THE TOP COVER IS OPEN. DO NOT IMMERSE THE UNIT IN WATER WHEN THE TOP COVER IS OPEN OR WHEN THE PURGE KNOB IS OPEN.

CAUTION: The CR1200R contains delicate electronic circuitry. The chassis and case have been designed for year-round, day-to-day field use, but severe mechanical shocks and temperature extremes could degrade the operation of the unit or damage it. Do not drop the CR1200R.

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CHAPTER 2

PREPARATION FOR USE

INTRODUCTION

Read this chapter to prepare the Sunrise Telecom Hukk Division Model CR1200R Digital Signal Analyzer for use. Follow the instructions for unpacking and inspecting the CR1200R. Compare the received items to the packing list. Read all warnings and information on power requirements. Follow the initial checkout procedure to verify that the CR1200R is in good working order.

UNPACKING AND INITIAL INSPECTION

Inspect the shipping container when the CR1200R is received. If the shipping container or shipping material is damaged, check the contents of the shipment for completeness, and check the mechanical and electrical condition of the CR1200R and accessories. Notify Sunrise Telecom, Hukk Division if the contents are incomplete, if there is mechanical damage or defect, or if the CR1200R does not pass its internal self-test procedure. If the shipping container is damaged, keep the container and packing materials for inspection by the carrier, and notify the carrier as well as Sunrise Telecom, Hukk Division.

SHIPMENT CONTENTS

The following equipment is supplied with each unit:

Model CR1200R Digital Signal Analyzer
Operating Manual and Training CD-ROM
AC Adapter/Charger
DC Power Adapter/Charger
Carry Strap

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OPERATOR MAINTENANCE

Charge the CR1200R before and after use. Optimize internal battery life by leaving the charger connected whenever the CR1200R is not in use in the field.

Clean the display screen and keypad with water, and a small amount of mild soap if necessary. Do not use abrasive cleaners or chemical agents, which will damage the display window.

POWER REQUIREMENTS

Operate the Sunrise Telecom, Hukk Division Model CR1200R Digital Signal Analyzer from its internal battery, the external AC adapter or the 12 VDC adaptor. The supplied universal AC adaptor which converts 100-240 VAC to 15.5 VDC at 3.4A maximum. The AC adaptor can power the unit for normal use, however, the battery will only recharge when the unit is powered down.

NOTE: THE CR1200R IS WATER-RESISTANT WHEN THE TOP COVER IS SECURED WITH ITS BUILT-IN LATCHES AND THE PURGE KNOB NEAR THE HANDLE IS CLOSED. THE UNIT IS WEATHER RESISTANT BUT NOT WATERPROOF DURING NORMAL OPERATION WHEN THE TOP COVER IS OPEN. DO NOT IMMERSE THE UNIT IN WATER WHEN THE TOP COVER IS OPEN OR WHEN THE PURGE KNOB IS OPEN.

CAUTION: The CR1200R contains delicate electronic circuitry. The chassis and case have been designed for year-round, day-to-day field use, but severe mechanical shocks and temperature extremes could degrade the operation or damage it. Do not drop the CR1200R.

BATTERY REPLACEMENT

The CR1200R battery is a Nickel Metal Hydride battery which is user replaceable. Battery replacement kit **120-10789-001** is available from the Hukk Division. The use of batteries other than those specifically approved by Sunrise Telecom, Hukk Division may damage the CR1200R and will void the warranty. Call Service for a replacement kit before attempting to replace the battery.

Note: At the end of it's useful life the battery must be recycled or disposed of properly.

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CHAPTER 3

GETTING STARTED

INITIAL SETTINGS

Press the POWER button. The speaker will beep three times to turn on the unit. Look at the display as the unit performs its self-test. Wait about six seconds for the self-test process to complete. The CR1200R will start operation in the upper level screen of the last test performed. For example, if the last test an operator performed was an adaptive equalizer stress test, and the CR1200R was then turned off, the CR1200R will return to the "Digital" screen the next time the CR1200R is powered up. Press the BACK LIGHT button to make the display easy to read indoors. A short beep will sound to acknowledge each key press.

F1 THROUGH F5 FUNCTION KEYS

The CR1200R is designed to be easy to operate. All of the upper level functions are available by pushing one button and all key tests can be performed by the CR1200R by pushing, on average, only 2 buttons. After any upper level test button (the "Digital" key for instance) is pushed, the function keys F1 through F5 take the operator to the various tests that are available.

THE ESCAPE BUTTON

While any tests are running, the key labeled ESC will halt the test in progress. The ESC key can also be used to take the operator UP one level until the upper level of that particular test screen is reached. For instance, if an operator is performing the same equalizer stress test mentioned above, pushing the ESC key once will stop the stress test and return the operator to the "Digital" test main screen. From any upper level screen the ESC key becomes inoperative.

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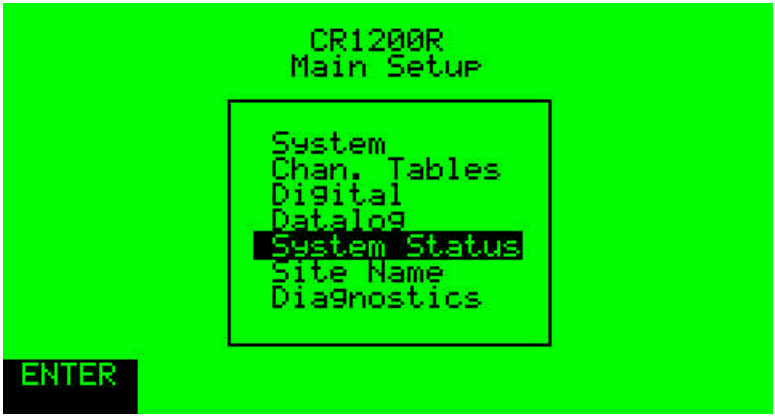


FIGURE 3-1

CHECK THE SYSTEM STATUS

To check system status press the SETUP button . The *Main Setup* screen will appear as shown in Figure 3-1. Utilizing the tuning knob, move the cursor until it highlights *System Status* then press ENTER. The screen shown in Figure 3-2 will appear.

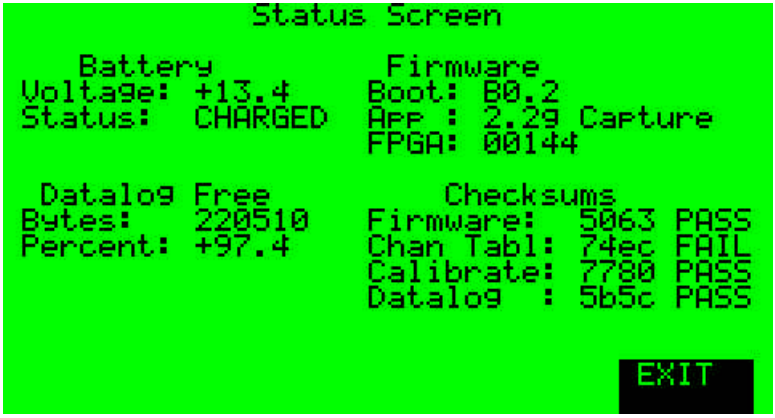


FIGURE 3-2

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CONNECTIONS

RF INPUT

Connect a drop cable to the RF INPUT of the CR1200R. The back panel RF INPUT uses a 75-ohm field replaceable F81 connector. The CR1200R uses auto attenuation on the RF input; the use of additional attenuation should not be necessary. A precision field replaceable F81 barrel is recommended for use on the CR1200R. Most F81 barrels used for subscriber installations do not have the required return loss at high frequencies.

AC ADAPTER

Use only the AC power adapter supplied with the CR1200R. This adapter produces 15.5 VDC with a 3.4A rating. Plug the adapter into the CR1200R before attaching it to the AC source. See Chapter 5 *Options and Accessories* for additional information.

The CR1200R can be used for measurements while powered by the AC adapter. However, the AC adapter will charge the CR1200R battery only while the CR1200R is powered off.



FIGURE 3-3

Do not use a power adapter that has not been specifically approved by Sunrise Telecom, Hukk Division for use with the CR1200R. Incorrect polarity or voltage could damage the CR1200R or the internal battery, resulting in a fire or smoke hazard.

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CONNECT RF TO ANY SINGANAL SOURCE

Use a signal from the QAM or analog modulator front panel test point, the headend combiner output, a system amplifier test point, a tap port or at the end of the subscriber's drop. The CR1200R has a built in auto attenuator; the use of additional attenuators should not be necessary at any point in the network.

CONNECT TO A SERIAL PRINTER FOR A PRINTED LOG

Use a DB9 cable to connect the RS-232 connector on the CR1200R to the input of a serial printer. The CR1200R acts as a "Data Communications Equipment". The output rate is configurable using the setup screen, with 8-bit words, one stop bit, and no parity. The CR1200R does not perform flow control. The printer must be able to print at the configured rate without overflow.

CONNECT TO A COMPUTER SERIAL PORT

Use a DB9 straight through cable to connect the RS-232 connector on the CR1200R to the serial port of a computer. You must have communication software on your computer that can manage serial communications and perform "text capture" operations. Set the computer to communicate at the configured speed of the CR1200R, with 8-bits and no parity. Remote software for the CR1200R is available at www.hukk.com.

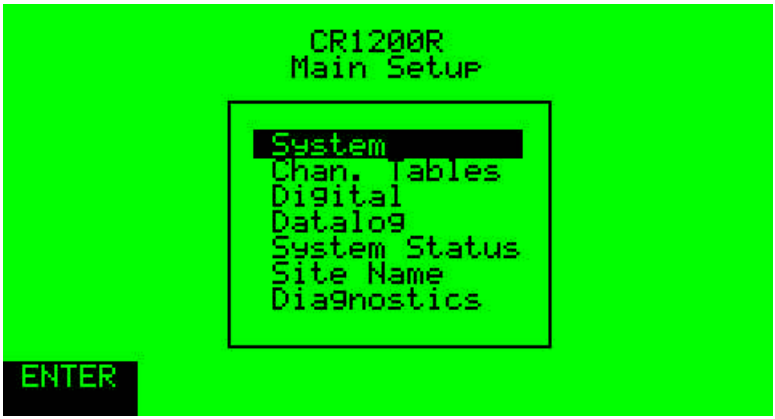


FIGURE 3-4

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SETUP BUTTON

The SETUP button takes the operator into the main screen where the basic configuration of the CR1200R is programmed and saved. Figure 3-4 shows the initial setup screen for the CR1200R.

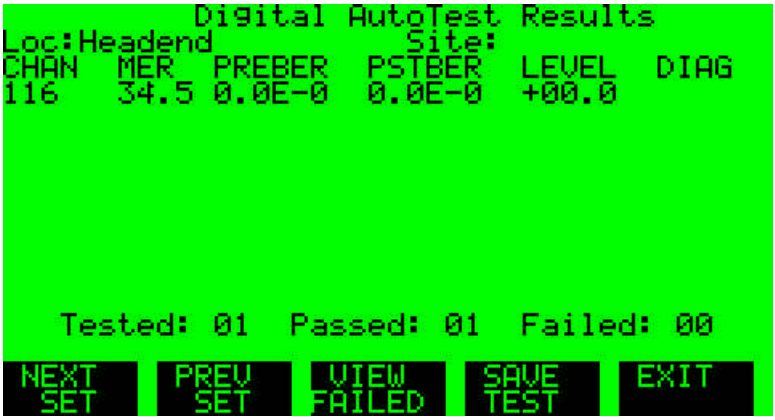


FIGURE 3-5

SYSTEM

From the main SETUP SCREEN (Figure 3-4) use the tuning knob to position the cursor over *System* and press ENTER.

The *SYSTEM SETUP* screen shown in Figure 3-5 will appear. Use the F1 and F2 keys to move the cursor through the choice of fields and turn the tuning knob to change the settings. Be sure to press the SAVE (F4) key to save your settings before exiting via the EXIT (F5) key.

SET THE CONTRAST

While on the *SYSTEM SETUP* screen (Figure 3-5) use the F1 and F2 keys to position the cursor over *Contrast.* Use the knob to adjust the contrast from 0% (very dark) to 100% (very light). Adjust contrast to the operator's preference. Make sure you save your work when done by pressing SAVE (F4).

Contrast may also be set by pressing the BACKLIGHT key at any time and using the tuning knob to adjust the contrast. Press ENTER (F1) to return to the previous screen.

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TURN SPEAKER ON/OFF

While on the *SYSTEM SETUP* screen (Figure 3-5) use the F1 and F2 keys to position the cursor over *Speaker*. Use the F1 and F2 function keys to position the cursor over the speaker control. The knob is used to control speaker on and off. Note that the speaker always beeps when a key is pressed, regardless of this setting.

