APPLIED INSTRUMENTS, INC.

RF TEST AND MEASUREMENT

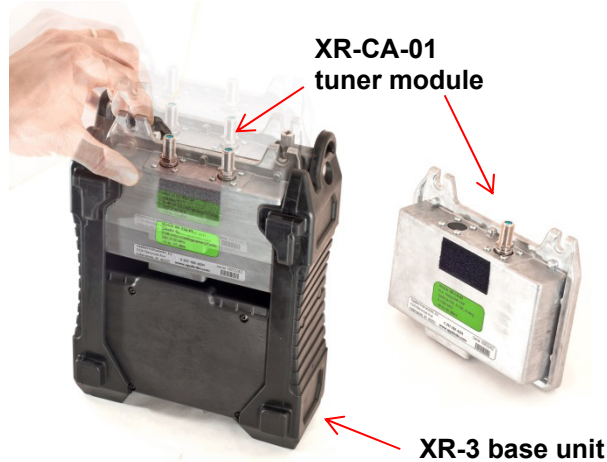# XR-3 Modular Test Instrument Cable Air Module
Operation Manual

Revision	1.00
Date	04/03/2015

This manual covers basic operations and functions of the XR-3's Cable Air Module. For more detailed instructions on how to use the instrument for different applications, see the Application Notes available on our website, http://www.appliedin.com

1. <u>Introduction to XR-3's Cable Air Module</u>

The XR-3 Cable Air module is used with the XR-3 modular test instrument base unit. The XR-3 Cable Air module is a signal level meter and analyzer for cable and terrestrial over-the-air broadcast TV installation and troubleshooting. It is ideal for CATV and UHF off-air antenna installers and private cable operators that need fast, easy signal measurements.

XR-CA-01 tuner module

XR-3 base unit

GENERAL FEATURES
- Works with the XR-3 Modular Test Instrument
- Friendly user interface
- Tune by frequency or tune by channel number
- Field replaceable type F-female barrel connector
- Fast system boot-up time
- Compatible with digital and analog signals
- Store measurements for Proof-of-Performance
- Programmable Pass/Fail limit scan for all channels
- Quick scan of all channels
- Easily create new custom channel plans or use standard base plans
- Spectrum Screen (frequency on x-axis, amplitude on y-axis)
- Constellation Screen (I and Q demodulator values)

VHF / UHF OFF-AIR FEATURES
- Supplies Pre-Amp / LNA power
- Simultaneously displays signal level and quality of multiple channels
- Displays measurements for analog and digital signals
- High signal sensitivity assures Off-Air antenna alignment optimization
- Manually tunes to custom channels
- Audible tone for signal lock and peak

CATV FEATURES
- Compatible with analog and digital CATV signals
- Frequency range from 5 MHz to 1 GHz
- Tilt measurement

MMDS FEATURES
- • Powers frequency block down-converters

MEASUREMENTS
- • Digital and Analog Signal Level (dBm, dBmV, or dBμV) with present and peak bar graph
- • Analog Signal Quality (C/N)
- • Digital Signal Quality (MER & BER)
- • Locks on 8VSB (ATSC A/53) UHF digital Off-Air signals
- • Locks on 64QAM and 256QAM (ITU-T J.83, Annex B) CATV signals
- • Tilt
- • Analog Video and Audio Carrier Measurements (NTSC, PAL, SECAM)
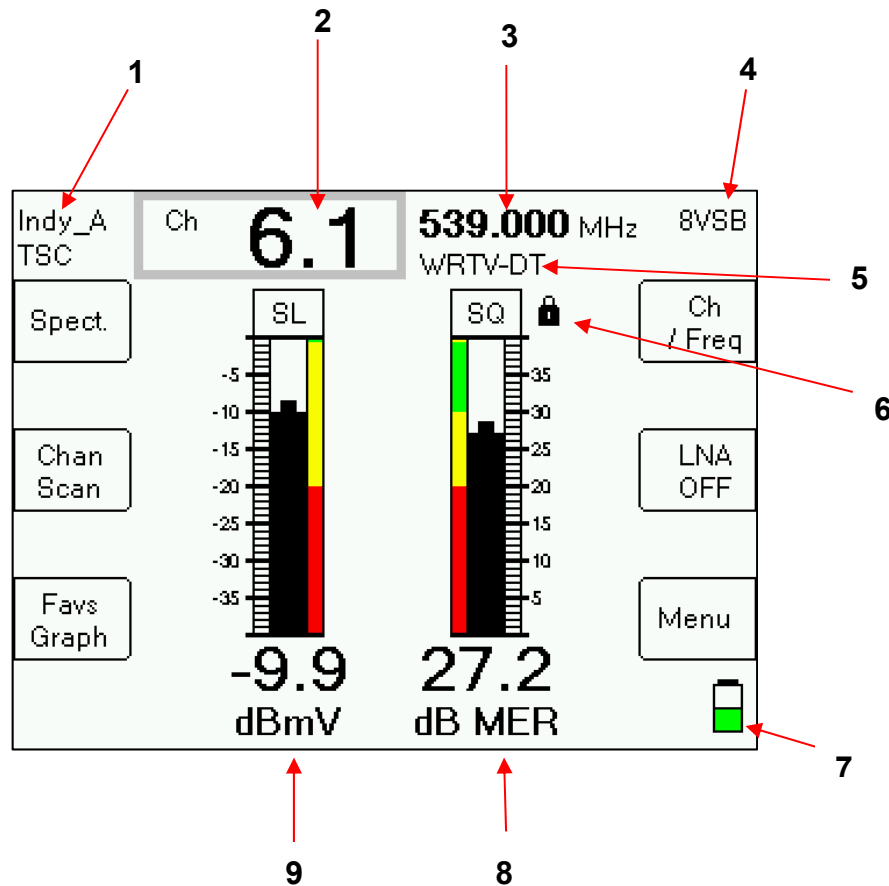- • Current draw of off-air antenna pre-amp / LNA

Standard Accessories

Accessories included with your XR-CA-01 Cable Air module include:
- • Quick Start Guide

2. <u>Run Screen</u>

The Run Screen displays valuable information used to test a cable network or to point an off-air antenna.

Main Run Screen Fields

1) Name of active channel plan
2) Channel number – When in Tune by Channel mode (chosen via top right Ch/Freq soft-key), use up or right arrow keys to toggle to next highest channel in active channel plan. Use down or left arrow keys to toggle to next lowest channel in active channel plan. To direct-tune to a particular channel, use numeric keypad to type desired channel number to tune to and then press Enter button.
3) Channel frequency – When in tune by channel mode, field displays frequency related to selected channel. When in Tune by Frequency mode (chosen via top right Ch/Freq soft-key), the up or right arrow key toggles to the next highest available frequency (0.125 MHz increments) in the active channel plan. The down or left arrow key toggles to the next lowest available frequency (0.125 MHz increments) in the active channel plan. To direct-tune to a particular frequency, use numeric keypad to type desired frequency to tune to and then press Enter button.
4) Signal type – 8VSB, QAM64, QAM256, or Analog (NTSC, PAL, SECAM)
5) Channel label (network, i.e. ESPN or station identifier, i.e. WRTV) – to be entered by you by editing Channel Parameters
6) Lock status indicator (for digital channels)
   a. Empty white space is shown when searching for a matching signal
   b. Padlock icon is displayed when signal lock is obtained
7) Battery level icon
8) Signal Quality (MER or C/N)
   a. Right bar graph (with peak hold center line)
   b. MER (for digital channels) or C/N (for analog channels), in dB
   c. Scale: 0 to >40 dB MER
9) RF Signal Level (dBm, dBmV, or dBµV)
   a. Left bar graph (with peak hold center line)
   b. Numeric value in dBm, dBmV, or dBµV
   c. Scale: default scale is -30 to +10 dBmV
      Note: Entire amplitude range -40 to +60 dBmV (-89 to +11 dBm) (+20 to +120 dBµV) is not shown on scale by default, but will auto-scale when appropriate, according to level measured

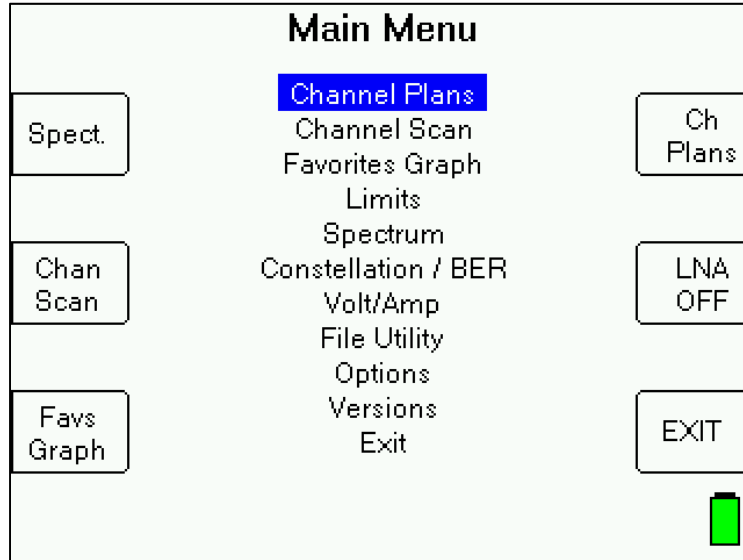## Soft Keys
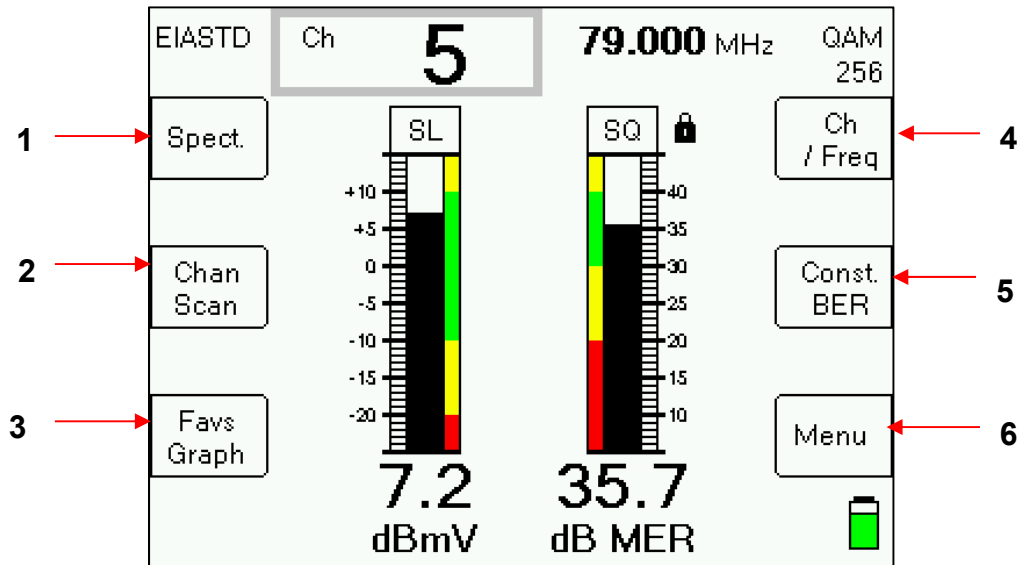
1) Spectrum screen shortcut soft-key
2) Channel Scan shortcut soft-key
3) Favorites Graph shortcut soft-key
4) Channel Number / Frequency toggle soft-key – toggles between tune-by-channel and tune-by-frequency modes. Active mode is indicated by gray rectangle shown around the channel field or frequency field.
5) Constellation / BER shortcut soft-key
6) Main Menu shortcut soft-key

3. <u>Main Menu</u>

Pressing the MENU soft-key on the main Run screen takes you to a menu of all of the XR-3 screens. Some of these screens are also available via shortcut soft-keys from the Run Screen.

You can navigate the Main Menu using the up/down and Enter keys. Some functions are also available via soft-keys as a shortcut. "Exit" takes you back to the Run Screen.

The functions are described in the sections that follow.

4. <u>Channel Plans</u>

From the Run screen, press 'Menu' soft-key, then select 'Channel Plans' from the Main Menu to reach the Channel Plans screen. Select a channel plan corresponding to the type of channels in the system you are testing. This step is essential since the XR-3 only tunes to relevant channel numbers and their frequencies and signal types based on this information.

```
                    Channel Plans
                          ↑
   PAL I              PAL I analog              ┌──────┐
   SECAM              SECAM analog              │ Edit/│
                                                │Create│
                                                └──────┘
   Standard Off-Air Plans
    NTSC ATSC         VHF/UHF analog & 8VSB     ┌──────┐
    FM N.Am           FM N.America              │Delete│
                                                └──────┘
   Custom Plans
    Indy_ATSC         INDY OFF-AIR              ┌──────┐
    HILTON            CABLE HEADEND             │ EXIT │
    DENVER ATSC       DENVER OFF-AIR            └──────┘
                          ↓
```
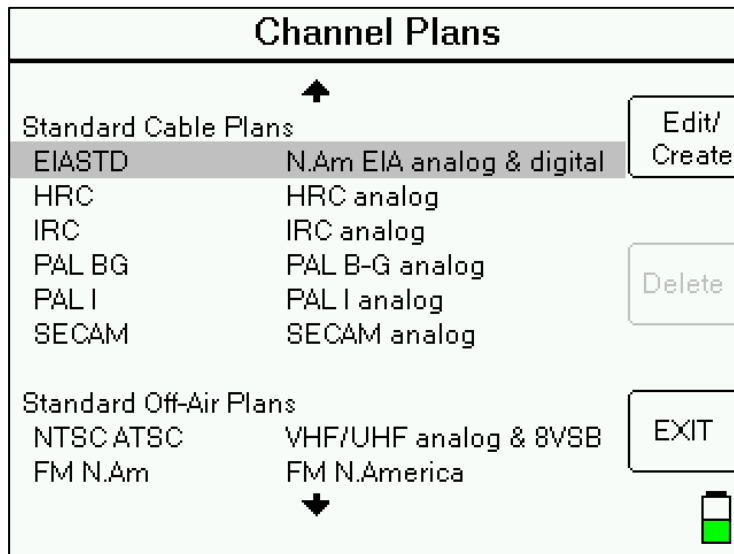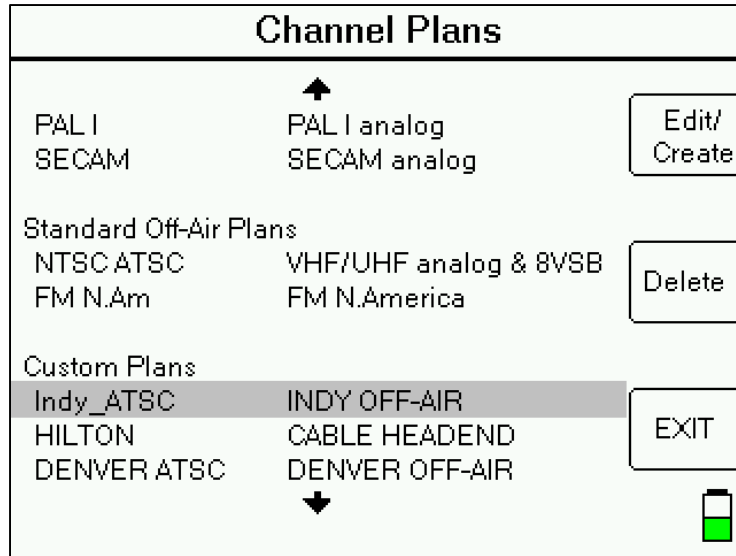
This screen is a simple menu selection. To select and activate a plan, use the up/down arrow buttons to highlight the selection you want to use and press ENTER. To create a new custom channel plan, highlight a standard plan to be used as the base plan and press the Edit/Create soft-key. See more details below in the Custom Plans section about how to create custom channel plans. To edit a custom channel plan, select an existing custom channel plan and press the Edit/Create soft-key.

Due to the large variety of systems in use, the Channel Plans selection is divided into three sections:
1)   Standard Cable Plans
2)   Standard Off-Air Plans
3)   Custom Plans

Standard Cable Plans

When the unit is shipped from the factory, it will have the most common compatible cable channel plans for North America loaded:
- EIASTD – This plan is designed for and automatically detects North American EIA analog (NTSC) & digital (QAM64 or QAM256) signals from 55.25 MHz to 997.25 MHz (analog) or 57.00 MHz to 999.00 MHz (digital).
- HRC
- IRC
- PAL BG
- PAL I
- SECAM

Standard Off-Air Plans

When the unit is shipped from the factory, it will have the most common compatible off-air channel plans for North America loaded:

- NTSC ATSC – This plan is designed for and automatically detects North American analog (NTSC) & digital (8VSB) signals from 55.25 MHz to 747.25 MHz (analog) or 57.00 MHz to 749.00 MHz (digital).
- FM N. Am – This plan tunes to the 100 analog FM carrier frequencies from 88.100 MHz to 107.900 MHz.

Custom Plans

Create a Custom Channel Plan

There are 3 ways that you can create a custom channel plan:

1) Use the Channel Scan feature and then from the Save menu, select "Save Found Channels as new Plan".
   This method is desirable if you're at a site and want to find which channels are present on the existing cable or off-air system. After selecting the appropriate base Standard Cable or Standard Off-Air channel plan, connect the meter to a coax cable and run a Channel Scan. The meter will automatically find the active channels and determine if they are analog or digital and will save the channel plan with the signal type detected.

2) Manually edit all of the desired channel numbers and frequencies using the meter. In the Channel Plans section of the Main Menu, highlight a Standard Cable or Standard Off-Air plan to be used as the base plan and press the Edit/Create soft-key. This allows you to save the standard channel plan lineup under a different file name (Save As) so that the new custom plan can be edited. This method is desirable if you just want to slightly modify the channel lineup from the way it is in the Standard Plan.
   Or highlight a custom channel plan in the Custom Plans section and press the Edit/Create soft-key to edit the channel lineup and individual channel parameters. You can change the filename, if desired (Save As), to create a new custom channel plan from an existing custom plan.

3) Use the MeterMaid application on a PC to load a custom channel plan (.pln) file after editing the plan file using a text editor (i.e. Notepad or Notepad++)

Create Custom Channel Plan by Scanning Channels Present On Active System

1) Connect the XR-3 to an off-air antenna (that is already aligned) or to your cable system and detect your channels to create a custom channel plan
   a. Press **Menu** soft-key to enter the Main Menu
   b. Select 'Channel Plans' and press Enter.
   c. Highlight the desired channel plan to use as your base plan and then press **Enter**.
   d. If you haven't already, connect a coax cable from the cable system or off-air antenna's output to input port of XR-3's Cable Air module.
   e. While on the main Run screen where your bar graphs are, press the 'Chan Scan' soft-key to initiate a channel scan. The meter will sound an audible tone (beep) when the scan is complete.
   f. If you wish to pick favorite channels and tilt channels, highlight the desired channel using the up/down arrow buttons and then press the **Fav/Tilt** soft-key (by pressing the #1 button on the alphanumeric keypad that corresponds to that soft-key). Press soft-key once to flag the channel as one of your favorites. Press

soft-key a 2nd time to flag channel as one of your tilt channels. Press soft-key a 3rd time to remove the flags. You may pick up to 5 favorite channels per channel plan. The 2 tilt channels count as favorite channels as well.

Choosing favorite channels in an off-air plan can be very useful since you'll then be able to view all 5 favorite channels on the screen at once (in the Favs Graph) while aligning the off-air antenna. Since off-air antenna alignment sometimes ends up being a compromise because some transmitter towers are located in one direction and other transmitter towers are located in another direction, seeing multiple channels on the screen at once is critical to be sure that improving the signal on one channel isn't significantly degrading the signal on another channel.

g. Press the **Save** soft-key (by pressing the #2 button on the alphanumeric keypad that corresponds to that soft-key).

h. Then select 'Save Found Channels as new Plan'. If you have flagged any channels as favorite / tilt channels, then these will be saved to the new plan, too.

Edit a Base Channel Plan and Save As New Custom Channel Plan

a. Press **Menu** soft-key to enter the Main Menu

b. Select 'Channel Plans' and press Enter.

c. Highlight the desired channel plan to use as your base plan and then press the **Edit / Create** soft-key.

d. In the Channel Plan File Summary screen,

    i. Using the alphanumeric keypad, type the desired filename for your custom channel plan in the Filename field and then press Enter.

    ii. Specify the location, technician name, and enter any notes in their respective fields, as desired.

    iii. In the 'LNA voltage' field, select whether you want to allow voltage output from the meter for this channel plan or not (choices are 13V, 18V, NONE). You would want to allow voltage output if you envision powering off-air antenna pre-amplifiers using the XR-3 while your custom plan is selected. You would not want to allow voltage output if the channel plan is designed for CATV testing.

    iv. Press the **Next** soft-key to enter the Channel Lineup screen.

    v. Delete any channels that you don't wish to measure (if the off-air channels don't exist in your area or the cable channels aren't active on your system) by highlighting the channel and then pressing the **Delete** soft-key.

    vi. To edit the parameters of any channel, highlight the channel and press **Enter** to enter the Channel Parameters screen.

        1. You may edit or enter a new Channel Number by entering the new desired channel number (i.e. 2, 4.1, 6, 44.1, 52, 61.1, etc.) using the meter's alphanumeric keypad. Then press **Enter**.

        2. You may edit or enter a new Channel Label by entering the new desired channel label (i.e. ESPN or CNN or KTFD-DT or WTTV, etc.) using the meter's alphanumeric keypad. Then press **Enter**.

        3. If the channel is a digital channel, then you should ensure that these parameters are entered in the following fields:

            a. For UHF digital off-air (ATSC A/53) channels:

                i. Type: 8VSB

                ii. Subtype: NONE

                iii. Bandwidth: 6000 kHz

                iv. Symbol Rate: 10782 kSym/Sec

                v. Noise Offset: -3000 kHz

            b. For QAM 64 (ITU-T J.83 Annex B) digital cable channels:

       i.   Type: QAM
      ii.   Subtype: QAM 64
     iii.   Bandwidth: 6000 kHz
     iv.   Symbol Rate: 5057 kSym/Sec
      v.   Noise Offset: -3000 kHz

  c.   For QAM 256 (ITU-T J.83 Annex B) digital cable channels:
       i.   Type: QAM
      ii.   Subtype: QAM 256
     iii.   Bandwidth: 6000 kHz
     iv.   Symbol Rate: 5361 kSym/Sec
      v.   Noise Offset: -3000 kHz

  d.   For digital cable channels whose signal type could be either QAM 64 or QAM 256 (ITU-T J.83 Annex B):
       i.   Type: QAM
      ii.   Subtype: AUTO
     iii.   Bandwidth: 6000 kHz
     iv.   Symbol Rate: AUTO (leave as is)
      v.   Noise Offset: -3000 kHz

  e.   For analog (NSTC) video cable or off-air channels:
       i.   Type: ANALOG
      ii.   Subtype: 1-AUDIO
     iii.   Audio 1 Carrier: 4500 kHz
     iv.   Audio 2 Carrier: 0 kHz
      v.   Noise Offset: -1250 kHz

4. If you want a particular channel to be marked as one of your favorite channels or tilt channels, then you can specify that in the Favorite/Tilt field of the Channel Parameters screen. After moving cursor to the Favorite/Tilt field, use the left/right arrow buttons to make your selection. You may specify up to 5 favorite channels. The 2 tilt channels count as favorites.

5. After you've finished editing the channel parameters, press the **Back** soft-key to reach the Channel Lineup screen, then press the **Back** soft-key again to reach the Channel Plan File Summary screen, then press the **Save** soft-key to save your changes to your custom channel plan.

**Edit Custom Channel Plan Files Using Text editor On PC**

Use the MeterMaid application on a PC to load a custom channel plan (.pln) file after editing the plan files using a text editor program (i.e. Notepad or Notepad++) on a PC. This method is for advanced users. Contact Applied Instruments for more details and assistance.

6. <u>Limits</u>

You can define Signal Level and Signal Quality Limits. Once limits have been defined, the XR-3 can provide:

- Color coding next to the bar graphs on the main Run screen to indicate if the present signal level and quality are good (green), marginal (yellow), or bad (red), when compared to the defined limits. If there isn't an active Limits file, then each bar graph will be displayed in black and white.
- Overall Scan Result (PASS or FAIL) and results for each channel (PASS or FAIL) within a Channel Scan or Favorites Scan, based on comparing the measurements to the set of defined limits. Passing channels are indicated by a green check mark. Marginal channels are indicated by a yellow triangle. Failing channels are indicated by a red 'X'.
- Color coding on the graph view of a Channel Scan or Favorites Scan - If a Limits file is active, then passing channels are displayed in green color, marginal channels are displayed in yellow color, and failing channels are displayed in red color. If there isn't an active Limits file, then all channels will be displayed in black color.

To define Limits, select 'Limits' from the Main Menu. To select a Limits profile file, use the up/down arrow buttons to highlight the selection you want to use and press ENTER. To create a new limits file, press the Create soft-key. To edit a Limits file, select the file and press the Edit soft-key.
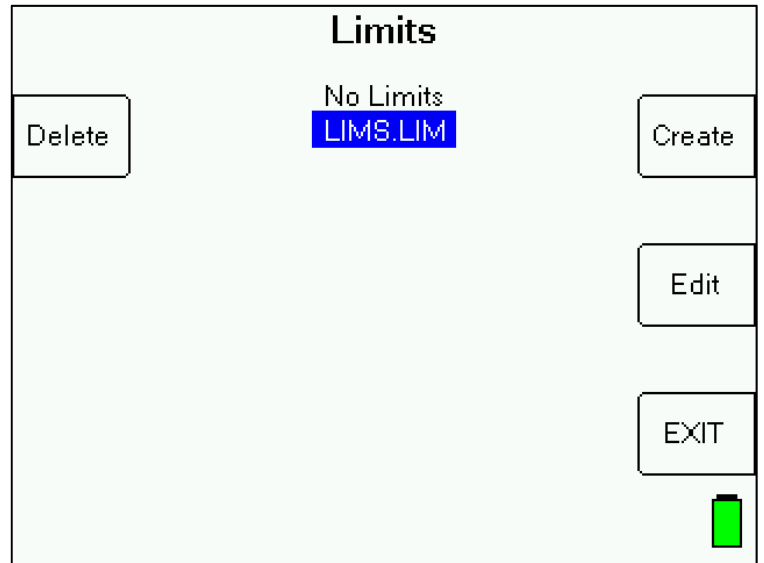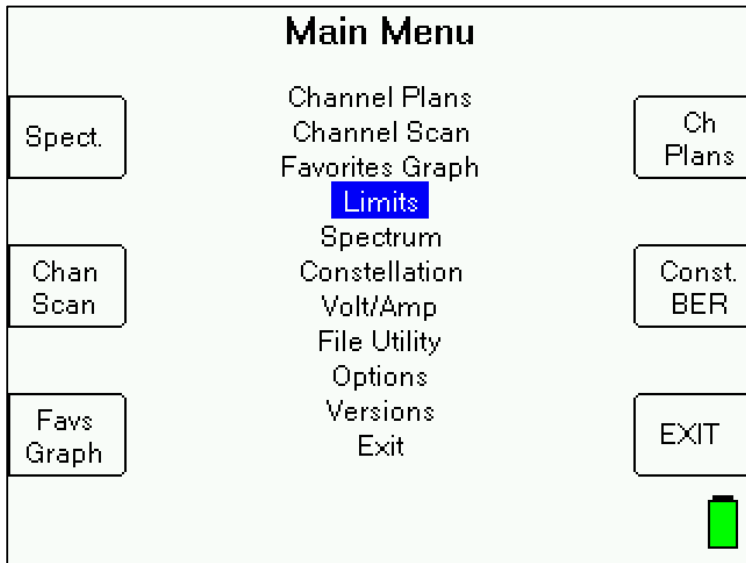
```
                         Edit Limits
          Signal Type           Level    Quality
                                 dBmV       dB
          QAM64
                    Minimum:    -20.0      20.0
                  Min Warning:  -10.0      30.0
                  Max Warning:   10.0      40.0       ┌────────┐
                    Maximum:     20.0      50.0       │  Next  │
                                                      └────────┘
          QAM256
                    Minimum:    -20.0      20.0
                  Min Warning:  -10.0      30.0       ┌────────┐
                  Max Warning:   10.0      40.0       │  Exit  │
                    Maximum:     20.0      50.0       └────────┘
                                                  More ⬇  🔋
```

```
                         Edit Limits      More ⬆
          Signal Type           Level    Quality
                                 dBmV       dB
          8VSB
                    Minimum:    -20.0      20.0
                  Min Warning:    0.0      30.0
                  Max Warning:   10.0      40.0       ┌────────┐
                    Maximum:     20.0      50.0       │  Next  │
                                                      └────────┘
          DIGITAL
                    Minimum:    -20.0      20.0
                  Min Warning:  -10.0      30.0       ┌────────┐
                  Max Warning:   10.0      40.0       │  Exit  │
                    Maximum:     20.0      50.0       └────────┘
                                                  More ⬇  🔋
```

Edit Limits   More ⬆

Signal Type	Level	Quality
	dBmV	dB
DIGITAL		
Minimum:	-20.0	20.0
Min Warning:	-10.0	30.0
Max Warning:	10.0	40.0
Maximum:	20.0	50.0
ANALOG		
Minimum:	-20.0	20.0
Min Warning:	0.0	30.0
Max Warning:	10.0	40.0
Maximum:	20.0_	50.0

Next

Exit

Edit Limits

Max Tilt	10.0
Min Delta V/A	10.0
Max Delta V/A	17.0

Back

Save

Exit

When you open a Limits file in MeterMaid, it appears as shown below:

MeterMaid - [LIMITS 11.CLIM]

File   View   Help

Cable/Air Limits

LIMITS 11.CLIM

Date : 02/18/2015
Location : APPLIED INSTR
Technician : JOHN SMITH
Notes :

Max Tilt : 10.0
Max Delta Video : 10.0
Min Delta V/A : 10.0
Max Delta V/A : 17.0
Max Delta Adj Chan : 3.0
Max delta In Chan : 5.0
Max 24 Hr Deviation :5.0
Units : dBmV

Chan Type	Min Level	Min Warn	Max Warn	Max Level	Min Qual	Min Warn	Max Warn	Max Qual
QAM64	-20.0	-10.0	10.0	20.0	20.0	30.0	40.0	50.0
QAM256	-20.0	-10.0	10.0	20.0	20.0	30.0	40.0	50.0
DIGITAL	-20.0	-10.0	10.0	20.0	20.0	30.0	40.0	50.0
ANALOG	-20.0	0.0	10.0	20.0	20.0	30.0	40.0	50.0
8VSB	-20.0	0.0	10.0	20.0	20.0	30.0	40.0	50.0

7. Channel Scan

Definition of a Channel Scan

A "channel scan" is a quick measurement of each channel in the selected channel plan or plan subset. It measures the level and quality of each channel and compares the measurements to a set of limits if one is selected.