BACKLIGHT CONTROL

While on the *SYSTEM SETUP* screen (Figure 3-5) use the F1 and F2 keys to position the cursor over *Backlight*. Use the tuning knob to scroll through the choices of ALWAYS ON and TIMER. The ALWAYS ON feature leaves the backlight on continuously, while the TIMER feature sets a 2 minute timer that will automatically shut the backlight off if no buttons are pressed for 2 minutes. Caution should be taken if the backlight is set to ALWAYS ON, as this will discharge the internal battery sooner than using the CR1200R without the backlight.

AUTOMATIC POWER DOWN

Setting this field to ON will cause the CR1200R to power itself down after approximately three minutes of inactivity on the keypad. The unit will not power down automatically if locked to a QAM signal, data logging, or if the AC adapter is plugged in.

SET THE TIME

Use the F1 and F2 function keys to move left or right in the hour, minute and second fields. The knob is used to change each entry up or down. The CR1200R uses 24-hour time, so 9:00 is 09:00 AM, and 9:00 PM is 21:00.

SET THE DATE

Use the F1 or F2 function keys to position the cursor (reverse text) over the month day and year fields. Use the knob to change each .

SERIAL PORT SPEED

Use F1 or F2 function keys to position the cursor on the serial speed control. Use the knob to vary the speed of the serial port from 300 BPS to 19200 BPS.

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SERIAL FORMAT

Use the F1 or F2 function keys to position the cursor over the serial format control. The recommended setting is 8 bits, no parity and 1 stop bit (8, n, 1). Other formats are available, use the knob to switch between them.

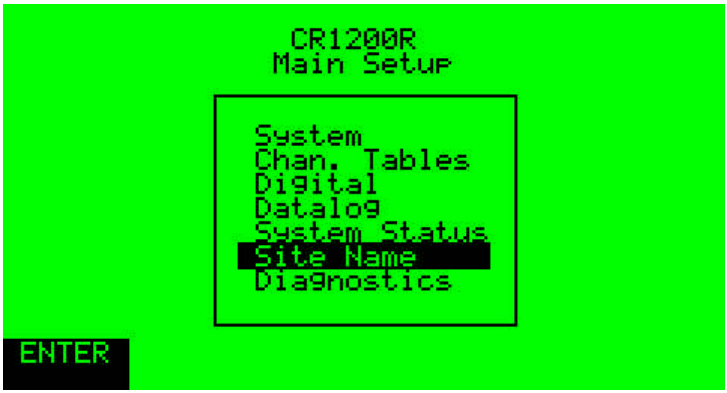


FIGURE 3-6

SITE NAME

From the *Main Setup* screen (Figure 3-6) utilize the tuning knob to move the cursor over *Site Name* and press ENTER. The Site Name Edit screen will appear as shown in Figure 3-7. Enter the

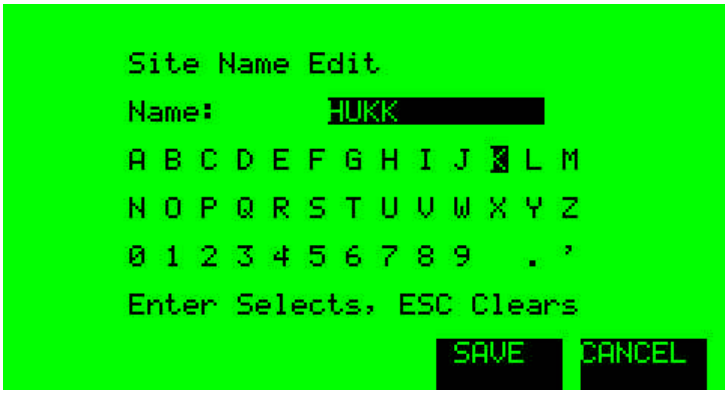


FIGURE 3-7

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letters of the Site Name by turning the knob until the cursor is over the letter desired then press the ENTER button located in the lower right corner of the numeric keypad. When the site name has been completely entered, push the SAVE button (F4) to save your new site name. Any data sent to the data log will show this newly entered site name. Save or Cancel will return you to the Main Setup menu (Figure 3-6).

CHANNEL TABLE SETUP

The CR1200R Digital Signal Analyzer is designed to operate on Standard, HRC or IRC Cable TV networks. In addition there are 3 user programmable plans that can be stored in memory. This allows the CR1200R to be used on separate networks with different channel plans without reprogramming the CR1200R each time.

Due to the nature of digital signal testing it is highly recommended that operator program a custom channel plan with the specific digital channels stored in memory. This will let the CR1200R tune between analog and digital channels without additional input from the operator.

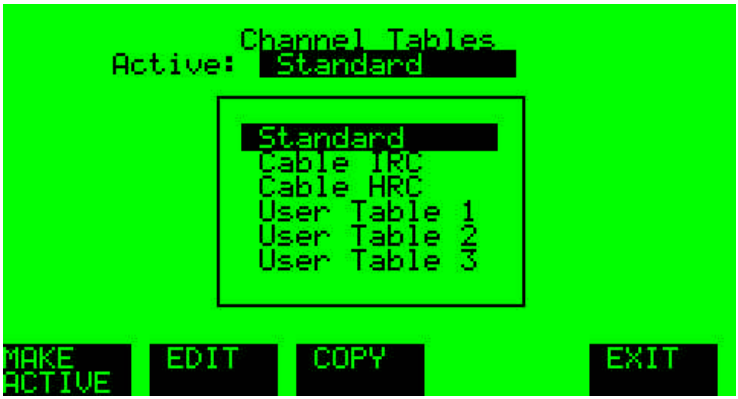


FIGURE 3-8

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COPY CHANNEL TABLE

The first step in creating a custom network plan is to copy the standard, HRC, or IRC channel plan into one of the 3 User Tables. This Standard Channel plan sets up Channel 2 through 135 with the following parameters: Modulation "NTSC", Freq. Offset "0", Active "yes" and Auto Test "yes". To customize your own channel plan, you need only change the channels which are not NTSC or are not active.

From the *Main SETUP* screen (Figure 3-6) turn the tuning knob to position the dark cursor over "Channel Table" and push the ENTER (F1) function key to enter the *Channel Tables* menu (Figure 3-8).

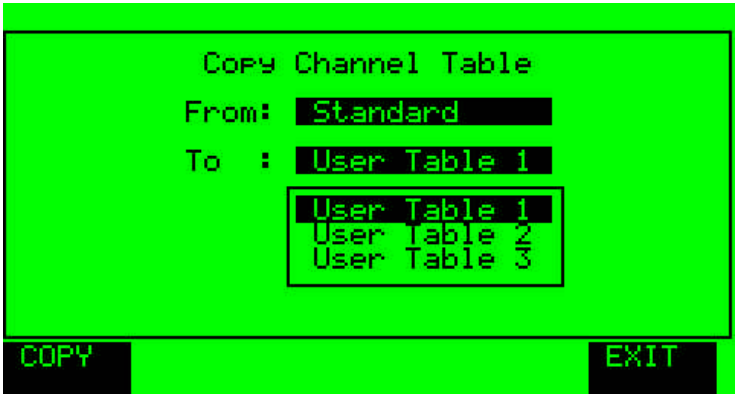


FIGURE 3-9

In the *Channel Tables menu* turn the tuning knob clockwise or counterclockwise to highlight the channel plan type currently in use in your system (Standard, HRC, or IRC). Once the channel plan type is selected, pushing the F3 function key selects the highlighted plan to be copied and takes the user to the *Copy Channel Table* screen (Figure 3-9).

Once the ***Copy Channel Table*** screen appears, you are now ready to copy **FROM** the plan type previously selected under the *Channel Tables* menu. Use the knob to select the User Table number you wish to **copy TO** and push COPY (F1) to complete the copying process. This copies the desired plan into the selected

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User Table. Pushing the EXIT (F5) function key (EXIT) or the ESC (Escape) key takes the operator up one level to the *Channel Tables* menu.



FIGURE 3-10

EDIT CHANNEL TABLE

The *Edit Channel* screen allows the operator to select the modulation format and related parameters for each channel on the network. Access the *Edit Channel* screen (Figure 3-10) from the *Main Setup menu (Figure 3-6). P*osition the cursor so that it highlights *Chan. Tables* and press ENTER (F1) to enter the *Channel Tables* screen (Figure 3-8). Push EDIT (F2) to begin editing channels. Channel 2 comes up as the default channel. Utilizing the tuning knob, select the channels you wish to edit. Pressing NEXT FIELD (F1) will move the cursor through each of the parameters to be set. PREV FIELD (F2) will move the cursor in the opposite direction. The defaults parameters are:

Modulation:	NTSC
Frequency Offset:	00.0 kHz
Active:	Yes
Auto Test:	Yes
*Invert Spectrum:	No
*Symbol Rate:	5.059641Mhz (keypad)
*Use FEC info:	YES
*MEAS. BANDWIDTH:	5.312500MHZ (KEYPAD) *

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NOTE: THESE PARAMETERS APPEAR ON SCREEN ONLY WHEN 64QAM OR SURFBOARD MODULATION SCHEME IS CHOSEN. IF 256QAM IS SELECTED THE SYMBOLE RATE IS 5.360537 MHZ AND THE OTHER PARAMETERS REMAIN THE SAME.

The choices for each field of the Edit Channels screen (Figure 3-10) are:

MODULATION:

NTSC
64-QAM
256-QAM
SURFboard cable modem
DIGITAL

FREQUENCY OFFSET:

Variable up or down in 62.5 kHz steps. This allows the operator to tune a channel to a specific frequency outside a standard plan. Channels on or near emergency or aeronautical frequencies are sometimes offset to avoid potential interference.

ACTIVE:

Yes—The channel is active both when the tuning knob is used to while making a channel selection and during system scans.

No—The channel will not appear during system scans and tuning knob channel selection. Channels will need to be manually entered.

AUTOTEST:

Yes—The channel is active during all Auto Test functions.

No—The channel is not active during Auto Test functions.

INVERT SPECTRUM:

No— Used for normal operation. This is the default and in most cases this parameter will not have to be changed.

*****Yes—The CR1200R expects a signal with an inverted spectrum.

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*** NOTE:** INVERTED SPECTRUM WOULD BE SET TO YES WHEN TESTING A QAM IF SIGNAL. ALSO SOME CABLE MODEMS SYSTEMS UTILIZE AN INVERTED SPECTRUM. IF YOU ARE SURE THAT THE SIGNAL YOU ARE TRYING TO MEASURE IS AN ANNEX B SIGNAL, AND THE CR1200R WON'T LOCK, TRY SETTING THIS FIELD TO "YES".

SYMBOL RATE:

The CR1200 automatically sets the correct symbol rate for the modulation type chosen. **Changing the symbol rate for an Annex B signal should not be necessary.** However, if the symbol rate is different from that of a normal Annex B symbol rate the field can be changed by entering a new rate utilizing the keypad. Make sure that "ENTER" is pressed after typing in the new symbol rate.

USE FEC INFO:

Yes — This is the default setting and is used for normal operation.

No — This disables Pre and Post FEC bit error rate measurements allowing the user to measure a signal other than Annex B.

*NOTE: IF MEASURING A SIGNAL THAT IS NOT ANNEX-B, THE CONSTELLATION AND MER VALUES CAN STILL BE OBTAINED BY SETTING THIS FIELD TO NO.

MEASUREMENT BANDWIDTH:

This mode allows the user to set a measurement bandwidth for digital channels with a bandwidth other than the 6 MHz standard (default). To change the Measurement Bandwidth (MBW), enter the bandwidth in MHz utilizing the keypad followed by the "ENTER" key.

CHANNEL PRESETS

The CR1200R can store up to 5 channels as favorites to get an overall indication of network performance. To program and store these channels push the CHANNEL PRESETS (F3) function key from the *Edit Channels* screen. The PRESETS editing screen is shown in Figure 3-11.

The Channel table currently in use is displayed at the top of the preset screen. Preset One is highlighted. Use the knob to display the desired channel. The channel, frequency and modulation type is also displayed. This information is based on information ob-

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tained from the Channel Table Setup. The frequency and modulation type is displayed, but not edited in this screen. After the 5 channels are programmed pushing the **SAVE (F4)** function key will save the preset information. Pushing the EXIT (F5) function key (or ESCAPE) takes the CR1200R to the Channel Table set up screen.