The Channel Scan feature allows you to:
1) Collect and store signal level and quality data to the flash storage of the XR-3 for later recalling and viewing on the meter or for transfer to a PC for reporting or archiving
2) Select favorite and tilt channels
3) Save found channels as a new channel plan

Collect Test Data

Perform your installation as usual. When the system is fully installed, use the Favorites Graph (Favorites Scan) or the Channel Scan feature to perform the scan and collect the data:

Favorites Graph (Favorites Scan) – scans only your defined tilt and favorite channels (up to 5) in the active channel plan and collects data. For more information on the Favorites Scan, see the Favorites section of the operation manual.
Channel Scan – scans all channels in the active channel plan and collects data

To activate the Channel Scan, press the 'Chan Scan' shortcut soft-key on Run screen or select 'Channel Scan' from the Main Menu.
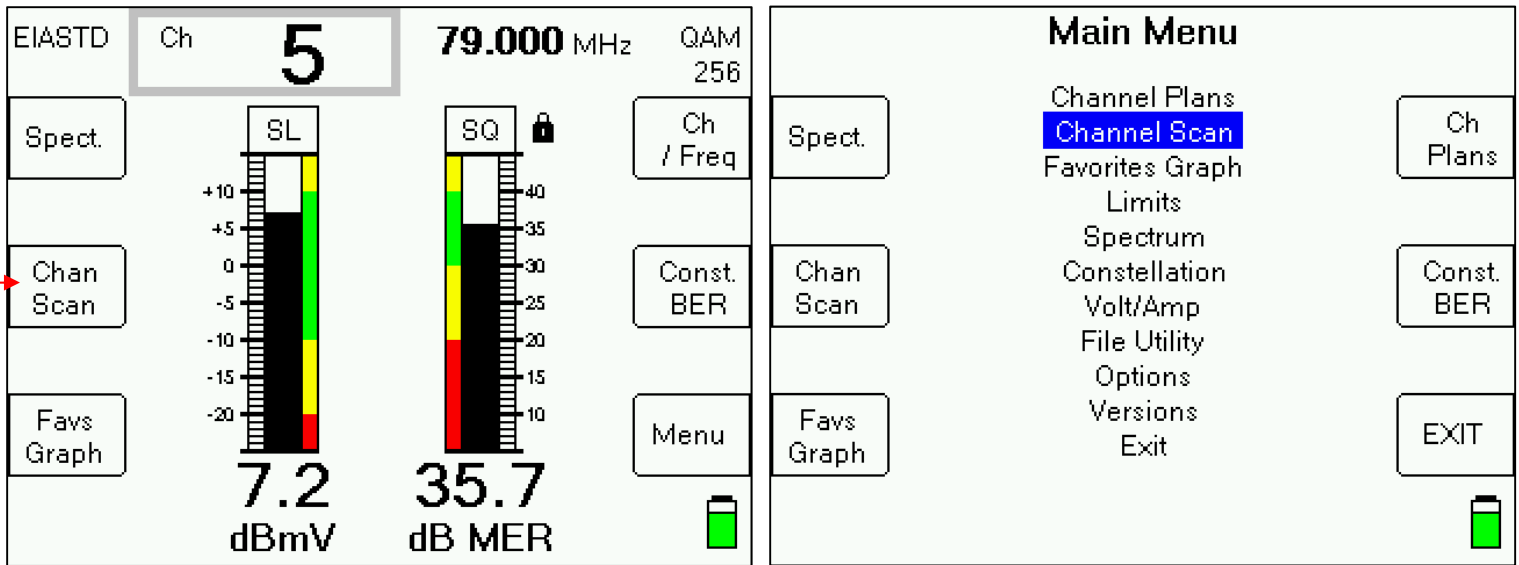
The meter will scan through all channels in the active channel plan, collecting the measurements. You can press the 'Stop' soft-key to abort the scan, otherwise, wait until the scan completes. A progress bar is shown near the bottom middle of the screen. By default, the Table View is displayed, but you may press the 'Graph View' soft-key if desired to see the scan plotted graphically as it progresses.
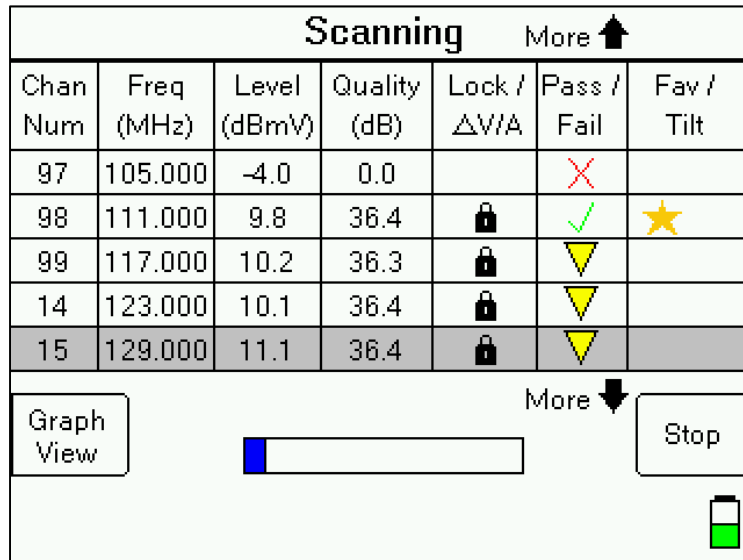
When the scan completes, an audible beep will sound, the progress bar disappears, and the message 'Scan Complete' will be shown at the top center of the screen.

Scan Complete More ↑						
Chan Num	Freq (MHz)	Level (dBmV)	Quality (dB)	Lock / ΔV/A	Pass / Fail	Fav / Tilt
154	975.000	UNDER	0.0		✗	
155	981.000	UNDER	0.0		✗	
156	987.000	UNDER	0.0		✗	
157	993.000	UNDER	0.0		✗	
158	999.000	UNDER	0.0		✗	

Graph View   Tilt = -4.3 dB   Exit

Fav/ Tilt   Save   Sum- mary

Pressing the up and down arrow buttons toggles through the channels to view the measurement results for each channel.

Five soft-keys are shown:
Graph View
Fav/Tilt
Save
Summary
Exit - You can press "EXIT" to discard the data and return to the Run screen

Graph View

Pressing the 'Graph View' soft-key displays the same data as the table view, but in a graphical format. In the Graph View, pressing the left and right arrow buttons toggles through the channels. The presently selected channel is highlighted in gray color on the graph. The measurement results for each channel are shown near the bottom center of the screen under the graph. If a Limits file is active, then passing channels are displayed in green color, marginal channels are displayed in yellow color, and failing channels are displayed in red color. If there isn't an active Limits file, then all channels will be displayed in black color. If two tilt channels have been defined, then a tilt line will be shown in purple color on the graph and a numeric tilt value will also be displayed on the screen.

Scan Complete
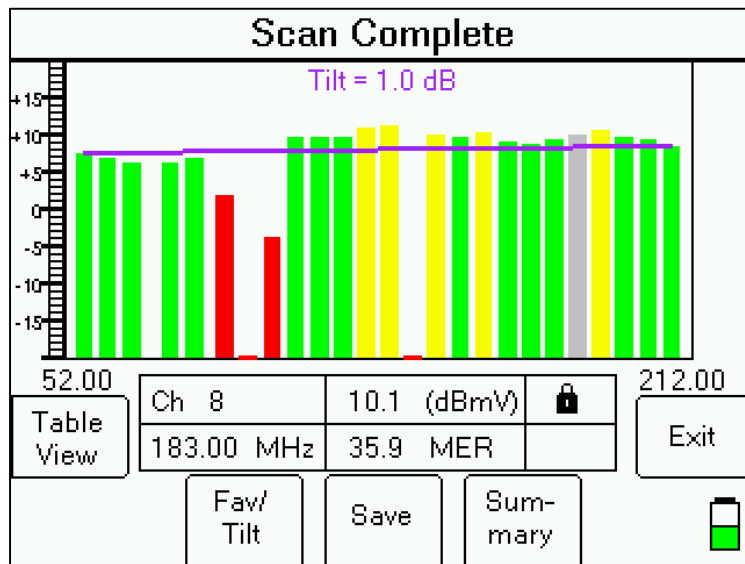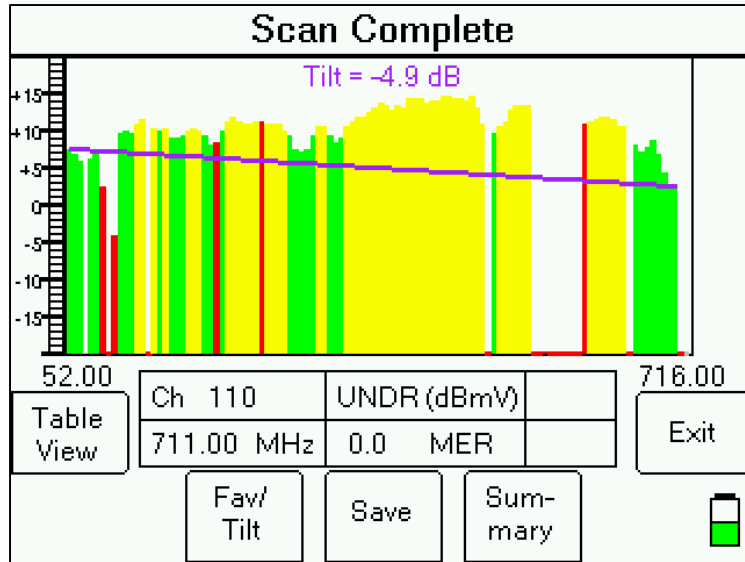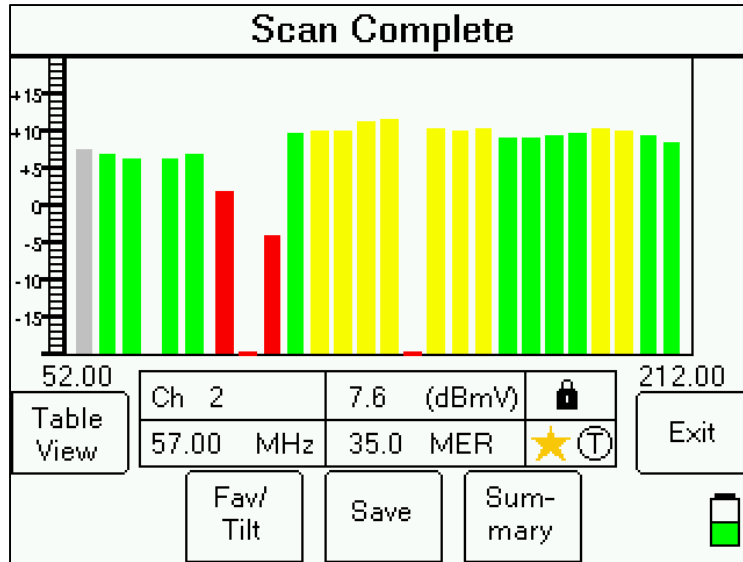
Favorites / Tilt Channels

Pressing the Fav / Tilt soft-key allows you to tag the presently selected channel as a Favorite or as a Tilt channel. You can select up to 2 tilt channels and can select up to 5 favorite channels. The tilt channels are also considered favorites and count towards your max limit of 5 favorites. Pressing the Fav/Tilt soft-key once tags the channel as a Favorite (denoted by yellow star), pressing a 2nd time tags the channel as a Tilt channel (denoted by a 'T' with a circle around it), and pressing the soft-key a 3rd time removes the channel tags (denoted by blank white space).

Scan Complete

Chan Num	Freq (MHz)	Level (dBmV)	Quality (dB)	Lock / ΔV/A	Pass / Fail	Fav / Tilt
3	63.000	4.5	33.3	🔒	✓	★ Ⓣ
4	69.000	4.8	35.8	🔒	✓	★
5	79.000	5.6	36.1	🔒	✓	★
6	85.000	4.5	35.8	🔒	✓	
98	111.000	5.0	35.9	🔒	✓	

Graph View   More ⬇   Tilt = –4.6 dB   Exit

Fav/ Tilt   Save   Sum-mary

Summary

Press the Summary soft-key to view a Summary of the results of the Channel Scan.
The Channel Scan Results Summary screen displays:

- Overall Scan Result (PASS or FAIL) - based on comparing the measurements to a set of limits, if a limits file is active
- Passing / Failing Channels – number of channels passing the defined limits (passing channels are shown in green colored text) and number of channels failing the defined limits (failing channels are shown in red colored text)

- Number of Channels Found / Number of Channels Scanned – indicates how many channels were found out of the number of total channels that were scanned
- Number of Digital Channels Found - indicates how many digital channels (i.e. QAM64, QAM256, or 8VSB) were found
- Number of Analog Channels Found - indicates how many analog channels were found

Saving
Pressing 'SAVE' soft-key proceeds to the file save function, as described below in the Saving Data section.

Scan Results Summary			
Overall Results			View Digital
Scan Result	FAIL		
Passing/Failing Ch	91/66		
Ch Found/Scanned	92/157		View Analog
Digital Ch Found	90		
Analog Ch Found	2		
			Back
	Save		

Digital and Analog Channel Summary
Pressing 'View Digital' or 'View Analog' soft-keys presents a more detailed Channel Scan summary of the Digital or Analog Channels.