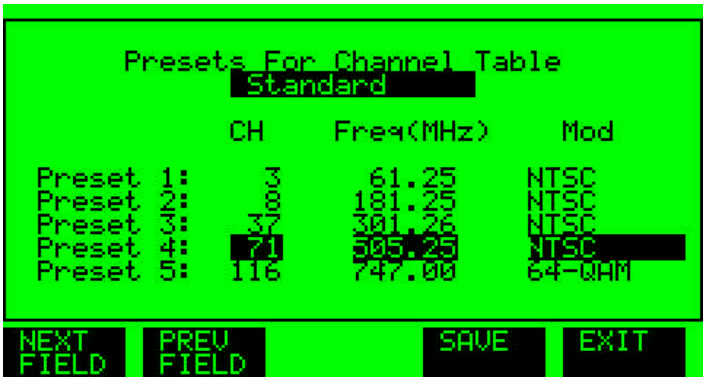


FIGURE 3-11

Instructions for viewing the preset channels can be found in the next section under the LEVEL Button menu.

INSERT AND DELETE CAHNNELS

Selecting MORE (F5) from the EDIT CHANNELS menu will allow the user to insert additional channels or to delete channels from the existing channel plan.

INSERT CHANNEL

From the EDIT CHANNEL menu press MORE (F5) and select INSET CHANNEL (F1). The screen shown in Figure 3-12 will be displayed with the Frequency highlighted. Enter the frequency on the numeric keypad and press ENTER on the numeric keypad. Use the NEXT FIELD (F1) and PREV FIELD (F2) function keys to highlight the Channel Number. Enter the Channel Number on the numeric keypad and press ENTER on the numeric keypad. Continue to use the NEXT FIELD (F1) and PREV FIELD (F2) keys and the tuning knob to scroll through the remaining channel features and set them up as previously described in this section .

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FIGURE 3-12

DELETE CHAANNEL

To remove a channel from the current channel plan in the EDIT CHANNEL menu press MORE (F5). Two functions will be displayed: INSERT CHANNEL (F1) and DELETE CHANNEL (F2). Pressing DELETE CHANNEL (F2) will delete the currently displayed channel. Use the tuning knob to scroll thought he channels in the plan to display the channel that you want to delete.

CAUTION: Channels are deleted immediately without a warning or request for a confirmation. Once deleted the channel will have to INSERTED in order to restore it to the channel plan.

LEVEL BUTTON

Pushing the front panel LEVEL button on the CR1200R opens the main signal level test screen (Figure 3-13). Channel number, frequency and modulation formats are displayed at the top of the screen. On the right is a numerical indication of the video and audio level of the channel being tested. On the left is a graphical display of the channel being tested. On an NTSC signal, the display shows video and audio simultaneously; the delta video to audio ratio measurement is also displayed.

If the channel being tested is a digital channel the average power,

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in dBmV, will be displayed. In this mode the audio carrier level and delta video to audio ratio are dropped and the MBW measurement bandwidth is displayed. All other screen identifiers (channel, frequency etc.) remain the same. Note that the frequency displayed is the video carrier frequency for an NTSC channel (see Figure 3-13) and the channel center frequency for a digital channel (see Figure 3-15).

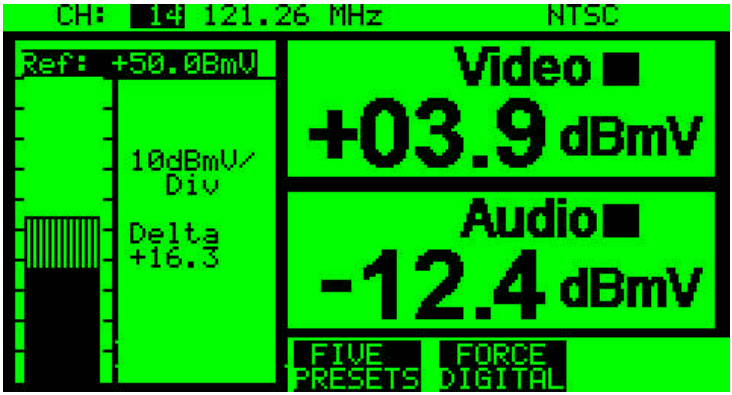


FIGURE 3-13

TUNING

The unit may be tuned in either the channel plan mode, per the programmed channel tables or by frequency using the numeric keypad.

Channel Tuning is accomplished by using the tuning knob to sequence through the channels. The channel may also be tuned using the alpha numeric keypad to enter the channel number followed by the CHAN key. The CH: ## a the top of the display will indicate the currently tuned channel, with the appropriate frequency next to it

Frequency Tuning is accomplished by pressing the FREQ MHz key and using the tuning knob to sequence through the channels. Only frequencies programmed into the channel table may be selected. To tune to frequencies not programmed in the channel plan. The frequency may also be tuned using the alpha numeric keypad by pressing the FREQ MHz key and entering the frequency followed by the ENTER key. The CH: ## a the top of the display will indicate the currently tuned channel or N/A if not tuned to a programmed channel and the currently tuned frequency next to it

There are 2 soft key function buttons active in the main LEVEL win-

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dow. The FIVE PRESETS (F3) key moves the operator into the 5 channel presets display screen and the FORCE ANALOG/ DIGITAL (F5) function key provides the operator with a quick method to toggle between digital and NTSC analog detection mode without going back to the channel setup tables.

FIVE CHANNEL PRESETS

The Five Channel Presets screen displays the five preset channels stored in the Channel SETUP screen (Figure 3-14). Frequencies are shown at the top of the bar graph and levels are shown on the bottom. The graph is shown at 5 dB per division, and the knob can be used to change the reference level so that the levels are not full screen. The ESCAPE key ends the test and takes the operator up to the main LEVEL screen.

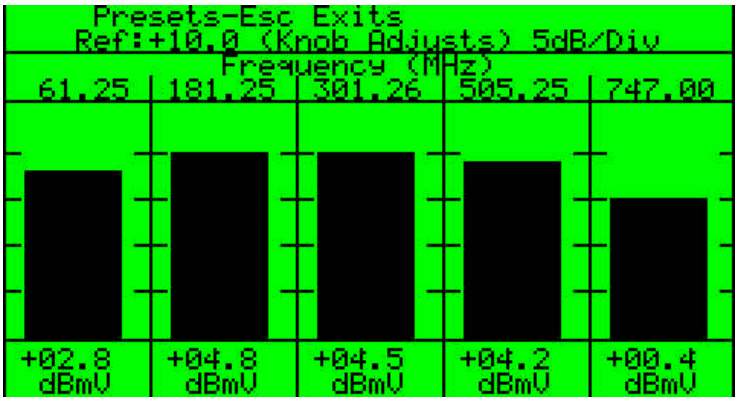


FIGURE 3-14

FORCE NTSC / DIGITAL (MODULATION CHANGE)

From the LEVEL main screen, the user can use the FORCE NTSC / DIGITAL (F4) function key to force the modulation measurement type to be changed The two choices are FORCE NTSC and FORCE DIGITAL The mode toggles between FORCE NTSC and FORCE DIGITAL each time the key is pressed. The unit is in the mode opposite of what is displayed on the “FORCE” key. For example, pressing FORCE DIGITAL (F4) from the analog level screen (Figure 3-13) will force the unit into the digital

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level mode (Figure 3-15) and measurements will be made using the average detector. At this time the displays will read “FORCE NTSC”.

MEASUREMENT BANDWIDTH CHANGES

While in *Digital Level* mode, pushing the KEYPAD MBW button will highlight the MBW (Measurement Bandwidth) for a keyboard entry as shown in Figure 3-15. The channel must be programmed in the channel plan and the modulation format properly set to avoid an error message.

Caution - When changing the MBW ensure that you have the correct bandwidth information for the signal under test.

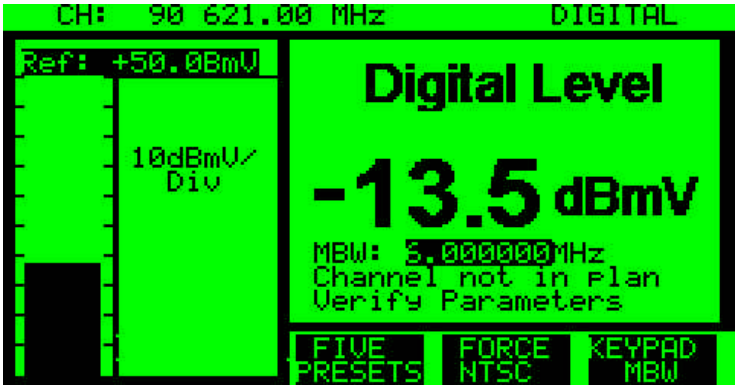


FIGURE 3-15

The typical measurement band width for digital channels is 5.312500 MHz. Changing MBW does not change the resolution bandwidth of the unit, but compensates the measurement and adjusts the displayed measurement value based on the desired bandwidth. (Only in the Average Detector mode).

SCAN MODE

The SCAN feature on the CR1200R allows the operator to scan the entire network and view the results in a graphics display. The scan

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screen with a completed system scan is shown in Figure 3-16.

Once the SCAN button is depressed on the front panel the SCAN test begins automatically. It take about 10 seconds to scan all carriers on a fully loaded HFC network. The full scale REF level and channel information is displayed in the Marker Data screen on the left of the display. Information about channel number, frequency, modulation format and levels are displayed. The channel scan progress is displayed by a horizontal bar at the horizontal (x) axis at the bottom on the spectral display area.

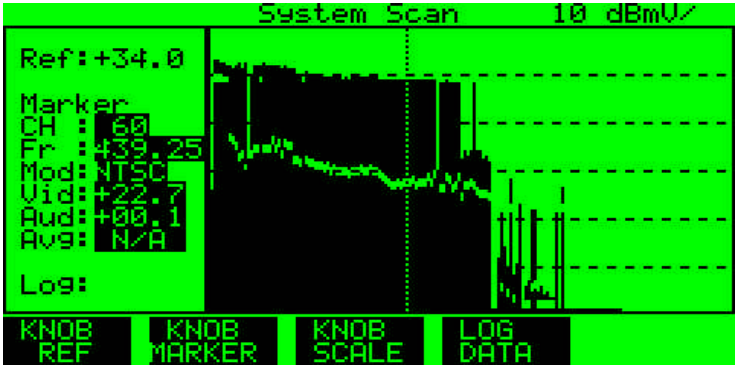


FIGURE 3-16

KNOB REF

The reference level of the scan can be changed by hitting the KNOB REF (F1) button and then turning the tuning knob until the desired reference level appears on the Marker Screen. Note that the scan takes approximately 10 seconds. The new levels are not reflected in the display until a new measurement is taken for that channel. A new scan is started when the knob is turned.

KNOB MARKER

The position of the Marker can be changed by hitting the KNOB MARKER (F2) key and then turning the knob to move the marker to the desired channel or frequency.

The knob sequences through the channels as programmed in the channel tables. The data in the MARKER section of the window is updated as the marker is positioned on each channel.

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KNOB SCALE

The scale of the scan in dB/division can be changed by pressing the KNOB SCALE (F3) key and turning the knob until the desired scale appears in the upper right corner of the screen. The scale choices are 10, 5 and 2 dB/division.

LOG DATA

To save the current scan to the Data Log push the LOG DATA (F4) function key. The LOG DATA function key and other function key displays will change to black lettering with a clear background for the duration of time it takes to make one scan. The CR1200R will save this scan and store the results in the data log. The data log entry will be referenced to the site name currently stored in the setup screen. When the scan is complete, the log shuts off automatically and the LOG DATA soft key returns to normal. The results of the log can be viewed via the DATALOG selection in the SETUP menu screen.

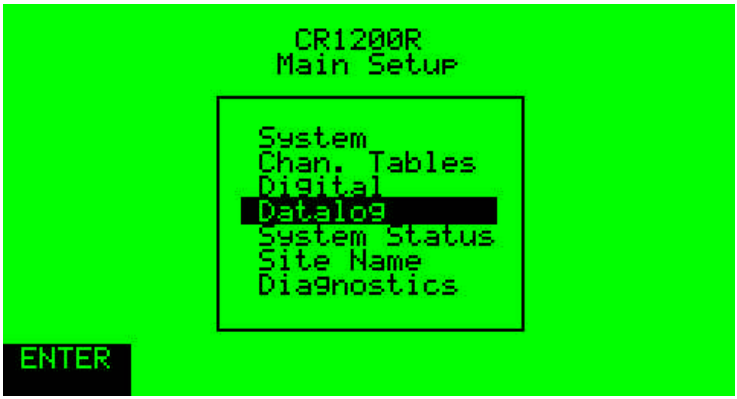


FIGURE 3-17

DATA LOG

The information stored in the Data Log can be recalled at any time. To access the data log, press the SETUP button on the front panel. The Main Setup Screen (Figure 3-17) will appear. Rotate the knob until Datalog is highlighted and press ENTER (F1).

The ***Data Log*** screen will appear as shown in Figure 3-18.

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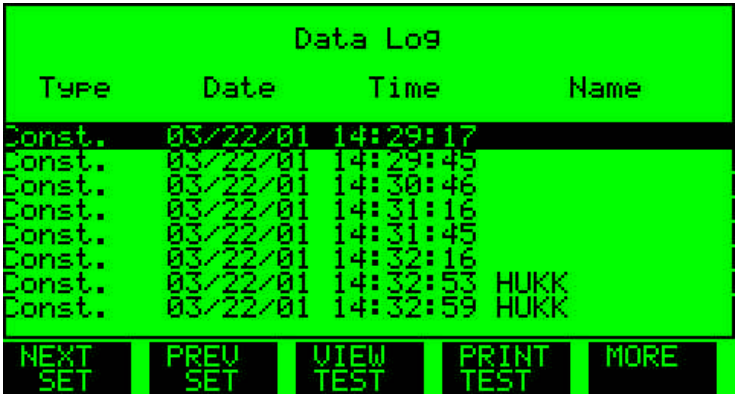


FIGURE 3-18

The log shows test type, date, time and the name of the site where the test was taken. The site Name column reflects the most recent *Site Name* entered through the Main SETUP screen (Figure 3-17) at the time when the data is logged. As discussed in the System SETUP section, the site name can be changed by accessing the SETUP menu via the SETUP key and selecting SITE NAME from the menu using the tuning knob and pressing the ENTER (F1) key.

VIEW TEST

To view stored data, use the tuning knob to scroll through the menu to select the set of data that you want to display. Use the NEXT SET (F1) or PREV SET (F2) keys to "page" through additional pages of stored data. To view the highlighted data, press the VIEW TEST (F3) key. The stored screen data will be displayed, just as it was stored. The tuning knob will be active in modes that have a marker to allow the user to reposition the marker to analyzer the stored data.

PRINT TEST

To print the data selected, press the PRINT TEST (F3) key. Data is "dumped" through the serial printer interface port.

SPECTRUM / RETURN TESTING MODE

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Pushing the SPECTRUM main level button puts the CR1200R in spectrum analyzer mode as shown in Figure 3-22.

There are three main menu screens in the Spectrum mode. Each menu screen allows the user to change different operating parameters of the analyzer. The main menu screens listed below are discussed in detail in the section which follows.

Displayed along the top of each of the spectrum menu screens are the NTSC Channel, Center Frequency, dB/division and Span. The left side of the screen from top to bottom shows Reference Level, Marker 1 (frequency and level), Marker 2 (frequency and level) , Delta (frequency and level difference between markers) and whether the analyzer is utilizing the peak or average detector.

When in SPECTRUM analyzer mode, hitting the MORE key will toggle the user through each of the Spectrum menu screens and attached soft keys listed below:



Knob Ref / Knob Mkr1 / Knob Mkr2 / Knob Span / More

FIGURE 3-19 (SPECTRUM MENU SCREEN 1)



Knob Scale / Misc. Setups / Hold On\Off / Avg\Peak Det / More

FIGURE 3-20 (SPECTRUM MENU SCREEN 2)



Zero Span / More

FIGURE 3-21 (SPECTRUM MENU SCREEN 3)

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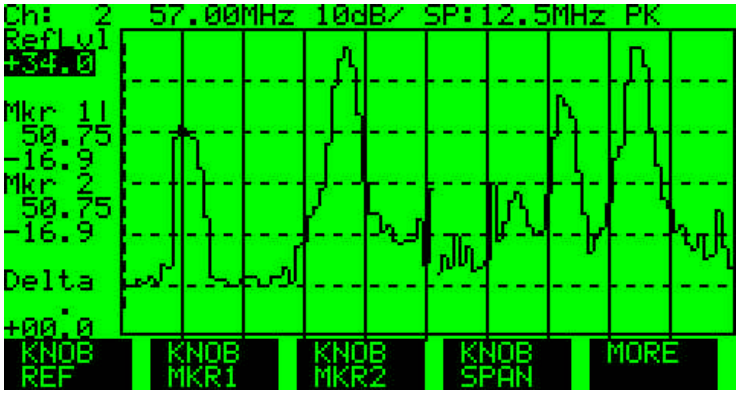


FIGURE 3-22 SPECTRUM MENU SCREEN ONE

SPECTRUM MENU SCREEN ONE

KNOB REFERENCE

Selecting the KNOB REF (F1) key highlights the current reference level (Figure 3-22). Once the KNOB REF button has been selected, the knob can then be used to change the reference level. The reference level can be set at any level from +50 dBmV to –10 dBmV in 4 dB increments.

KNOB MKR1 & KNOB MKR2—MARKERS

The CR1200R has two markers available. Each marker can be scrolled across the full display showing both frequency and level information as well as the frequency and amplitude delta between the two markers. When KNOB MKR1 (F2) is pressed, the knob controls Marker 1. When KNOB MKR2 (F3) is pressed, the knob controls Marker 2.

KNOB SPAN

The frequency span of the spectrum analyzer display can be set by pushing the KNOB SPAN (F4) key. When this button has been pressed, turning the knob will change the span setting. The selections are 6.25 / 12.5 /25.0 / 50.0 MHz.

MORE (SPECTRUM ANALYZER SCREEN TWO)

Pressing MORE (F5) from the first spectrum screen (Figure 3-22) takes the user to the second spectrum screen as shown in Figure 3-23.

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SPECTRUM MENU SCREEN TWO

KNOB SCALE

Selecting the KNOB SCALE (F1) key highlights the dB/div parameter at the top center of the screen as shown in Figure 3-23. Rotating the knob allows the user to select 10 dB, 5 dB or 2 dB per division. The user may need to adjust the KNOB REF, covered on the preceding page.

AVERAGE/PEAK DETECTOR

Selecting the average/peak detector (F4) key, toggles the user between the peak and average detector. The detector currently in use is displayed in the top right portion of the screen. PK is displayed for Peak Detector, used on normal NTSC signals, and AV is displayed for Average Detector, used on Digital signals.

HOLD ON

Selecting the HOLD ON (F3) key puts the analyzer in maximum hold or peak hold mode. As the analyzer sweeps through the frequency range selected, the highest level at any given frequency is remembered and displayed over time. The analyzer will continue in this mode until the HOLD OFF (F3) key is depressed. F3 toggles between HOLD ON and HOLD OFF.

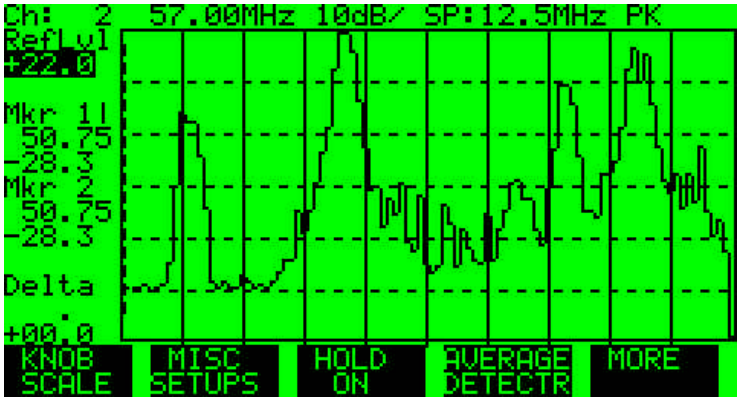


FIGURE 3-23 (SPECTRUM MENU SCREEN 2)

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MISCELLANEOUS SETUPS

Spectrum menu screen two contains a sub-menu called MISC SETUPS. Selecting the MISC SETUPS (F2) will display the screen shown in Figure 3-24.

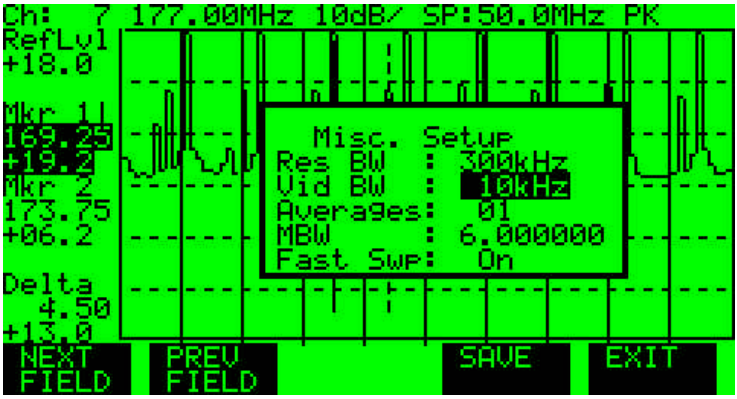


FIGURE 3-24

The Miscellaneous Setups sub-menu allows the user to make adjustments in the Resolution Bandwidth, Video Bandwidth, Number of Averages over the resolution bandwidth (average detector) and the Measurement Bandwidth.

RESOLUTION BANDWIDTH

The resolution bandwidth may only be adjusted in the ZERO SPAN mode. To change the resolution bandwidth, press the NEXT FIELD (F1) or the PREV FIELD (F2) button until RES BW is highlighted. Turning the knob will toggle between 300 KHz and 2 MHz. Press SAVE (F4) to go back to the previous screen and use the new settings. Press ESC to return and use the previous settings.

VIDEO BANDWIDTH

To change the Video Bandwidth, press the NEXT FIELD (F1) or PREV FIELD (F2) button until the VID BW is highlighted. Turning the knob will toggle between 10 KHz, 100 KHz and 1 MHz.

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Press SAVE (F4) to go back to the previous screen and use the new settings. Press ESC to return and use the previous settings.

AVERAGES:

To change the number of averages the analyzer performs when providing a measurement, press the NEXT FIELD (F1) or PREV FIELD (F2) button until the number of averages is highlighted. Turn the knob to select the desired number. The choices range in increments of 1 from 1 to 50. The default is 1.

MEASUREMENT BANDWIDTH (MBW)

Changing MBW only affect measurements in the Average Detector mode (used for Digital measurements). To change the MBW of the spectrum analyzer, press the NEXT FIELD (F1) or PREV FIELD (F2) button until the MBW is highlighted. Rotate the knob until the desired measurement bandwidth is selected. The desired MBW can also be entered on the keypad by entering the desired number in MHz followed by either the ENTER or FREQ MHZ keys. The measurement bandwidth ranges from 1 Hz to 6 MHz. Changing MBW does not change the resolution bandwidth of the unit, but compensates the measurement and adjusts the displayed measurement value based on the desired bandwidth.

SAVE

Make sure you save your changes before exiting. To do so simply press SAVE (F4). To return without save press EXIT (F5).

EXIT

EXIT (F5) key returns the Spectrum Menu Screen 2 (Figure 3-23)

MORE

Pressing the MORE (F5) key from the Spectrum Menu Screen 2 will take the user to Spectrum Menu Screen 3, which offers the user the ZERO SPAN mode (Figure 3-25) and another MORE key to return back to the original SPECTRUM menu screen.

SPECTRUM MENU SCREEN 3

Spectrum Menu Screen 3 (Figure 3-25) is the gateway to the Spectrum Analyzer ZERO SPAN mode.

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ZERO SPAN

Selecting ZERO SPAN mode takes the user to the zero span screen shown in Figure 3-25

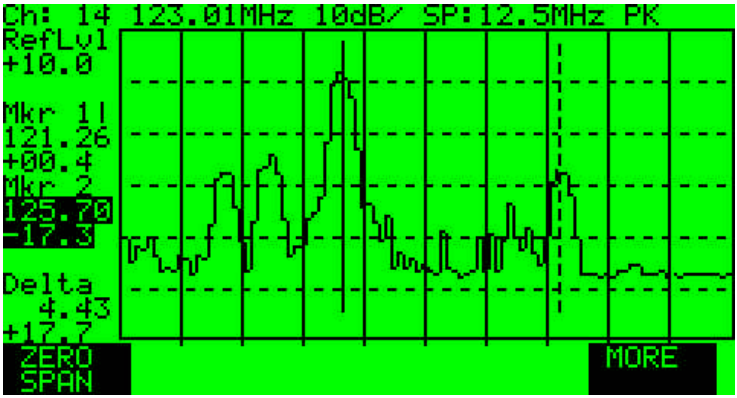


FIGURE 3-25

TIME DOMAIN (ZERO SPAN SPECTRUM MENU)

Selecting ZERO SPAN mode from Spectrum Menu #3 (Figure 3-25) puts the CR1200R's spectrum analyzer in the zero span mode. In this mode, the horizontal axis of the screen changes from the frequency domain to the time domain (Figure 3-26).