Detailed summary screens display various measurement extremes found during the scan:
- Minimum and maximum signal level
- Minimum and maximum signal quality (MER for digital or C/N for analog)
- Minimum and maximum V/A (delta video audio levels)
- Tilt value (applicable if you have selected 2 tilt channels)
- Level and frequency of each selected tilt channel

Scan Results Summary – Digital				
Digital Channels	Value	Chan Num	Freq (MHz)	View Analog
Min Level (dBmV)	UNDER	96	99.000	
Max Level (dBmV)	18.4	58	429.000	
Min Quality (dB)	0.0	95	93.000	Save
Max Quality (dB)	37.7	87	603.000	
Tilt (dB)	19.7			
Tilt 1 Level (dBmV)	–3.0	2	57.000	
Tilt 2 Level (dBmV)	16.7	117	753.000	Back

| Scan Results Summary – Analog				
Analog Channels	Value	Chan Num	Freq (MHz)	View Digital
Min Level (dBmV)	8.9	17	139.250	
Max Level (dBmV)	22.7	70	499.250	
Min CNR (dB)	29.3	17	139.250	Save
Max CNR (dB)	32.5	70	499.250	
Min V/A (dB)	12.8	70	499.250	
Max V/A (dB)	13.2	17	139.250	
Tilt (dB)	19.7			Back
Tilt 1 Level (dBmV)	–3.0	2	57.000	
Tilt 2 Level (dBmV)	16.7	117	753.000	

Saving Data

If you press the 'Save' soft-key, the following screen appears:
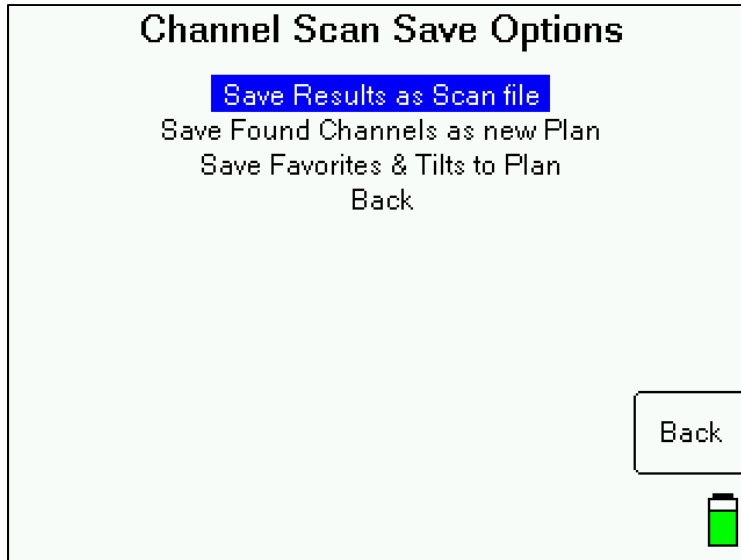
After you highlight the desired option and press Enter to select what you'd like to save, a file save screen will be displayed, allowing you to enter some identification data about the test:

- File Name – enter the desired filename
- Location – enter the location
- Technician – enter your name
- Notes – enter any relevant notes or description of this file (i.e. "150 FT CABLE" or "ROOM 401", etc.)
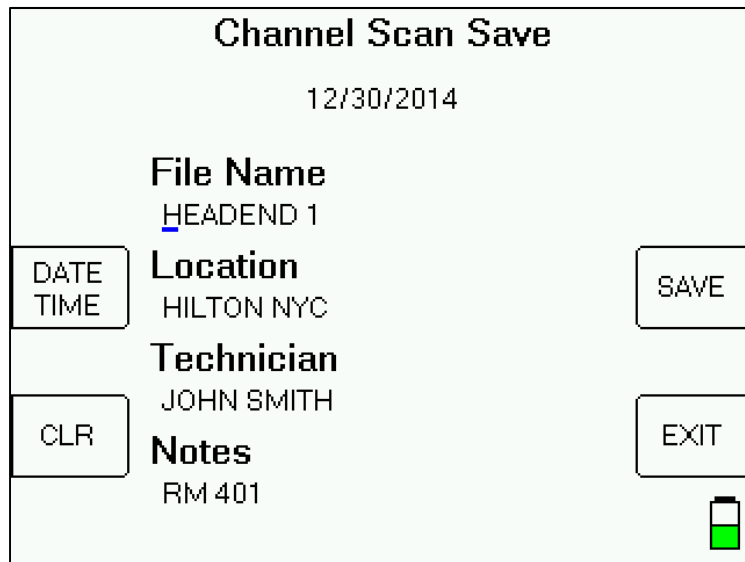
Press the 'DATE TIME' soft-key to edit the instrument's date and time clock if necessary.
Press the 'CLR' soft-key to erase all text to the right of the cursor in the selected field.
Press the 'EXIT' soft-key to discard the data entered in the File Save screen and return to the Scan results.

Note:
Alphanumeric characters can be entered in the following way:

- Press the key once to display the numeric digit.

- Press it quickly a second time to display the first alphabetic character.
- Press it quickly a third time to display the next alpha character, etc.
- A new key always moves to a new column.
- A pause will also move to a new column.
- Left/right keys move between columns.
- Press Enter after typing in characters for each field. After pressing Enter, the up/down keys will allow you to navigate to the next field.

Press the 'SAVE' soft-key to save the file to the instrument's flash memory.

The file name must be unique. An error message will appear if you enter a name that has already been used. To determine which names have been used, you can select 'File Utility' from the instrument's Main Menu or can run the MeterMaid program on a PC.

There is file storage space for about 70 files. The actual limit depends on the number of channels in each file and the types of files saved. Constellation Scan files consume the most storage space.

Pressing 'SAVE' will prompt the system to copy the file from temporary storage to flash file storage. If an error occurs during the copy process or the flash storage area is too full, the message "Flash copy failed" will appear and the test data will be lost.

If you fill up the file storage space, you can transfer all of the stored files to a PC and then erase the meter's flash memory to create new space. You can erase the stored files by pressing the 'Format' soft-key in the File Utility screen or by using the MeterMaid program on a PC.

Transfer Data File to PC

After the data is collected you can connect the instrument to your PC and transfer the files to the PC disk using the MeterMaid program.

Install PC Software

The MeterMaid program is required to transfer the data from the instrument to the PC and to print reports. This software is available from the Applied Instruments website along with the FlashUpdate software used to update the instrument. See Software Updating section in XR-3 base operation manual for more information.

The MeterMaid program, MeterMaid.exe, will most likely be found in the default location of C:\FlashUpdate\

1) Connect the meter to your PC using the supplied USB data transfer cable and power the meter on.
2) Start MeterMaid after the meter has completed its 5 second boot-up countdown. An icon that looks like the XR-3 should be installed on your desktop for this purpose.

MeterMaid

3) The File Transfer window appears somewhat like the following example.
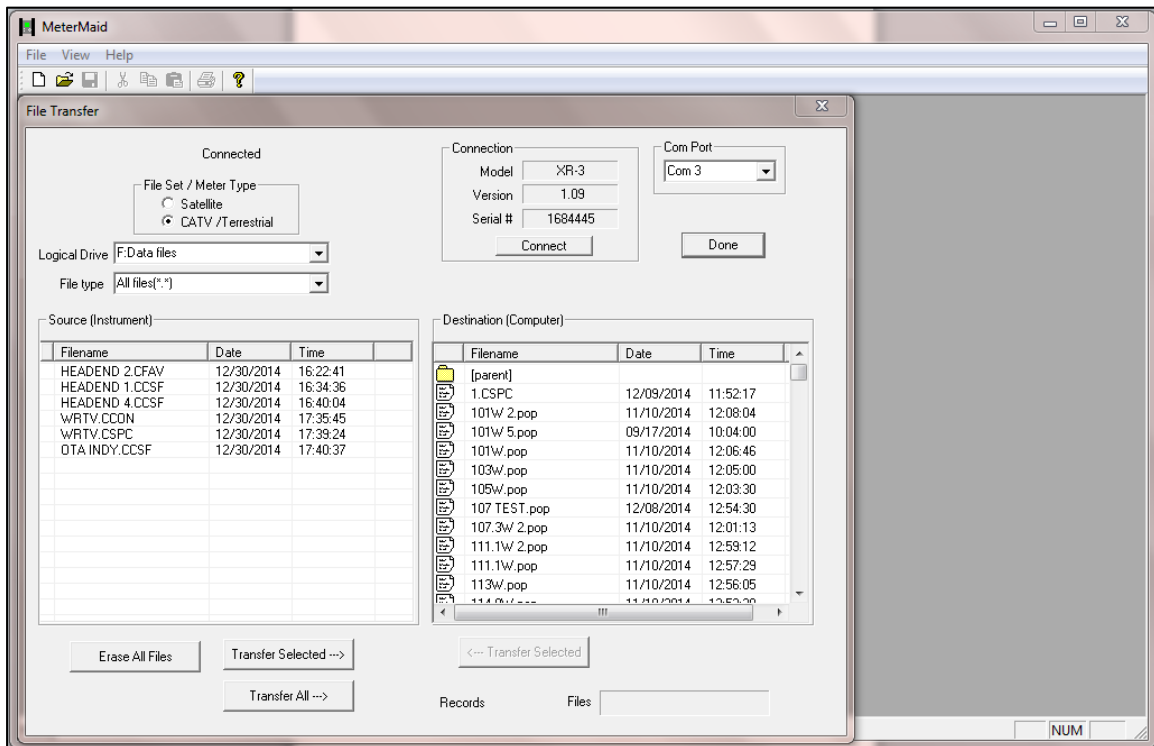
The box on the left displays the files stored on the instrument. The box on the right shows the files stored on the PC. The files are stored in a text file format (.txt) so they can be easily opened with Microsoft Excel or other PC applications (i.e. Notepad).

By default, the text files are stored in a "Data" folder under the "FlashUpdate" folder where the MeterMaid program is installed (in the folder C:\FlashUpdate\Data). You may navigate to other folders by double clicking on the folder icons shown in the destination file box. The [parent] folder icon takes you up one level.

Select the files in the left box (Source / Instrument) that you want to transfer by clicking on them. Selected files are highlighted. You may select more than one by pressing and holding Ctrl while clicking on the various files. Then click on 'Transfer Selected' to have the chosen files copied to the PC folder or you can click on 'Transfer All' button to copy all stored files from the instrument to the PC. A status message and progress bar near the bottom right of the MeterMaid screen will show you when the transfer is complete and the right box (Destination / PC) will be refreshed with the newly added files.

Erasing Files

When you have transferred all desired files, click "Erase All Files" to erase all files from the XR-3 and free up the flash storage space. Due to the way the flash memory works, it is not possible to erase only selected files; all files in the selected drive must be erased to free up the memory.

Print Reports

The File Transfer window is not the only window available in the MeterMaid program. You may also open one or more report windows to display and print the data.

There are two ways to open a report window:
1)   Double click the text file in the right (Destination / Computer) box of the File Transfer window.
2)   Use the menu bar File, Open function.

The report may be viewed on the screen or printed using the File, Print menu option.

When a report window is opened, it is usually mostly hidden behind the File Transfer window. The File Transfer window may be moved aside or closed to get it out of the way:
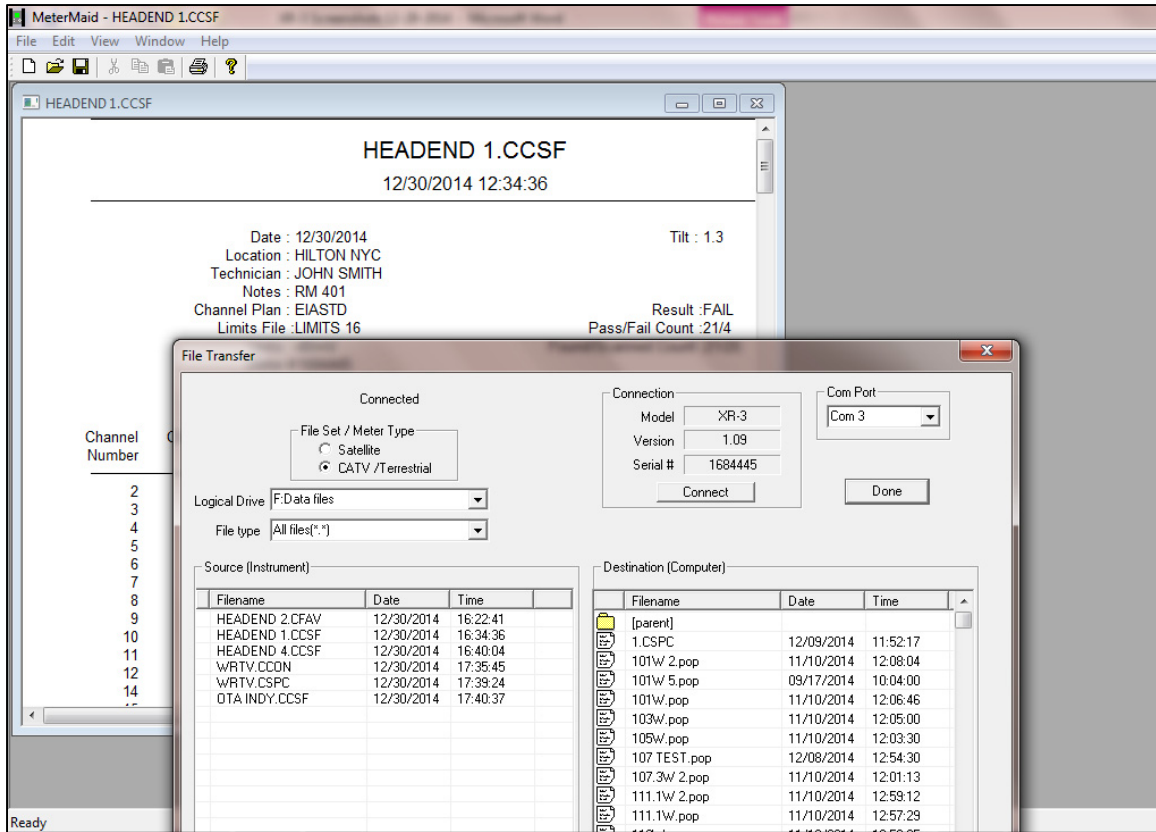
The report itself may not fit entirely on the screen but you may scroll down to see the rest.

MeterMaid - [HEADEND 4.CCSF]

File   Edit   View   Window   Help

Channel Scan

HEADEND 4.CCSF

Date : 02/18/2015
Location : HILTON NYC
Technician : JOHN SMITH
Notes : RM 204

Channel Plan : EIASTD
Custom Plan : No
Limits File :LIMITS 11
Units : dBmV
Meter #0000000
Module #1685431 CATV / OTA

Result :FAIL
Pass/Fail Count :21/4
Found/Scanned Count :22/25
Tilt : 10.9

Channel Number	Channel Label	Freq MHz	Level dBmV	Quality dB	Delta VA	Channel Type	Locked	Pass/ Fail	Fav/ Tilt
2	C2	57.000	-3.2	29.9	..	QAM256	Lock	Warning	Fav/Tilt
3	C3	63.000	-2.4	31.2	..	QAM256	Lock	Pass	Fav
4	C4	69.000	-0.9	32.1	..	QAM256	Lock	Pass	
5	C5	79.000	1.0	33.0	..	QAM256	Lock	Pass	
6	C6	85.000	-0.1	32.3	..	QAM256	Lock	Pass	
7	C7	177.000	6.4	35.5	..	QAM256	Lock	Pass	
8	C8	183.000	6.4	35.4	..	QAM256	Lock	Pass	
9	C9	189.000	6.8	33.3	..	QAM256	Lock	Pass	
10	C10	195.000	7.1	35.3	..	QAM256	Lock	Pass	
11	C11	201.000	7.4	35.5	..	QAM256	Lock	Pass	Fav
12	C12	207.000	7.7	35.6	..	QAM256	Lock	Pass	Fav/Tilt
14	C14	123.000	5.1	32.5	..	QAM256	Lock	Pass	
15	C15	129.000	5.0	35.2	..	QAM256	Lock	Pass	
16	C16	135.000	4.9	35.1	..	QAM256	Lock	Pass	
17	C17	139.250	9.5	31.8	13.4	1-AUDIO	Unlock	Pass	Fav
18	C18	147.000	5.8	34.6	..	QAM256	Lock	Pass	
19	C19	153.000	6.0	34.5	..	QAM256	Lock	Pass	
20	C20	159.000	6.9	35.4	..	QAM256	Lock	Pass	
21	C21	165.000	6.8	0.0	..	QAM256	Unlock	Fail	
22	C22	171.000	6.5	35.6	..	QAM256	Lock	Pass	

Ready

Right click with the mouse when your cursor is on top of the Channel Scan results to view the Properties menu, where you can select the units of measure to be displayed (i.e. dBm, dBmV, or dBuV), Table or Graph view, and you can sort by Channel or by Frequency.

Properties

View
  ◉ Table
  ○ Graph

Units
  ○ dBm
  ◉ dBmV
  ○ dBuV

Sort By
  ○ Channel
  ◉ Frequency

OK
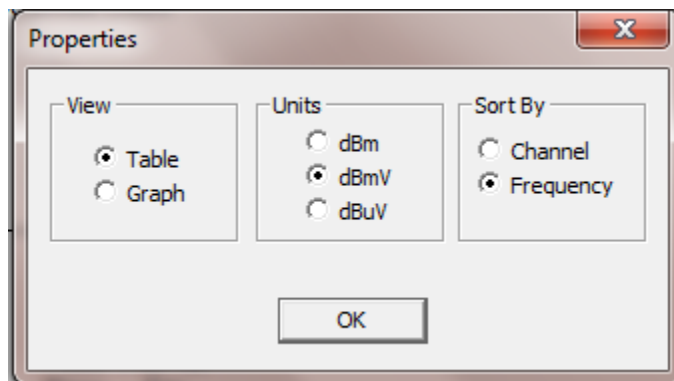
The Graph View of the Channel Scan Results, as it appears in MeterMaid, is shown below:

8. <u>Favorites Graph / Favorites Scan</u>

The Favorites Graph feature allows you to:
1) Observe the signal level and quality of your favorite / tilt channels in Graph View (with bar graphs displayed) in real-time while adjusting amplifiers to balance a CATV system or while aligning an off-air antenna
2) Collect and store signal level and quality data of only your favorite / tilt channels to the flash storage of the XR-3 for later recalling and viewing on the meter or for transfer to a PC for reporting or archiving.

To activate the Favorites Graph, press the 'Favs Graph' shortcut soft-key on Run screen or select 'Favorites Graph' from the Main Menu.
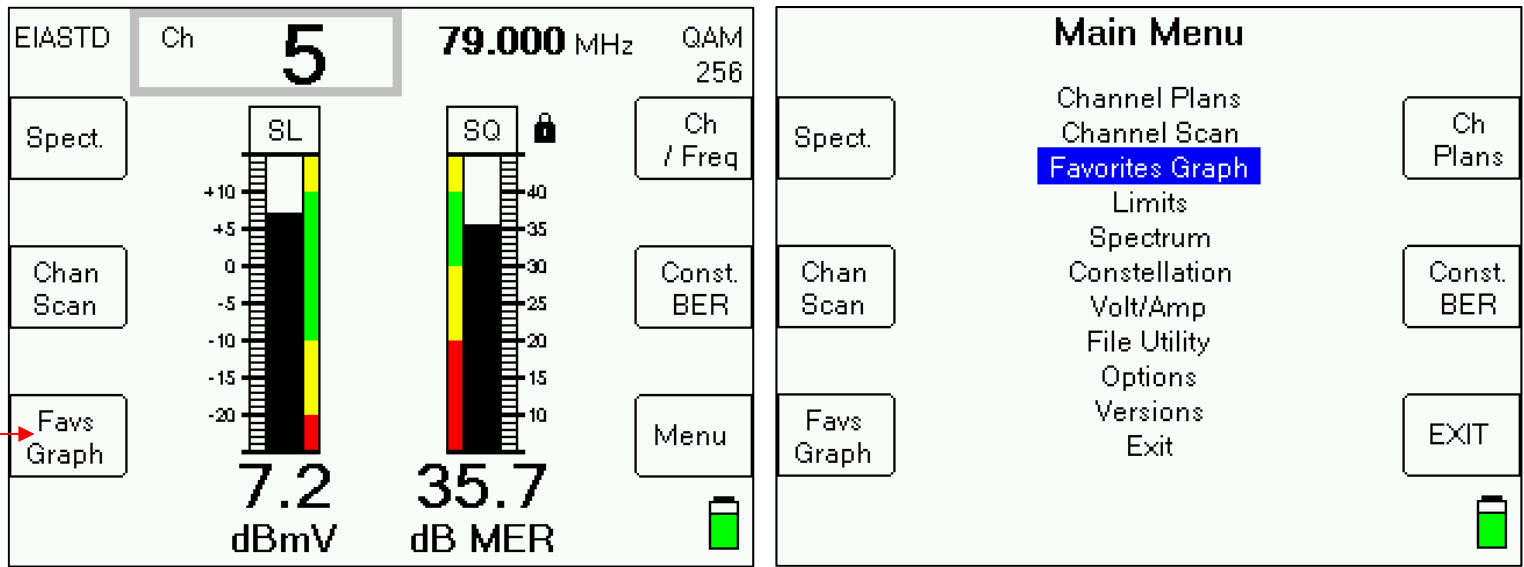
Graph View

The graph view is the default view for the Favorites Graph feature. It displays the signal level and quality of your favorite / tilt channels and the screen is constantly being updated.
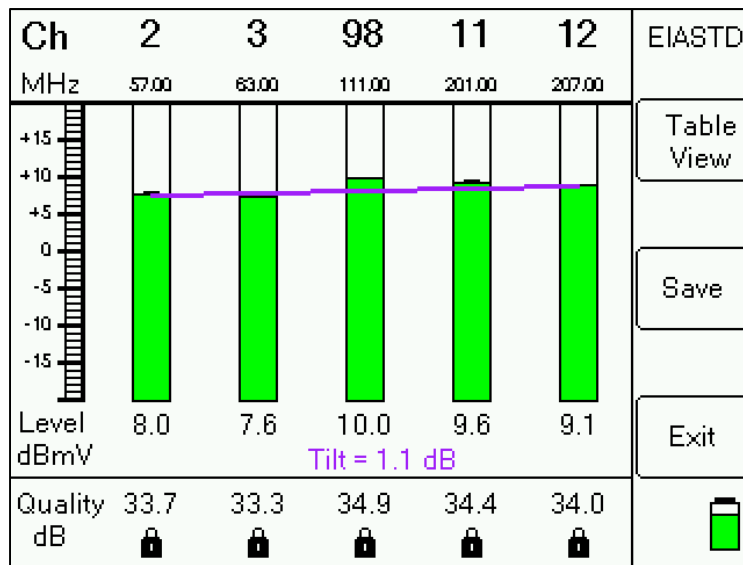

Table View

Press the 'Table View' soft-key to view the data in table format. The measurements are taken once.

Scan Complete						
Chan Num	Freq (MHz)	Level (dBmV)	Quality (dB)	Lock / △V/A	Pass / Fail	Fav / Tilt
2	57.000	7.9	33.6	🔒	✓	★ ⓣ
3	63.000	7.7	33.4	🔒	✓	★
98	111.000	10.0	34.9	🔒	✓	★
11	201.000	9.7	34.5	🔒	✓	★
12	207.000	9.1	34.0	🔒	✓	★ ⓣ

Graph View   Tilt = 1.2 dB   Exit

Fav/ Tilt   Save   Sum- mary

Summary

Press the Summary soft-key to view a Summary of the results of the Favorites Scan.

The Favorites Scan Results Summary screen displays:

- Overall Scan Result (PASS or FAIL) - based on comparing the measurements to a set of limits, if a limits file is active
- Passing / Failing Channels – number of channels passing the defined limits (passing channels are shown in green colored text) and number of channels failing the defined limits (failing channels are shown in red colored text)
- Number of Channels Found / Number of Channels Scanned – indicates how many channels were found out of the number of total channels that were scanned
- Number of Digital Channels Found - indicates how many digital channels (i.e. QAM64, QAM256, or 8VSB) were found
- Number of Analog Channels Found - indicates how many analog channels were found

Scan Results Summary			
Overall Results			View Digital
Scan Result	PASS		
Passing/Failing Ch	5/ 0		
Ch Found/Scanned	5/ 5		View Analog
Digital Ch Found	5		
Analog Ch Found	0		
			Back
	Save		

Saving

Pressing the Save soft-key allows you to assign a file name and save the Favorites Scan results to the flash storage of the XR-3.

Transfer Data File to PC

After the data is collected you can connect the instrument to your PC and transfer the files to the PC disk using the MeterMaid program. The process for transferring the saved Favorite Scans to your PC is identical to the process for transferring saved Channel Scans. Please see the Channel Scan section of the operation manual for instructions of how to transfer the saved files to your PC using the MeterMaid application.

A screenshot of an example of a transferred Favorites Scan file is shown below.

MeterMaid - [HEADEND 2.CFAV]

File   Edit   View   Window   Help

HEADEND 2.CFAV
12/31/2014 12:49:06

Date : 12/31/2014   Tilt : 1.0
Location : HILTON
Technician : JOHN SMITH
Notes : RM 401
Channel Plan : EIASTD   Result :
Limits File :LIMITS 16   Pass/Fail Count :
Units : dBmV   Found/Scanned Count :
Meter #1684445
Module #1683250   CATV / OTA

Channel Number	Channel Label	Freq MHz	Level dBmV	Quality dB	Delta VA	Channel Type	Locked	Pass/ Fail	Fav/ Tilt
2	C2	57.000	8.1	33.6	..	QAM256	Lock	Pass	Fav/Tilt
3	C3	63.000	7.6	33.3	..	QAM256	Lock	Pass	Fav
11	C11	201.000	9.7	34.4	..	QAM256	Lock	Pass	Fav
12	C12	207.000	9.1	34.0	..	QAM256	Lock	Pass	Fav/Tilt
98	C98	111.000	10.2	34.9	..	QAM256	Lock	Pass	Fav
Min		57.000	7.6	33.3	..				
Max		207.000	10.2	34.9	..				

Right click with the mouse when your cursor is on top of the Favorites Scan results to view the Properties menu, where you can select the units of measure to be displayed (i.e. dBm, dBmV, or dBuV), Table or Graph view, and you can sort by Channel or by Frequency.
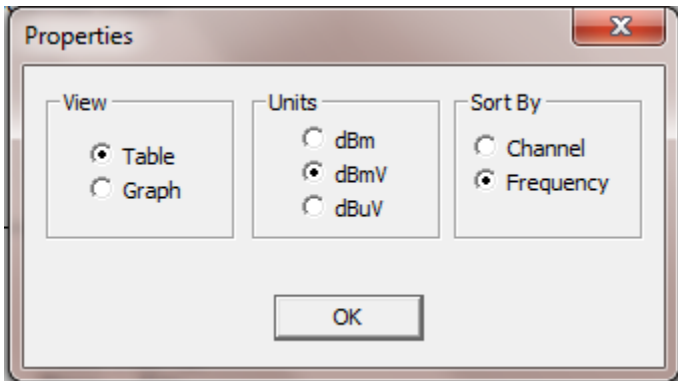
The Graph View of the Favorites Scan Results, as it appears in MeterMaid, is shown below:
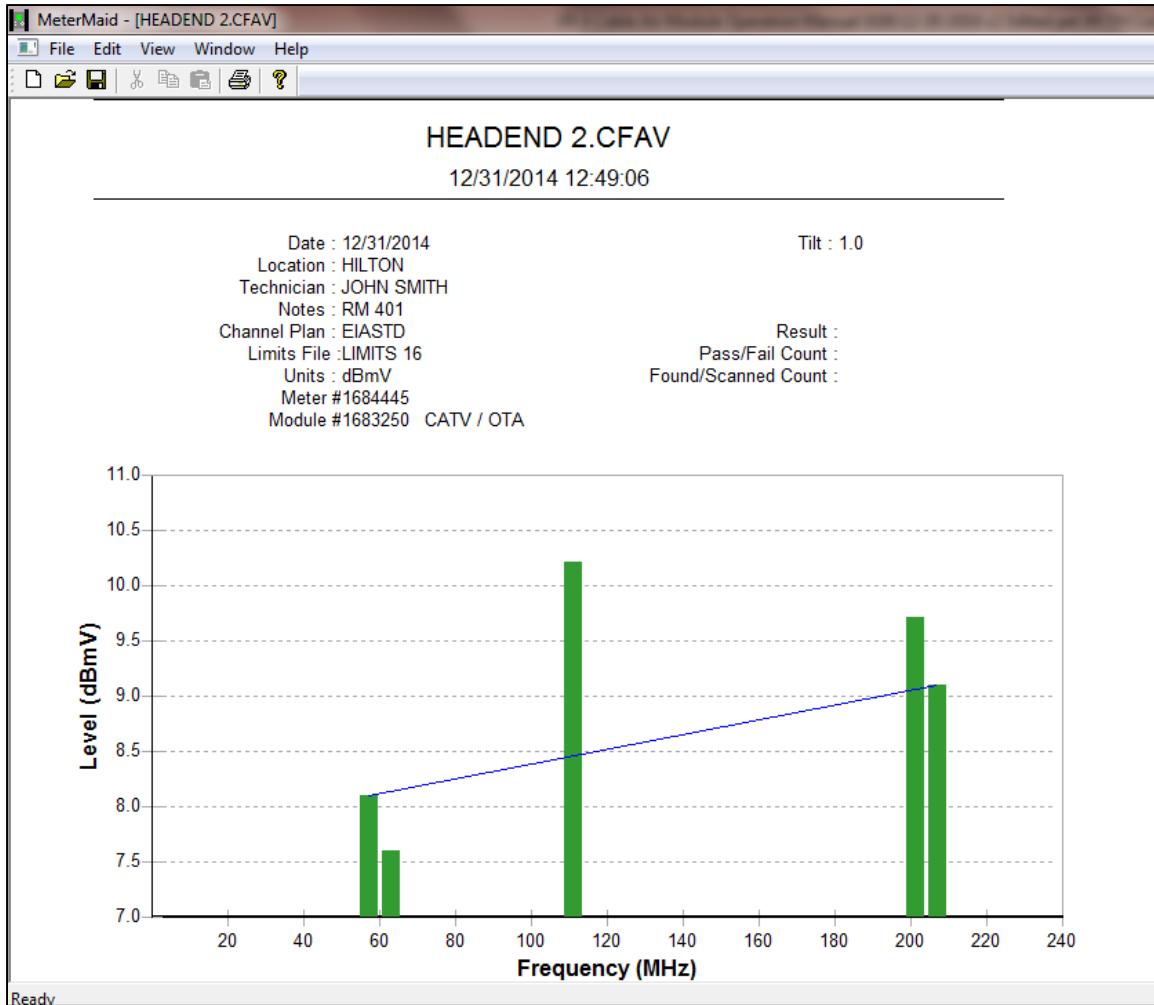
9. <u>Spectrum Screen</u>

The spectrum screen may be used to:

- Look for the presence of carriers
- Look at a carrier with an incompatible modulation type or encryption
- Look for interfering signals

This feature imitates a spectrum analyzer although it has less resolution and a slower sweep rate than an actual spectrum analyzer. This screen has the following features:

- Adjustable frequency span
- Automated level scaling
- Frequency/Level cursors
- Adjustable sweep rate

To view the spectrum display:
Press the Spect. shortcut soft-key on Run screen or
Press the MENU soft-key in bottom right hand corner of main Run screen. Then use your
up/down arrow keys to highlight 'Spectrum' and press ENTER.

The spectrum screen will automatically start sweeping and by default, the frequency of Marker 1
will be on the center frequency of the channel you had selected on the Run screen (for digital
channels) or will be on the video carrier frequency of the channel you had selected on the Run
screen (for analog channels) with the minimum frequency span.