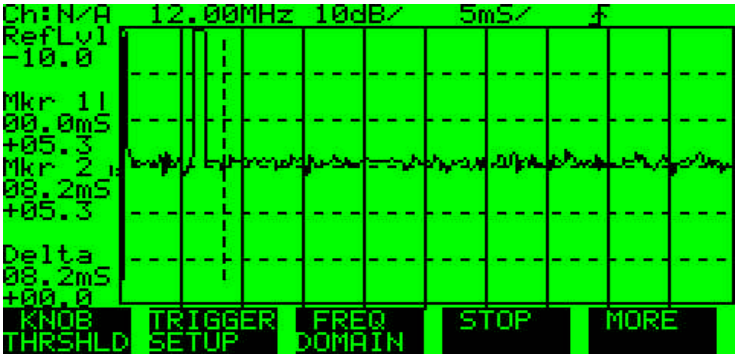


FIGURE 3-26

When in ZERO SPAN mode, selecting the MORE key will toggle the user through each of the ZERO SPAN menu screens and function soft keys listed below:

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Knob Scale / Misc. Setups / Hold On\Off / Avg\Peak Det / More

FIGURE 3-27 (ZERO SPAN MENU SCREEN 1)



Knob Ref / Knob Mkr1 / Knob Mkr2 / Knob Span / More

FIGURE 3-28 (ZERO SPAN MENU SCREEN 2)

Pressing MORE (F5) once in ZERO SPAN mode, the zero span menu screen shown in figure 3-27 replaces the screen shown in Figure 3-26. Pressing the MORE (F5) key from this screen will take the user to the additional function keys: Knob Ref , Knob Mkr1, Knob Mkr2, Knob Span and More (figure 3-28). The analyzer remains in ZERO SPAN mode until the FREQ DOMAIN (F3) soft key is depressed. As the MORE (F5) key of each ZERO SPAN menu is depressed, the screens toggle between the three ZERO SPAN menu screens.

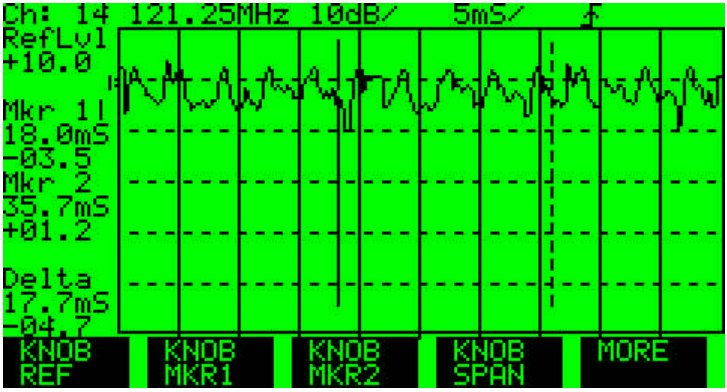


FIGURE 3-29 (ZERO SPAN SCREEN 1)

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KNOB THRESHOLD (TRIGGER LEVEL)

The KNOB THRESHOLD (F1) button allows the user to adjust the "carrot" along the left side of the screen utilizing the tuning knob. The carrot determines the level at which the CR1200R will trigger while in the zero span mode.

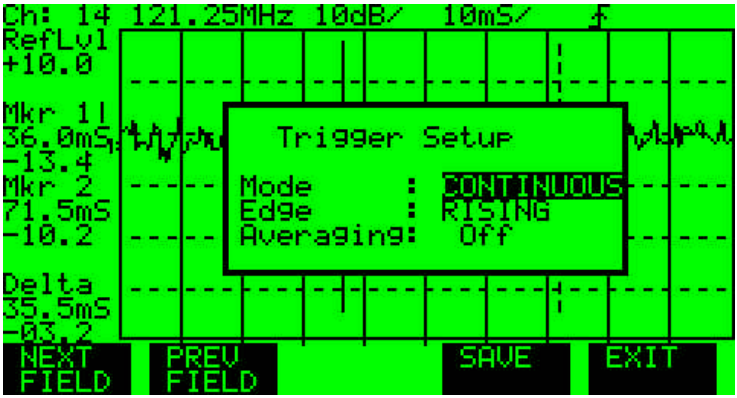


FIGURE 3-30

TRIGGER SETUP

Pressing the TRIGGER SETUP (F2) button from the ZERO SPAN screen brings up the trigger menu screen shown in Figure 3-30. Utilize the NEXT FIELD (F1) and PREVIOUS FIELD (F2) keys to select the parameter to revise. The tuning knob sequences through the parameter settings. Press SAVE to go back to the previous screen and use the new parameters or EXIT to return to the previous screen using the old parameters.

Mode (Sweep)

This allows the user to select the desired sweep mode. Use the tuning knob to sequence through the selections: CONTINUOUS, DISABLED and SINGLE. Press SAVE to go back to the previous screen and use the new settings or EXIT to return to the previous screen using the old settings.

Edge Trigger

The Edge Trigger menu allows the user to select the edge of the waveform to trigger on. Rotating the knob will toggle through the selection through the selections: FALLING EDGE

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or RISING EDGE. Press SAVE to go back to the previous screen and use the new settings or EXIT to return to the previous screen using the old settings.

Averaging

This function allows the user to turn trace averaging on or off. With trace averaging on, the display will show the average of all sweeps. With averaging off the display will show only the results of the current sweep. Turning the knob will rotate the user between averaging on and off. Press SAVE to go back to the previous screen and use the new parameters or EXIT to return to the previous screen using the old parameters.

FREQ DOMAIN (EXIT ZERO SPAN)

Pressing the FREQ DOMAIN (F3) key while in the ZERO SPAN mode (figure 3-31) turns off zero span taking the analyzer back to the frequency domain.

RUN/STOP

Selecting the RUN/STOP (F4) key temporarily stops the sweep. Note that when the function key displays STOP that the unit is running and updating the display, pressing STOP will stop the updates and toggle the (F4) function key to RUN.

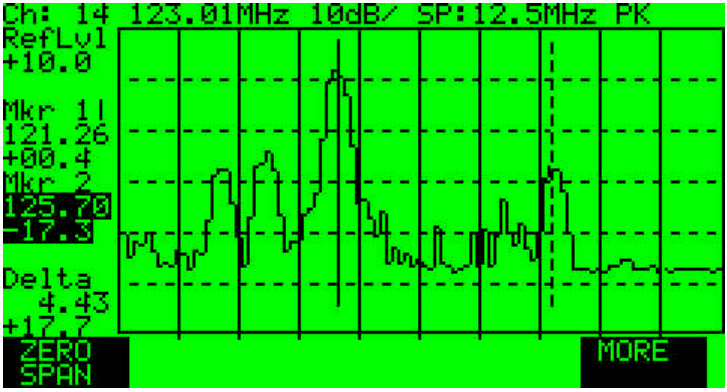


FIGURE 3-31 (ZERO SPAN SCREEN 2)

MORE

Pressing the MORE (F5) key will display the second ZERO SPAN

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menu Screen 2, with the functions: Knob Ref / Knob Mkr1 / Knob Mkr2 / Knob Span / More (Figure 3-27)

KNOB REFERENCE

Selecting the KNOB REF (F1) key highlights the current reference level. Once the KNOB REF button has been selected, the knob can then be used to change the reference level. The reference level can be set at any level from +50 dBmV to –10 dBmV in 4 dB increments.

KNOB MKR1 & KNOB MKR2—MARKERS

The CR1200R has two markers available. Each marker can be scrolled across the full display showing both timing and level information as well as the time and amplitude delta between the two markers. When KNOB MKR1 (F2) is pressed, the knob controls Marker 1. When KNOB MKR2 (F3) is pressed, the knob controls Marker 2. The display area on the left side of the screen provides the measurement results for the markers.

KNOB SPAN

The time span is displayed at the top of the screen. The span may be set by pushing the KNOB SPAN (F4) key. When this button has been pressed, turning the knob will change the span setting. The selections are 100 µSec to 500 mSec. The tuning knob continues to control the SPAN until another function is selected.

MORE (SPECTRUM ANALYZER SCREEN TWO)

Pressing MORE (F5) from the second ZERO SPAN screen (Figure 3-31) takes the user back to the initial ZERO SPAN screen (Figure 3-26).

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DIGITAL

The DIGITAL main level button sets the CR1200R in digital mode for testing 64 or 256 QAM digital signals. The CR1200R not only measures ITU-T J.83 Annex B digital signals, but will measures levels of other digital signals such as QPR and QPSK as well. Depressing the DIGITAL key on the front panel will bring up the screen shown in Figure 3-32. However, if the Channel Plan shows the selected channel to be other than a digital channel, the screen shown in figure 3-33 will appear. This screen indicates that the channel is not properly set up as a QAM channel. The unit will not lock to a 64QAM signal if the channel table is set for 256QAM and vise versa. The channel tables must be properly programmed.

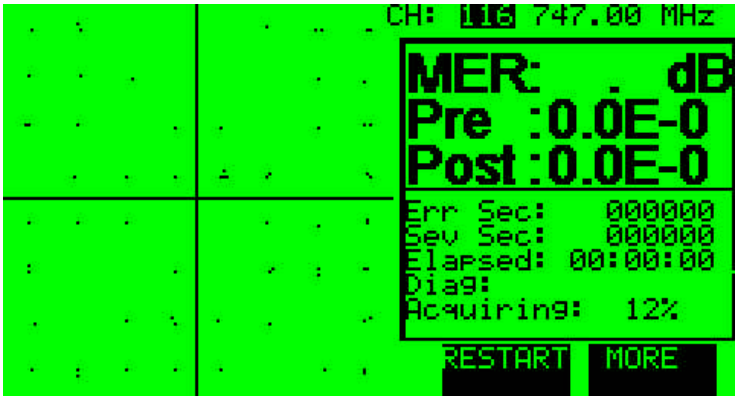


FIGURE 3-32

FORCE QAM MODULATION

If the CR1200R is tuned to a digital signal not programmed in the current channel plan the CR1200R opens up the force modulation screen as shown in Figure 3-29. This allows the operator to quickly force the CR1200R to 64 QAM or 256 QAM signals. Pushing the FORCE 64-QAM (F1) function key forces the CR1200R to demodulate the signal as a 64 QAM signal. The FORCE 256 QAM (F2) function key forces the CR1200R to demodulate the signal as a 256 QAM signal.

It is highly recommended that you take the time to set up a current

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channel plan for your system. This will save time and make your measurements much easier to make. The channel plan menu screen can be accessed by pushing the SETUP button on the front panel and selecting Chan. Tables. The Channel Table screen is shown in figure 3-8.

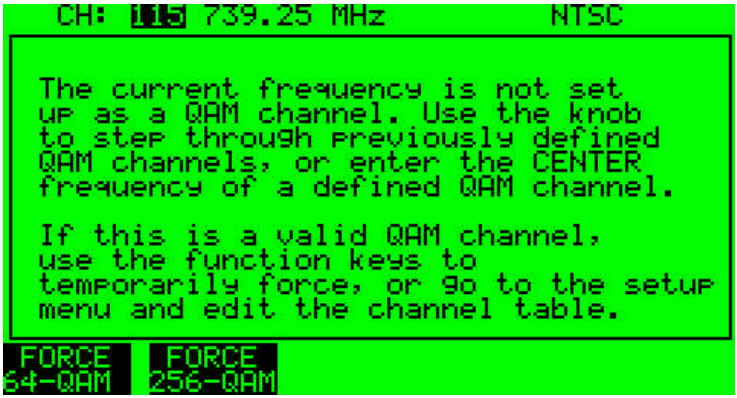


FIGURE 3-33

FORWARD ERROR CORRECTION TESTS

After a forced modulation, or if the channel being tested was previously programmed as a digital signal, the main DIGITAL screen opens as seen in figure 3-34. The main digital screen consists of four different measurements. They are Modulation Error Ratio, Pre-Forward Error Correction error ratio (Pre-FEC), Post-Forward Error Correction error ratio (Post-FEC) and the Constellation Display which includes an Auto Diagnosis function.

At the top of the screen is the channel number and the *center* frequency of the digital channel being tested. The test results are found along the right hand side of the screen along with Errored Seconds (Err Sec), Severely Errored Seconds and Elapsed test time. The left side of the screen is reserved for the Constellation display.

As the CR1200R starts its FEC tests the word “LOCKING” appears below the FEC numbers. This indicates that the CR1200R

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demodulator is attempting to acquire and "LOCK" onto the digital signal. No FEC information is available at this time. When the CR1200R acquires the digital signal this display changes to "LOCKED" as seen in figure 3-34. Once this "Locked" screen appears, the CR1200R is now ready to perform FEC and all other digital tests.