Soft-Keys:
1) MRK1 / MRK2 / CTR FREQ – MRK1 or MRK2 allows you to select which marker is active
   (either Marker 1 or Marker 2). 'CTR FREQ' allows you to quickly jump through the
   frequencies with the paging function while maintaining the same span.
2) LVL – performs Automated Level Scaling
3) Menu – displays the Spectrum Menu
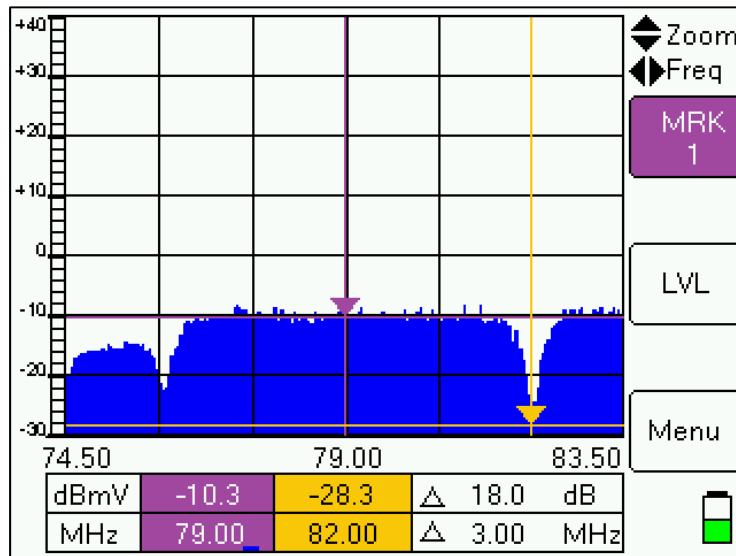
Cursor Position
Press Left/Right arrow buttons to move active cursor (either MRK1 or MRK2) horizontally to
different frequencies on x-axis. To jump to a particular frequency, use numeric keypad to type in
desired frequency and then press ENTER. The frequency of each cursor (marker) position is
shown in the bottom row in the lower area of the screen and is color coded to match the color of
the related marker.

You will notice that the signal level for each cursor (marker) will automatically adjust as the
frequency of the cursor changes, riding on the power curve. The numeric signal level measured
at each cursor's (marker's) position is also shown in the bottom area of the screen and is color
coded to match the color of the related marker. Note: Signal Level displayed will depend on
whether you have selected dBm, dBmV, or dBµV in the Options menu.

Span
Press the Up arrow button to zoom in (less span). This will cut the displayed span in half around
the active cursor's frequency position. Minimum span is 9 MHz.

Press the Down arrow button to zoom out (more span). This will double the displayed span around the active cursor's frequency position. Full (maximum) span is 995 MHz (i.e. 5 to 1000 MHz).

Start and Stop frequencies may also be set manually in the Settings section of the Spectrum Menu.

Paging
Press the upper right soft-key twice until 'CTR FREQ' is displayed. Then press the Left / Right arrow buttons to "page" to the left or right, changing the start and stop frequencies, but maintaining the same span (when not at full span). This allows you to quickly jump through the full range of frequencies.

Amplitude Range
The default amplitude range shown on the spectrum display is -30 to +40 dBmV. Press the LVL soft-key on middle right side of the screen to perform auto level scaling. Each time you press the LVL soft-key, the instrument will rescale the amplitude range according to the min/max amplitude levels detected during the last sweep. The auto level scaling makes the measured signal levels more obvious and easier to see.

Ceiling and floor levels may also be set manually in the Settings section of the Spectrum Menu.

Spectrum screen before pressing LVL to perform auto level scaling:
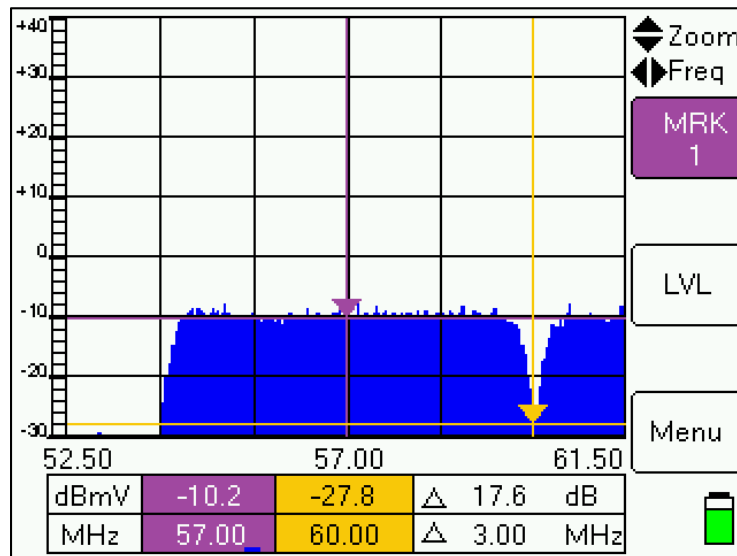
Spectrum screen after pressing LVL to perform auto level scaling:
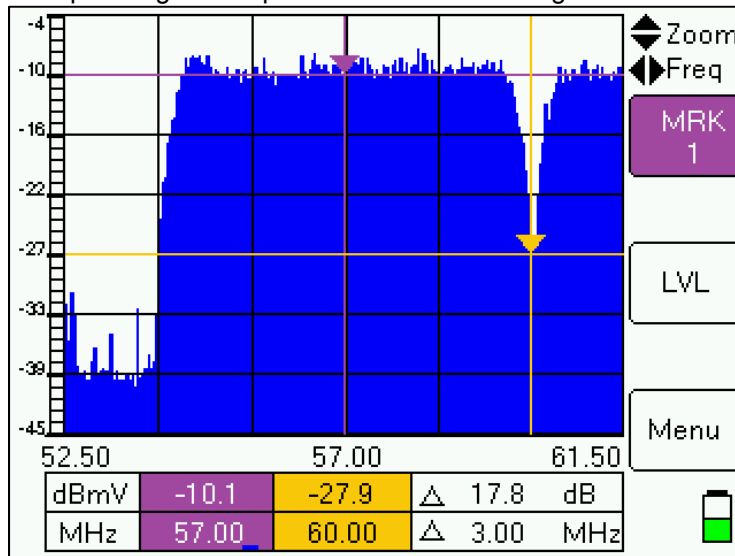
Resolution and Refresh Rate
Press +/- key on numeric keypad to change the number of samples per sweep. You can choose between 60, 120, 240, or 480 samples. 60 samples results in lower resolution and less detail, but a faster sweep. 480 samples results in a higher resolution and more detail, but a slower sweep. By default, the meter measures 240 samples to create a picture of the power spectrum.

The samples may also be modified in the Settings section of the Spectrum Menu.

Spectrum Menu
From within the Spectrum Screen, press Menu soft-key to enter the Spectrum Menu.
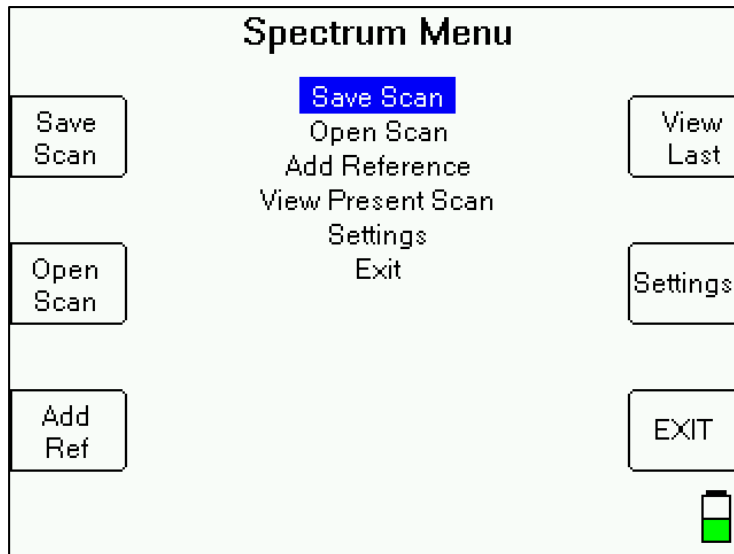
Spectrum Menu fields include:
- Save Spectrum – allows you to save a screenshot of the screen as it appeared immediately before entering the Spectrum Menu for later recalling and viewing in the meter or on a PC

- Open Spectrum – allows you to open and view a previously saved spectrum
- Add Reference – allows you to add a reference to the spectrum screen, which could be a spectrum at the same site performed at an earlier time on the same carriers, or the same signal at another point in the network to show the change.
- View Present Spectrum – allows you to return to the Spectrum screen
- Settings – allows you to manually modify the spectrum screen settings

Settings
For the top five fields, use the up/down arrow buttons to highlight a field and then use the left/right arrow buttons to change the setting in the field.

For the bottom four fields, use the up/down arrow buttons to move cursor to a field, use the numeric keypad to type a setting into the field, and then press ENTER.

```
                     Spectrum Settings

                Samples      240
        Attenuator Level    AUTO
         Peak Hold Line      OFF
    Vertical Bar Marker       ON
  Horizontal Bar Marker       ON
          Moving Cursor      OFF


                Ceiling     40.0      dBmV
                  Floor    -30.0      dBmV
            Start Freq     74.50      MHz  ┌──────┐
             Stop Freq     83.50      MHz  │ EXIT │
                                          └──────┘
   Resolution Bandwidth      300       kHz
```

- Samples – allows you to modify the number of samples per sweep, as described above in the Resolution and Refresh Rate section
- Attenuator Level – allows you to set desired attenuator level setting, from 0 to 55 dB (in increments of 5 dB) or set to AUTO. Default setting is AUTO.
- Peak Hold Line – allows you to turn ON or OFF the peak hold line. In addition to the present power measurement line (shown in royal blue color), turning this function ON will display a line (shown in turquoise color) at the maximum amplitude at each frequency that has been detected in previous sweeps du ring this session. By default, the Peak Hold Line is turned OFF.
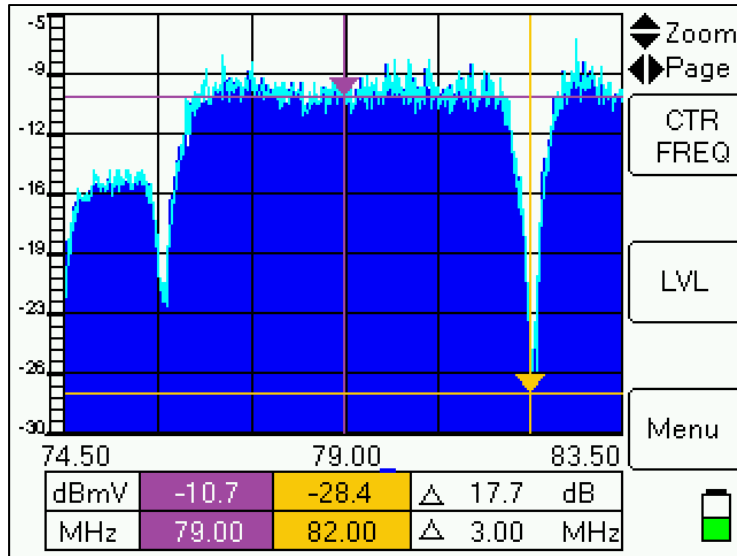
- Vertical Bar Marker - allows you to turn ON or OFF the vertical bars for MRK1 (marker 1) and MRK2 (marker 2). The vertical bars make it much easier to see the frequency of where each of your markers is positioned. By default, the Vertical Bar Marker is turned ON.
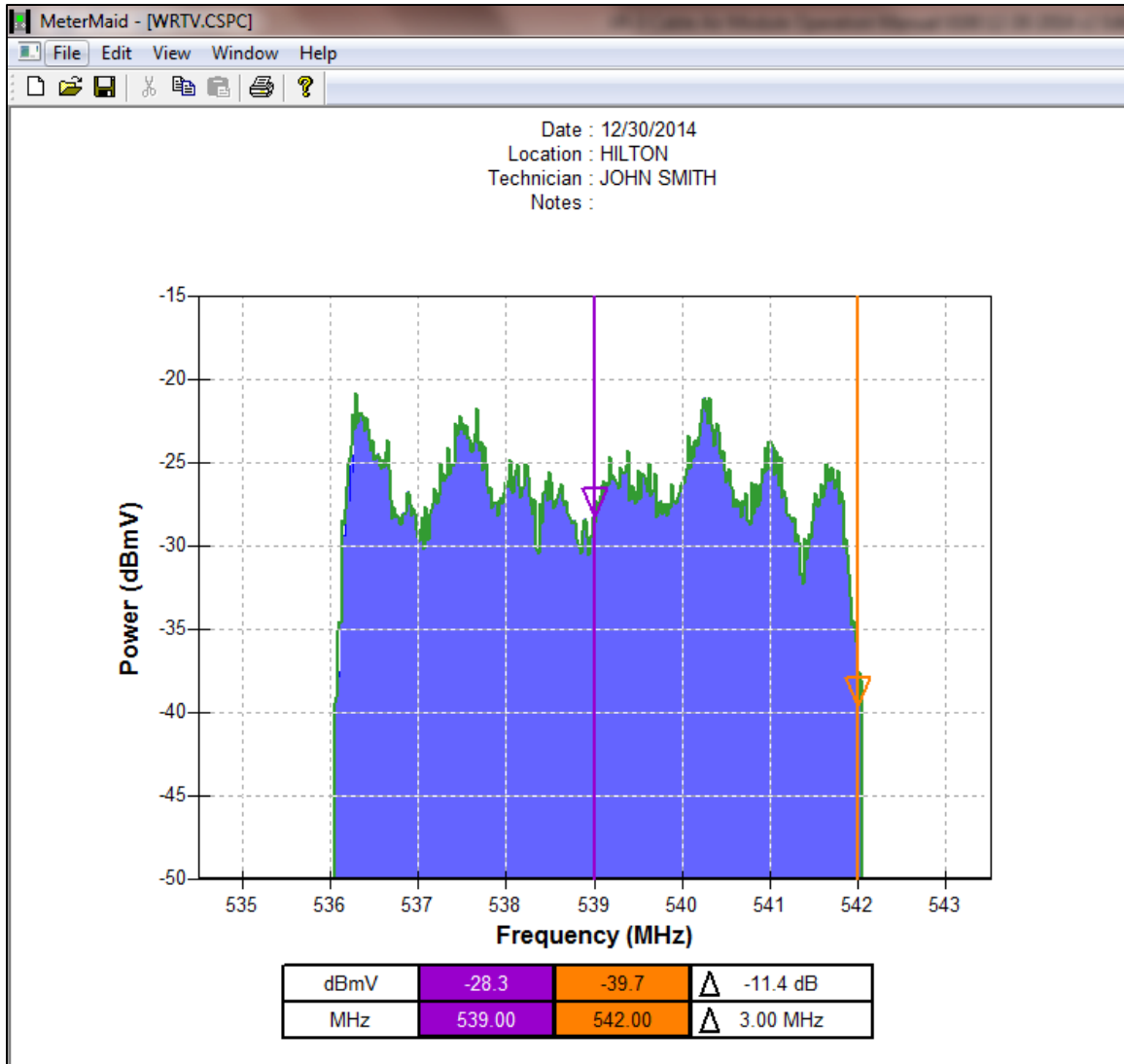- Horizontal Bar Marker - allows you to turn ON or OFF the horizontal bars for MRK1 (marker 1) and MRK2 (marker 2). The horizontal bars make it much easier to see the RF level of where each of your markers is positioned. By default, the Horizontal Bar Marker is turned ON.
- Moving Cursor – the moving green vertical cursor allows you to see the progress of the sweep
- Ceiling and Floor - allows you to modify the ceiling and floor levels (maximum and minimum RF levels) displayed, as described above in the Amplitude Range section
- Start and Stop Frequencies - allows you to modify the span (lowest and highest frequencies) displayed, as described above in the Span section

Exit - Press EXIT soft-key in bottom right hand corner of screen to return to Spectrum screen.