NOTE: IF THE CR1200R DOES NOT "LOCK" TO A DIGITAL SIGNAL IT WILL NOT PERFORM ANY DIGITAL TEST.

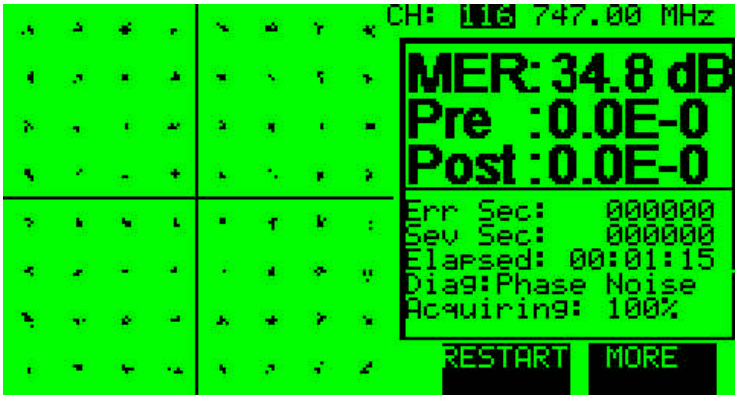


FIGURE 3-34

ALL TESTS BEGIN AFTER UNIT IS "LOCKED"

After the CR1200R acquires the digital carrier and locks on it the FEC test, the Modulation Error Ratio test and the Constellation test begin. The Elapsed test time counter starts at the same time.

MER (MODULATION ERROR RATIO)

The Modulation error ratio (MER, the digital equivalent of signal-to-noise) is the measurement of the demodulated digital signal in the noise of its environment. In the CR1200R this measurement is based on constellation statistics and is the ratio of where a constellation dot should be versus where the dot is actually measured. This number, expressed in dB, is a useful measurement showing how much digital margin exists in your network.

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FEC (FORWARD ERROR CORRECTION)

In accomplishing the FEC measurements, the CR1200R interrogates the digital demodulator for information on the Reed/ Solomon error correction codes to determine how many errors are being counted before the error correction codes are applied to the data stream (PRE-FEC) and how many errors remain in the stream after the error correction codes have been applied (POST-FEC).

NOTE: THE CR1200R DISPLAYS FEC INFORMATION IN SCIENTIFIC NOTATION. DUE TO THE LARGE NUMBERS ASSOCIATED WITH A DIGITAL BER MEASUREMENTS, SCIENTIFIC NOTATION IS USED TO SHOW THESE NUMBERS IN A MORE COMPACT MANNER. AN EASY EXAMPLE OF THIS IS ONE ERROR FOR EVERY 1,000,000 BITS OF DATA. NUMERICALLY THIS IS 0.000001. IN SCIENTIFIC NOTATION THIS BECOMES 1.0 E-6.

While FEC error tests are running an elapsed timer shows how long that test has run. Errored and severely errored seconds are also displayed. An errored second is a point in time where the Pre-FEC rate is not zero (some errors are received). The FEC codes correct these errors and the Post-FEC remains at zero. A severely errored second is a point in time when the FEC codes are unable to correct all errors received and a possible impairment is passed through the set top box to a subscriber's television set.

CONSTELLATION

The Constellation is a graphic display of a QAM modulated digital signal. It can be used to show impairments in a network whether they come from noise, spikes, or irregular frequency translation. The shape of the constellation can provide many clues to the condition of the QAM signal. The MER is also displayed on this screen.. The graphic display on the left is the constellation. Each dot should always plot near, or on top of the dot before it. In a perfect signal the constellation would look like only 64 single points. Impairments on a network will cause the dots to spread in recognizable patterns, which can point to the cause and location of the impairment in the network. If the dots become too spread out bit errors become inevitable.

Constellation displays can indicate the presence of noise, phase distortion, compression, coherent disturbances and interference. See the "Common QAM Impairments and Possible Causes" chart provided with the CR1200R.

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DIGITAL SETUP

The constellation display refresh rate and the decision whether to log errored and severely errored seconds in the Data Log is made based on the Digital Setup of the CR1200R. To access the Digital Setup screen press the SETUP button on the front panel of the unit. The *Main Setup* screen (Figure 3-35) will appear.

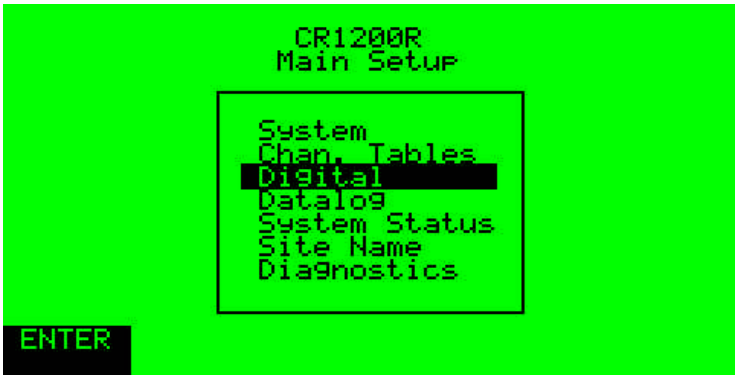


FIGURE 3-35

Rotate the tuning knob until DIGITAL is highlighted then press the ENTER (F1) key. The Screen shown in figure 3-36 will appear. Utilizing the NEXT FIELD and PREV FIELD keys, choose which of the three parameters you would like to change.

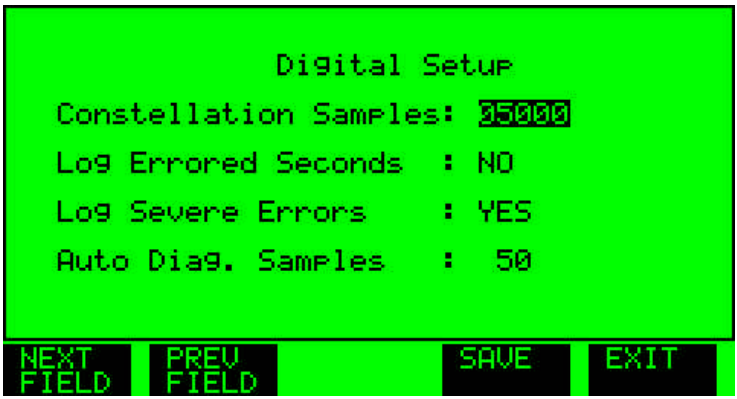


FIGURE 3-36

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Press SAVE to go back to the previous screen and use the new settings or EXIT to return to the previous screen using the old settings.

CONSTELLATION SAMPLES

To change the number of samples the Constellation takes before refreshing the screen, highlight CONSTELLATION SAMPLES using the NEXT FIELD (F1) or PREV FIELD (F2) keys and rotate the knob to the desired number. The user can set the number of samples in increments of 1000 up to and including 30,000 samples. Continuous sampling may be achieved by choosing DWELL Press SAVE to go back to the previous screen and use the new settings or EXIT to return to the previous screen using the old settings.

LOG ERRORED OR SEVERELY ERRORED SECONDS

The Digital setup screen also allows the user to determine whether or not Errored Seconds or Severely Errored Seconds will be considered an error event to be automatically recorded in the data log.

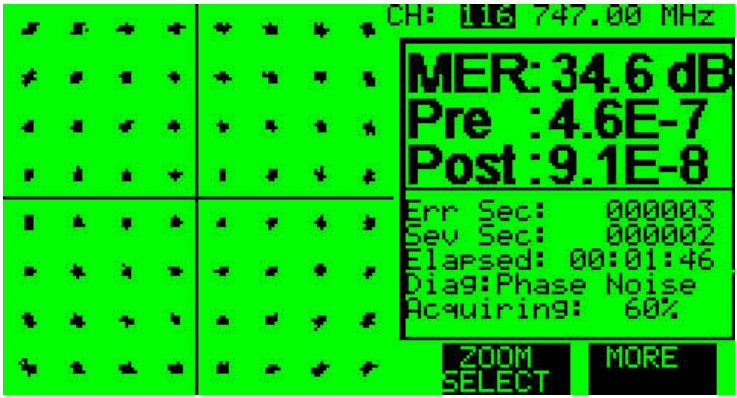


FIGURE 3-37

AUTO DIAGNOSIS MODE

The CR1200R has a built-in algorithm which automatically interprets the results of the Constellation display and gives the results in the lower right corner of the screen. The AUTO DIAGNOSIS algorithm will detect faults caused by coherent disturbances, phase

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distortion, compression and noise. Figure 3-37 shows the display of a CR1200R locked on a QAM signal which has a coherent disturbance problem.

DIGITAL MEASWUREMTNS

Once in the DIGITAL mode the CR1200R offers a series of Digital measurements and views which can be used to analyze the Digital signals on the network. The series of functions presented on sequential screens include: RESTART, ZOOM SELECT, LOG ON/OFF, EQUALIZER and HIPASS ON/OFF

RESTART

Pushing the RESTART (F1) function key at any time while in the first Digital screen (Figure 3-37) will cause the CR1200R to re-lock on the digital signal and reset all counters to zero (Errored Seconds, Severely Errored Seconds and the Elapsed Time).

MORE

Selecting MORE at any time while in the first Digital screen will bring up the next digital screen as shown in Figure 3-38.

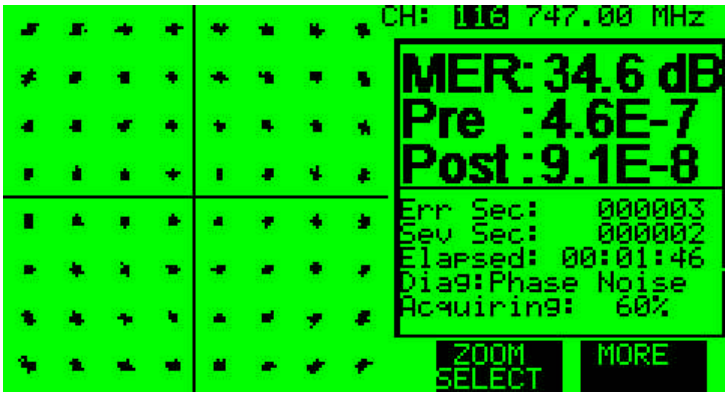


FIGURE 3-38

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ZOOM MODE

The CR1200R features a "ZOOM" mode which allows the user to see one sector of the display with 16:1 magnification. To enter the "ZOOM" mode, press ZOOM SELECT (F4) from the second digital screen (Figure 3-38). Choose the area you wish to zoom in on by turning the tuning knob then press SELECT. This allows the operator to see part of the constellation up close in order to aid in the interpretation of the pattern formed by the symbols as they are plotted. Figure 3-39 shows the ZOOM mode screen. The EXIT (F5) key returns the user to the second digital screen (Figure 3-31).

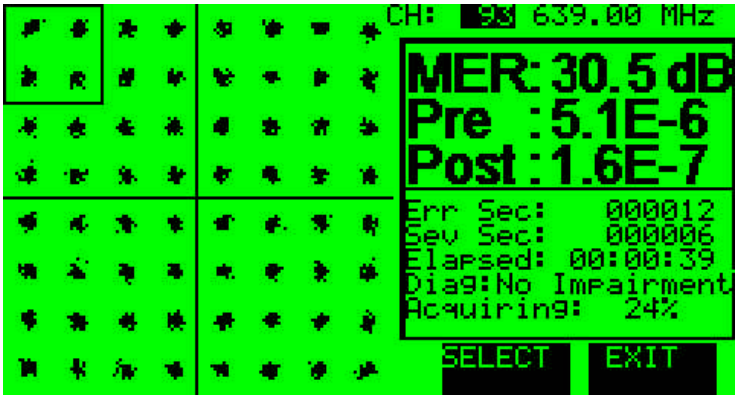


FIGURE 3-39

MORE

Selecting MORE at any time will bring up the next digital screen as shown in Figure 3-40

LOG ON/OFF

Selecting the LOG ON (F4) function will write all error events to the Data Log . This is particularly effective for intermittent problems that occur at random intervals. (See Figure 3-17 and 3-18 for more Data Log information).

Once the LOG ON button has been selected, all error events will be recorded in the data log until the LOG OFF (F4) button is depressed or until the Data Log is full.

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FIGURE 3-40

MORE

Selecting MORE from the third Digital menu screen (3-40) will bring up the Adaptive Equalizer mode as shown in Figure 3-41.

ADAPTIVE EQUALIZER

The adaptive equalizer is a feature of the digital demodulator that looks at reflections on a network and attempts to minimize their influence on a digital bit stream.