Attached below is a sample saved spectrum scan of a QAM256 carrier when opened in MeterMaid:

MeterMaid - [COMCAST 94 .CSPC]

File   Edit   View   Window   Help

Date : 12/30/2014
Location : APPLIED INSTR
Technician : JOHN SMITH
Notes :

| dBmV | -10.9 | -29.8 | Δ | -18.9 dB |
| MHz | 63.00 | 66.00 | Δ | 3.00 MHz |
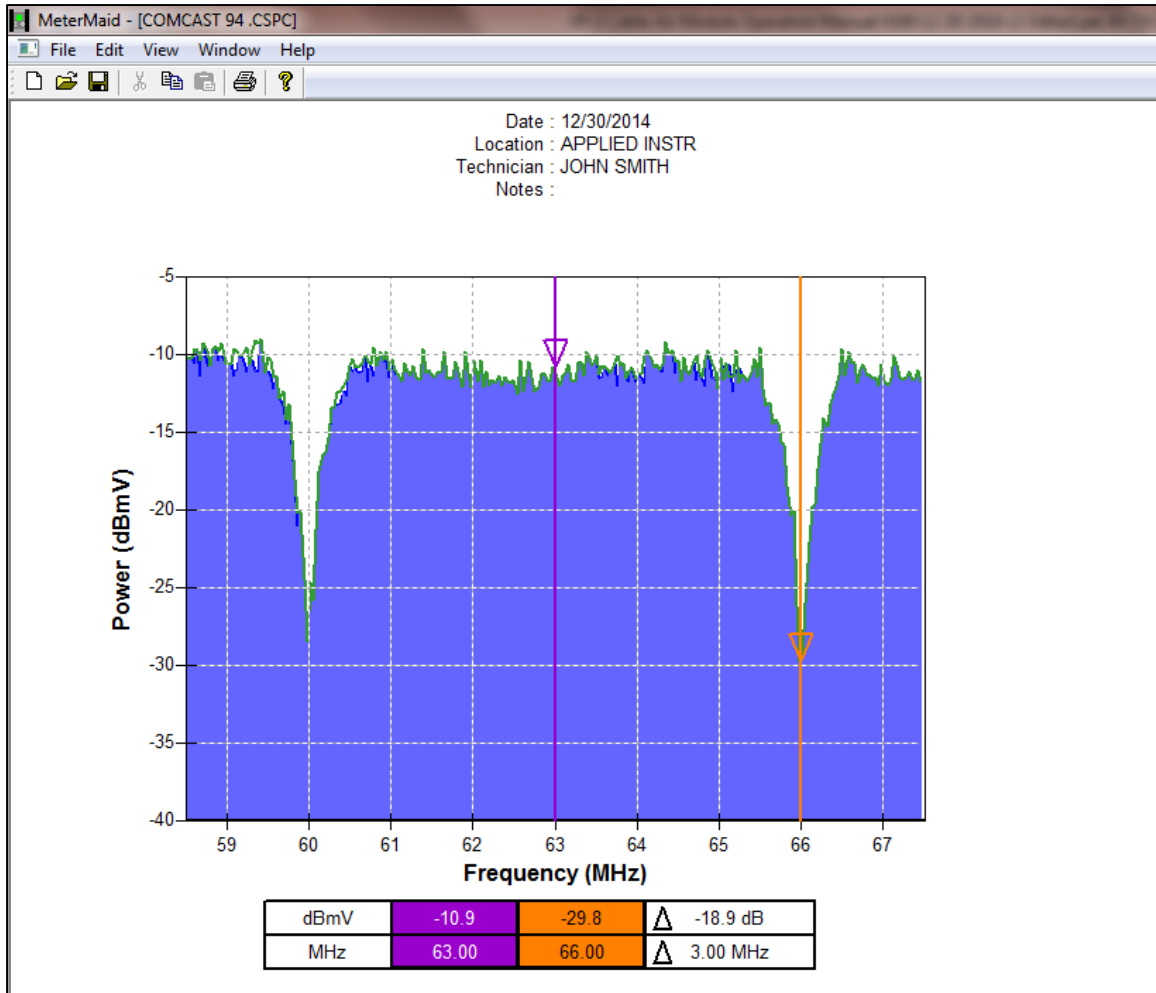
Attached below is a sample saved spectrum scan of an 8VSB carrier when opened in MeterMaid:

MeterMaid - [WRTV.CSPC]

File   Edit   View   Window   Help

Date : 12/30/2014
Location : HILTON
Technician : JOHN SMITH
Notes :

| dBmV | -28.3 | -39.7 | △ | -11.4 dB |
| MHz | 539.00 | 542.00 | △ | 3.00 MHz |

10.   Constellation Screen
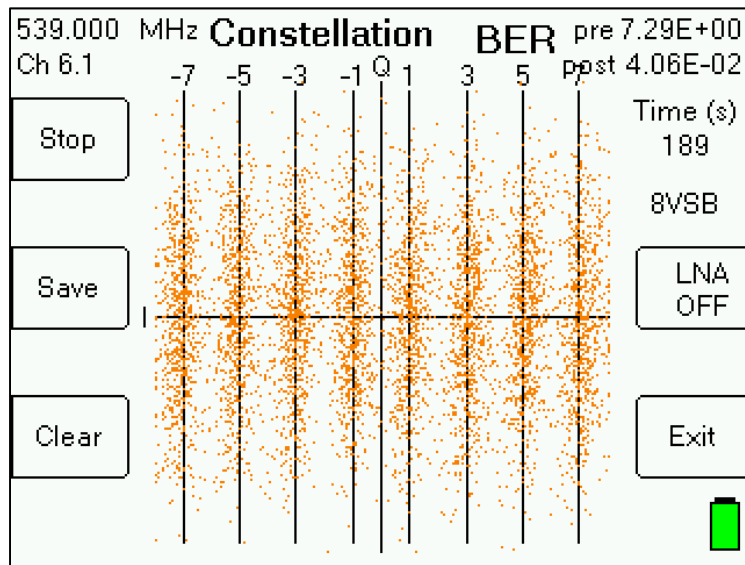
To view the constellation screen:
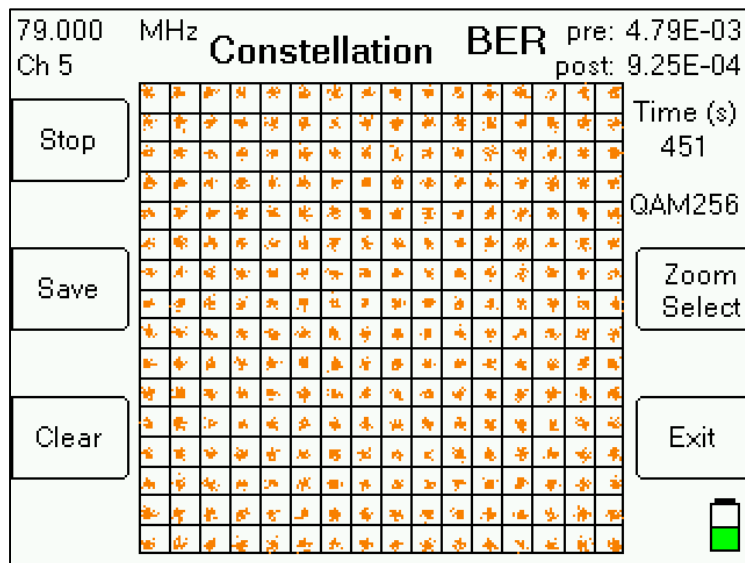Press the 'Const. BER' shortcut soft-key on Run screen or
Press the MENU soft-key in bottom right hand corner of main Run screen. Then use your up/down arrow keys to highlight 'Constellation' and press ENTER.

The constellation plotting will automatically begin if the meter is locked on a digital signal.

8VSB Constellation:

QAM256 Constellation:
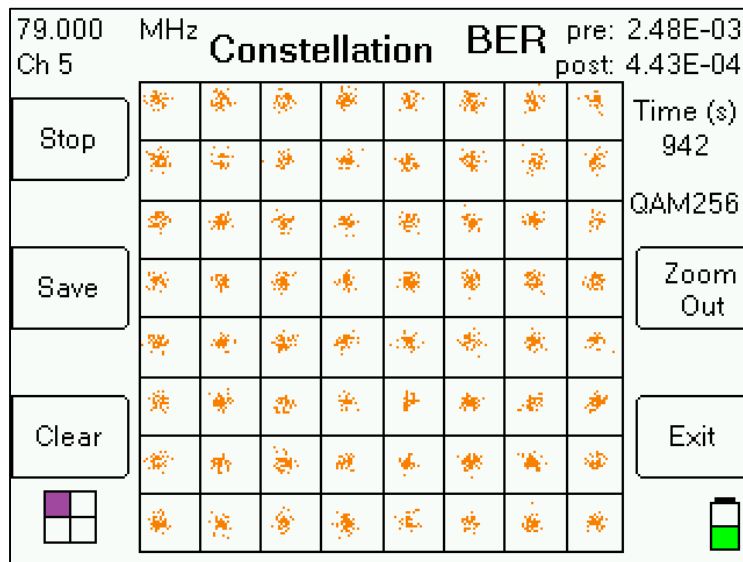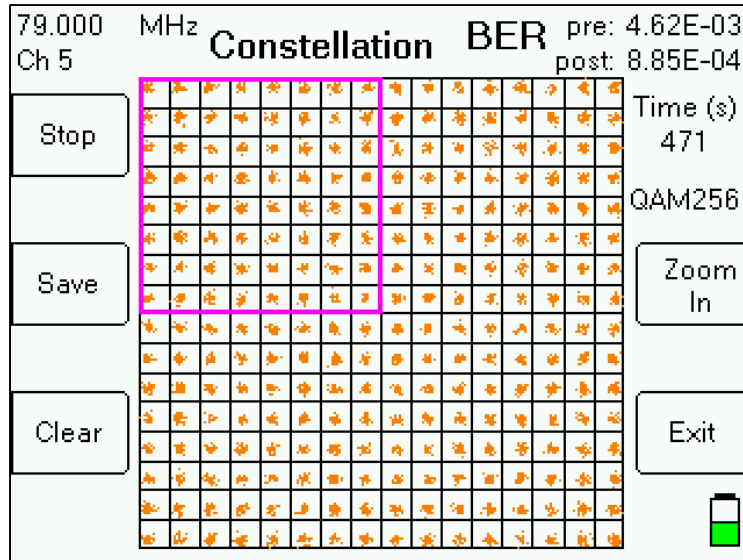
Soft-Keys:
1) Stop – stops the plotting of the constellation diagram
2) Save – allows you to save the present constellation scan
3) Clear – clears the present constellation diagram (new diagram will begin to be plotted)
4) Zoom Select – allows you to select a quadrant to zoom in on
5) Zoom In – zooms in on selected quadrant to get closer look at constellation
6) Zoom Out – zooms out to go back to full constellation plot view
7) Exit – exits to Run screen

BER
The Bit Error Rate (BER) of the signal, as detected by the demodulator chipset in the XR-3's Cable Air module, is displayed in the top right corner of the constellation screen.

The meter displays the errors Pre-Viterbi (before the Viterbi decoder) and Post Viterbi (after the Viterbi decoder).

If the error rate is preceded by a less than sign (<), it indicates that no errors have yet been detected and so the bit error is not known but is less than the number given.

The BER displayed accumulates errors as long as the screen is active. To reset the counters, exit and restart the constellation screen.

This test can only be performed when a signal lock is obtained. If the lock is lost, the rates are not shown and will be restarted when lock is re-obtained.

In most cases, a one minute test is sufficient to determine the BER for the present conditions. As long as both rates continue to read less than some number (the < character is shown), then no errors have been detected and the system is working well.

11.   <u>Voltage / Current</u>

The V/I or Voltage / Current Screen displays:
LNA – voltage output supplied to LNA or antenna pre-amp
mAmps - current draw of LNA / pre-amp
Ohms – Impedance or resistance of system, as calculated by voltage output and current draw
Battery - meter's internal battery voltage (Full is approximately 12.6 volts and empty is approximately 10.9 volts).
Ext DC – amount of voltage being supplied to instrument by external AC to DC switching power supply connected to DC charge port on bottom panel of instrument
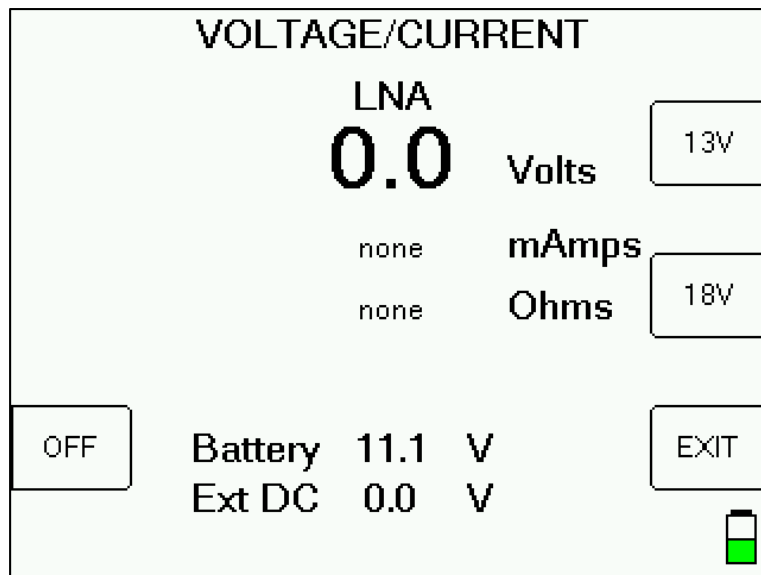
Soft Keys

1) 13V   - Turns on the output voltage at 13 volts DC
2) 18V   - Turns on the output voltage at 18 volts DC
3) OFF   - Turns LNA output voltage power off
4) EXIT   - returns to the Main Menu screen

The XR-3 (with the Cable Air module loaded) can output 13 or 18VDC to power LNA's or antenna pre-amplifiers (pre-amps).

12.   <u>File Utility</u>

The File Utility feature allows you to see the filenames that you have used for saved scans and custom channel plans. You can also delete a single file or format the flash drive and therefore erase all saved files from the flash memory of the selected drive.

Press MENU soft-key and then select 'File Utility' from Main Menu list.

By default, the File Utility function displays the filenames of all saved files. To filter the saved files, first press the File Set soft-key and then use up/down arrow keys to select "CATV / OTA Files", then press Enter. Then press the File Type soft-key and use up/down arrow keys to select desired file type (i.e. Channel Scans, Favorites, Spectrum Scans, Constellation Scans, Limits files, or Channel Plans), then press Enter.

File Utility
All Files

For mat		File Set

HEADEND 1.CCSF
HEADEND 4.CCSF
WRTV.CCON
WRTV.CSPC
OTA INDY.CCSF
HEADEND 5.CFAV
HEADEND 2.CFAV

Del File
File Type

EXIT

48K used
310K free

Select Set of Files

Satellite Files
CATV / OTA Files

EXIT

```
                    Select Type of File
                          All Files
                    Channel Scans (FAIL)
                    Channel Scans (PASS)
                  Channel Scans (No Limits)
                        Favorites Scans
                        Spectrum Scans
                        Constellations
                            Limits
                        Channel Plans

                                            EXIT
```

To delete a single file, highlight the file using the up/down arrow keys and then press the Del File soft-key. Note that erasing a single file does not free up flash memory. You must use the Format function to really erase the files. To format the flash memory and erase all saved files on the drive, press Format soft-key.

Each CATV / OTA file type is designated by a different file type extension:
Cable & Off-Air Channel Scan (FAIL) = .CCSF
Cable & Off-Air Channel Scan (PASS) = .CCSP
Cable & Off-Air Channel Scan (NO LIMITS) = .CCSN
Cable & Off-Air Favorites = .CFAV
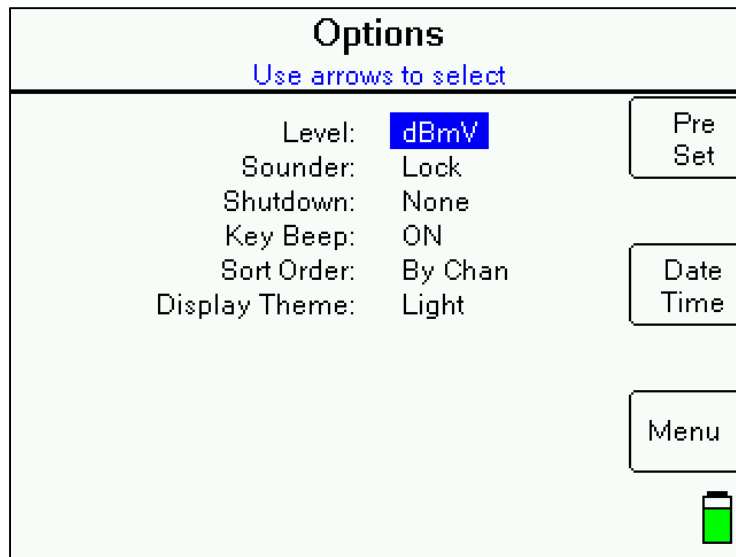Cable & Off-Air Spectrum Scans = .CSPC
Cable & Off-Air Constellation Scans = .CCON
Cable & Off-Air Limits = .CLIM
Cable & Off-Air Channel Plans = .PLN

13. <u>Options</u>

There are several options you may select to personalize the operation of your meter.

To use this screen, highlight the option you want to change with the up/down arrow buttons and select the value you want with the left/right arrow buttons. Press Menu when done.

Level

The signal level may be displayed in dBm, dBmV or dBμV.

Sounder

Antenna peaking via the audible tone can be done in two ways: "tone-on-lock" and "peak-o-matic". The "tone-on-lock" method uses the following:

1) Slow beep - the function is on
2) Fast beep – the digital signal is locked
3) Solid – the digital signal is locked and at the highest level yet seen

This method works well when the antenna is close enough to obtain a signal lock. If you have trouble finding a lock however, you may want to use the "peak-o-matic" method:

1) Slow beep – the function is on
2) Fast beep – the signal is at least 5 dB higher than the lowest level seen
3) Solid – the signal is higher and at the highest level seen so far

Note that the peak-o-matic method does not indicate a lock. It allows you to peak the azimuth even before a peak is obtained.

In both methods, to fully peak the antenna, you must move it in one direction until the signal is found, and continue moving it until you move past the peak, then move back to the solid tone.

Shutdown Timer

The unit can be set to automatically shut off after 5, 10, or 15 minutes with no buttons being pressed. This timeout can be disabled by setting the option to "none".

Key Beep
By default, key beep is on and you will hear an audible "beep" when any buttons on the meter are pressed. You can turn off the key beep if desired.

Sort Order
By default, the channel lineup on the Run screen is sorted by Frequency. If desired, you can sort channel lineup on the Run screen by Channel number.

Display Theme
By default, display theme is 'Light', with a white screen background. You can select the 'Dark' display theme to enable a black screen background, if desired.

Preset
Pressing the Preset soft-key in the Options menu will return the XR-3's cable air module settings to its factory default settings (will return the RF signal level field to its default dBmV value, will return the Sort Order preference to sort by frequency, etc.).

Date / Time
Pressing the DATE TIME soft-key in the Options menu will take you to a new screen that allows you to specify and store the date and time for the meter's internal clock. The date and time are displayed on scan results.

```
            DATE / TIME


                Date
             (mm/dd/yyyy)
              06/23/2014


                Time
              (hh:mm:ss)
               14:13:17               ┌──────┐
                                      │ EXIT │
                                      └──────┘

                                          ▯
```

14. <u>Versions</u>

Versions
Selecting Versions from the Main Menu list takes you to a screen that displays versions of software that are loaded in the instrument. It also displays the hardware versions and serial numbers of the XR-3 base unit and any connected module, as well as the active channel plan and Limits file.

Versions

Base Serial#   1684445
Base Main   1.09
Base Boot   1.07

Module Name   CATV / OTA
Module Serial# 1683250
Module Main   1.12
Module Boot   1.01

G:EIASTD.PLN
C:LIMITS 16.CLIM

Exit

15.   <u>Power</u>

LNA Power

The LNA current is limited:

	Current Limit
1) Normal battery operation:	780 mAmps
2) Charger active (AC):	780 mAmps

Under conditions 1 and 2, an inrush current of 900 mAmps is allowed for a short period of time.

Battery Charge

1) Charging: Use either the AC to DC switching power supply or the 12VDC vehicle charger. To fully charge a dead battery, it should require approximately 3 hours. It is okay to leave the meter charging all night since the smart battery charge circuitry will throttle back charge rate as required to prevent over-charging of the battery. During cold weather keep the XR-3 indoors in a warm environment while charging. The battery charge temperature range is 41°F to 100°F or 5°C to 38°C. Only use replacement batteries from Applied Instruments.

2) Discharge / Charge: Before initial use of the meter you should fully discharge the battery and then recharge overnight. To discharge the battery, disable the automatic shut-off in the Options menu and then leave XR-3 powered on until it shuts off.

3) Battery Charge Symbol: The battery symbol indicating remaining battery life in the lower right corner of the LCD display can be misleading. It is normal for the battery symbol of a fully charged battery to quickly drop by ¼. The symbol should remain in the middle two segments for the longest time period, and will again drop faster when the last battery symbol segment is displayed. In summary, the symbol drops by 25% quickly, remains in the middle 50% the longest, and then the last 25% drops quickly.

   The symbol's (and the battery's discharge) behavior is non-linear. The battery charge indicator is based on the internal battery voltage, which changes slowly during the normal period of operation but quickly when the battery is either fully charged or nearly discharged. Therefore, the battery indicator will only appear full or empty for a short time. Most of the time, it will appear ½ or ¾ full. When the charge indicator shows ¼ charge, you will need to charge it soon. It will shut off very soon after the indicator goes to empty.

4) Automatic Shutoff: If desired you can activate the automatic shutoff feature. To activate it, press MENU → OPTIONS and then scroll to the Shutdown field with your Up/Down arrow buttons and use the Left/Right arrow buttons to choose the desired auto shut-down time (5 min, 10 min, 15 min, NONE). The auto shutdown feature is turned off (set to NONE) in its default state.

5) LNA Power Awareness: Only turn on LNA power (to power a LNA or pre-amp) while taking measurements. Avoid powering an LNA while not actually taking measurements to extend battery run time.

6) Attempting to turn on a unit when the battery contains insufficient charge may result in beeps and/or a flash on the LCD but will not harm the unit.

AC Power

When 110VAC or 220VAC power is applied to the external AC adapter, it supplies 15VDC power to charge the battery, run the meter, and power the LNA or pre-amp. In this case, the power available to the LNA is limited to 750 mAmps to avoid overdriving the power circuit and the battery charging circuit.

DC Power

When external 12VDC power is provided from a vehicle, it supplies enough power only to charge the battery, but not enough power to run the instrument while the battery is being charged.

16. <u>Troubleshooting / FAQs</u>

a) My XR-3 instrument is displaying a message on the screen that says "ERROR Module not found". Why is this message displayed?
   i) It means the XR-3 base instrument isn't detecting the presence of the Cable Air module. If you encounter this message, power the unit off, remove the module, reinsert the module, and power the unit back on again.

b) While I have the cable connected to the RF IN port of the meter, I don't even see any signal level shown on left bar graph. It just says "UNDER".
   i) Try toggling to a different channel. Perhaps the frequency you were tuned to doesn't have an active channel present.
   ii) Replace top (Signal In port) F-connector barrel. Use a 7/16" wrench to loosen existing barrel. Install new F-connector barrel and only tighten to 20 inch pounds of torque with wrench after finger-tightening. Warning: Do NOT over-tighten!
   iii) If issue still remains, contact Applied Instruments' Tech Support department and request a RMA# to send the instrument to the factory for inspection and repair.

c) Can the XR-3's Cable Air module be used to measure CATV and Off-Air signals outside the United States?
   i) Yes, the XR-3 meter's XR-CA-01 Cable Air module can be used outside the United States, but it depends on the signal types being used in each country. Be sure to select the appropriate channel plan in the meter depending on your signal type.

      For digital off-air signals, the XR-CA-01 is compatible with the 8VSB signal type, which is used in the USA (and U.S. territories such as Puerto Rico), Canada, Mexico, Dominican Republic, Guatemala, Honduras, and South Korea.

      For digital cable signals, the XR-CA-01 is compatible with the QAM64 and QAM256 (ITU-T, J.83 Annex B) signal types, which are used primarily in North America (USA, Canada, Mexico), but also some parts of Central and South America.

      For analog cable and off-air signals, the XR-CA-01 is compatible with NTSC, PAL, and SECAM, so it can be used worldwide for legacy analog cable TV and off-air testing purposes.

d) My serial number is missing off the back of my XR-3 meter. How can I obtain my serial number to check with the factory if it's still under warranty?
   i) Connect your XR-3 instrument to the PC, power it on, and open the FlashUpdate or MeterMaid program. The serial number of the connected unit will be displayed in FlashUpdate and MeterMaid if proper connection is established.
   ii) Turn the meter on. Then go to MENU, Versions, to see the base unit's serial number and the module's serial number, along with the loaded software versions.

e) While attempting to download or install the FlashUpdate application, the download just seems to stall out and not make any progress. What could be the cause of this?

    i) This issue is most likely caused by your anti-virus software or firewall blocking our program. Please temporarily disable your computer's anti-virus software and firewall so it doesn't interfere with the installation of the FlashUpdate and MeterMaid programs and the related USB drivers. If you have a hardware firewall, either stand-alone, or in a router, you must either modify the settings of the device to permit access to our program or you will have to entirely by-pass the router or other inhibiting hardware device. Also ensure that you are signed on as Administrator or have Administrator rights for Microsoft Windows.

    If your company has a strict policy and the firewall blocks any executable files, then please contact your IT department and ask for assistance. Applied Instruments is more than happy to speak to the IT department about a work-around solution.

17. <u>XR-3 Replacement Parts & Accessories</u>

Standard Accessories

Item Description	Part Number
Padded Cordura Flap for model XR-3	978-09390
Axle for Cordura Flap for model XR-3	976-09400
Threaded Cross Dowel Pin to secure module (qty 1)	940-89900
Thumb Screw (Tuner Lock-Down Screw) to secure module (qty 1)	940-89901
Battery door gasket for model XR-3	975-09340
Shoulder Strap	978-01843
Replacement Battery for model XR-3	742-00016
120-240VAC/15VDC AC Adapter and related line cord for model XR-3	990-08520
12VDC Vehicle Battery Charge Cord	967-20003
USB Data Transfer Cable	983-00002
Desktop kickstand for model XR-3	976-08430
Replacement Double Female F-Connector Barrel	715-01026
Signal splitter / Combiner (5-2150 MHz, single side power passing)	340-00012
Operation Manual for model XR-3 base instrument	078-00380
Operation Manual for model XR-3 Cable Air meter module	078-00400
Operation Manual for model XR-3 TS2 DBS satellite meter module	078-00390
Operation Manual for model XR-3 S2ACM VSAT sat meter module	078-00410

Optional Accessories

Item Description	Part Number
Hard Shell Protective Carrying Case	978-00008
NS-1 Handheld Broadband RF Noise Generator (5-2150 MHz)	NS-1

18. <u>Maintenance and Repairs</u>

Repair Services
In the event that a unit is damaged or otherwise not performing as specified, repair and maintenance service is available. Warranty repair will be performed within one year from the date of purchase at no charge. Beyond one year, charges for time, material, and handling will be incurred. Warranty repair includes defects in material and workmanship only. Each repair is done on a case by case basis and charged according to the technician's time and the components replaced. If unit is under warranty (standard warranty period is 12 months), charges do not apply unless instrument has been opened, abused, or exposed to moisture. Accidental damage or abuse repairs will always incur time, material, and handling charges. Shipping charges to our factory are the responsibility of the customer. Return shipping charges are also the responsibility of the customer (except for "in warranty" repairs for customers located within the USA).

If you need to return equipment for service, please call our factory at +1 (317) 782-4331 and ask for Tech Support or email us at info@appliedin.com and indicate REPAIR REQUEST in the subject line. To obtain a RMA number, you will first need to provide the following information:

-Your first and last name, company name, email address, telephone number, ship-to address, and bill-to address
-Model of instrument you have
-Version of software that you have loaded (if applicable)
-Serial number of the instrument
-Detailed description of the issue

The RMA number must be written on the outside of the shipping box and on all correspondence relating to that particular shipment. Please include details of the service requested. Ensure that the equipment is securely packed with proper cushioning material on all sides. The unit should be insured for its full value in case of damage or loss in transit. After the repair is completed, we will contact you for payment. If payment is not received within 60 days after contact is made, then the repaired equipment will become the property of Applied Instruments.

Version Updating
As our product lines are refined and features and performance are enhanced, we will upgrade older units at a nominal cost when possible. Shipping charges are additional. Contact us at +1 (317) 782-4331 for price and schedule if you are interested in having a unit updated.

Calibration
Periodic calibration of modules may be necessary to ensure that the unit is operating within the original factory specifications. A standard calibration charge will be incurred.

19. <u>Specifications</u>

SPECIFICATIONS
Frequency Range...5-1000 MHz
Tuning Resolution...Standard channel spacing or 125 kHz increments
Signal Level Range......................................-40 to +60 dBmV (-89 to +11 dBm)
                                                                    (+20 to +120 dBµV)
RF Level Accuracy.......................................+/- 1.5 dB typical
Compatible Analog Signal Formats..............NTSC, PAL, SECAM
Compatible Digital Signal Lock Formats......8VSB (ATSC A/53)
                                                                    64QAM, 256QAM (ITU-T J.83, Annex B)
Nominal Impedance......................................75 Ohm
LNA/Pre-Amp Power....................................13, 18 VDC
RF Connector ....Type F-female barrel, field replaceable
Warranty...12 month limited
Specifications subject to change without notice.

WARRANTY

The Applied Instruments XR-3 is warranted against defects in materials and workmanship for a period of twelve months. Applied Instruments agrees to repair or replace any assembly or component found to be defective under normal use during this period. Our obligation under this warranty is limited solely to repairing the instrument proven to be defective within the scope of the warranty when returned to the factory. Transportation to the factory is to be prepaid by the customer. Authorization (RMA#) by Applied Instruments is required prior to shipment.

Applied Instruments assumes no liability for secondary charges or consequential damages and, in any event, Applied Instruments' liability for breach of warranty under any contract shall not exceed the purchase price of the instrument shipped, and against which a claim is made.

Any application recommendation made by Applied Instruments for the use of its products is based upon tests believed to be reliable, but Applied Instruments makes no guarantee of the results to be obtained. This warranty is in lieu of all other warranties, expressed or implied, and no representative or person is authorized to represent or assume for Applied Instruments any liability in connection with the sale of our products other than that set forth herein.

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APPLIED INSTRUMENTS, INC.
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