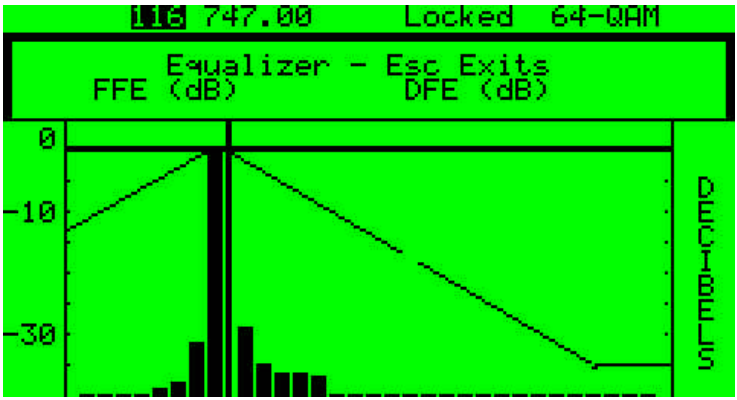


FIGURE 3-41

The Adaptive Equalizer screen (Fig. 3-41) is accessed from the

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third Digital menu screen (Fig. 3-40) by selecting the MORE (F5) function key while in that screen. This takes the CR1200R to the Adaptive Equalizer stress screen. An active stress test in constantly displayed. The Center Tap (large line to the immediate left of the full screen solid line) will be in the –10 to +10 range. All other lines should be well below the Center Tap line. Any other line but the Center Tap appearing equal to or above the Center Tap indicates a reflection in the network. The digital demodulator uses summing to minimize or reduce the reflection. Each bar of the Adaptive Equalizer graph represents 100 nanoseconds in time. The distance to a system fault can be calculated as approximately 67 feet per bar. The ESCAPE key returns the operator to the main Digital screen.

MORE

Selecting MORE from the current Digital menu screen (3-41) will bring up the HIGH PASS Filter mode.

HIGH PASS FILTER

Pressing the "MORE" key from the equalizer screen allows the user to implement a special high pass filter in the CR1200R. This filter is designed to be utilized in conditions where the network is showing reverse tilt at levels that are higher than normal (>8 db of reverse tilt). For example, at the end of a long drop which has an un-equalized drop amplifier, the low end levels can be very high when compared to those at the higher end of the spectrum. In these cases, the high pass filter will prevent any overloading that might otherwise have occurred under these conditions. The result is a more accurate digital test.

The high pass filter should not be needed under normal network conditions.

MORE

Selecting MORE from the current Digital menu screen will bring the user back to the original DIGITAL measurement screen.

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AUTOMATIC TESTING

The CR1200R has the capability of performing automatic tests with parameters that are pre-defined by the user. These tests make the unit more convenient to use and saves time in cases where a number of signal level measurements are required at the same location. AUTOTEST is accessed by pressing the AUTO key on the front panel. The first screen is shown in Figure 3-42.



FIGURE 3-42

The AUTO TEST provides 5 locations, HEADEND, NODE, END-of-LINE, SUBSCRIBER DROP and USER DEFINED. Each location may be SETUP with pass fail criteria for evaluating the AUTO test. Prior to initializing an AUTO TEST, use the tuning knob to select the Location for the AUTO TEST. The Location will be stored along with the data and SITE NAME if the AUTO TEST is STORED.

The RUN ANALOG, RUN DIGITAL and START 24-HR tests are all based on the current channel plan programmed into the Channel Tables. See the SETUP operation and Figure 3-6. The channel tables should match the network channel lineup, otherwise erroneous test results may result.

RUN ANALOG & RUN DIGITAL

To run a series of amplitude measurements on all of the analog channels, per the current channel plan programmed in the channel

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tables, select the Location and press the RUN ANALOG (F1) or RUN DIGITAL (F2) function key. The AUTO TEST progress screen shown in Figure 3-43 will be displayed.

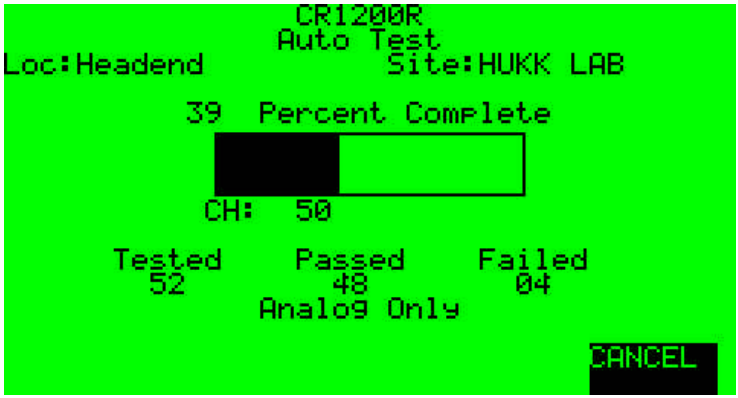


FIGURE 3-43

The AUTO TEST progress screen displays the Location and Site Name, the progress bar graph with the percentage of the channels completed, the number of channels tested, the number that passed and the number that failed according to the SETUP criteria for the Location and the test in process.

AUTO TEST RESULTS

Following an AUTO TEST, the screen shown in Figure 3-44 is automatically updated to the AUTO TEST RESULTS screen. This screen provides the test results for each channel in the channel table used for the measurements. The initial screen displays only those channels which failed according to the SETUP criteria for that site.

ANALOG RSULTS

The AUTO TEST RESULTS screen following an ANALOG test displays the Location and Site Name, the list of Channel numbers, the Video carrier level, the Audio carrier level and the Delta (difference between video and audio level), the number of channels Tested, the number that Passed and the number that Failed according to the SETUP criteria for the Location and the test in

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process. (Figure 3-42)

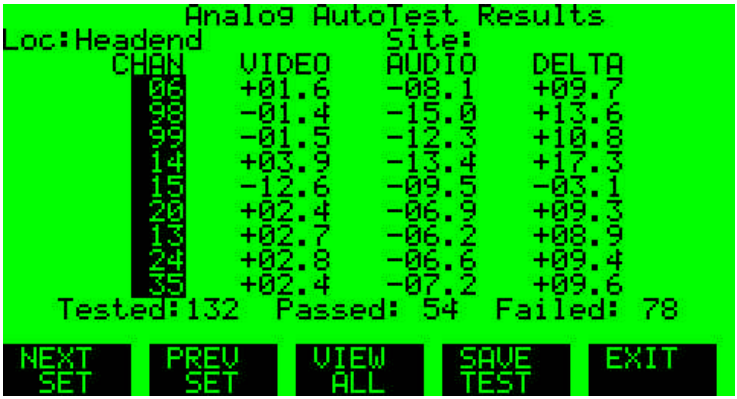


FIGURE 3-44

DIGITAL RSULTS

The AUTO TEST RESULTS screen following a DIGITAL test displays the Location and Site Name, the list of Channel numbers, the MER, PEEBER, PSTBER, LEVEL and DIAGNOSIS, the number of channels Tested, the number that Passed and the number that Failed according to the SETUP criteria for the Location and the test in process. (Figure 3-45)

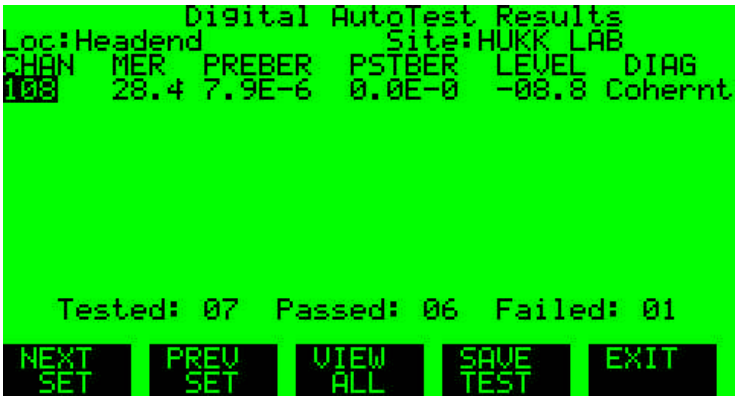


FIGURE 3-45

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The AUTO TEST RESULTS screen also offers the user additional function keys to view the next set of data NEXT SET (F1) [page down], view the previous set of data PREV SET (F2) [page up], view all channel results or view just the failed channels VIEW ALL / VIEW FAILED (F3), to save the test results via SAVE TEST (F4), or EXIT the screen back to the initial AUTO TEST screen. F3 toggle between VIEW ALL and VIEW FAILED. Channels failing the criteria are displayed with their channel number in light test in a dark box, while channels that pass the criteria are displayed in normal dark text.

24 – HR. FCC TESTING

The CR1200R Digital Signal analyzer will perform 24-hour level testing as required by the Federal Communications Commission. To begin the FCC testing, press the START 24 HR TEST (F3) soft key. The FCC DATALOG screen will appear as shown in Figure 3-45.

The FCC Testing Data Log screen Figure 3-46 prompts the operator to enter the time the test should begin and the site location where the test is taking place.

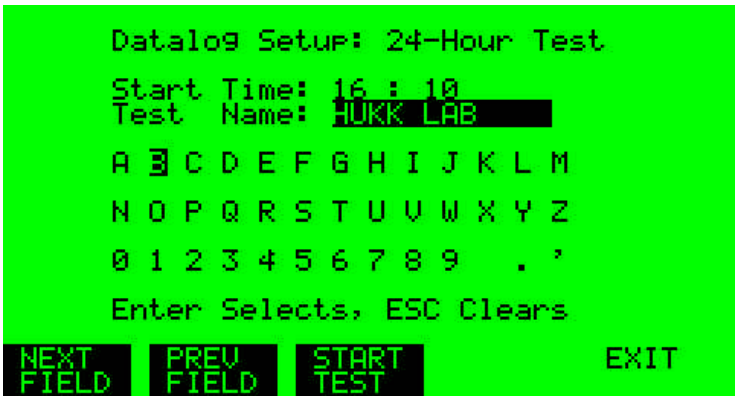


FIGURE 3-46

ENTERING THE TIME

Utilizing the NEXT FIELD (F1) and the PREV FIELD (F2) keys, move the cursor over the hours portion of the start time. Turn the knob until the hour correct hour appears. Keep in mind that the CR1200R utilizes 24 hour time, so that if you want the test to begin at 1 PM, you need to set the clock to 13 hours. Next position the cursor

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over the minutes portion of the start time and rotate the knob until the correct number of minutes appears.

ENTER THE TEST SITE NAME

To enter the Test Site Name, use the NEXT FIELD (F1) and the PREV FIELD (F2) keys to position the cursor over the test site name. Once the Test Site Name is highlighted, turn the knob to highlight the first letter of the Site Name. Pressing enter will accept that letter. Move on to the next letter and continue this process until the entire name is entered. The Site Name field will accept up to 12 characters.

NOTE: THIS NEW SITE NAME WILL REMAIN THE SYSTEM DEFAULT UNTIL CHANGED EITHER AS IN FIGURE 3-36 OR AS DESCRIBED IN THE SYSTEM SETUP SECTION OF THE MANUAL (SEE FIGURE 3-6).

STARTING THE TEST

Pressing the START TEST (F3) soft key from the FCC DATA LOG SETUP screen (Figure 3-46) will begin the test process immediately. Otherwise, the CR1200R will wait for the programmed start time before beginning the test.

If the test is started immediately, a system scan screen will appear as shown in Figure 3-47. Once the scan is complete a message stating that the unit is entering stand-by mode will appear.

If the start test button is not depressed, the unit will go into stand-by mode and begin the auto test at the assigned time.

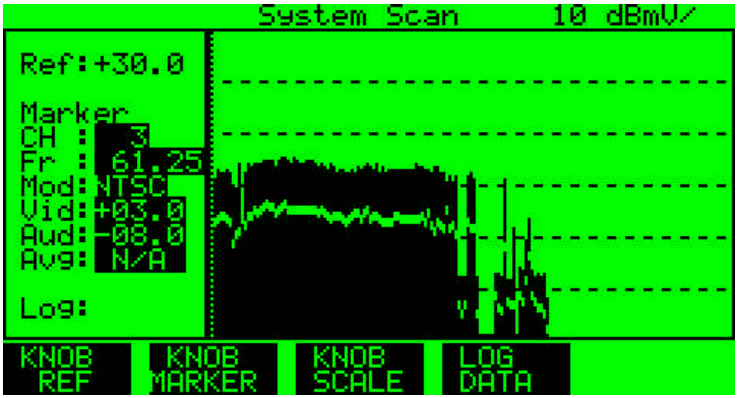


FIGURE 3-47

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SETUP

SETUP will allow the user to define a set of pass fail criteria for all of the AUTO TEST measurements. A criteria set may be defined for each Location listed in the initial AUTO TEST screen (Figure 3-42). Pressing the SETUP (F4) function key will provide a menu of the criteria which the user can set as shown in figure 3-48.

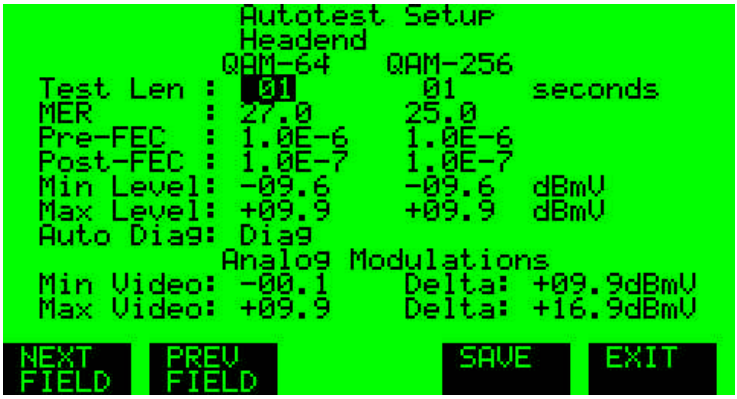


FIGURE 3-48

Utilize the NEXT FIELD (F1) and PREVIOUS FIELD (F2) keys to select the parameter to revise. The tuning knob sequences through the parameter settings. Press SAVE to go back to the previous screen and use the new parameters or EXIT to return to the previous screen using the old parameters.

REMOTE SOFTWARE

Test results can be viewed on the CR1200R screen or downloaded to a computer utilizing the CR1200 remote software, which can be downloaded at no charge at www.hukk.com. The software is designed for Windows 95 and Windows 98 operating systems. It will not work properly with systems running Windows NT.

AN example screen of the REMOTE PC software is displayed in Figure 3-49

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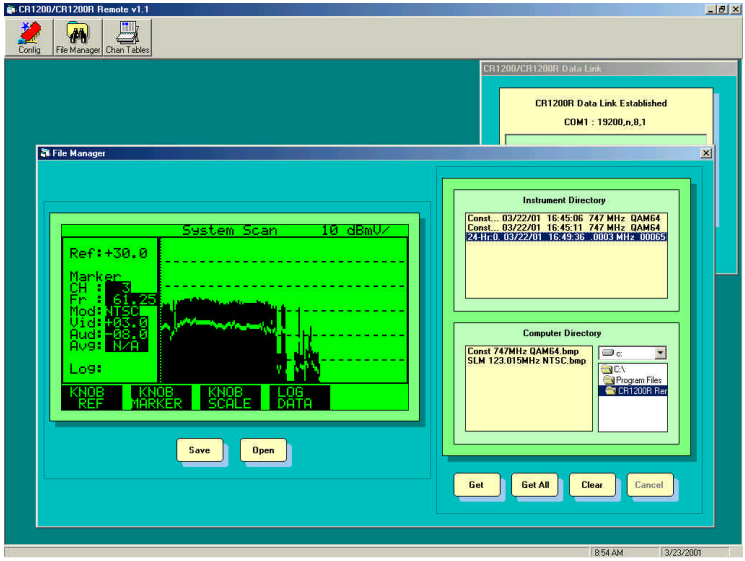
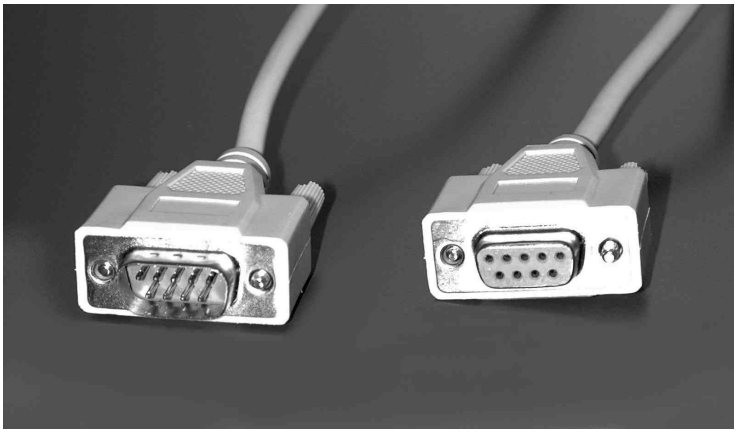


FIGURE 3-49

INTERFACE CABLE

Any standard RS-232C “straight through” interface cable will work with the Remote Software. The cable connects between your computer’s communications port and the CR1200R DB-9 interface connector. A pin-out of the cable is shown in figure 3-50.

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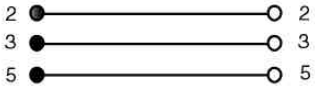


FIGURE 3-50

Please note that similar cables are used for computer interface with a different pin out. “Null Modem” cables appear to be identical, but have the connections to pin 2 and 3 crossed in the cable.

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CHAPTER 4

SPECIFICATIONS

This section contains the specifications for the Sunrise Telecom, Hukk Division Model CR1200R Digital Signal Analyzer.

DIGITAL SIGNAL ANALYSIS

MODULATION

Modulation Type: 64/256 QAM (DVS031, ITU-T J.83 Annex B)
Lock Range 64 QAM: -20 to +50 dBmV (typical)
Lock Range 256 QAM: -15 to +50 dBmV at 256 QAM (typical)

MER MODULATION ERROR RATIO**

Range: 21 to 35 dB
MER Accuracy: ±2.0 dB

SIGANL LEVEL

Accuracy: ± 2.0 dB @ 25º C Average Detector

GRAPHIC DISPLAYS

Constellation: I-Q display of 64 or 256-QAM signal
Equalizer: Display of adaptive equalizer taps

BER (Pre and Post FEC)

Range 1.0×10^{-9} to 9.0×10^{-3}
FEC Lock Loss/Lock-indication
Errored Seconds Numerical count of errored seconds
Severely Errored Seconds: Numerical Count of SEC

ANALOG SIGNAL ANALYSIS

Modulation Type: VSB (NTSC)
Operation Range: -20 to +50 dBmV typical
Signal Level Meter Measurements: Video & Audio Carrier Level
Accuracy: ± 2.0 dB over operating temperature.
Amplitude: -20 to +50 dBmV

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SPECTRUM MODE

Spans: 6.25, 12.5, 25 and 50 MHz.
Display scaling and range: 2, 5 and 10 dB/div. (6 divisions)
Spurious-Free Dynamic range: 60 dB
Measurement range: -50 to +50 dBmV

SYSTEM FEATURES

ELECTRICAL

Tuning Range: 50-800 MHz
Input Resistance: 75 ohms (nominal)
RF Input: F81 connector (field replaceable)
Serial Interface: EIA RS-232

PHYSICAL

Approx. size: 10.75”W x 9.75”D x 5”H
Weight: <10 pounds
Temperature: 0º C - 50º C

POWER

Power: Internal battery pack
External Power: 120V AC adapter/charger or DC power cord
Operating Time: 3 hours (nominal)

ADDITIONAL FEATURES

GENERAL

Display: LCD with backlight
Frequency Plans: NTSC STD., IRC, HRC
Power Reduction: Auto unit shut down
Elapsed Time: hr, min, sec
Store/Recall: All data and graphs
Printouts: RS-232 to computer

* Hukk Engineering reserves the right to change any or all specifications without notice.

** All digital measurements are for individual channels with power levels between -20 and +40 dBmV over specified temperature range. All analog measurements are for individual channels with power levels between -15 and +40 dBmV over specified temperature range.

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CHAPTER 5

OPTIONS & ACCESSORIES

INTRODUCTION

This chapter describes the options and accessories that are available for use with the Hukk Engineering Model CR1200R QAM Monitor.

OPTIONS

These Options may be added to the CR1200R for an additional charge.

Return Path Option - 01

With **Option 01 (Return Path)**, the CR1200R frequency coverage is extended to include the return path frequencies between 5 and 42 MHz. The combination of the return path capability and zero span testing creates a powerful tool for measuring return path TDMA signals such as the 16-QAM and QPSK signals used by both cable and telephony modems. For return path operation see Chapter 3— Operation.

ACCESSORIES

The CR1200R comes with the following standard accessories:

Manual and Training CD-ROM

AC power adaptor

Input:	100-240 VAC
Output:	15.5 volts DC @ 3.4 A max.

F to F female adapter

Nylon Carry strap

Vehicle Adaptor

Input:	12 volts DC
Output:	18 volts DC

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CHAPTER 6

MAINTENANCE AND SERVICE

INTRODUCTION

This section contains information on maintenance and service for the Sunrise Telecom, Hukk Division Model CR1200R Digital Signal Analyzer.

MAINTENANCE

INTERNAL RECHARGEABLE BATTERY

Recharge the CR1200R before and after each field use. As often as possible, power the CR1200R with the supplied AC adapter when the unit is turned off and not in use. This allows an internal control circuit to maintain an optimum standby charge voltage on the battery to maximize its shelf and operating life.

NOTE: USE ONLY THE SUPPLIED AC ADAPTER TO RECHARGE THE CR1200. INCORRECT POLARITY OR VOLTAGE COULD DAMAGE THE CR1200 OR INTERNAL BATTERY.

Only Replace Battery with Hukk part number 120-10789-001 9-Cell Nimh Battery Pack.

Used batteries should not be discarded. Dispose of battery through appropriate recycling program..

CLEANING

Clean the CR1200 with a soft cloth moistened with water. Use a small amount of mild soap if necessary. Do not apply abrasive or chemical cleaners. These may damage the plastic finishes on the case, keypad, or display windows.

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TROUBLESHOOTING

If the CR1200R fails to operate and no front panel indicators are illuminated, the internal lead battery may be discharged. Use the supplied AC adapter to power the unit and recharge the battery. If the failure persists while using the AC adapter, call Sunrise Telecom, Hukk Division for service.

If the internal battery fails to recharge, verify that the AC adapter is actually sending power to the CR1200R. Plug the AC adapter into the CR1200R to RECHARGE the input, then connect the AC adapter to the 115VAC source. Turn the CR1200R on. If the internal battery fails to recharge, but the AC adapter delivers power to the CR1200R, the battery may be deeply discharged or damaged. A deep discharge requires a longer charge time. If the battery is not restored to normal operation by an eight-hour recharge, call Sunrise Telecom, Hukk Division for service.

If the CR1200R fails to maintain the date and time, or loses all data from the optional log memory, the internal lithium battery may have failed. Call Sunrise Telecom, Hukk Division for service.

If the CR1200R fails to detect QAM carriers, or if the unit won't lock to carriers when using the "force modulation" mode, check the RF input power level. The CR1200 can be overloaded by excess power at the input. The resulting signal distortion impairs the ability of the CR1200 to detect and identify QAM signals.

SERVICE

WARRANTY

Sunrise Telecom, Hukk Division warrants the CR1200R Digital Signal Analyzer and supplied accessories against defects in materials and workmanship for a period of one year from receipt by the customer. During the warranty period, Sunrise Telecom, Hukk Division will, at its option, repair or replace defective products.

Liability under this warranty extends only to the replacement value of the equipment.

This warranty does not apply under the following conditions:

The CR1200R or its accessories have been partially or fully disassembled, or altered or repaired by persons not authorized by Hukk Engineering, Inc. to do such work.

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The CR1200R is installed or operated other than in accordance with instructions contained in its operating manual.

No other warranty is expressed or implied. Hukk is not liable for consequential damages.

RETURNING EQUIPMENT

Before returning any equipment, call Sunrise Telecom, Hukk Division to obtain a Return Authorization number. Indicate the Return Authorization number on all correspondence.

Pack the equipment securely in its original shipping material. Mark the Return Authorization number clearly on the outside of the shipping container. If the original container is not available, pack the equipment in materials sufficient to avoid damage in transit. Sunrise Telecom, Hukk Division is not liable for damage that occurs during shipping. Return equipment to Sunrise Telecom, Hukk Division with shipping prepaid.

Attach the following information to all equipment returned for repair:

- Owner's name and address.
- A list of the equipment being returned and the serial number.
- A detailed description of the problem, or service requested.
- The name and telephone number of the person to contact regarding questions about the repair.

TO CONTACT HUKK ENGINEERING

Call Sunrise Telecom, Hukk Division between the hours of 9 AM and 5 PM Eastern Time at (770)-446-6086. Send correspondence to:

Sunrise Telecom, Hukk Division
3250-D Peachtree Corners Circle
Norcross, GA 30092
(770)-446-6086

Or email at:
www/support@hukk.com

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